THE PROPOSED HARRY GWALA MASSIFICATION IRRIGATION PROJECT LOCATED WITHIN WARD 8 OF THE UMZIMKHULU LOCAL MUNICIPALITY (KWASENTI & DRIEFONTEIN SITES)

DRAFT BASIC ASSESSMENT REPORT

Reference Number: DC43/0016/2021

NOVEMBER 2021

PROJECT APPLICANT:

rural development & land reform
Department:
Rural Development and Land Reform
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF RURAL DEVELOPMENT AND LAND REFORM
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DETAILS OF THE INDEPENDENT ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

THE REPORT WAS COMPILED BY:

Environmental Assessment Practitioner:

Ms Prisantha Govender

Qualifications:

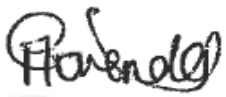
- BSc Honours (Environmental Management) – University of South Africa
- BSc (Environmental Science) – University of KwaZulu Natal
- Short Course in Environmental Impact Assessment Law
- Short Course in Environmental Law

Work Experience:

- October 2019 - Present: Environmental Assessment Practitioner at K2M Environmental
- October 2017- September 2018 - Intern at the Built Environment Training Academy (BETA)

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 (KZN DEDTEA). A record will be kept of all comments received from Interested and Affected Parties (I&APs) and will be submitted in the Final Basic Assessment Report to KZN DEDTEA in the form of a Comments and Responses Report.



November 2021

Ms. Prisantha Govender
K2M Environmental (Pty) Ltd

Date

THE REPORT WAS REVIEWED BY:

Environmental Assessment Practitioner:

Mr Gert Watson

Qualifications:

- B.Art. et. Scient. (Planning) - University of Potchefstroom
- Advance Project Management (Project Management Body of Knowledge Methodology)
- IEMA Approved Environmental Impact Assessment Course: The National Environmental Management Act Regulations – A Practical Approach
- IEMA Approved Environmental Auditors Course

Work Experience:

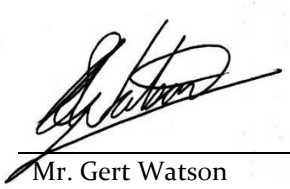
- 2009- Present: Director for K2M Environmental
- 2005- 2009: Senior Environmental Consultant for K2M Environmental (Durban Office)
- 2002- 2005: Environmental Consultant for K2M Technologies (Rustenburg Office)

Expertise to undertake Environmental Impact Assessments:

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 10 years.

Independence:

I, Gert Watson 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 (KZN DEDTEA). A record will be kept of all comments received from Interested and Affected Parties (I&APs) and will be submitted in the Final Basic Assessment Report to KZN DEDTEA in the form of a Comments and Responses Report.



November 2021

Mr. Gert Watson
K2M Environmental (Pty) Ltd
Director

Date

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1 BACKGROUND INFORMATION

1.1 INTRODUCTION AND BACKGROUND

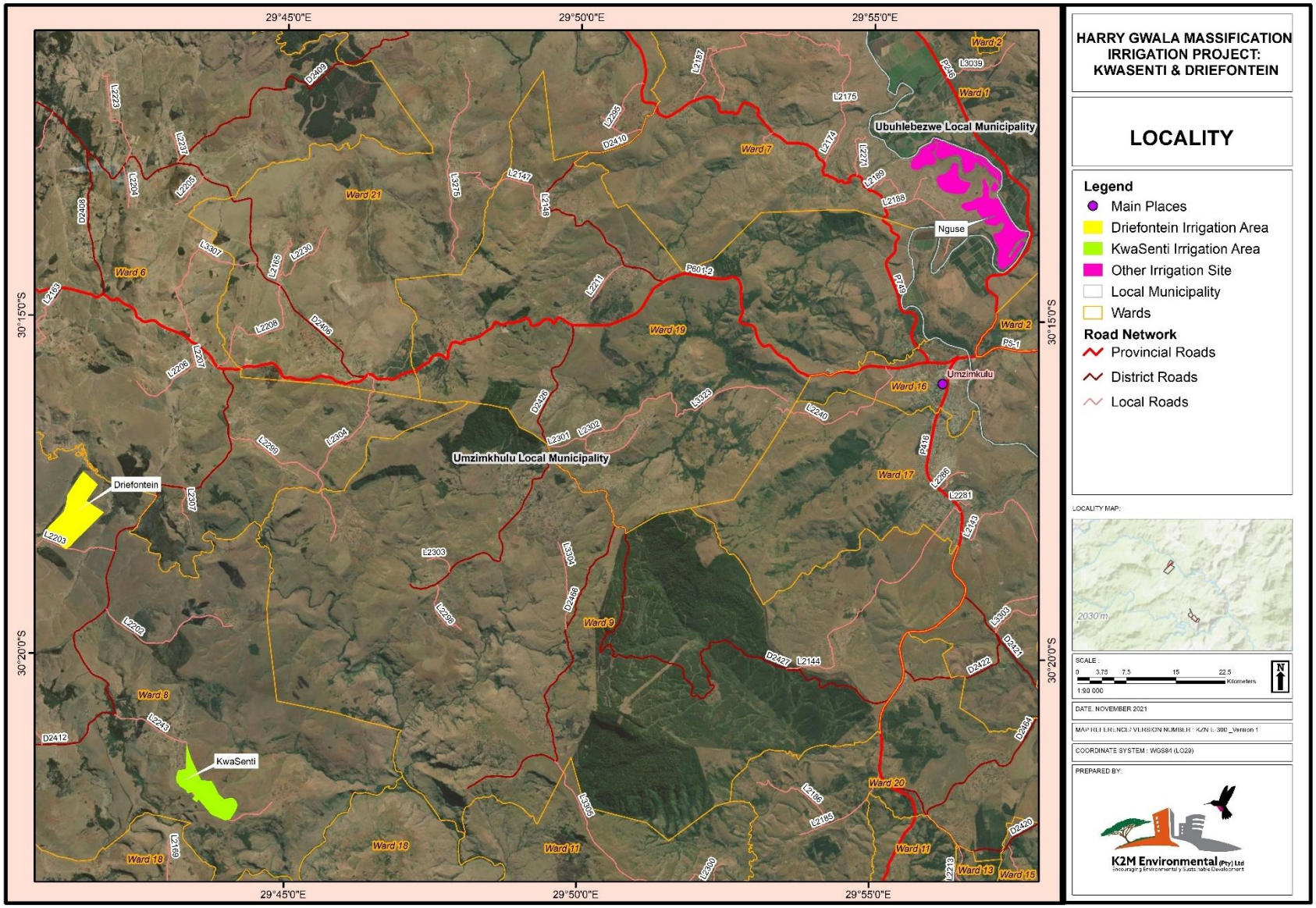
The Department of Rural Development and Land Reform (DRDLR) has identified three irrigation projects to be implemented in the uMzimkhulu Local Municipality. The objective of the proposed project is to provide irrigation infrastructure to the identified sites which in turn will stimulate economic transformation in these communities. The three sites identified for irrigation within the uMzimkhulu Municipality include Nguse, Driefontein and KwaSenti. Currently, all three of the sites do not have existing irrigation infrastructure.

The Applicant, who is the Department of Rural Development and Land Reform (DRDLR), appointed FMA Engineers to undertake the Feasibility Study for the Design and Construction of the Harry Gwala Massification Irrigation Project with the uMzimkhulu Local Municipality. Subsequently, FMA Engineers appointed K2M Environmental (Pty) Ltd as the independent Environmental Assessment Practitioner (EAP), to undertake the Environmental Impact Assessment for the proposed project. This Basic Assessment Report related to the proposed massification irrigation project located on the KwaSenti and Driefontein sites.

The KwaSenti and Driefontein sites are located approximately 23.33km west of the uMzimkhulu town and is located with Ward 8 of the uMzimkhulu Local Municipality. Both sites are currently being utilised for agricultural purposes and livestock grazing. At the KwaSenti site, the cooperatives are currently farming maize and beans; and the Driefontein site, the farmers currently have 100 ha of maize under production. It should be noted that KwaSenti and Driefontein farming co-operatives were dependent on rainfall for all their current agricultural activities, therefore mostly farming in Summer which is the rainy season.

The locality map of the KwaSenti and Driefontein project areas in relation to the Municipal Wards is illustrated in Map 1.1 below and is attached as **Appendix B**. The map also depicts the Nguse site which is located within Ward 7 of the uMzimkhulu Municipality.

Map 1.1: Project Area



1.2 ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS

The Environmental Impact Assessment Regulations of 2014 (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 (KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs) for activities listed in Government Notices R324, R325 and R327. Table 1.1 below identifies the activities that has been triggered for the proposed development.

Table 1.1: Triggered EIA Listed Activities

Activity No.	Description of Activity	Relevance to Project
Activity 12 of Listing Notice 1	The development of – (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 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 - (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such activity occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures be removed within 6 weeks of the commencement of	The proposed development will entail the construction of infrastructure with a physical footprint of 100m² within a watercourse 32m of a watercourse, particularly within the Driefontein site.

	development and where indigenous vegetation will not be cleared.	
Activity 27 of Listing Notice 1	The clearance of an area of 1 hectare of more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for – (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	This activity was initially applied for, however, the proposed areas of irrigation are existing croplands with no indigenous vegetation.
Activity 14 of Listing Notice 3	The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (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 has been adopted, 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>** vii. Critical biodiversity areas or ecological support areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;	The proposed development will entail the construction of infrastructure within a watercourse and within 32m of a watercourse within an ESA and CBA: Optimal Area at the Driefontein site.

1.3 TERMS OF REFERENCE

Regulation 19 of the Environmental Impact Assessment Regulations of 2014 determines that a Basic Assessment Procedure must be followed for all activities listed in Government Notice R327 and R324. K2M Environmental (Pty) Ltd has been appointed as the independent Environmental Assessment Practitioner (EAP) and will therefore be responsible for the Basic Assessment procedures concerned with the proposed development as specified in Sections 19 and 20 of Government Notice R326 promulgated in terms of Section 24(5) of the National Environmental Management Act, (Act No. 107 of 1998), as amended.

K2M Environmental has submitted the completed Application Form for Environmental Authorisation to the KwaZulu-Natal Department of Economic Development, Tourism and Environmental Affairs (KZN DEDTEA) (see **Appendix C1**). KZN DEDTEA registered the project with **Reference Number: DC43/0016/2021** in their letter **(Appendix C2)** dated 21st September 2021. This reference number is to be quoted in all correspondence with KZN DEDTEA for ease of reference.

1.4 APPROACH AND METHODOLOGY

The overall approach to this assignment included the following activities:

- Apply for Environmental Authorisation to KZN DEDTEA regarding the Harry Gwala Massification Irrigation Project – KwaSenti and Driefontein Site.
- A detailed analysis of the proposed development, the area where it will take place, and the identification of potential impacts.
- Identification of specialist input required and the facilitation of the studies.
- All legislative requirements in terms of the EIA Regulations and to provide KZN DEDTEA with sufficient information to take a decision regarding the development.

1.5 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to the EIA:

- The environmental authorization application has been initiated during the conceptual design and planning stages of the development.

- It is assumed that the information provided by the various specialists and project engineers are accurate.
- The EIA project team is of the view that an adequate level of information is 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.

1.5.1 Baseline Information

Sufficient baseline information for the Draft Basic Assessment Report was available from a variety of desktop data sources, reports and relevant data bases. This was supplemented by site visits to the project area and inputs from other professionals involved in the project.

1.5.2 Time Constraints

There were no time constraints and sufficient time was available for the Basic Assessment Process.

1.6 REPORT STRUCTURE

The report is structured as follows:

Section 2 consists of a summary description of the proposed activity.

Section 3 provides a description of the environment that may be affected by the activity.

Section 4 consists of a summary of the potential **impacts of the proposed activity** on the environment.

Section 5 provides describes the **public participation** process conducted during the scoping phase.

Section 6 provides recommendations and opinion of the Environmental Assessment Practitioner

Supporting documents, reports, correspondence and other relevant information are contained in various Appendixes attached to this report. Table 1.2 has been included to assist the reader to find the relevant sections in the report.

Table 1.2: 2014 EIA Requirements for the Basic Assessment Report

Information Required	Document Section
Details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	Just after cover page, **Appendix I** & **Appendix J**
The location of the activity, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (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
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- (i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Section 2.1 & **Appendix D1**
A description of the scope of the proposed activity, including (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure;	Sections 1.2 & 2.3
A description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	Section 1.7
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 5.3.2
A motivation for the preferred site, activity and technology alternative;	Section 2.5
A full description of the process followed to reach the proposed preferred alternative within the site, including: (i) details of all the alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (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; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (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;	Sections 2.5, 3, 5 & 6.

(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives; (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; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	
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- (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;	Section 5
An assessment of each identified potentially significant impact and risk, including- (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 avoided, managed or mitigated;	Section 5
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 report;	Sections 3.6, 3.7, 3.8 & 3.9
An environmental impact statement which contains- (i) a summary of the key findings of the environmental impact assessment; (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 (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 5.3.1 and 2.3.2
Based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Not Applicable
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 authorization;	Section 7
A description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 1.5

A reasoned opinion as to whether the proposed activity should or should not be authorized, and if the opinion is that it should be authorized, any conditions that should be made in respect of that authorization;	Section 7
Where the proposed activity does not include operational aspects, the period for which the environmental authorization is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalized;	Not Applicable
An undertaking under oath or affirmation by the EAP in relation to: 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	Just after cover page
Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Not Applicable
Any specific information that may be required by the competent authority; and	Not Applicable
Any other matters required in terms of section 24(4)(a) and (b) of the Act.	Not Applicable

1.7 APPLICABLE LEGISLATION, POLICIES AND GUIDELINES

In addition to the Environmental Impact Assessment Regulations of 2014 (as amended), Table 1.3 below indicates other applicable legislation that has been considered in the preparation of this Draft Basic Assessment Report.

Table 1.3: Applicable Legislation

Legislation	Relevance to the development
Constitution of the Republic of South Africa (Act No. 108 of 1996)	All environmental aspects should be interpreted within the context of the Constitution. The Constitution has enhanced the status of the environment by virtue of the fact that environmental rights have been established in terms of Section 24.
National Environmental Management Act (No. 107 of 1998) and the 2014 EIA Regulations (as amended)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) is South Africa's overarching framework for environmental legislation. Section 24(5) of NEMA stipulates that certain "listed activities" require environmental authorisation by way of either a Basic Assessment (BA) or a full Scoping and Environmental Impact Assessment (SEIA) as defined in the Listing Notices. The proposed project requires a Basic

	Assessment to be conducted in terms of the 2014 EIA Regulations, as amended.
National Environmental Management: Biodiversity Act (No. 10 of 2004)	The National Environmental Management: Biodiversity Act, 2004 provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA. This Act allows for the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources and the establishment and functions of the South African National Biodiversity Institute (SANBI).
National Water Act (No. 36 of 1998)	The National Water Act, 1998 is the fundamental law for managing South Africa's water resources. The NWA provides the legal basis upon which to develop tools such as the authorisation of water uses as defined in Chapter 4 of the NWA. Section 21 of the NWA lists water uses which can only be legitimately undertaken through the water use authorisation issued by the Department of Water and Sanitation (DWS).
KwaZulu-Natal Heritage Act (No. 4 of 1998)	This Act has been put into place to conserve, protect and conserve heritage resources within KwaZulu Natal. Documentation was submitted to AMAFA for their comment, however, till date no comments have been received from AMAFA.
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 (EMPr).
National Environmental Management: Air Quality Act and National Dust Control Regulations	Mitigation measures have been included into the EMPr which provides recommendations on how to manage pollution and dust during the construction phase.
Noise Regulations R2544	The EMPR provides recommendations on how to manage noise during the construction phase of the proposed development.
Occupational Health and Safety Act (No. 85 of 1993)	The contractor needs to manage his staff and crew in strict accordance with the Occupational Health and Safety Act in order to prevent injuries to the 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.
Polluters Pay Principal	The Polluters Pay Principal has been included into the preparation the EMPr.
uMzimkhulu Local Municipality Integrated Development Plan (2021/2022)	The proposed development is aligned with the municipal IDP as it will assist and contribute to the Municipality achieving its KPA Goal 3: Local Economic Development (LED) and Social Development.
uMzimkhulu Local Municipality Spatial Development Framework (2021)	The composite SDF Map has earmarked the KwaSenti and Driefontein site as being "threatened".

1.8 THE APPLICANT

The details of the applicant are as follows:

Applicant name: Department of Rural Development and Land Reform

Contact Person: Musa Khathi

Tel: 033 355 4300

Email: musa.khathi@drdlr.gov.za

Address: 188 Hoosen Haffejee Street, Pietermaritzburg, 3200

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

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: 086 622 7276
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

2.1.1 Co-ordinates

The tables below indicate the co-ordinates of the irrigation area at the KwaSenti and Driefontein sites as well as the proposed abstraction points.

Table 2.1: Co- ordinates of the KwaSenti and Driefontein irrigation area

	Latitude /Longitude	Degrees	Minutes	Seconds
KwaSenti	South	30°	22'	0.35"
	East	29°	43'	37.70"
Driefontein	South	30°	18'	0.078
	East	29°	41'	21.37"

Table 2.2: Co-ordinates of the Driefontein Abstraction Point

Latitude /Longitude	Degrees	Minutes	Seconds
South	30°	17'	16.87"
East	29°	41'	49.62'

Table 2.3: Co-ordinates of the Driefontein Pump Station

Latitude /Longitude	Degrees	Minutes	Seconds
South	30°	17'	24.42"
East	29°	41'	44.53'

2.1.2 21 Digit Surveyor General Code

Table 2.4 below indicates the 21-digit surveyor general code.

Table 2.4: Surveyor General Code

Property Description	21- Digit Surveyor Code
Portion 1 of the Farm Drie Fontein No.18168	NoESoooooooo1816800001
Remainder of the Farm Pilaas Fontein No. 18167	NoESoooooooo1816700000
Portion 1 of the Farm Expectation No.18185	NoESoooooooo1818500001
Remainder of the Farm Expectation No.18185	NoESoooooooo1818500000

2.2 ACTIVITY DESCRIPTION

2.2.1 Extent of Development

The KwaSenti and Driefontein sites are located approximately 23.33km west of the uMzimkhulu town and is located with Ward 8 of the uMzimkhulu Local Municipality. The total extent of the site at KwaSenti and Driefontein is approximately 109.75 ha and 149.81 ha, respectively.

2.2.2 Description of the proposed activity

The proposed project will entail the cultivation of a variety of crops for which irrigation infrastructure will be constructed in order to irrigate the crops. The total extent of the KwaSenti site is approximately 109.75 ha of which 80 ha is irrigable land and at the Driefontein site, the total extent of is 149.81 ha of which 130 ha is irrigable land.

A Preliminary Design Report was undertaken by FMA Engineers in November 2021 and is attached as **Appendix G**. The KwaSenti layout is based on two irrigation systems: drip irrigation and micro sprinkler irrigation. The terrain in KwaSenti is relatively steep, coupled by the characteristically low water potential of the area, would be better suited by these two irrigation systems while the Driefontein layout is based on

mainly three irrigation systems: the centre pivot, drip and micro irrigation systems. A description of each aspect of the proposed project is provided in the subsections below.

2.2.2.1 Crop Selection

Crops selection criteria included, amongst others, the suitability of the soil conditions and the suitable irrigation methods. The selected crops applicable to the three irrigation sites (Nguse, KwaSenti and Driefontein) include: White Maize, Yellow Maize, Dry Beans, Lucerne, Potatoes, Carrots, Spinach and Cabbage. Other suitable crops that were incorporated during the design, based on suitability, are Butternut, Sweet Potatoes, Tomatoes, Barley, Wheat or Macadamia Nuts.

2.2.2.2 KwaSenti Irrigation System Layout and Design

2.2.2.2.1 Abstraction

Further investigations at Preliminary Design stage revealed that the previously proposed abstraction point cannot be adopted owing to the high pumping head (See **Appendix D2** for Alternative Layout 1). It is proposed that further investigations be undertaken as part of the detailed design stage for the selection of the most suitable abstraction point for the scheme. As such, the water resources development process is considered to still be ongoing for KwaSenti.

2.2.2.2.2 System Irrigation Demand

A conservative irrigation design duty of 0.8l/s/ha has been adopted for the scheme for design purposes.

2.2.2.2.3 Drip Irrigation System

Drip irrigation systems shall cover 50 hectares of the total land area. The irrigable land in KwaSenti is characteristically steep and is best suited for the system. A gravity feeding system is proposed, to enable water to flow by gravity from the highest point of the scheme to all the irrigation blocks. Grains and vegetables can be farmed in these areas.

Drip irrigation systems will consist of head control units, main pipelines, submain pipelines, hydrants, manifolds, and lateral lines with dripper emitters. The drip irrigation systems are classified as low-pressure systems.

2.2.2.2.4 Microsprinkler Irrigation System

The microsprinkler irrigation system will cover about 30 ha of the total land area in KwaSenti.

To contribute towards a mixed farming enterprise, planting of high value crops such as macadamia, avocado, blueberries and citrus is highly recommended. These are allocated to specific areas in the scheme as a way of risk management with respect to offering diversified cash flow streams for the farming venture. Microsprinklers are most suited for production of fruit trees and are excellent for water conservation.

2.2.2.2.5 Irrigation Water Storage

It is proposed that two earth irrigation balancing dams with a capacity of a 7-day irrigation cycle be constructed for storage purposes. This shall serve to augment water reticulation over the vast expanse of the plot.

2.2.2.3 Driefontein Irrigation System Layout and Design

2.2.2.3.1 Abstraction

Water will be abstracted from the Little Ibisi 1 river which has an estimated 2.3ML/d flow at a 75% flow assurance and will be pumped directly into the irrigation system.

2.2.2.3.2 System Irrigation Demand

A conservative irrigation design duty of 0.8l/s/ha has been adopted for the scheme. It should be noted that the final allowable demand for the scheme shall be determined by the Water Use License (WUL).

2.2.2.3.3 Pump Station

One main pump station is proposed to be located at co-ordinates provided in Table 2.3 above. The design caters for a pumping head of 60m. It is proposed that three pumps placed in parallel be provided with intent to manage demand over the growing season. Booster pump stations shall be utilised to the high pressure centre pivot systems.

Cognisance has been given to the flood line delineation. This shall impact on the exact location of the pump station and its construction for Driefontein.

2.2.2.3.4 Centre Pivot Irrigation System

The centre pivot system shall cover 68 ha of the total extent of the Driefontein site. The centre pivot system is proposed for the harsh terrain areas of the Driefontein site. As illustrated in preferred layout plan (see Map 2.2 and **Appendix D1**), the pivots are positioned at the relatively flat top part of the field where landscaping earthworks requirements are minimal.

The six pivots have an average area of 11 ha each, thus allowing the farmers to grow different crops e.g. maize, wheat, barley etc. Owing to the number of centre pivots, it also becomes easier to stagger the production of crops in a way that makes farmers' products available throughout the marketing season. This makes it possible for planning the time for market entry in order to realise price premiums based on supply and demand in the market.

The centre pivot system shall consist of one single sprayer or sprinkler pipeline of 125mm diameter composed of high tensile galvanised light steel or aluminium pipes. This shall be supported above ground by towers that rotate on wheels, with long spans, steel trusses and/or cables. One end of the line shall be connected to a pivot mechanism at the centre of the command area, with the entire line rotating about the pivot. The application rate of the water emitters varies from lower values near the pivot to higher ones towards the outer end by using small and large nozzles along the line accordingly.

Water emitters shall be computerized sized and spaced for high uniformity of application. They shall be mounted on the pipeline at spacings of 1.5 to 6m according to the type and coverage of the sprayer emitters, operating when the system is in motion.

2.2.2.3.5 Drip Irrigation System

Drip irrigation systems shall cover 11 ha of the total land area. In the proposed layout (Map 2.2 and **Appendix D1**) it is positioned in the low lying areas of the Driefontein scheme since it is suited for undulating terrain. It is more suitable for small areas where it is not economical to install centre pivots because of the irregularity of the shape of the land. The drip irrigation systems are classified as low-pressure systems and can be combined easily with the centre pivot system on the Driefontein plot.

2.2.2.3.6 Microsprinkler Irrigation System

The micro-sprinkler irrigation system shall cover about 40 ha of the total land area. Micro irrigation systems can be installed in tight, undulating terrain which is why they are proposed for these lower lying areas in Driefontein. Based on the visit to site the lower lying area tend to be marginal in nature and would be better served by an irrigation system that is versatile for such areas.

2.2.2.3.7 Irrigation Water Storage

It is proposed that one earth irrigation balancing dam with a capacity of a 7-day irrigation cycle be constructed for storage purposes. This shall serve to augment water reticulation over the vast expanse of the plot. This storage facility shall be used to irrigate low lying drip and micro irrigation systems using gravity.

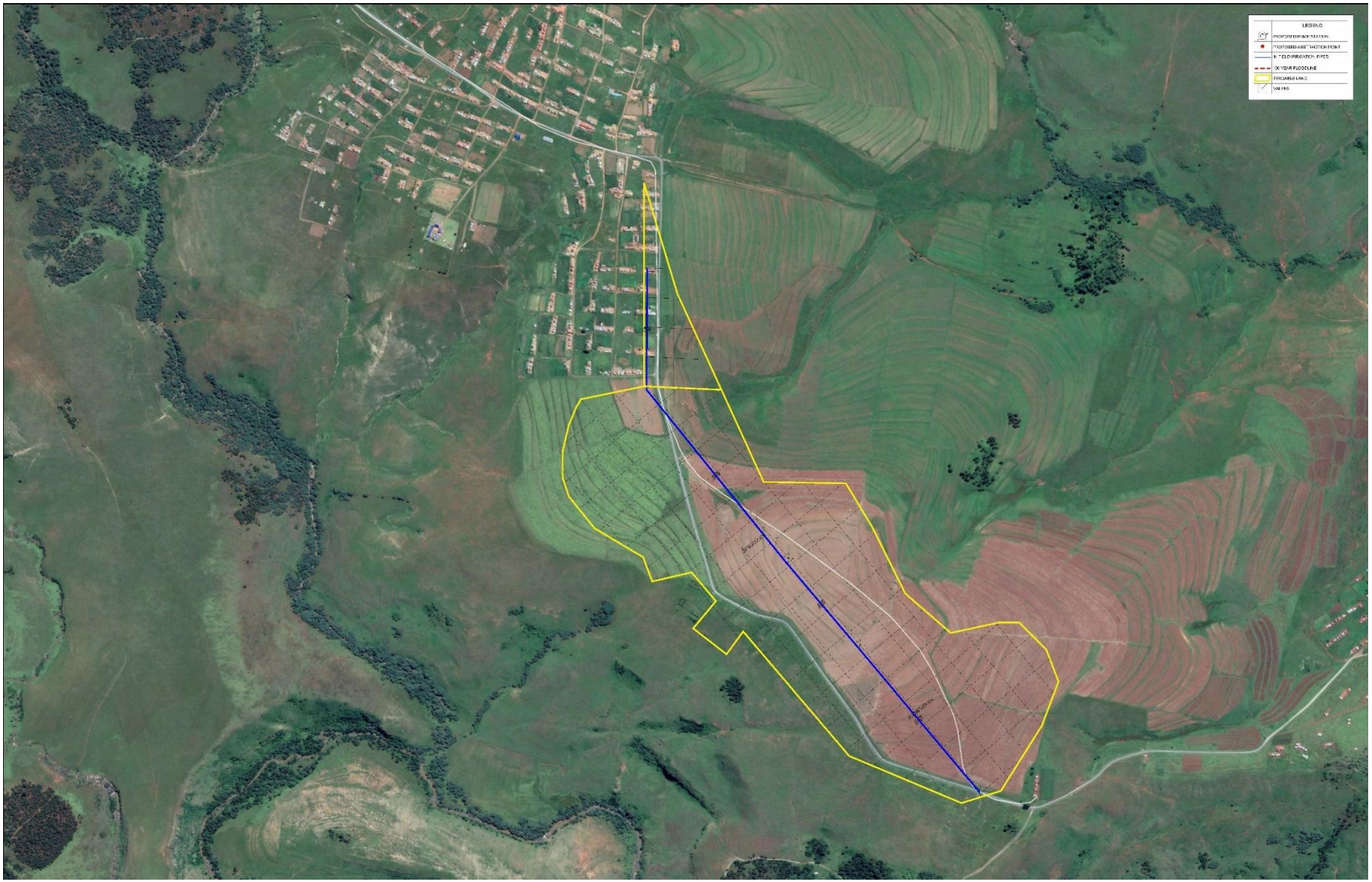
2.2.2.4 Preferred Irrigation Layout and Environmental Features

The preferred Irrigation Layout Plans KwaSenti and Driefontein are illustrated in Map 2.1 and 2.2, respectively. The irrigation systems that will used within the KwaSenti site include Drip, Microsprinklers Irrigation Systems and for the Driefontein site, in addition to Drip and Microsprinkler Systems, Centre Pivot Systems will also be used. The positioning and location of these systems can be seen in Map 2.1 and 2.2 in addition to the proposed pumpstation and abstraction point for Driefontein.

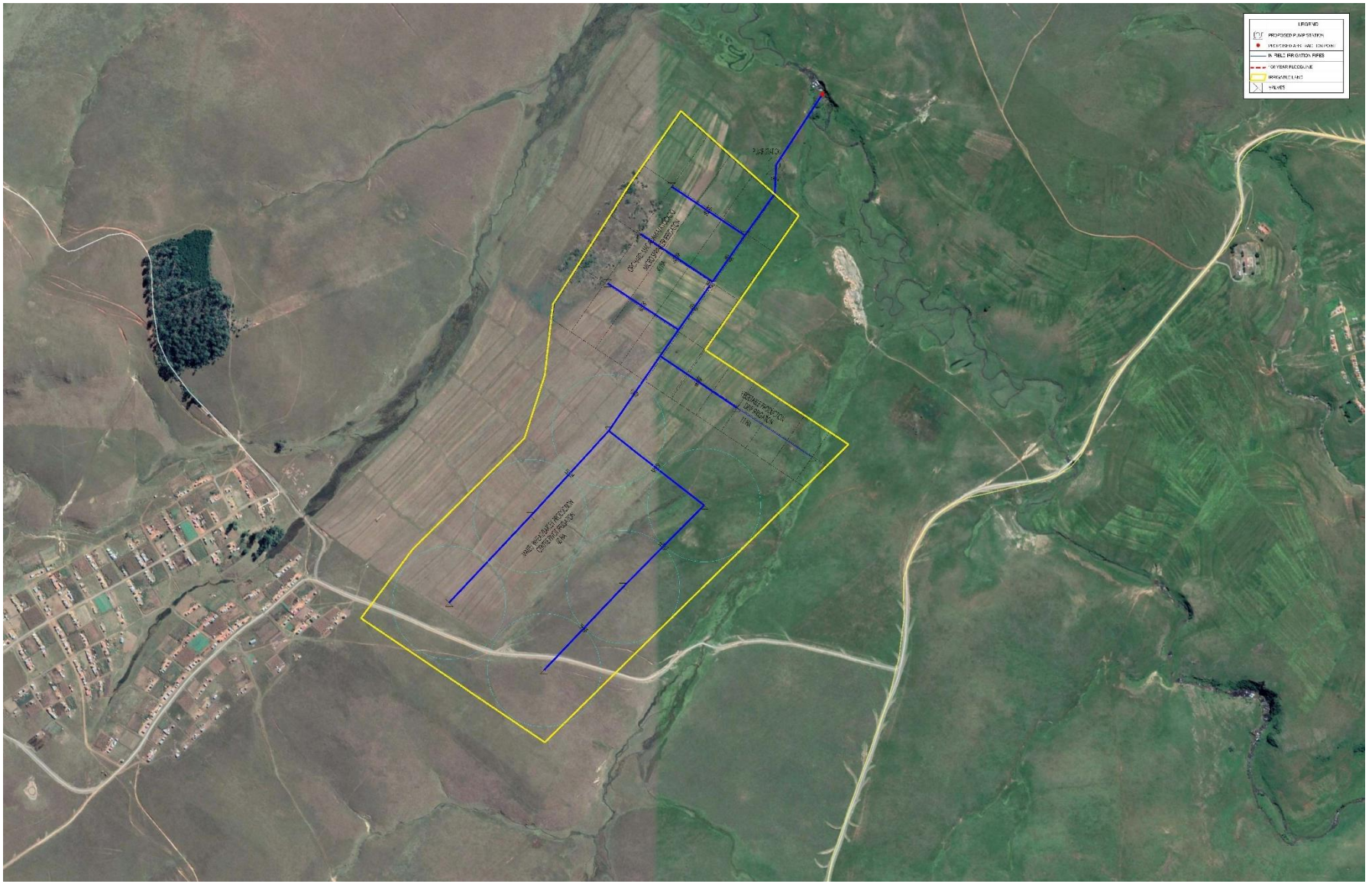
Map 2.3 and 2.4 depicts the environmentally sensitive areas within the KwaSenti and Driefontein sites respectively. The environmental features that are illustrated include the 1:100 year floodline, unchanneled valley bottom wetlands, seepage areas, drainage lines and CBA Optimal Areas as well as Ecological Support Areas (ESAs) at Driefontein (see **Appendix E1**).

Map 2.5 and 2.6 further depicts the environmental features within each of the sites together with the preferred irrigation layouts. It can be seen at the KwaSenti site, that the proposed irrigation pipelines do not encroach into any environmentally sensitive features, however a portion of the unchanneled valley bottom wetlands and seepage areas are located on the periphery of the irrigation area. At the Driefontein site, it can be seen that the pipeline from the abstraction point to the pump station as well as the pump station are located with the floodplain which is also classified as a CBA: Optimal Area as well as an ESA (see **Appendix E2**).

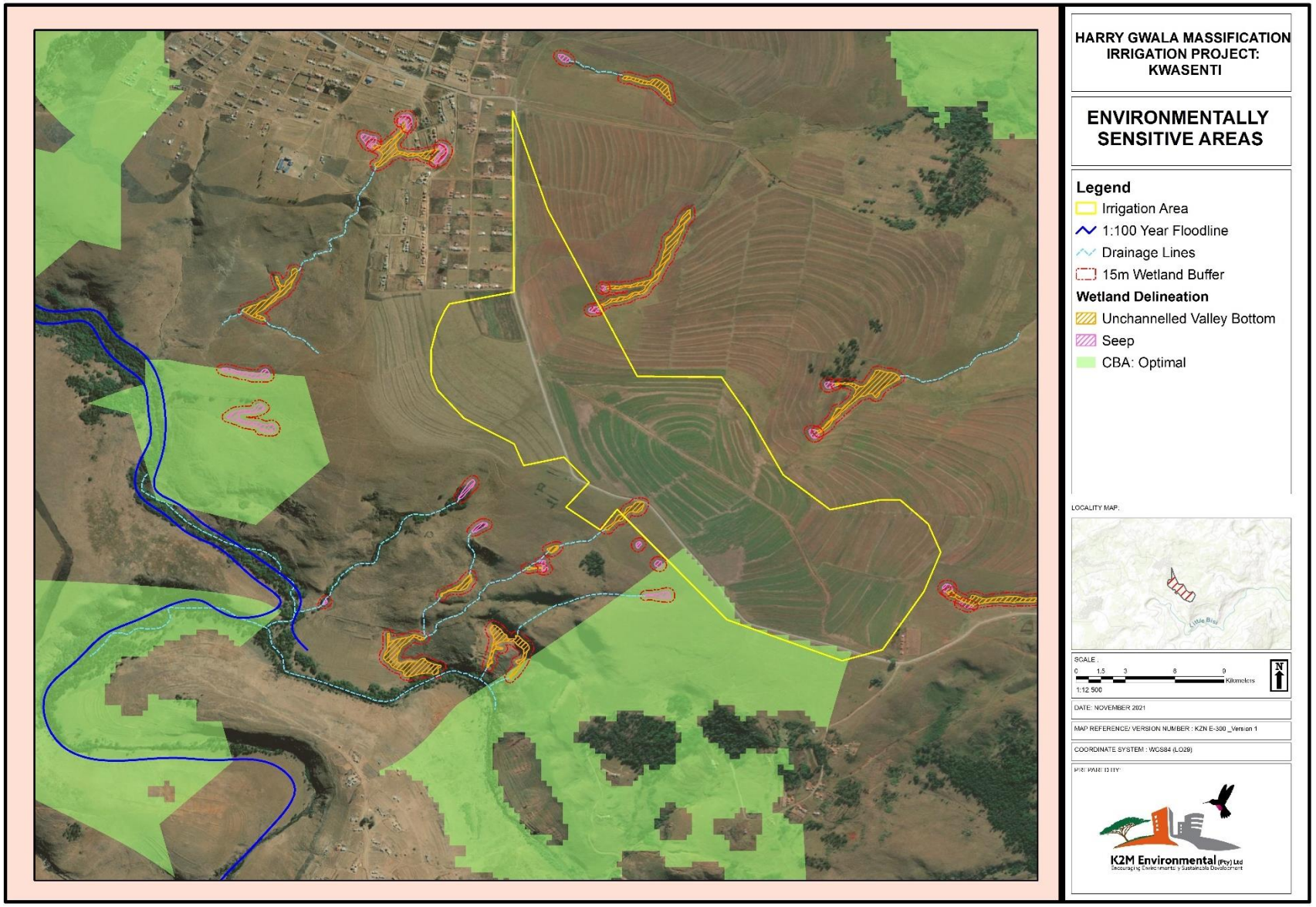
Map 2.1: Preferred Irrigation Layout for the KwaSenti Site



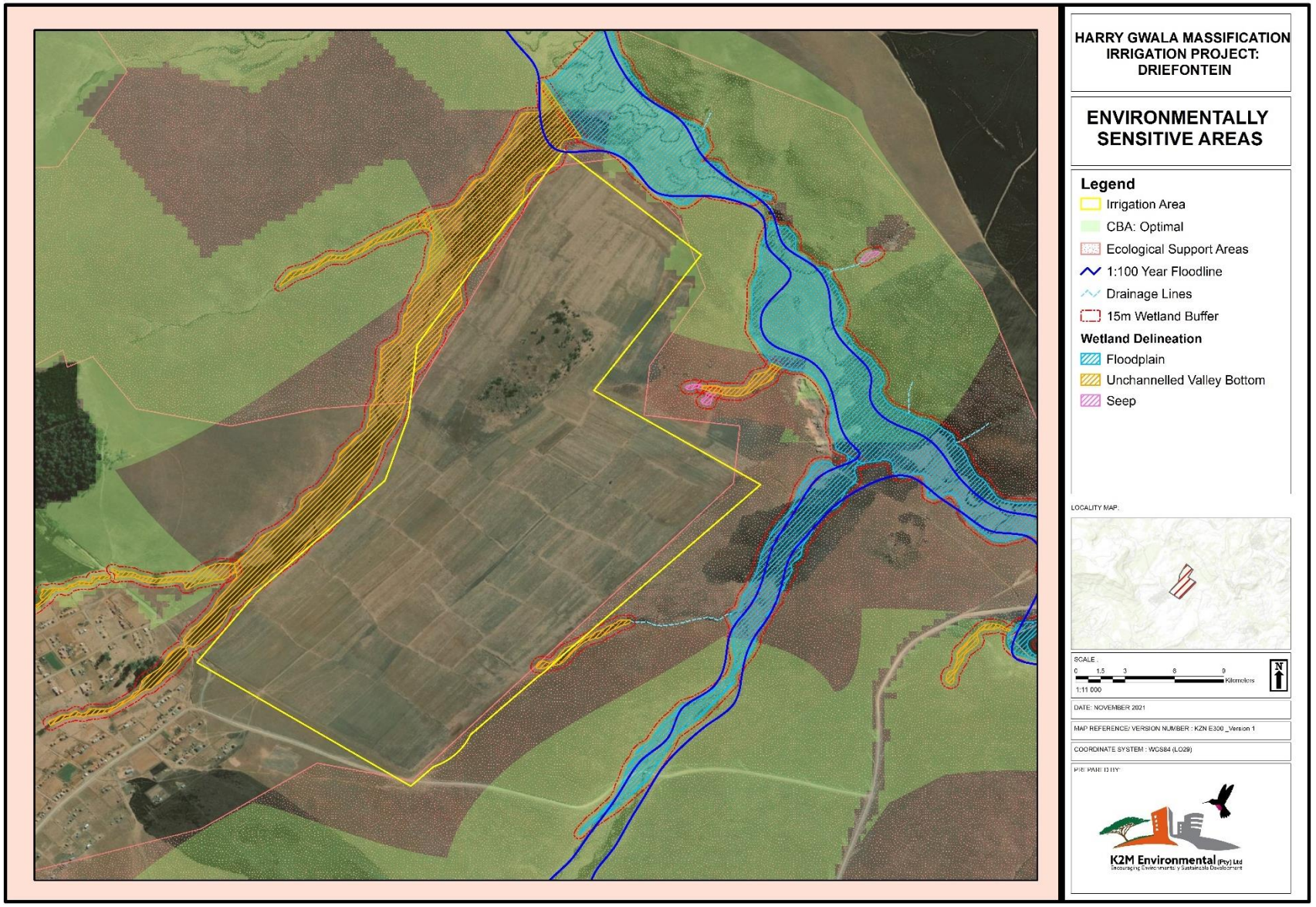
Map 2.2: Preferred Irrigation Layout for the Driefontein Site



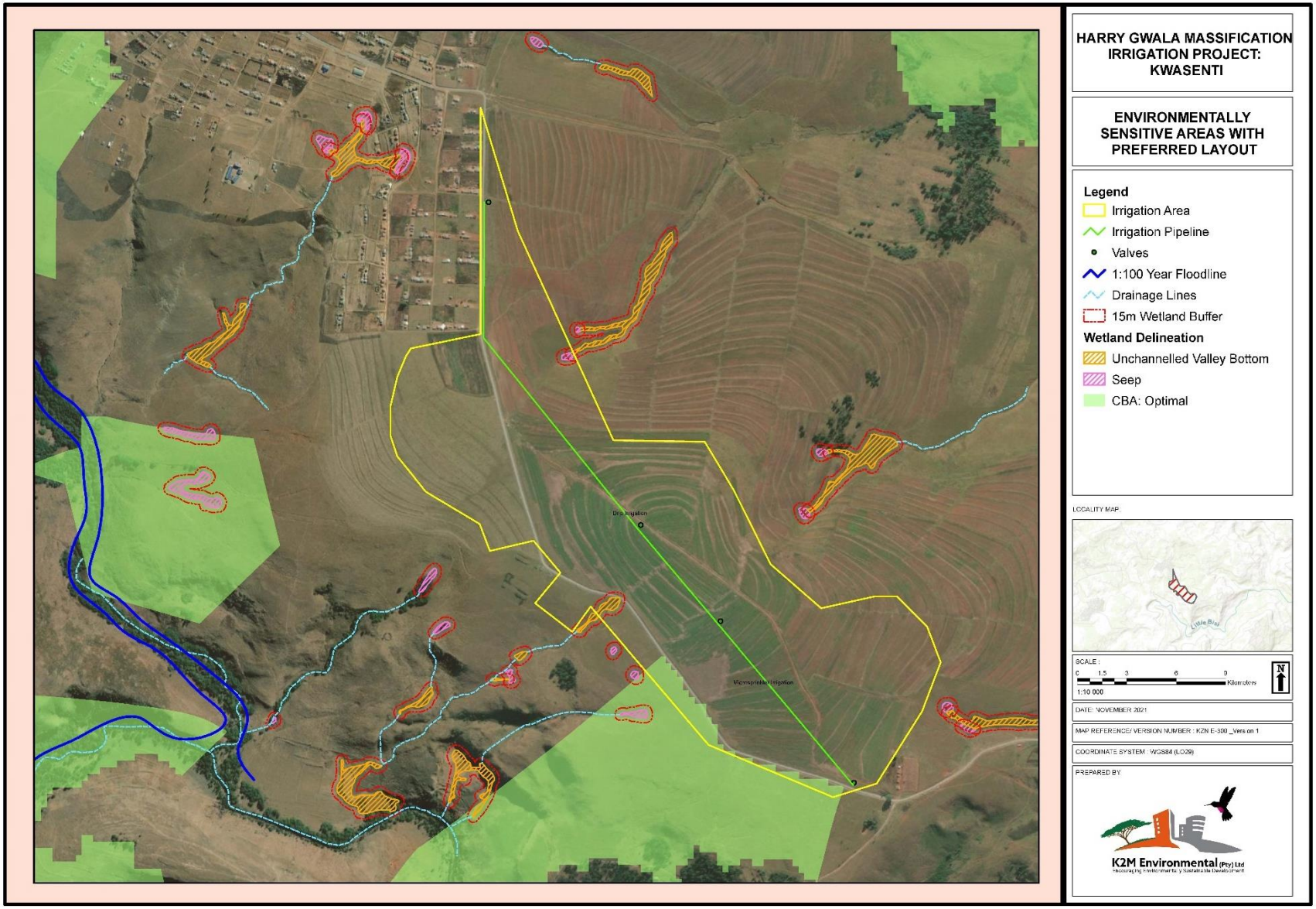
Map 2.3: Environmentally Sensitive Areas at the KwaSenti Site



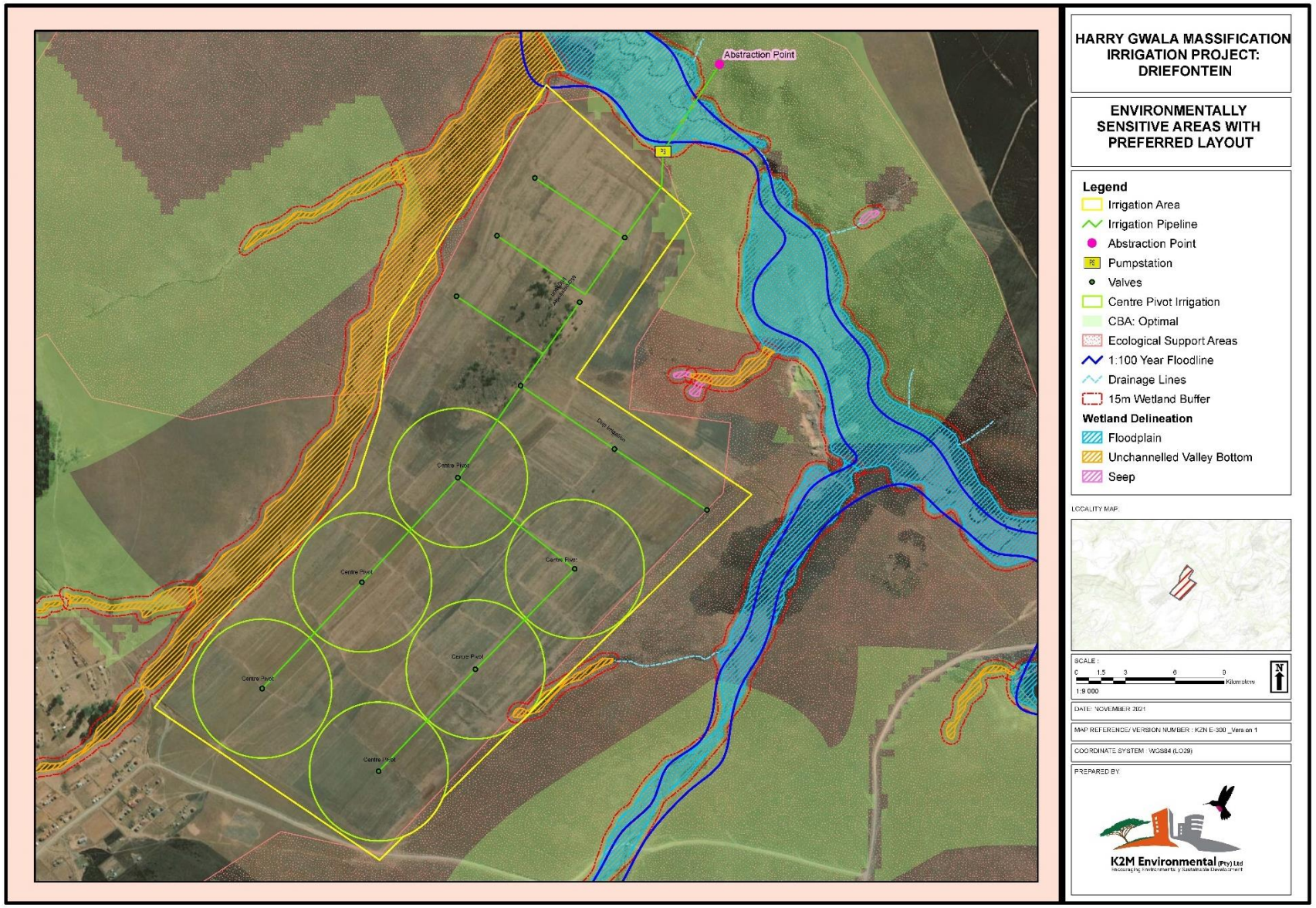
Map 2.4: Environmentally Sensitive Areas at the Driefontein Site



Map 2.5: Environmentally Sensitive Areas with Preferred Layout at the KwaSenti Site



Map 2.6: Environmentally Sensitive Areas with Preferred Layout at the Driefontein Site



2.2.3 Access to the proposed development

To access the Driefontein and KwaSenti Sites travel west on the P601-2 from uMzimkhulu town for approximately 24.27km before turning left onto the D2412. Travel on this route for approximately 7.17km before turning right onto the L2203. The Driefontein site can be accessed approximately 2km west along this route. To access to the KwaSenti Site, travel for approximately 24.27km west from uMzimkhulu town. Thereafter turn left on to the D2412, keep on this route for approximately 12.6km before turning left onto the L2243. The L2243 runs along and through the site after travelling for approximately 2.30km east.

2.3 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. There will only be one phase in terms of construction, which will be completed from start to finish in one phase.

2.4 CONSIDERATION OF ALTERNATIVES

Alternatives are seen as different means of meeting the general purpose and need of a proposed activity. Alternatives could include, amongst others, the following:

- 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.

2.4.1 Location Alternatives

The location for the project area was identified by the Applicant (the Department of Agriculture and Land Reform) for the proposed massification irrigation project prior to commencement with the EIA Process.

2.4.2 Layout Alternatives

An initial irrigation layout plan was prepared for the KwaSenti and Driefontein irrigation areas by FMA Engineers in March 2021 and is referred to as Alternative Layout 1 hereafter (see **Appendix D2**). At the time of the preparation of the layout, specialist input was not available. Alternative layout 1 was then amended in November 2021 to include specialist input such as the delineated wetlands and the 1:100 year floodline and is referred to the Preferred layout herein (**Appendix D1**).

The advantages and disadvantages of the Preferred and Alternative Layout is tabulated below.

	Advantages	**Disadvantages**
	KwaSenti	
Preferred Layout (**Appendix D1**)	Proposes irrigation area is on existing croplands.	
	No pipeline encroachment on environmental features.	
Alternative Layout 1 (**Appendix D2**)	Proposes irrigation area is on existing croplands.	Pipeline from the Abstraction Point to the irrigation area encroaches onto wetlands, drainage lines and CBA: Optimal Areas.
	Driefontein	
Preferred Layout (**Appendix D1**)	Proposes irrigation area is on existing croplands.	Pipeline from the Abstraction Point to the to the proposed pump station are located with the floodplain which is also classified as a CBA: Optimal Area as well as an ESA.
	The pipeline from the Abstraction Point to the pump station cover a smaller extent.	
Alternative Layout 1 (**Appendix D2**)	Proposes irrigation area is on existing croplands.	The pipeline from the pump station to the reservoir disturbs a greater extent of the floodplain.

2.4.3 Scheduling Alternatives

The detailed time frame for implementation and completion of the proposed project is not currently available. No scheduling alternatives were therefore considered.

2.4.4 "No-go" alternative

Should the proposed irrigation project not go ahead, the site will continue to be used for sugarcane plantation and no abstraction of water from the Little Ibisi River will take place. There will also be a loss of potential community livelihood and in turn loss of potential economic opportunities associated with the agricultural project.

3 SITUATION ASSESSMENT OF PROJECT AREA AND AFFECTED ENVIRONMENT

3.1 PHYSICAL AND LANDSCAPE CHARACTERISTICS OF THE SITE

According to the Municipal SDF, the topography land of uMzimkhulu Local Municipality ranges from flat to gentle rolling slope to hilly and ragged terrain across the municipality.

3.2 CLIMATE

The climate zone of the project areas is defined as subtropical. The climate category can be described as humid and warm to hot, especially during summer. The climate of the project areas is favourable for good yields of a wide range of adapted crops and a year-round growing season., There is a moderately restricted growing season due to low temperatures and severe frost.

3.3 DRAINAGE AREAS

The Kwasenti site is situated on a watershed with no significant water courses that would necessitate floodline calculations. The proposed abstraction point is from the Little Bisi River, 1.3km south west of the project area. The catchment area for the Little Bisi River and one tributary will have an effect on the proposed abstraction point.

The Driefontein project area is situated on the slope of a local high area. The abstraction point for the irrigation is proposed to be from the Upper Bisi River, which is about 1.2km east of the project area. The catchment area for the Upper Bisi River and one tributary will have an effect on the proposed abstraction point. The site does not have any significant water courses that would necessitate floodline calculations.

3.4 GEOLOGY AND SOILS

3.4.1 Generalised Land and Soil Characteristics

The generalised characteristics of the KwaSenti and Driefontein sites are provided in Table 3.1.

Table 3.1: Generalised Land and Soil Characteristics for KwaSenti and Driefontein

Geological Aspect	Characteristics
Geology	Mainly shale
Terrain	Flat
Soil Erosion and Hazard rating	Limited Risk

3.4.2 Soil Forms

3.4.2.1 KwaSenti

A total of 6 soils forms are found within the KwaSenti site. These include Avalon, Bainsvlei, Bloemdal, Hutton, Pinedene and Shortlands. The Bloemdal soil form may pose a limitation due to the rockiness observed.

3.4.2.2 Driefontein

At the Driefontein site, a total of 5 soil forms occur, namely Avalon, Bainvlei, Bloemdal, Katspruit, Pinedene. The Bloemdal soil form may pose a limitation due to the rockiness observed and the Katspruit soil form may pose a limitation for crops that are not resilient to prolong periods of wetness.

3.5 EXSITING AND SURROUNDING LAND USES

Both sites are currently being utilised for agricultural purposes. At the KwaSenti site, the cooperatives are currently farming maize and beans; and the Driefontein site, the farmers currently have 100 ha of maize

under production. It should be noted that KwaSenti and Driefontein farming co-operatives were dependent on rainfall for all their current agricultural activities, therefore mostly farming in Summer which is the rainy season. Figure 3.1 below illustrates the Existing and Surrounding uses at the KwaSenti and Driefontein sites.

Figure 3.1: Existing Land Uses

Driefontein

KwaSenti

Source: Google Imagery, 2021

3.6 WETLAND ASSESSMENT

A Wetland and Vegetation Assessment Report was undertaken by The Biodiversity Company in November 2021 and is attached as **Appendix F1**. The site assessment was conducted during the week of 25th to 29th October 2021, which would constitute a wet season survey. This cultivation area (area for irrigation) together with the 500 m regulated area assigned to its outer edge are referred to as the Area of Influence (AOI).

3.6.1 Classification and Extent of Delineated Wetlands

A total of 12 individual wetland hydrogeomorphic (HGM) units were identified and delineated within the KwaSenti and Driefontein sites as defined by 500 m regulated area applied to the cultivation area. Seven HGM units were identified and delineated for the KwaSenti AOI, whereas five HGM units were delineated for the Driefontein AOI. Further to this, a network of drainage lines was also identified and delineated for the areas.

The wetlands were grouped into one of five main HGM types, namely floodplains, unchanneled valley bottoms and seeps. It was then necessary to increase the resolution of the assessment in a way that was both intuitive and ecologically meaningful to prioritise wetlands in lieu of the planned reserve determination.

To do this the wetlands were further classified under two criteria namely ecological state and degree of saturation. In terms of ecological state, known PES ratings and current fieldwork results were used to classify each wetland as either (1) intact (largely natural to moderately modified) or (2) disturbed (largely modified to seriously modified). Lastly all wetlands were further classified, with each wetland being classified as either (a) perennial (permanently to seasonally inundated) or (b) non-perennial (seasonally to temporarily inundated). This yielded four main wetland groups into which each of the three main HGM types were classified namely (1a) intact-perennial, (1b) intact-non-perennial, (2a) disturbed-perennial and (2b) disturbed-non-perennial. This classification system yielded a total of 12 wetland subgroups or HGM units. Figures 3.2 and 3.3 illustrate the wetlands delineated within the KwaSenti and Driefontein sites, respectively.

Figure 3.2: Delineated Wetlands within the KwaSenti site

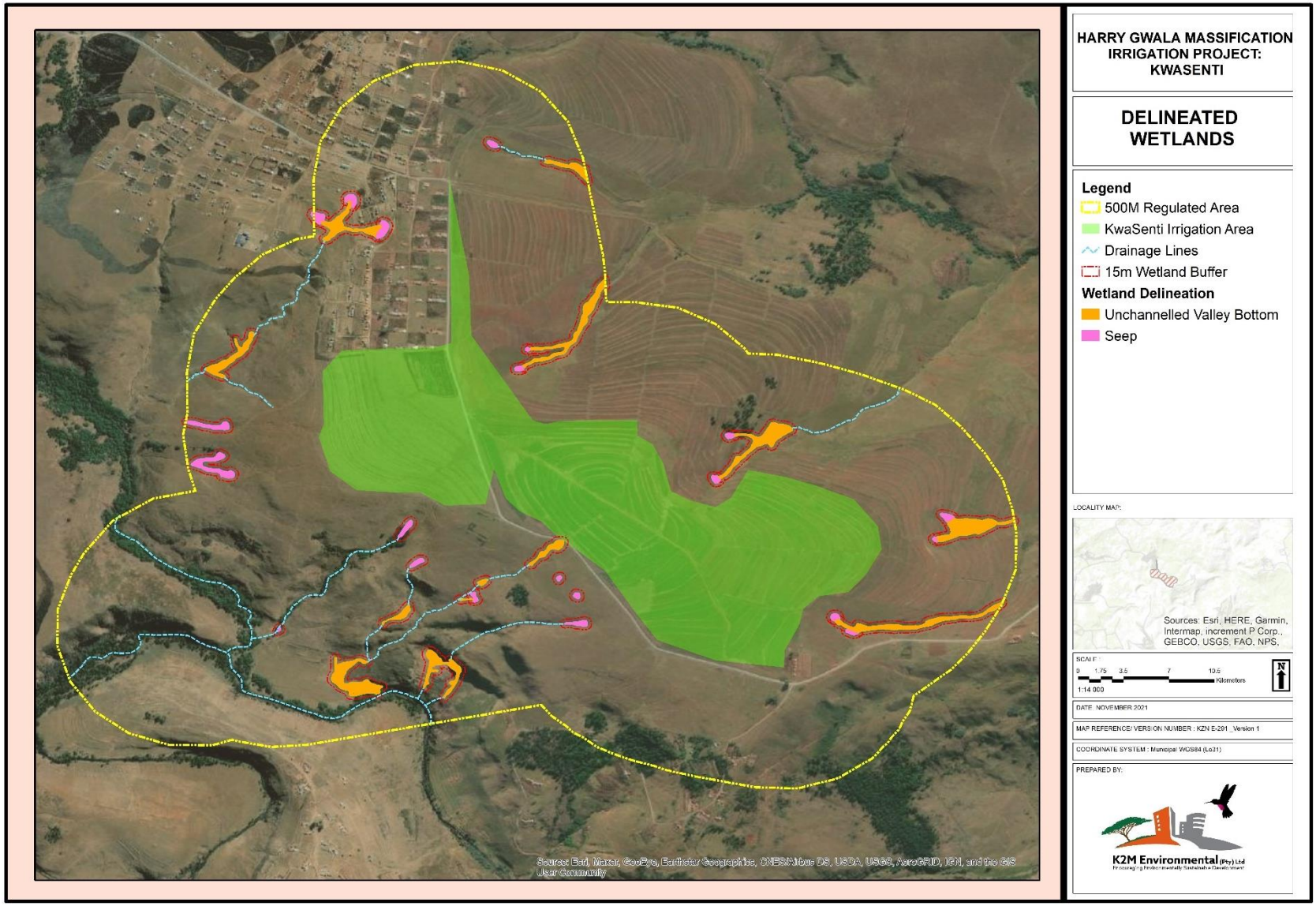
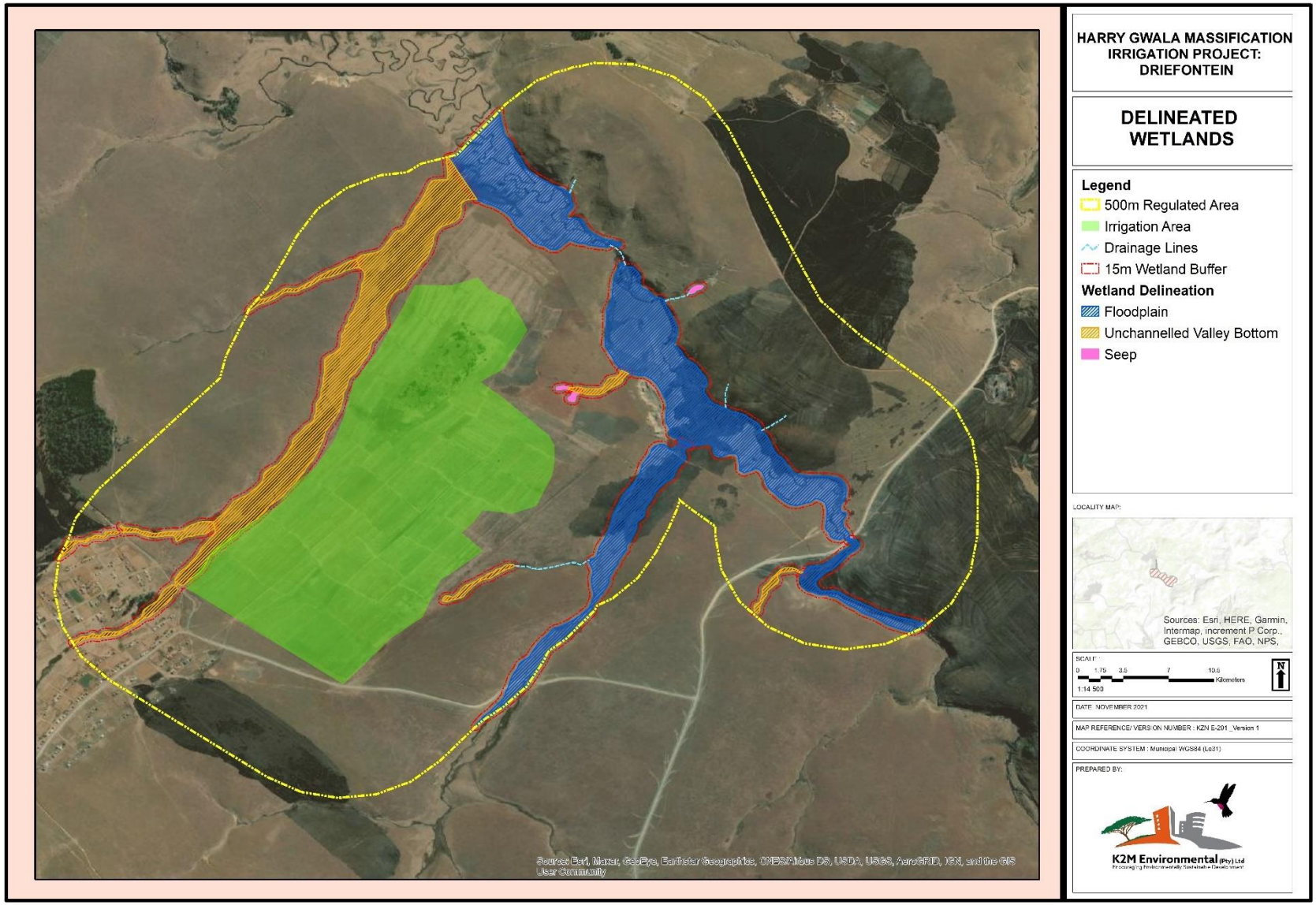


Figure 3.3: Delineated Wetlands within the Driefontein site



3.6.2 Wetland Characteristics

3.6.2.1 Hydrogeomorphology

Figures 3.4 and 3.5 illustrate the HGM types within the KwaSenti and Driefontein sites. A total of seven and five wetlands HGM units were identified for the KwaSenti and Driefontein areas respectively, representing three HGM types namely floodplain, unchanneled valley bottom, and seep wetlands. A general description of the wetland HGM types is provided below.

Figure 3.4: Wetland HGM units identified within for the KwaSenti site

Source: Wetland and Vegetation Assessment Report, 2021

Figure 3.5: Wetland HGM units identified within for the Driefontein site

Source: Wetland and Vegetation Assessment Report, 2021

3.6.2.1.1 Floodplain

The floodplain flow path remains in a relatively intact state. The system is large, well developed and relatively intact which displays typical floodplain features. These include a highly sinuous stream channel, large floodplain depressions and an abundance of well vegetated backwaters and meander cut-offs. These systems are distinctly "U" shaped, well vegetated and are perennially inundated with a large proportion of

the flow paths occupied by permanent and seasonal zone vegetation. The system is largely natural but is, in places, heavily encroached by alien and invasive plant species.

3.6.2.1.2 Valley Bottom Wetlands

A network of valley bottom wetlands are located in AOI for the KwaSenti and Driefontein sites. The catchments of this wetland type have been altered by cultivation, but the periphery of the AOI consequently retains a largely natural vegetation cover. They occur mainly in the more natural grassland areas. They are typically associated with a lower slope gradient than the channeled valley bottoms.

3.6.2.1.3 Seeps

Seeps occupied a limited portion of the wetland surface area and have been heavily impacted by agriculture and development. These are seasonally to temporarily inundated wetlands. In the project area they occur on the flatter crest areas in areas where the water table intersects the surface. Rainwater likely contributes most greatly to the recharge of these wetlands, particularly the seasonally-temporarily saturated seeps. Due to their size and position it is likely that these systems contribute to the recharge and streamflow regulation of the valley bottom wetlands with which they are associated. Seeps generally lack channels.

3.6.2.2 Hydromorphic Soils

According to (DWAF, 2005), soils are the most important characteristic of wetlands in order to accurately identify and delineate wetland areas. Three dominant soil forms were identified within the identified wetland, namely the Katspruit, Longlands and Westleigh soil forms.

The Westleigh soil form consists of an orthic topsoil on top of a soft plinthic horizon. The soil family group identified for the Westleigh soil form on-site has been classified as the “2100” soil family group due to the chromic colouring of the topsoil and the alluvial characteristics of the soft plinthic horizon.

The Longlands soil form consists of an orthic topsoil on top of an albic horizon. The soil family group identified for the Longlands soil form on-site has been classified as the “1000” soil family due to the grey colour of the soil in wet conditions.

The Katspruit soil form consists of an Orthic topsoil on top of a Gleyic horizon. The 2210 family group is applicable to this soil form given the grey colours, the firm texture and structure of the soil form and the absence of lime.

3.6.3 Wetland Health

The present ecological state (PES) of the wetlands identified within the 500 m regulated area is provided in Table 3.1 and Table 3.2. Some notable impacts include (see Figure 3.6):

- Dirt roads
- Clearance of vegetation
- Erosion
- Built-up areas
- Grazing
- Alien invasive species

Figure 3.6: Aspects impacting the delineated systems; A) Settlements B) Crop cultivation C) Livestock and infrastructure D) Gully formation E) Erosion F) Alien vegetation

Source: Wetland and Vegetation Assessment Report, 2021

All of the wetlands are subject to similar catchment impacts but vary in terms of the intensity and proximity of these impacts. Catchment impacts centre on the conversion of large areas of grassland to commercial crop cultivation and, in places also include encroachment by alien and invasive species (AIS) and the presence of impeding features such as roads. Crop production has led to the creation of vast exposed soil surfaces during intercrop periods which increase the runoff potential of the catchment. This in turn increases the potential for erosion in the steeper valley-heads while heightening sediment deposition towards the toes of lower energy wetlands.

Crop cultivation not only affects the catchment but has encroached upon the wetlands themselves. Some of the less conspicuous wetlands such as the temporarily saturated seeps have been completely transformed by cultivation. Tillage practices (including ridge and furrow as well as terraced croplands) have increased drainage in these wetlands and consequently decreased the distribution and retention time of water, effectively draining these wetlands. Beneficially to wetlands these croplands are not actively irrigated but rely on rainwater yet the crops produced still act to increase evapotranspirative losses above the natural grassland state.

Within wetlands, impacts vary markedly between the various HGM units. The main impacts altering the hydrological regime within the valley bottom wetlands are roads which have, in places served to promote downstream erosion through concentrated sediment deprived overflows. The main hydrological impacts faced by the seeps centre on crop cultivation and its draining effects, but also due to rill erosion and gulley formation caused by the exposed soil surfaces.

Table 3.2: Summary of the scores for the wetland PES for the KwaSenti site

Unit	PES			
	Hydrology	Geomorphology	Vegetation	Overall
Group 1a				
HGM1	3.5	2.7	2.1	2.9
	Moderately Modified (Class C)	Moderately Modified (Class C)	Moderately Modified (Class C)	Moderately Modified (Class C)
HGM2	2.5	2.3	1.2	2.1
	Moderately Modified (Class C)	Moderately Modified (Class C)	Largely Natural (Class B)	Moderately Modified (Class C)
Group 1b				
HGM3	3.5	2.3	1.5	2.6
	Moderately Modified (Class C)	Moderately Modified (Class C)	Largely Natural (Class B)	Moderately Modified (Class C)
HGM4	2.5	2.9	1.2	2.2
	Moderately Modified (Class C)	Moderately Modified (Class C)	Largely Natural (Class B)	Moderately Modified (Class C)
Group 2a				
HGM5	4.5	2.7	3.8	3.8
	Largely Modified (Class D)	Moderately Modified (Class C)	Moderately Modified (Class C)	Moderately Modified (Class C)
HGM6	5.5	2.6	3.2	4.0
	Largely Modified (Class D)	Moderately Modified (Class C)	Moderately Modified (Class C)	Largely Modified (Class D)
Group 2b				
HGM7	5.5	4	3.9	4.6
	Largely Modified (Class D)	Largely Modified (Class D)	Moderately Modified (Class C)	Largely Modified (Class D)

Source: Wetland and Vegetation Assessment Report, 2021

Table 3.3: Summary of the scores for the wetland PES for the Driefontein site

Unit	PES			
	Hydrology	Geomorphology	Vegetation	Overall
Group 1a				
HGM1	2.5	2.2	1.3	2.1
	Moderately Modified (Class C)	Moderately Modified (Class C)	Largely Natural (Class B)	Moderately Modified (Class C)
HGM2	3	2.5	1.4	2.4
	Moderately Modified (Class C)	Moderately Modified (Class C)	Largely Natural (Class B)	Moderately Modified (Class C)
Group 1b				
HGM3	3.5	2.3	3.1	3.0
	Moderately Modified (Class C)	Moderately Modified (Class C))	Moderately Modified (Class C)	Moderately Modified (Class C)
Group 2a				
HGM4	5	3.6	2.7	3.9
	Largely Modified (Class D)	Moderately Modified (Class C)	Moderately Modified (Class C)	Moderately Modified (Class C)
Group 2b				
HGM5	5	4.2	5.6	4.9
	Largely Modified (Class D)	Largely Modified (Class D)	Largely Modified (Class D)	Largely Modified (Class D)

Source: Wetland and Vegetation Assessment Report, 2021

3.6.4 Importance and Sensitivity

The Importance and Sensitivity ratings for each of the wetland HGM units is provided in Table 3.3 and Table 3.4. Several factors were considered when establishing the IS of the various wetlands. At a regional scale the NFEPA Wetveg database recognises seeps and floodplains within the Sub-escarpment Grassland Group 3 as Critically Endangered and Not Protected, whereas unchanneled valley bottom wetlands are recognised as Endangered and Not Protected. The following was also considered for the IS description for each AOI:

- They are located in in the South Drakensberg Strategic Water Source Area;
- The Midlands Mistbelt Grassland vegetation type is Endangered;
- The Southern KwaZulu-Natal Moist Grassland vegetation type is Vulnerable;
- The areas do not overlap with Critical Biodiversity Areas; and
- The project area does not overlap any Ecological Support Areas.

Table 3.4: Ecological importance and sensitivity for the KwaSenti site

HGM Type	Wet Veg		NBA Wetlands			SWSA (Y/N)	Calculated IS
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018		
Seeps	Sub-escarpment Grassland Group 3	Critically Endangered	Not Protected	B/C/D	Critically Endangered	Yes	High
UCVB		Endangered	Not Protected	B/C	Critically Endangered	Yes	Moderate

Source: Wetland and Vegetation Assessment Report, 2021

Table 3.5: Ecological importance and sensitivity for the Driefontein site

HGM Type	Wet Veg		NBA Wetlands			SWSA (Y/N)	Calculated IS
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018		
Floodplains	Sub-escarpment Grassland Group 3	Critically Endangered	Not Protected	B	Vulnerable	Yes	High
Seeps		Critically Endangered	Not Protected	C/D	Vulnerable	Yes	High
UCVB		Endangered	Not Protected	C	Vulnerable	Yes	Moderate

Source: Wetland and Vegetation Assessment Report, 2021

3.6.5 Ecosystem Services

The ecosystem services provided by the wetlands identified were assessed and rated using the WET-EcoServices method (Kotze et al. 2008) (Table 3.5 and Table 3.6).

Overall, the wetlands generally provide important indirect regulating and supporting services relating to flood attenuation, streamflow regulation, sediment trapping and nutrient and toxicant removal. As the wetlands are not situated in a rural community setting (prevailing land use being agriculture) the wetlands are not considered important from a cultural perspective nor in terms the direct provision of water and harvestable resources on a subsistence level.

The wetlands are also generally considered relatively important from a biodiversity maintenance perspective, supporting a unique and diverse floral assemblage while providing important foraging, shelter and movement corridors for a wide diversity of wetland associated fauna.

Of all the HGM units, the floodplain in particular, provides the highest levels of ecosystem services with an overall score of High due to the large size, high channel sinuosity and largely intact vegetation cover.

Specifically, the system plays an important role in attenuating floods received from the large (often ploughed catchments). The system also plays an important role in assimilating toxicants received from agricultural practices, supporting unique, charismatic and conservation important biodiversity as well as their aesthetic, recreational (e.g. bird watching and fishing) and educational values.

The valley bottom wetlands with their broad, shallow flow paths and high saturation levels allow for the proliferation of wetland vegetation, slow diffuse flows and consequently efficient trapping of sediments and assimilation of nutrients and toxicants. These aspects also make them important from a streamflow regulation perspective.

The seeps, likely play an important role in stream flow regulation and recharge for the floodplain and valley bottom wetlands particularly during low flow periods. Additionally, the seeps play a role in trapping sediments from agriculture due to their diffuse subsurface flow and shallow gradient.

Table 3.6: The ecosystem services being provided by the HGM units for the KwaSenti site

				Wetland Unit	HGM 1	HGM 2	HGM 3	HGM 4	HGM 5	HGM 6	HGM 7
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits		Flood attenuation	2.5	2.1	2.1	2.2	2.1	2.4	2.2
				Streamflow regulation	2.7	2.3	2.3	2.5	2.0	2.0	2.0
			Water Quality enhancement benefits	Sediment trapping	2.1	1.7	1.7	1.9	1.8	2.3	1.7
				Phosphate assimilation	2.7	2.7	2.7	2.6	2.1	1.8	2.0
				Nitrate assimilation	2.9	3.0	3.0	2.9	2.2	1.9	1.9
				Toxicant assimilation	2.7	2.6	2.6	2.6	2.1	1.9	1.9
				Erosion control	2.1	1.6	1.4	1.4	1.3	1.8	1.4
				Carbon storage	2.0	1.3	1.0	1.4	1.0	0.7	1.0
	Direct Benefits			Biodiversity maintenance	2.1	1.7	1.6	1.8	1.3	1.8	1.2
		Provisioning benefits		Provisioning of water for human use	1.3	1.1	1.1	1.1	1.0	2.0	1.0
				Provisioning of harvestable resources	1.8	1.4	1.4	1.4	1.4	2.2	1.4
				Provisioning of cultivated foods	1.4	1.4	1.4	1.4	1.8	2.0	1.4
		Cultural benefits		Cultural heritage	1.0	1.0	1.0	1.0	1.0	1.0	1.0
				Tourism and recreation	0.9	0.7	0.4	0.7	0.3	0.6	0.4
				Education and research	1.3	1.0	0.5	1.0	0.3	0.3	0.3
				Overall	29.4	25.7	24.1	25.9	21.5	24.5	20.8
				Average	2.0	1.7	1.6	1.7	1.4	1.6	1.4

Source: Wetland and Vegetation Assessment Report, 2021

Table 3.7: The ecosystem services being provided by the HGM units for the Driefontein site

				Wetland Unit	HGM 1	HGM 2	HGM 3	HGM 4	HGM 5
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits		Flood attenuation	2.9	2.6	2.1	2.4	1.9
				Streamflow regulation	2.7	2.7	2.1	2.0	2.0
			Water Quality enhancement benefits	Sediment trapping	2.9	2.6	1.9	2.3	1.8
				Phosphate assimilation	2.3	2.5	2.3	1.7	1.7
				Nitrate assimilation	2.5	2.8	2.8	1.9	1.9
				Toxicant assimilation	2.6	2.7	2.6	2.0	1.9
				Erosion control	2.4	2.5	1.4	1.8	1.4
				Carbon storage	2.0	2.0	1.0	1.2	1.0
	Direct Benefits			Biodiversity maintenance	2.0	1.9	1.6	1.8	1.2
		Provisioning benefits		Provisioning of water for human use	3.3	3.1	1.1	1.8	1.0
				Provisioning of harvestable resources	3.2	2.8	1.4	1.4	1.4
				Provisioning of cultivated foods	2.0	2.0	1.4	1.4	1.4
		Cultural benefits		Cultural heritage	1.0	1.0	1.0	1.0	1.0
				Tourism and recreation	2.6	1.9	0.7	0.7	0.3
				Education and research	1.3	1.0	1.0	0.5	0.3
				Overall	35.5	34.0	24.3	23.8	20.2
				Average	2.4	2.3	1.6	1.6	1.3

Source: Wetland and Vegetation Assessment Report, 2021

3.6.6 Sensitivity and Buffer Analysis

The "Buffer zone guidelines for wetlands, rivers and estuaries" (Macfarlane et al., 2014) was used to determine the appropriate wetland buffer zone for the proposed upgrade.

According to Ezemvelo KZN Wildlife (EKZNW, 2013) a minimum recommended buffer size of 30 m is required for wetlands within the province. The wetland buffer zone tool was used to calculate the appropriate buffer required for the upgrade of the existing road. The model shows that the largest threat (High) posed during the construction and operational phases is that of "increased sediment inputs and turbidity". During the operational phase a moderate risk is posed by the possible inputs of toxic heavy metal contaminants and nutrients.

According to the buffer guideline (Macfarlane, et al., 2014) a high-risk activity would require a buffer that is 95% effective to reduce the risk of the impact to a low-level threat.

The risks were then reduced to Low with the prescribed mitigation measures and therefore the recommended buffer was calculated to be 15 m for the construction and operational phases.

A conservative buffer zone was suggested of 15 m for the construction and operation phases respectively, this buffer is calculated assuming mitigation measures are applied. The buffer zone will not be applicable for proposed infrastructure that traverse wetland areas, however, for all secondary activities such as laydown yards and storage areas, the buffer zone must be implemented.

3.6.7 Wetland Risk Assessment (Impacts and Mitigation Measures)

The risk assessment was completed in accordance with the requirements of the DWS General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016).

This section details the findings of the risk assessment for the various activities associated with the proposed crop cultivation activities. It is important to note that the planned crop cultivation all takes place within the footprints of previously disturbed croplands. Although no loss of novel wetland habitat due to cropland establishment is likely to occur, it must be noted that portions of some of the existing croplands are on the periphery of seep zones and that systems will be traversed by the proposed pipelines.

3.6.7.1 Loss / Degradation of Wetland Habitat

The clearing of wetland habitat for cultivation (including pipelines) has the potential to result in the direct loss / degradation of wetland habitat. Noteworthy is the fact that the proposed crop allocation layout provided suggests no clearing of novel wetland habitat as all of the proposed cultivation areas are situated on previously cultivated land that avoids delineated wetlands for both AOIs. It is thus not expected that the proposed cultivation over the previously cultivated land will result in further significant degradation of wetland habitat, especially given that the property has been utilised for crop farming in the past. However, portions of some of these croplands are on the (upper) periphery of drainage areas and seep zones which were likely once considerably more widespread throughout the AOIs than at present due to the vegetation loss and increased drainage facilitated by past cropland tillage practices. The applicant commits to adhering

to the current layout to ensure that the project has limited potential to cause further wetland losses which represents a Moderate risk significance. However, post-mitigation the risk may be reduced to Low. Reduction to Low risk significance is motivated by the fact that the croplands and active farming will not directly impact on the wetlands, limiting the effects to vegetation, hydrology and geomorphology.

Mitigation:

- Avoid further loss of wetland habitat by adhering to the current layout to only farm croplands in previously disturbed croplands as indicated by the currently proposed crop allocation layout; and
- In all other areas avoid cultivation or development of permanent infrastructure within the identified wetlands and their associated buffers.

3.6.7.2 Loss / Degradation of Vegetation

Clearing of the vegetation for the establishment of pipelines and reservoirs must be kept to a minimum. Although clearing will be localised, occurring in predominantly previously disturbed areas, further alien vegetation infestation is also a concern.

Mitigation:

- This impact has already occurred in the general area, and thus pro-active mitigation is limited, reactive measures must now ensue. Actively control and eradicate alien vegetation establishment in these disturbed areas;
- Avoid any further loss of the vegetation areas by avoiding any further development within these areas and also the wetland (and buffer) areas as delineated;
- Where feasible, align pipelines with existing access routes. Prioritise the placement of reservoirs in already disturbed areas

3.6.7.3 Spread of Alien and Invasive Species

Disturbance of soil and vegetation has the potential to be accompanied by the proliferation and spread of alien and invasive species.

Mitigation:

- Keep disturbances to within existing disturbance footprints;
- Control new stands of alien species as the arise;

- Land users are required by law, to remove and / or control Category 1 AIS according to the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). Additionally, unless authorised, in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse;
- It is recommended that Category 1 species are prioritised for control, with control of herbaceous weedy species restricted to the disturbance footprints created around any constructed intervention structures (which would need to include follow-up control); and
- Foliar herbicide spray must not be used within any of the delineated wetland areas, rather opt for mechanical removal or direct dribbled application to stumps (use a dye).

3.6.7.4 Direct Water Losses

This impact is an inevitable consequence of this sort of crop cultivation practice and therefore cannot be entirely negated. The impact has the potential to affect an expected Moderate risk on water losses to the affected wetlands especially given that evaporative losses in this area are relatively high. Consequently, the residual risk is set as Low. This rating is however given in low confidence in the absence of a quantitative data from a hydrological / water balance study. However, there are various water conservation practices that can be implemented which could reduce the overall risk to Low, and it is assumed such a rating would be backed by quantitative data.

Mitigation:

- Only abstract water in accordance with the allow reserve;
- Implement effective water conservation practices;
- Utilise variable rate irrigation (VRI) by managing irrigation according to in-field soil moisture levels:
    - Monitor soil moisture either manually or through the deployment of wireless soil moisture sensors;
    - Take into account spatial variation in soil moisture, remembering that soil moisture is not naturally evenly distributed throughout the lands. There will be places where soil moisture holds longer and requires less irrigation (e.g. within the seep zones or lower down the landscape catena or in areas with less well drained soil);
    - React timeously and accordingly to any received rainfall.
    - Employ the controlled deficit irrigation strategy (above a certain optimal irrigation amount the yield per unit water begins to decrease again); and

- Utilise temporal water conservation practices which minimise evapotranspirative losses by watering during the cooler times of the day such as night, early morning and late afternoon when wind is also generally lower.

- Utilise good quality efficient sprayer nozzles and service them promptly at any signs of failure;
- Carefully manage water pressure to obtain optimum sprayer efficiency and avoid excessive wastage through venting. The ideal flow rate for an irrigation system is dependent on various factors, such as required water application spread, peak crop evapotranspiration and area required to be irrigated. The more total pressure required.

3.6.7.5 Indirect Water Losses

This impact is also unavoidable and necessary to the operation of the farm. There are various water saving practices that could reduce this impact to Moderate.

Mitigation:

- Practice good water saving measures on site such as fixing leaking pipes, taps and sprayers timeously; and
- Consider rainwater harvesting for crop washing and other processing purposes without compromising health and safety standards.

3.6.7.6 Eutrophication of Watercourses

Commercial crop cultivation often requires intensive soil management due to the high demands placed on the soil. This often involves the use of fertilizers which have the potential to eutrophy (contaminate with excess nutrients) nearby watercourses with organic nutrients such as nitrates and phosphates. This leads to an artificially increased primary productivity in the form of cyanobacterial and algal blooms at the expense of the natural plant and animal diversity due to competition, habitat modification, toxicant amplification and increased prevalence of anoxic events.

Mitigation:

- Carefully control the application, timing and amount of fertilizers;
- Current satellite and drone technology allow for the mapping of nutrient or moisture deprived areas which in turn allows farmers to use a GPS to apply of fertilizers to only the areas that require it, thus saving on fertilizer cost and wastage;

- Actively and accurately track weather patterns using satellite data to avoid fertilizing ahead of a major predicted stormfront. Free software such as Windy may assist in this regard if other means are too costly;
- It is recommended that septic tanks be opted for over a French drain systems for human waste given the proximity of the workshop to wetlands; and
- Utilize a French drain / artificial wetland to return process water in a diffuse manner to the nearest watercourse.

3.6.7.7 Contamination of Wetlands

Weeds and pest management is an ongoing problem with crop cultivation. One of the main ecological trade-offs is that wetlands are contaminated with herbicides and pesticides with adverse consequences for the native biota within them.

Mitigation:

- Avoid the use of rodenticides wherever possible. Excessive rodent populations can be effectively controlled with the use of large buckets baited with peanut butter, partially filled with water. These should be placed so as to minimize incidental trapping of non-target organisms such as reptiles and amphibians. (i.e. place away from wetlands and natural areas);
- Minimise pesticide and herbicide use wherever possible. Do not apply in any of the delineated wetlands unless used for alien control in which case apply directly to cut stumps (not foliar spray); and
- Investigate incorporating biopesticides into the farm's Integrated Pest Management (IPM) system so as to rely less on higher-risk pesticides and effectively produce higher crop yields and quality with lower impact on the environment.

3.6.7.8 Sedimentation

Tillage practices to prepare cropland beds and increase drainage will be inevitably accompanied by an increase in sedimentation as rainwater washes exposed soils into downslope watercourses.

Mitigation:

- The soils on site are very sandy and are particularly prone to loss due to wind or water;
- Practice good soil management;

- Minimize the bare soil intercrop period as much as possible;
- Investigate the use of a cover crop (e.g. *Eragrostis)* if intercrop period is expected to be long;
- Continue to grass all inter-cropland areas to prevent soil loss; and
- Devise and implement a stormwater management plan.

3.6.7.9 Erosion

Similarly increased exposed soil surfaces from tillage practices will be inevitably accompanied by an increase in the potential for erosion in those area following stormflow events.

Mitigation:

- Avoid the creation of concentrated flow paths wherever possible (i.e. do not opt for ridge and furrow terraced cultivation practices or try to make large drains between croplands as they will erode);
- Minimize the bare soil intercrop period as much as possible;
- Investigate the use of a cover crop (e.g. E*ragrostis*) if intercrop period is expected to be long;
- Continue to grass all inter-cropland areas to prevent soil loss;
- Stem any erosion as it occurs by bulldozing, filling, re-contouring and re-vegetating the head cut / erosion gulley.

3.7 VEGETATION ASSESSMENT

A Wetland and Vegetation Assessment Report was undertaken by The Biodiversity Company in November 2021 and is attached as **Appendix F1.** The site assessment was conducted during the week of 25th to 29th October 2021, which would constitute a wet season survey. This cultivation area (area for irrigation) together with the 500 m regulated area assigned to its outer edge are referred to as the Area of Influence (AOI).

3.7.1 Vegetation Type

The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include seasonal precipitation; and the minimum

temperatures in winter (Mucina & Rutherford, 2006). Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

The AOIs overlap with a two sub-escarpment vegetation type, namely the Midlands Mistbelt Grassland and the Southern KwaZulu-Natal Moist Grassland for KwaSenti and Driefontein respectively.

3.7.2 Indigenous Flora & Habitat Types

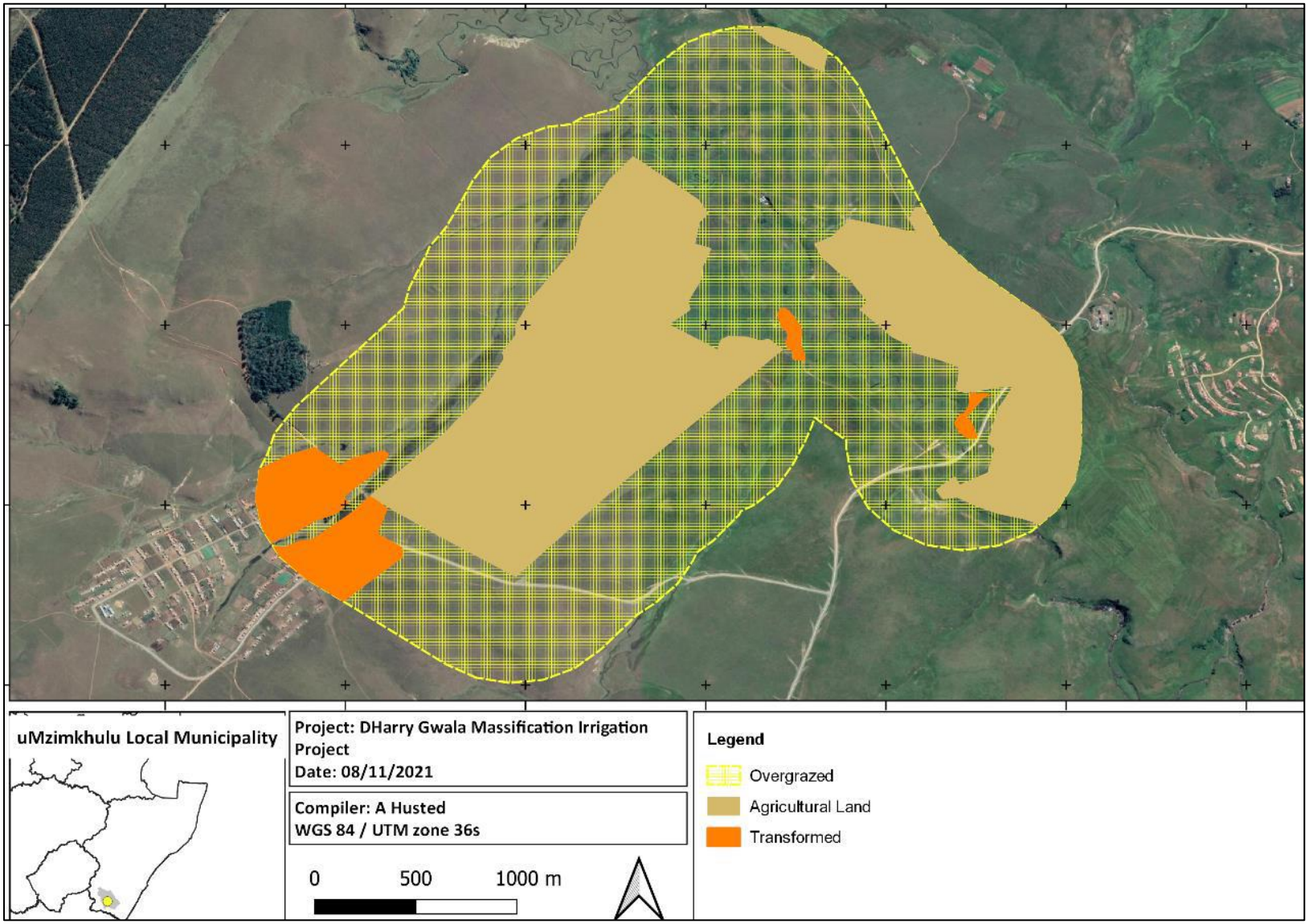
Twenty-six species of indigenous flora were recorded within the assessment area. No species of conservation concern were identified in the local area.

In addition to the delineated wetlands and drainage lines, three habitat units have been delineated for the two AOIs. These included transformed areas, overgrazed and also agricultural land. Transformed areas refers to habitats that have been completed altered to accommodate development. The delineated habitats for the KwaSenti and Driefontein areas are presented in Figure 3.7 and Figure 3.8 respectively.

Figure 3.7: The Delineated Habitats for the KwaSenti site

Source: Wetland and Vegetation Assessment Report, 2021

Figure 3.8: The Delineated Habitats for the Driefontein site



Source: Wetland and Vegetation Assessment Report, 2021

3.7.3 Invasive Alien Plants (IAPs)

Invasive Alien Plants (IAPs) tend to dominate or replace indigenous flora, thereby transforming the structure, composition and functioning of ecosystems. Therefore, it is important that these plants are controlled by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

Thirteen species of Invasive Alien Plants (IAPs) were recorded within the assessment area. Nine of these species are categorised as 1b and one as a Category 2.

NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the NEMBA. The Alien and Invasive Species Regulations were published in the Government Gazette No. 44182, 24th of February 2021. The legislation calls for the removal and / or control of AIP species (Category 1 species). In addition, unless authorised thereto in terms of the NWA, no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.

Category 1b species are invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
    - Section 75 of the Act;
    - The relevant invasive species management programme developed in terms of regulation 4; and
    - Any directive issued in terms of section 73(3) of the Act

Category 2 species are invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.

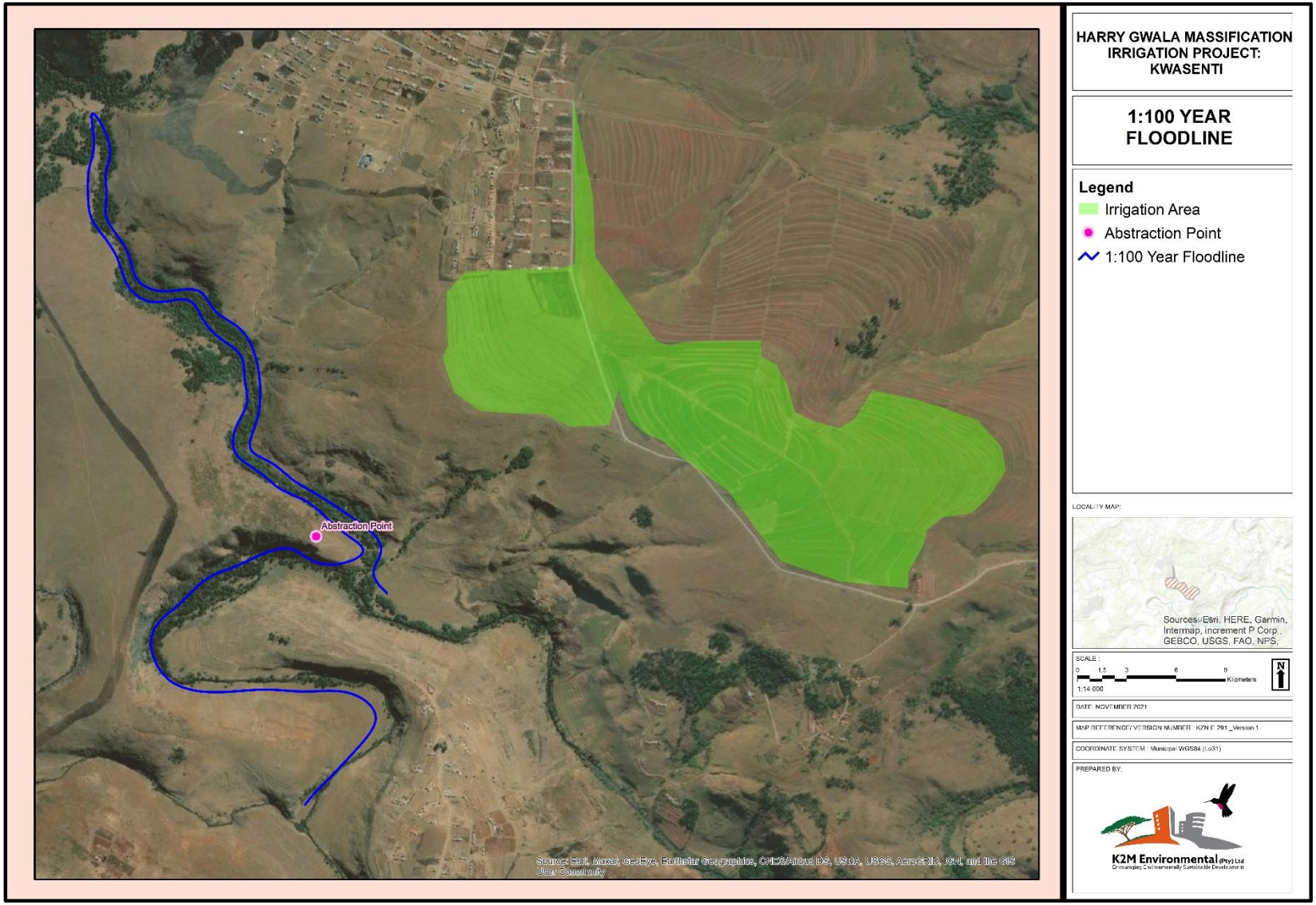
3.8 FLOODLINE ASSESSMENT

A 1:100 year Floodline Assessment was undertaken for the proposed irrigation project in November 2021 by Zamimpilo Consulting and is attached as **Appendix F2**. The findings for the assessment for the KwaSenti and Driefontein sites are provided below.

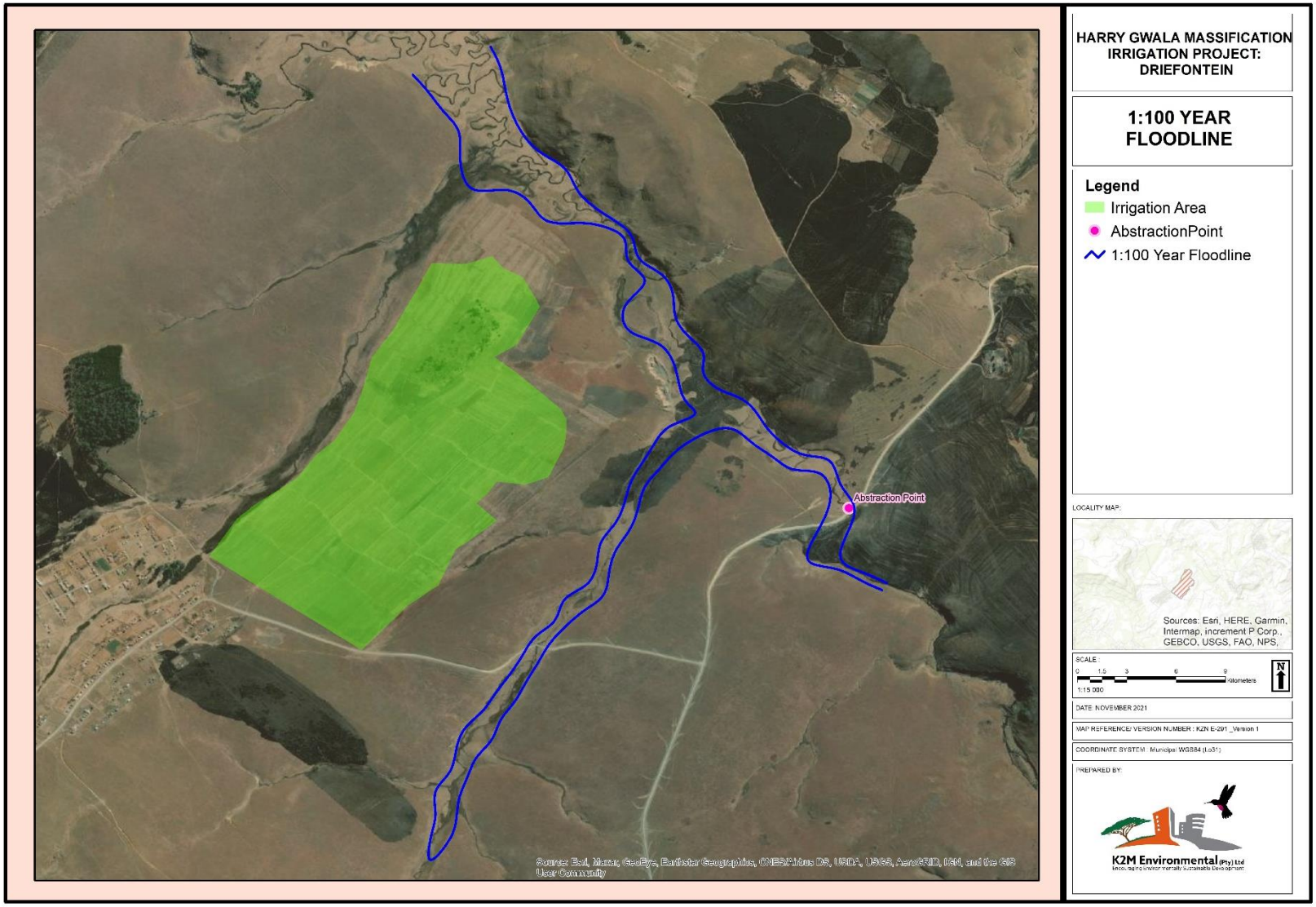
For the analysis of the 1:100 year floodlines, cross-sections were generated from an electronic 1m and 2m interval contour DTM. All other relevant information was obtained by utilizing the appropriate topographical maps and ortho photos applicable, as well as hydrological data acquired from GISap.

It is recommended that no development take place below the calculated flood lines/32m buffers in terms of the National Water Act and other development legislation. Furthermore, it was confirmed that the 1:50 and 1:100 year floodlines as indicated on Map 3.1 and 3.2 below, situated along watercourses within the proposed sites, represent the maximum flood levels that is likely to be reached on an average every 100 years, by flood water within the said watercourses.

Map 3.1: :100 Year Floodline Delineation for the KwaSenti site



Map 3.2: 1:100 Year Floodline Delineation for the Driefontein site



3.9 AGRICULTURAL POTENTIAL ASSESSMENT

An Agricultural Potential Assessment was undertaken by JG Afrika in August 2019 for various cluster sites within the Harry Gwala District. The objective of the study was to assess the agricultural potential of the various clusters. The findings were then used to provide a recommendation of the extent of the areas within the plot boundaries that were suitable for the preferred crop types which were irrigated annual crops. The KwaSenti and Driefontein sites formed part of Cluster 12 and was titled Plot 12.34 and 12.21, respectively. The Agricultural Potential Assessment Report is attached as **Appendix F3**.

The findings of the assessment indicated that Cluster 9 and 12 plots were most favourable for the proposed project considering the prevailing land and soil properties as well as the availability of water. The cultivation of irrigated annual crops is viable if appropriate agricultural practices and design are implemented and followed.

3.10 SITES WITH ARCHEALOGICAL INTEREST

The KwaZulu-Natal Heritage Act requires that Amafa aKwaZulu-Natali (Heritage KwaZulu-Natal) is to comment on the need for an archaeological assessment for proposed development if:

- Development area is larger than 5 000 m²
- Development is longer than 300m
- The development area contains known archaeological sites.

Documentation pertaining to the proposed project was submitted to AMAFA. Till date no comments from AMAFA have been received.

4 IMPACT ASSESSMENT

4.1 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 are considered both without and with mitigation and management measures.

4.2 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:

4.2.1 Nature of impact

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

4.2.2 Extent/Scale

The physical extent of the impact.

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

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

iii. Local

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

iv. Regional

Impact could be widespread with regional implication.

v.National

Impact could have a widespread national level implication.

4.2.3 Duration

The duration of the impact.

i. Short term

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

ii. Medium term

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

iii. Long term

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

iv. Permanent

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

4.2.4 Intensity

These criteria evaluate intensity of the impact and are rated as follows:

i. 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.

ii. Low

The activity will have a low impact on the affected environment

iii. Medium

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

iv. 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.

v. 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.

4.2.5 Probability

This describes the likelihood of the impacts actually occurring.

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

ii. 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).

iii. 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).

iv. 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).

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

4.2.5.1 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.

i. No significance
The impact is not substantial and does not require any mitigatory action.

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

iii. 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.

iv. 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.

The following assessment scale is used to determine the significance of the identified potential impacts on the environment.

Significance = (probability + duration + scale) x intensity

Probability: 1 – 5
Extent: 1 – 5
Duration: 1 – 4
Intensity: 1 – 10

Significance rating criteria

>75	High environmental significance
50 – 75	Medium environmental significance
<50	Low environmental significance

4.2.5.2 Abbreviations for tables listed below:

WOM: Without Mitigation
WM: With Mitigation
O: Operational
C: Construction

4.2.6 Assessment of Potential Impacts

4.2.6.1 Ecological characteristics

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Introduction and spread of alien invasive vegetation due to soil and vegetation disturbance.	C/O	Negative	Site	Permanent	Medium	Medium	Low	1. Promptly remove all alien and invasive plant species that may emerge during construction 2. Limit soil disturbance. 3. Minimize unnecessary clearing of vegetation beyond the infrastructure footprints. 4. Continue to remove all alien and invasive plant species as they arise during the operational phase. 5. Foliar herbicide spray must not be used within any of the delineated wetland areas, rather opt for mechanical removal or direct dribbled application to stumps (use a dye).	Low
2. Impact on surrounding vegetation during construction (e.g. collection of firewood, veld fires, etc.).	C	Negative	Local	Short	Medium	Low	Low	1. No harvesting of firewood from the site or from the areas adjacent to it. 2. Under no circumstances are the staff allowed to start a fire.	Low
3. Loss / Degradation of wetland habitat (Clearing of wetland habitat for cultivation)	C/O	Negative	Local	Long	Medium	Medium	Medium	1. Avoid further loss of wetland habitat by adhering to the current layout to only farm croplands in previously disturbed croplands as indicated by the currently proposed crop allocation layout. 2. In all other areas avoid cultivation or development of permanent infrastructure within the identified wetlands and their associated buffers	Low
4. Loss / Degradation of Vegetation for pump stations	C/O	Negative	Local	Long	Medium	Medium	Medium	1. Actively control and eradicate alien vegetation establishment in these disturbed areas; 2. Avoid any further loss of the vegetation areas by avoiding any further development within these areas and also the wetland (and buffer) areas 3. Where feasible, align pipelines with existing access routes. Prioritise the placement of reservoirs in already disturbed area.	Low

4.2.6.2 Soil characteristics and geology

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Sedimentation of downstream wetlands from increased soil wash from exposed soil surfaces	C/O	Negative	Site	Medium	Medium	Low	Low	1. The soils on site are very sandy and are particularly prone to loss due to wind or water; 2. Practice good soil management; 3. Minimize the bare soil intercrop period as much as possible; 4. Investigate the use of a cover crop (e.g. *Eragrostis*) if intercrop period is expected to be long; 5. Continue to grass all inter-cropland areas to prevent soil loss;	Low
2. Soil Erosion of on site wetlands due to increased floodpeaks from exposed and hardened soil surfaces.	O	Negative	Site	Medium	Medium	Low	Low	6. Avoid the creation of concentrated flow paths wherever possible (i.e. do not opt for ridge and furrow terraced cultivation practices or try to make large drains between croplands as they will erode. 7. Minimize the bare soil intercrop period as much as possible; 8. Investigate the use of a cover crop (e.g. *Eragrostis*) if intercrop period is expected to be long; 9. Continue to grass all inter-cropland areas to prevent soil loss; 10. Devise and implement a stormwater management plan; and 11. Stem any erosion as it occurs by bulldozing, filling, re-contouring and re-vegetating the head cut / erosion gulley.	Low

4.2.6.3 Ground and surface water

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Direct Water Losses due to large scale abstraction for irrigation purposes (Increased on-site water usage).	O	Negative	Local	Long	Medium	Medium	Medium	1. Only abstract water in accordance with the allowed reserve; 2. Implement effective water conservation practices; 3. Utilise variable rate irrigation (VRI) by managing irrigation according to in-field soil moisture levels. 4. Monitor soil moisture either manually or through the deployment of wireless soil moisture sensors; 5. Take into account spatial variation in soil moisture, remembering that soil	Low

								moisture is not naturally evenly distributed throughout the lands. There will be places where soil moisture holds longer and requires less irrigation (e.g. within the seep zones or lower down the landscape catena or in areas with less well drained soil); 6. React timeously and accordingly to any received rainfall. 7. Employ the controlled deficit irrigation strategy (above a certain optimal irrigation amount the yield per unit water begins to decrease again); and 8. Utilise temporal water conservation practices which minimise evapotranspirative losses by watering during the cooler times of the day such as night, early morning and late afternoon when wind is also generally lower. 1. Utilise good quality efficient sprayer nozzles and service them promptly at any signs of failure; 2. Carefully manage water pressure to obtain optimum sprayer efficiency and avoid excessive wastage through venting. The ideal flow rate for an irrigation system is dependent on various factors, such as required water application spread, peak crop evapotranspiration and area required to be irrigated.	
2. Indirect Water Losses to wetlands from increased water use for domestic purposes	O	Negative	Site	Long	Medium	Medium	Medium	1. Practice good water saving measures on site such as fixing leaking pipes, taps and sprayers timeously; and 2. Consider rainwater harvesting for crop washing and other processing purposes without compromising health and safety standards	Low
3. Eutrophication of Watercourse with grey water and compounds associated with fertilisation	O	Negative	Local	Long	Medium	Medium	Medium	1. Carefully control the application, timing and amount of fertilizers; 2. Current satellite and drone technology allow for the mapping of nutrient or moisture deprived areas which in turn allows farmers to use a GPS to apply of fertilizers to only the areas that require	Low

								it, thus saving on fertilizer cost and wastage; 3. Actively and accurately track weather patterns using satellite data to avoid fertilizing ahead of a major predicted stormfront. Free software such as Windy may assist in this regard if other means are too costly;	
4. Eutrophication of watercourses with process wastewater and / or domestic sewage and greywater	O	Negative	Local	Long	Medium	Low	Low	1. It is recommended that septic tanks be opted for over a French drain systems for human waste given the proximity of the workshop to wetlands; and 2. Utilize a French drain / artificial wetland to return process water in a diffuse manner to the nearest watercourse	Low
5. Contamination of Wetlands with toxicants associated with pesticides and herbicides	O	Negative	Site	Medium	Medium	Medium	Low	1. Avoid the use of rodenticides wherever possible. Excessive rodent populations can be effectively controlled with the use of large buckets baited with peanut butter, partially filled with water. These should be placed so as to minimize incidental trapping of non-target organisms such as reptiles and amphibians. (i.e. place away from wetlands and natural areas); 2. Minimise pesticide and herbicide use wherever possible. Do not apply in any of the delineated wetlands unless used for alien control in which case apply directly to cut stumps (not foliar spray); and 3. Investigate incorporating biopesticides into the farm's Integrated Pest Management (IPM) system so as to rely less on higher-risk pesticides and effectively produce higher crop yields and quality with lower impact on the environment.	Low

4.2.6.4 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	Negative	Site	Short	Minor	Low	Low	1. Should any archaeological artifacts be exposed during excavation, work on the area where the artifacts were found, shall cease immediately and the ECO and AMAFA should be notified as soon as possible.	Low

4.2.6.5 Socio-economic impacts

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Direct employment creation, including construction workers	C	Positive	Local	Short	Minor	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	Local	Short	Minor	High	Medium	No mitigation required	Medium (positive)
3. Job creation during operation phase	O	Positive	Local	Long	Minor	Medium	Medium	No mitigation required	Medium (positive)

4.2.6.6 Safety and Security

Nature	Phase	Type	Extent	Duration	Intensity	Probability	WOM	Mitigation	WM
1. Construction activities on the proposed development may pose various risks to workers safety.	C	Negative	Local	Short	Medium	Medium	Medium	1. The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No.85 of 1993) and the National Building Regulations.	Low

4.2.6.7 Potential Environmental Impacts

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.). 2. Some phases of construction may cause odours that are detective over	C/O	Negative	Local	Short	Low	Medium	Low	1. Air filters on all mechanized equipment must be properly designed and maintained. 2. Onsite burning of waste is not permitted. 3. All industrial activities are subject to operating within the conditions of national legislation, including the National Environmental Management: Air Quality Act No. 39 of 2004.	Low

	some distance (e.g. burning of plastic containers and bags). 3. Impact on the ambient air quality								
4.	Increase in ambient noise level affecting surrounding properties during construction.	C/O	Negative	Local	Short	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
5.	Visual impact of development on landscape ("sense of place").	C/O	Negative/ Positive	Local	Long	Medium	High	Low	1. All construction material must be stored in one place out of the direct eyesight of pedestrians.	Low

4.3 ENVIRONMENTAL IMPACT STATEMENT AND SUMMARY ON NEED AND DESIRABILITY

4.3.1 Environmental Impact Statement

An impact statement is required as per the NEMA regulations with regards to the proposed development. The major environmental impacts, which are likely to result from this development, may be assessed according to the potential impacts of the proposed development on the surrounding land uses.

Several risks to the identified wetlands associated with the current and proposed crop cultivation practices were listed together with the recommended mitigation measures in the risk assessment. No impacts received a residual (post-mitigation) rating of Moderate (or High). The overall residual rating is expected to be Low for all the aspects considered for the project.
It is important to note that the planned crop cultivation all takes place within the footprints of previously disturbed croplands. The proposed pipelines and reservoirs do have the potential to impact on the local habitats.

It is imperative that the project implement effective water conservation practices as provided in Section 3.6.7, one such measure could be the use of variable rate irrigation (VRI) to manage irrigation according to varying in-field soil moisture levels.

Overall, the project represents a critical development (provision of food) that is set to occur entirely within previously developed croplands and largely occurs outside of wetland areas and can be considered favourably.

Table 5.1 considers both the advantages and disadvantages of the proposed development.

Table 4.1: Advantages and Disadvantages of the proposed development

Advantages	Disadvantages
Job creation and employment opportunities during the construction and operational phases of the project.	Potential soil erosion and sedimentation of downstream watercourses.
Community upliftment and improved standards of living.	Potential wetland contamination / eutrophication due to compounds associate with fertilisation.
Contribution to the growth of the local economy.	

4.3.2 Need and Desirability

Table 5.2 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. The proposed project aims to facilitate the establishment of rural enterprises and is supported by the DRDLR in terms of inputs such as the construction of infrastructure associated with irrigation of the proposed croplands/ areas of irrigation. Furthermore, the proposed irrigation project will enable and provide sustainable irrigation systems to create food security, increased agricultural production, increased household income through enterprise development and employment creation by the irrigation schemes.

Table 4.2: Need and Desirability

1. Is the activity permitted in terms of the property's existing land use rights?		YES
The proposed project will occur on land that is currently being utilised for agricultural purposes.		
2. Will the activity be in line with the following?		
(a) Provincial Growth and Development Plan	YES	
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.		

(b) 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 proposed development is aligned with the municipal IDP as it will assist and contribute to the Municipality achieving its KPA Goal 3: Local Economic Development (LED) and Social Development.		
(c) 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?)		N/A
(d) Any other Plans (e.g. Guide Plan)	YES	
Please refer to the specialist studies undertaken for the proposed development.		
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 proposed development will provide food and will boost the local economy. Improved standards of living the community as the proposed project will enable job creation and employment opportunities during the construction and operational phases of development.		
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?		N/A
6. 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	
The proposed sites are existing croplands.		
7. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES	
The proposed project will enable the establishment of rural enterprises. The initiative aims to maximise market access to all farmers with a particular focus on the rural small-holder sector, maximise the use of high-value agricultural land and to promote economic growth. It also aims to improve rural-urban linkages.		
8. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES	
Three sites have been identified for the proposed project, namely Nguse, Driefontein and KwaSenti.		

9. Will any person's rights be negatively affected by the proposed activity/ies?	NO
This development will not infringe on any person's rights but will provide economic growth in rural communities.	

10. What will the benefits be to society in general and to the local communities?

- Sustainable irrigation systems to create food security
- Increased agricultural production
- Increased household income through enterprise development
- Job creation and employment opportunities during the construction and operational phases of development
- Prevent illegal occupation of the land which will affect the existing community

5 PUBLIC PARTICIPATION

5.1 REQUIREMENTS OF THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS OF 2014 (AS AMENDED)

Table 6.1 below outlines the requirements for the public participation process set out in Section 41 of the Environmental Impact Assessment Regulations as well as the actions that will be taken by the Environmental Assessment Practitioners (EAP).

Table 5.1: Public Participation Process

2014 EIA requirements (as amended)	Action taken by EAP
a. Fixing a notice board at a place conspicuous to the public at the boundary or on the fence or along the corridor of- i. the site where the activity to which the application relates is or is to be undertaken; and ii. any alternative site;	Notice boards in English and isiZulu will be placed along the site boundary as well as in areas that are accessible to the surrounding community to ensure that it is visible (See **Appendix H1** for site notice board).
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	A Background Information Document will be distributed to the people living adjacent to the site. A copy of the BID is included in **Appendix H2.** The BID included some project background details of the Independent Environmental Assessment Practitioner as well as the process to be followed during the EIA. An invitation to become involved in the project and to register as a stakeholder was also included in the Background Information Document. A copy of the Draft BAR will be submitted to the following: • KwaZulu Natal Department of Economic Development, Tourism and Environmental Affairs (DEDTEA) • Department of Agriculture and Rural Development • Department of Water and Sanitation • uMzimkhulu Local Municipality • Harry Gwala District Municipality • Ward Councillor

ratepayers that represents 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.	• Ezemvelo KZN Wildlife • KwaZulu Natal AMAFA
c. Placing an advertisement in – i. one local newspaper; or ii. 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; and	An isiZulu advert will be published in the Ilanga and an English Advert was published in the Mercury (See **Appendix H3 and H4** for Adverts).

5.1.1 Comments received from the Departments and Stakeholders

The comments received from the Department and stakeholders regarding the Draft Basic Assessment Report will be included into the Final BAR, in the form of a Comments and Response Report.

5.1.2 Register of interested and affected parties

According to the Environmental Impact Assessment Regulations of 2014 (as amended), a register of interested and affected parties must be kept during the EIA process. A copy of the register of interested and affected parties will be included into the Final BAR.

6 SUMMARY RECOMMENDATIONS OF EAP

6.1 RECOMMENDATIONS

- It is recommended that any further loss of wetland habitat be avoided.
- This project involves direct alterations to wetlands as well as abstraction but poses an overall Low post-mitigation risk and therefore a General Authorisation is permissible.
- No development should take place below the calculated flood lines/32m buffers in terms of the National Water Act and other development legislation.

6.2 OPINION OF EAP

It is the opinion of the Environmental Assessment Practitioner that the project can be supported on condition that the Mitigation and Management measures recommended by Specialists and in the Draft Environmental Management Programme (EMPr) (**Appendix A**) be strictly adhered to as well as provided that sensitive planning, design and good environmental management be carried out by the proponent during construction.

A variety of mitigation measures have been identified in the Draft EMPr that will serve to mitigate the scale, intensity, duration or significance of the impacts which have a medium significance rating. These include guidelines to be applied during the construction phase of the development. The proposed mitigatory measures, if implemented, will reduce the significance of the majority of the identified impacts to "low", and allow for the proposed project to precede with minimal effect to the environment, local community and surrounding land use practices. The recommendations made within Specialist Reports conducted for the proposed project must also be adhered to so as to ensure that the proposed project imposes as minimal an impact as possible.

Any decision regarding the granting of authorization of this activity should also be subject to the implementation of all the management recommendations as contained in the Draft EMPr.

It is the opinion of the EAP that the information contained in the Draft Basic 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.