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FINAL BASIC ASSESSMENT REPORT

THE NTAMBANANA WATER SUPPLY SCHEME –THE INFILL AND EXCAVATION WITHIN WATERCOURSES FOR THE CONSTRUCTION OF RESERVOIRS, PIPELINES AND BULK WATER INFRASTRUCTURE

CITY OF UMHLATHUZE MUNICIPALITY

KING CETHWAYO DISTRICT MUNICIPALITY

EIA REF NO: DC28/0011/2022

EVP1472

CIVTECH ENGINEERS

CITY OF uMHLATHUZE

This report was prepared by EnviroPro Environmental Consulting in terms of Appendix 1 to GNR 982

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Executive Summary

The City of uMhlathuze proposes upgrading the existing Ntambanana Water Supply Scheme (WSS) within the Ntambanana Water Supply Area (Upper Nseleni area and specifically the Ntambanana, Obizo and Macekane areas), within Wards 24, 31, 32 and 33 of the uMthlatuze Local Municipality.

The new WSS infrastructure planned for the scheme includes the following:

- 79.8km of bulk water pipelines between 110mm dia – 450mm to supply the 12 reservoirs in the system, 8 of which will be new,
- The Installation of pump stations,
- The construction of 8 reservoirs,
- Pipe reticulation of approximately 395km with metered connections[1].

The water source supplying this scheme will come from Empangeni Town's Hillview Reservoir which has capacity (currently 7.2 Mℓ/d) to supply the Ntambanana WSS. The Ntambanana WSS will have a water demand of 3Mℓ/d.

The activities requiring environmental authorisation for this WSS are those associated with the infill and removal of material from the watercourses (LN1, Activity 19), installing more than 100m^2 of infrastructure within a watercourse (LN1, Activity 12), and installing a bulk pipeline with a diameter of more than 0.36m (LN1, Act 9). The following key impacts were identified and assessed:

- **Damage to the identified watercourses in the project area from construction activities:**
  Construction of the pipelines through Watercourses will result in the infill and excavation of more than 10m^3 of material within 63 watercourses within the project area. The installation of the proposed pipelines and bulk water infrastructure will require excavation within each watercourse. The pipeline route predominantly follows existing and previously cleared road and service servitudes. There are some riparian areas that have not been cleared or crossed previously. Caution must be exercised when working near and within a watercourse. A prescribed construction footprint of 10m has been given to the construction activity within the watercourses and 15m outside the watercourses. Construction materials must be stockpiled outside the recommended 18m "no-go" riparian zone buffer along the watercourses.
- **Damage to cultural heritage:**
  A number of graves and culturally sensitive trees were identified by the heritage specialist within the proposed pipeline route. The sensitive areas identified require a pipeline rerouting between 5-20m in each location.
- **Damage to Palaeontological sensitive aspects:**
  There are some high-sensitive palaeontological areas within the WSS. No specific palaeontological aspects have been identified however, a qualified palaeontologist will need to supervise/be present for the pipeline excavation for some sections of pipeline during the construction.
- **Loss of riparian vegetation during excavation across watercourses**
  The pipeline and related construction footprint will cross some sensitive riparian vegetated areas. Vegetation clearing is to be kept to a minimum and be restricted to the prescribed 10m width within the riparian areas. The trenching for the pipeline must be done using the smallest excavating bucket necessary for the size of pipe being laid. The potential for erosion is to be monitored by the contractor on an ongoing basis during clearing.
- **Damage to surrounding properties, services, and businesses**
  The construction activity could disrupt access to existing services, and residential properties. All services must be identified prior to construction and all stakeholders must be notified prior to road closures and service disruption. Temporary alternative access routes for affected properties must be created where required.
- **Pipeline impeding or altering flow in the watercourse**
  The pipeline within the watercourses will be laid below the level of the river bed and encased in concrete to prevent permanent water flow blockage. Reinforcing dowel bars and concrete bedding cradles will secure the pipeline.
- **Encroachment of alien vegetation into areas disturbed during the construction:**
  Alien vegetation within the construction footprint must not be allowed to encroach onto the site footprint area and must be continually removed during construction.
- **Improved services**

[1] Upgrade Of Water Supply Infrastructure for Ntambanana Supply Area (Upper Nseleni Supply) Feasibility Report (Rev 1) March 2022. Civtech Engineers.

The water supply scheme will improve service delivery to the Ntambanana area and increase the potable water supply for future expansion of the area. This is a positive impact.

These impacts can be mitigated by following the recommendations in this report and EMPr. Construction activities will be monitored and controlled through the implementation of the Environmental Management Programme (EMPr).

The aim of the project is to improve the supply of potable water to the Ntambanana area with as little environmental and infrastructural disturbance/impact as possible. No additional site alternatives were considered as the chosen pipeline route is mostly within the existing road servitudes. Two design alternatives have been considered; the preferred design alternative is to construct the new watercourse crossings for the pipeline along existing roads, tracks and footpaths and below the water course beds in encased concrete sleeves. This crossing technique will have a smaller construction footprint and less impact on the surrounding environment. The pipelines will not block or impede the flow of water in the watercourse as they will be below the surface of the river bed.

Taking into consideration the above impacts and mitigation measures, it is the EAP's opinion that there are no significant environmental impacts associated with the proposal which cannot be mitigated. Therefore, it is recommended that the preferred site and design alternative 1 be authorised for the construction of pipelines associated with the Ntambanana Bulk Water Supply Scheme.

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Section 1: Scope of Work and Location of Activity

1.1 Project Title

The Ntambanana Water Supply Scheme – The Infill and Excavation Within Watercourses for the Construction of Bulk Water Infrastructure within the uMthlatuze Local Municipality.

1.2 A Description of the Activities to Be Undertaken Including Associated Structures and Infrastructure As per Section 3(d) (ii)

The City of uMhlathuze proposes upgrading the existing Ntambanana Water Supply Scheme (WSS) within the Ntambanana Water Supply Area (Upper Nseleni area and specifically the Ntambanana, Obizo and Macekane areas), within Wards 24, 31, 32 and 33 of the uMthlatuze Local Municipality.

The new WSS infrastructure planned for the scheme includes the following:

- 79.8km of bulk water pipelines between 110mm – 450mm diameter to supply specific reservoirs,
- The Installation of pump stations,
- The construction of 8 reservoirs, and
- Smaller (narrow) pipe reticulation of approximately 395km with metered connections to households[2].

The project area was previously serviced by King Cetshwayo District Municipality which is a Water Service Authority (WSA). A large section of the WSS falls within Ntambanana Local Municipality. The Ntambanana Local Municipality was dissolved in September 2012 and taken over by The City of uMhlathuze. The City of uMhlatuze is a WSA. Historically, this area has faced a number of water supply challenges, namely:

- The previous WSS design philosophy was uneconomical and impractical.
- Intermittent water interruptions in the previous WSS created frustration in the community who resorted to illegal connections for access to water.
- The water source was unreliable and was shared with a number of water schemes.
- There was a history of poor water management. There were no individual household water meters installed to control water leakage to manage water losses.

The water source supplying this scheme will come from Empangeni Town's Hillview Reservoir which has capacity (currently 7.2 Mℓ/d) to supply the Ntambanana WSS. The Ntambanana WSS will have a water demand of 3Mℓ/d. The Hillview Reservoir receives its water supply from the Nsezi Lake.

1.2.1 Crossings

The pipeline network will cross multiple watercourses and wetlands. Cumulatively, there will be approximately 495m^3 of material infilled or removed from the watercourses for this project. The sixty six (66) watercourse crossings that will entail more than 10m^3 of infill or excavation within a watercourse for the pipe installations require Environmental Authorisation (EA) through NEMA. Therefore, these crossings are the predominant focus of this report and assessment.

The bulk water course crossings will be buried and encased with concrete. Utilising buried crossing structures is considered more favourable to raised structures in terms of atmospheric exposure, construction costs and accidental damage or vandalism. The length and depth of burial for each crossing will be determined by the nature of the specific crossing. There will be 63 pipe crossings that require environmental authorisation within the Ntambanana WSS project area.

Various options of pipeline materials were considered for the construction of the proposed pipelines, however due to the pressures the pipeline infrastructure will have to withstand (above 20 bar), ductile iron and PVC pipes where proposed for the larger bulk pipelines and uPVC will be utilized for the smaller bulk pipelines.
Numerous watercourses will be intercepted during the construction of the proposed pipeline infrastructure. At each crossing point, two options of construction will be followed; either the pipe will be buried with excavations beneath the river bed, or the pipe will be connected to the existing bridge structure. The preferred option would be to bury the pipe due to the potential for accidental damage or vandalism should it be attached to the bridge.

The pipe route will for the majority, be located within the municipal road and service servitudes already registered with the municipality.

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[2] Upgrade of Water Supply Infrastructure for Ntambanana Supply Area (Upper Nseleni Supply) Feasibility Report (Rev 1) March 2022. Civtech Engineers.

A list of all watercourses crossed by the pipeline network have been grouped per Ward and provided in Appendix A.

1.2.2 Construction Methodology

A standard construction methodology for the watercourse pipeline crossings has been provided below:

- A temporary river/stream diversion/cofferdam may be be required.
- A temporary diversion berm will be constructed using sand bags.
- Topsoil/foliage along the required river/stream bank will be carefully stripped and placed carefully to one side (foliage side up) to minimise the damage to the ecosystem surrounding the watercourse.
- A temporary trench will be excavated to create a diversion channel around the pipe crossing construction area.
- All topsoil will be seperated from the subbase material and ploaced outside of the river channel for the duration of construction through the watercourse.
- The pipe trench will be excavated across the dry river channel. Hand excavation will be used for the removal of soft/intermediate material. Areas with hard rock/boulders will be excavated using an excavator or TLB with a mini/small bucket.
- The reinforcing dowels will be placed and the concrete bedding cradle will be constructed.
- Once the concrete has set, the steel pipes will be laid.
- Pipes will be restrained to prevent floatation during construction.
- Concrete will be poured to completely encase the HDPE pipes.
- Once the concrete has set, the temporary cofferdam will be removed, the diversion channel will be backfilled and the river/stream will be reinstated to its original flow path.
- The impacted area will be re-shaped to its original topography.
- The topsoil and foliage will be reinstated.
- The impacted area will be rehabilitated to its original or an improved form.
- All Environmental and Health and Safety requirements and good practice will be strictly adhered to.

The construction methodology for the general pipeline is as follows:

- Pipe to be constructed adjacent to existing roads, tracks and footpaths where possible as these areas have already been disturbed.
- Topsoil will be removed and stockpiled carefully for later use, backfilled and used for rehabilitation.
- Trenches will be excavated. Hand excavation by local labour will be used for the removal of soft/intermediate material thus reducing the disturbed area. Areas with hard rock/boulders will be excavated using an excavator or TLB with a mini/small bucket thus reducing the disturbed area.
- Excavated material will be placed alongside the pipe trench if suitable for backfill material.
- Bedding will be placed and compacted, the pipe will be laid with selected fill placed and compacted.
- The trench will be backfilled to natural ground level.
- The impacted area will be re-shaped to its original topography.
- Topsoil will be reinstated.
- The impacted area will be rehabilitated to its original or an improved form.
- All Environmental and Health and Safety requirements and good practice will be strictly adhered to.

1.3 Description of Feasible Alternatives as Per Section 3(h)(i)

"Alternatives" are defined as "different means of meeting the general purpose and requirements of the activity"[3]. Alternatives considered must be feasible and reasonable[4]. Alternatives considered must aim to address key significant impacts of the proposed activity by "maximising benefits and avoiding or minimising the negative impacts"[5]. Two design alternatives have therefore been assessed in this report and are attached under Appendix A.

[3] Environmental Impact Assessment Regulations, 2014 as amended published under Government Notice No. 326 in Gazette No. 40772 of 07 April 2017.

1.3.1 Site Alternatives

1.3.1.1 Pipe Alignment Alternative 1 (Preferred Site Alternative)

Two pipeline alternatives have been considered in this assessment for the water course crossings. The preferred alignment alternative is to construct the pipelines adjacent to and within portions of the existing road servitude. This will allow the pipeline to follow previously disturbed areas thereby reducing the impact of vegetation clearing and excavation from the construction activities.

Realigning the pipeline outside the existing servitudes will result in the transformation of previously undisturbed areas which will have a significantly larger environmental impact than the preferred alignment alternative. Therefore, only one site alternative was considered in this application.

1.3.2 Design Alternatives

1.3.2.1 Design Alternative 1 (Preferred Design Alternative)

The preferred design alternative is to construct the pipeline watercourse crossings, encased in concrete at each watercourse crossing point, as recommended in the engineering report[6]. This alternative will involve the placement of the new bulk pipeline watercourse crossings along existing road servitudes, tracks, and footpaths below the river bed of the watercourses. This crossing technique will have a smaller construction footprint and less impact on the surrounding environment than crossing the watercourses in new locations outside existing servitudes. The pipelines once constructed, will not block or impede the flow of water in the watercourse as they will be below the surface of the river bed. Please see Appendix A for design drawings.

1.3.2.2 Design Alternative 2

Alternative 2 is to construct a pipe bridge over the watercourses. This would entail building pier structures into the watercourse beds to support the pipeline above-ground. This approach will have a larger environmental and visual impact with the above-ground pipes being very visible. Constructing piers in each watercourse would potentially create long term water flow impedance if piers are located in the watercourse beds and banks. This technique would make the pipe susceptible to damage during flood events when the water levels rise, which would demand more infrastructural maintenance and repair for the Municipality and ultimately threaten the consistent supply of potable water for all users in this area.

1.3.3 The No Go Alternative

The new Ntambanana Water Supply Scheme Infrastructure will not be constructed leaving the residents of this community without a consistent potable water supply. The use of water tankers for delivery of potable water will continue. This will increase the cost imposed on the municipality due to continued fuel and maintenance requirements of the water tankers and related plant. The current water shortage demands will be exasperated which may fuel further community frustration. This will lead to insufficient water capacity for the projected demand in the Ntambanana area.

1.4 All Listed and Specific Activities to Be Triggered and Being Applied For As Per Section 3(d) (i)

Table 1: Listed Activities Being Applied for

GNR	Activity Number	Activity as per the legislation	Activity as it applies to the proposal
Listing Notice 1; 4th December 2017 as amended	9	*The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for bulk transportation of water or storm water or*	Approximately 7 548m of the bulk pipeline will be 400mm-4500mm in diameter.

[6] City of uMhlatuze, Upgrade of Water Supply Infrastructure for Ntambanana Supply Area (Upper Nseleni Supply). Feasibility Report (rev1) March 2022.

		storm water drainage inside a road reserve or railway line reserve; or *(b) where such development will occur within an urban area.*	
Listing Notice 1; 4th December 2017 as amended	12	*The development of—* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *within a watercourse; or within 32m of a watercourse;*	The Ntambanana Water Supply Scheme will entail the development of cumulatively more than 100m^2 of infrastructure within 32m of the watercourses that will be crossed by the pipeline networks.
Listing Notice 1; 4th December 2017 as amended	19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.*	The applicant proposes to construct the pipelines including temporary diversion canals through the associated watercourse crossings. This activity will result in more than 10m^3 of material being moved/ deposited within 63 watercourses.

1.5 Location of Activity as per Section 3 (b)(i)-(iii)

Table 2: Location Information

District Municipality	King Cetshwayo District Municipality
Local Municipality	City of uMhlathuze
Wards	24, 25, 31, 32 and 33
Area / Town / Village	

Co-ordinates for the pipeline watercourse crossings (WC) within 32m of identified watercourses that will entail the infill or excavation of more than 10m^2 of material from within the watercourses. (Figure 3- Figure 26 Illustrates these crossing points)

WC No.	Latitude	Longitude	WC No.	Latitude	Longitude
Ward 24			**Ward 31**		
1	28°43'39.88"S	31°49'24.00"E	1	28°42'34.20"S	31°48'47.72"E
2	28°43'30.87"S	31°50'13.48"E	2	28°42'14.99"S	31°48'32.27"E
3	28°43'30.20"S	31°50'54.58"E	3	28°41'18.69"S	31°47'54.87"E
4	28°43'29.92"S	31°51'22.29"E	4	28°40'44.15"S	31°47'26.91"E
5	28°43'29.89"S	31°51'51.34"E	5	28°40'32.87"S	31°47'19.60"E
Ward 32			6	28°39'40.04"S	31°46'39.73"E
1	28°42'36.03"S	31°52'13.10"E	7	28°39'27.19"S	31°46'15.88"E
2	28°42'19.29"S	31°52'11.60"E	8	28°38'50.32"S	31°46'2.22"E
3	28°42'1.92"S	31°52'4.73"E	9	28°38'46.61"S	31°46'0.75"E
4	28°42'2.86"S	31°52'0.32"E	10	28°39'21.42"S	31°46'10.19"E
5	28°41'39.78"S	31°52'1.49"E	11	28°39'20.38"S	31°46'9.23"E
6	28°41'38.20"S	31°51'52.81"E	12	28°37'54.12"S	31°42'7.67"E
7	28°41'35.08"S	31°51'44.31"E	13	28°40'36.47"S	31°50'54.55"E
8	28°41'47.72"S	31°51'48.62"E	14	28°41'11.24"S	31°50'26.38"E
9	28°41'47.85"S	31°51'39.25"E	15	28°42'58.06"S	31°50'44.68"E
10	28°41'55.64"S	31°51'47.55"E	16	28°41'51.99"S	31°50'37.72"E
11	28°40'48.19"S	31°50'52.71"E	17	28°41'29.12"S	31°50'0.25"E
12	28°41'3.49"S	31°51'21.13"E	18	28°41'55.45"S	31°50'7.19"E
13	28°40'31.10"S	31°51'2.57"E	19	28°41'55.22"S	31°50'1.19"E
14	31°51'5.48"E	28°40'14.35"S	20	28°41'54.15"S	31°49'55.77"E
15	28°36'9.48"S	31°53'37.06"E	21	28°41'55.43"S	31°49'19.47"E
16	28°35'46.09"S	31°53'28.93"E	**Ward 33**		
17	28°35'31.13"S	31°53'3.11"E	1	28°35'49.51"S	31°43'47.81"E
18	28°35'47.04"S	31°52'28.41"E	2	28°34'54.84"S	31°49'47.68"E
19	28°36'5.99"S	31°52'10.51"E	3	28°34'40.64"S	31°49'55.64"E

20	28°36'15.21"S	31°52'12.65"E	4	28°34'18.36"S	31°50'13.47"E
21	28°36'37.72"S	31°51'47.17"E	5	28°34'12.12"S	31°51'10.23"E
22	28°35'12.39"S	31°52'13.15"E	6	28°37'38.89"S	31°45'20.83"E
23	28°35'1.56"S	31°52'4.66"E	7	28°37'6.92"S	31°45'19.73"E
24	28°34'59.97"S	31°52'4.51"E			
25	28°35'2.57"S	31°51'24.02"E			
26	28°37'25.52"S	31°52'19.07"E			
27	28°37'18.43"S	31°51'57.74"E			
29	28°37'16.96"S	31°51'43.23"E			
30	28°37'27.91"S	31°51'28.16"E			
31	28°37'32.11"S	31°51'38.79"E			
Reservoirs Associated with the Water Supply Scheme					
Reservoir 1	28°42'3.30"S	31°50'29.04"E	Existing 3ML Reservoir in Ward 31		
Reservoir 2	28°41'52.41"S	31°51'3.44"E	Proposed 1ML Reservoir in Ward 31		
Reservoir 3	28°39'21.60"S	31°52'21.61"E	Proposed 1ML Reservoir in Ward 32		
Reservoir 4	28°36'30.38"S	31°53'55.17"E	Proposed 5ML Reservoir in Ward 32		
Reservoir 5	28°36'7.58"S	31°51'26.60"E	Proposed 750kl Reservoir in Ward 32		
Reservoir 6	28°35'31.80"S	31°52'44.22"E	Proposed 500kl Reservoir in Ward 32		
Reservoir 7	28°31'17.37"S	31°51'43.66"E	Proposed 500kl Reservoir in Ward 17		
Reservoir 8	28°34'46.47"S	31°49'28.46"E	Proposed 500kl Reservoir in Ward 17		
Reservoir 9	28°33'48.08"S	31°48'41.34"E	Proposed 500kl Reservoir in Ward 17		
Reservoir 10	28°35'56.28"S	31°44'24.17"E	Proposed 10ML Reservoir in Ward 33		
Reservoir 11	28°36'6.94"S	31°45'11.69"E	Proposed 600kl Reservoir in Ward 33		
Reservoir 12	28°33'54.97"S	31°42'33.83"E	Proposed 750kl Reservoir in Ward 33		
Reservoir 13	28°36'13.36"S	31°41'14.54"E	Proposed 7ML Reservoir in Ward 31		
Reservoir 14	28°38'51.03"S	31°40'52.25"E	Proposed 200kl Reservoir in Ward 31		

Figure 1: 1:30 000 Map Indicating the Location of the Site

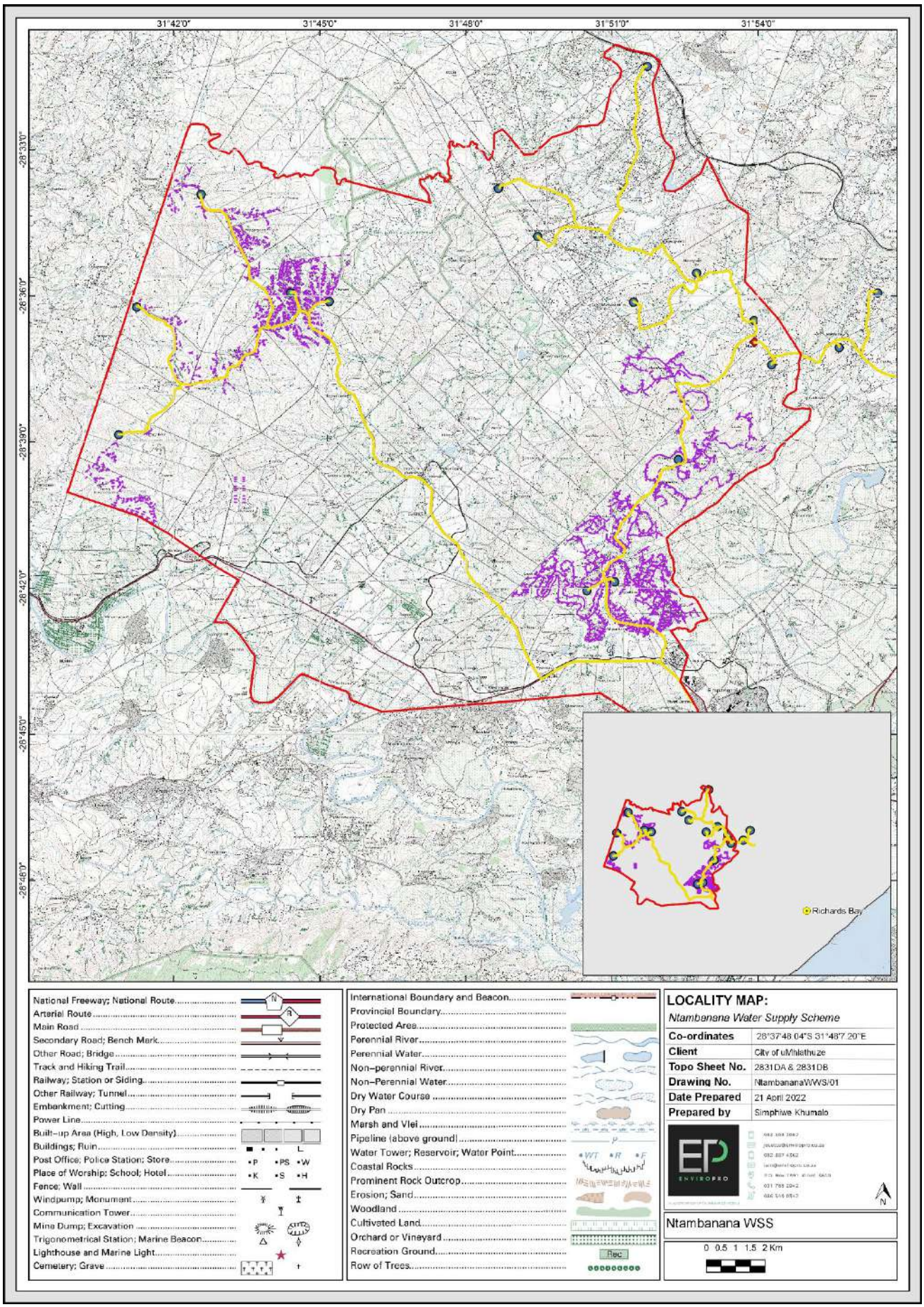


Figure 2: Aerial Photograph Showing An Overview Of The Ntambanana Water Supply Scheme And The Surrounding Topography. Google Earth Image, 2022.

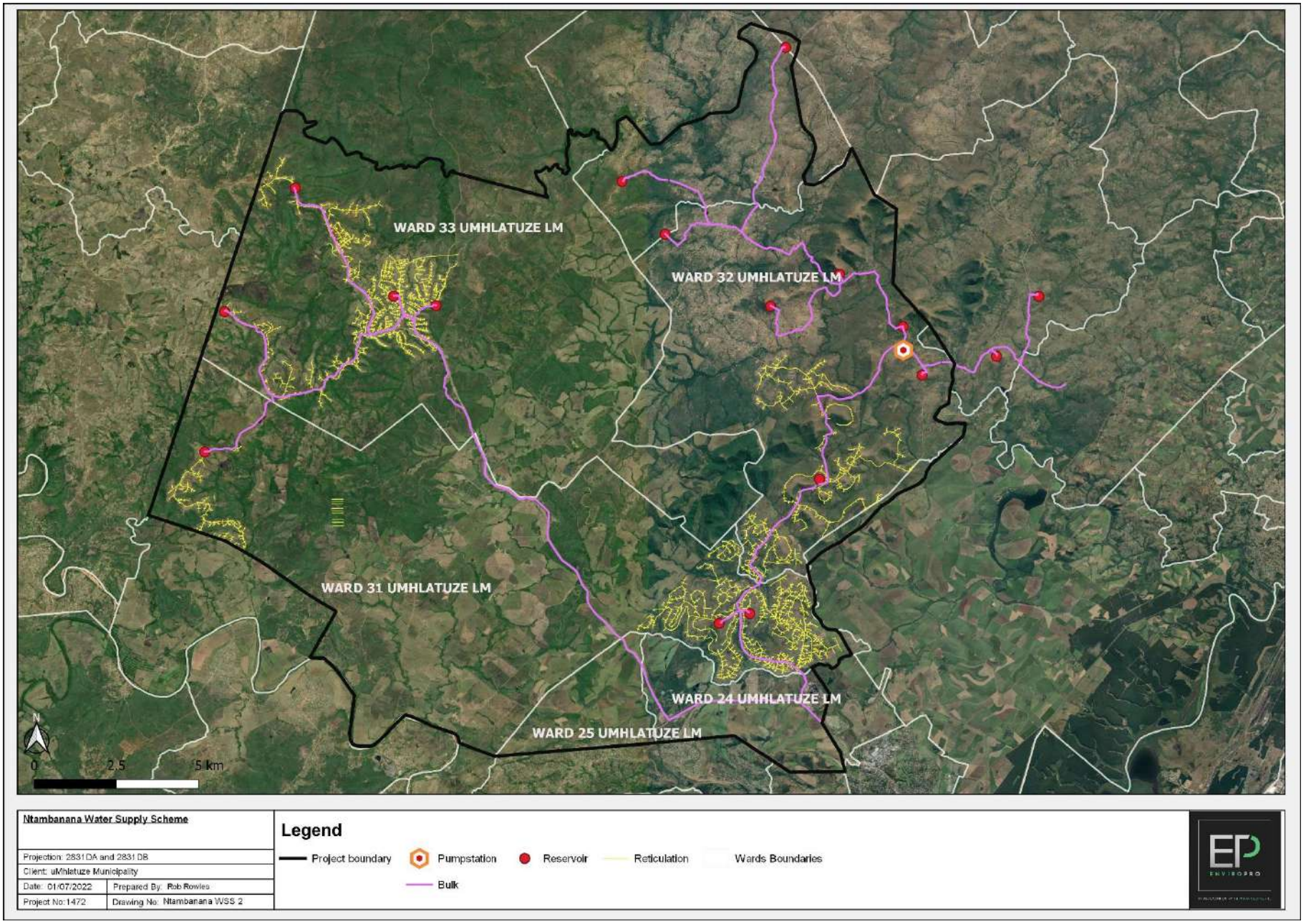


Figure 3: Aerial Photograph Showing Watercourse Crossings 1-5 in Ward 24 of uMhlatuze Local Municipality. Google Earth Image, 2022

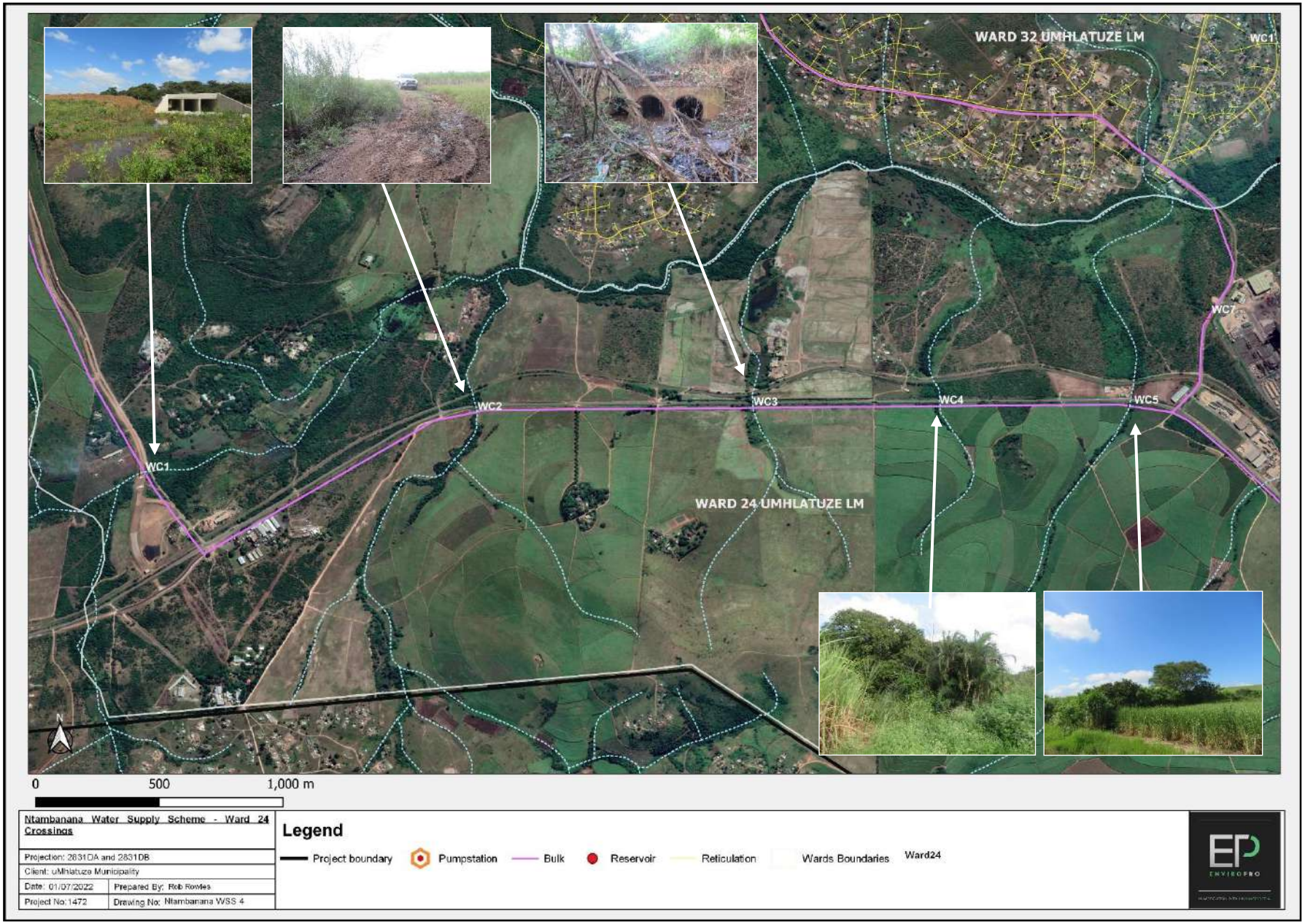


Figure 4: Aerial Photograph Showing Watercourse Crossings 1-31 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

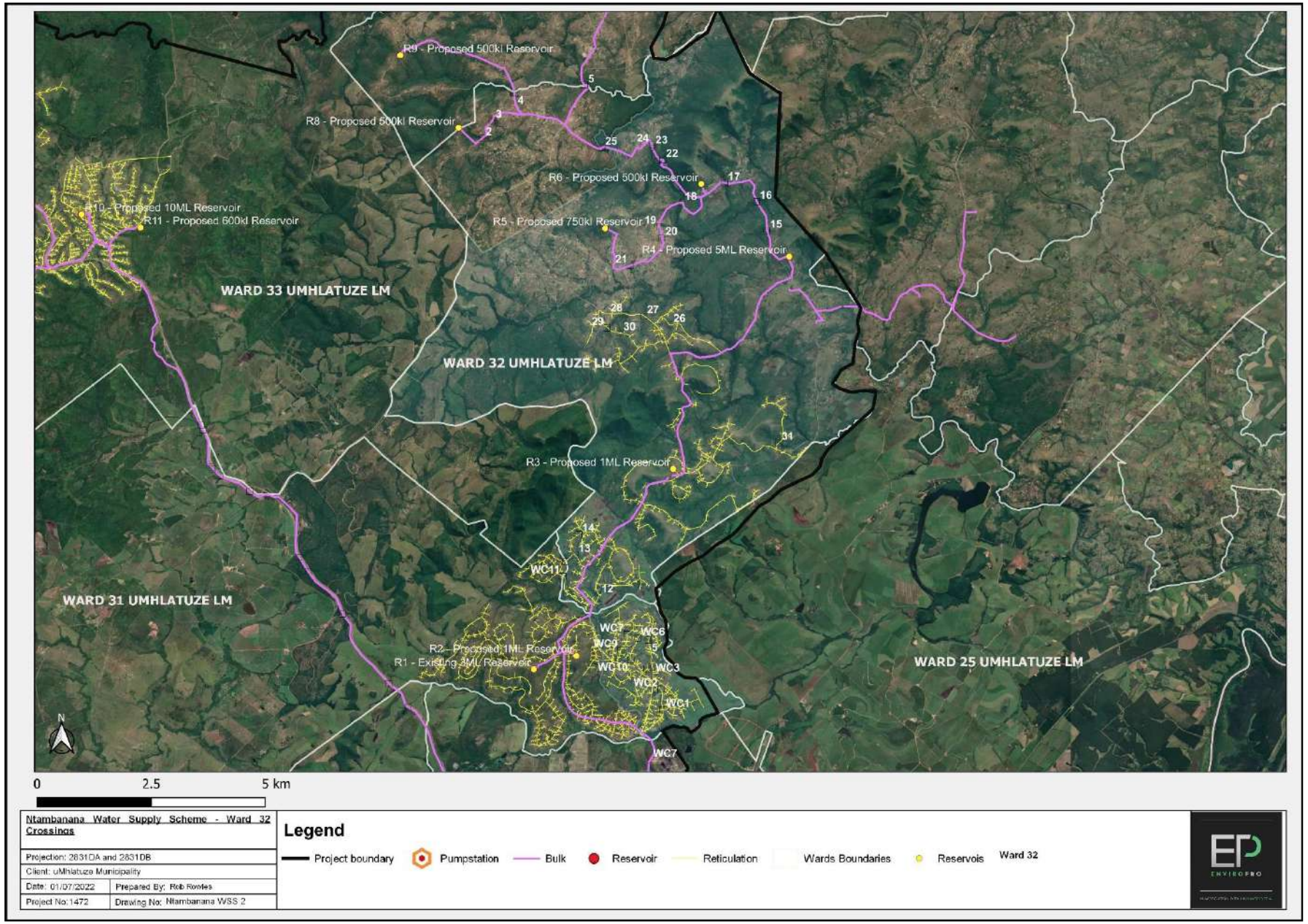


Figure 5: Aerial Photograph Showing Watercourse Crossings 1-10 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

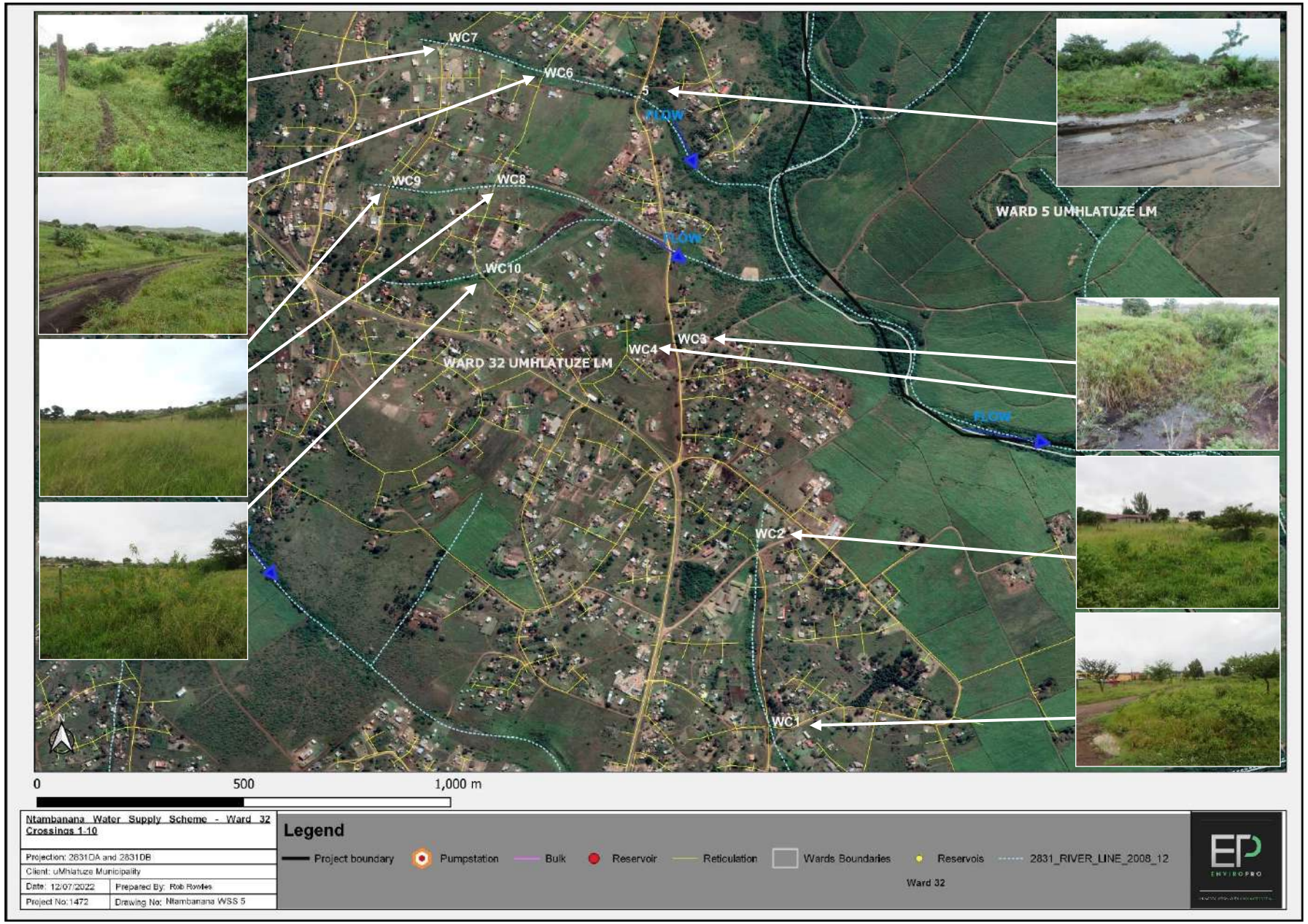


Figure 6: Aerial Photograph Showing Watercourse Crossings 11-14 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

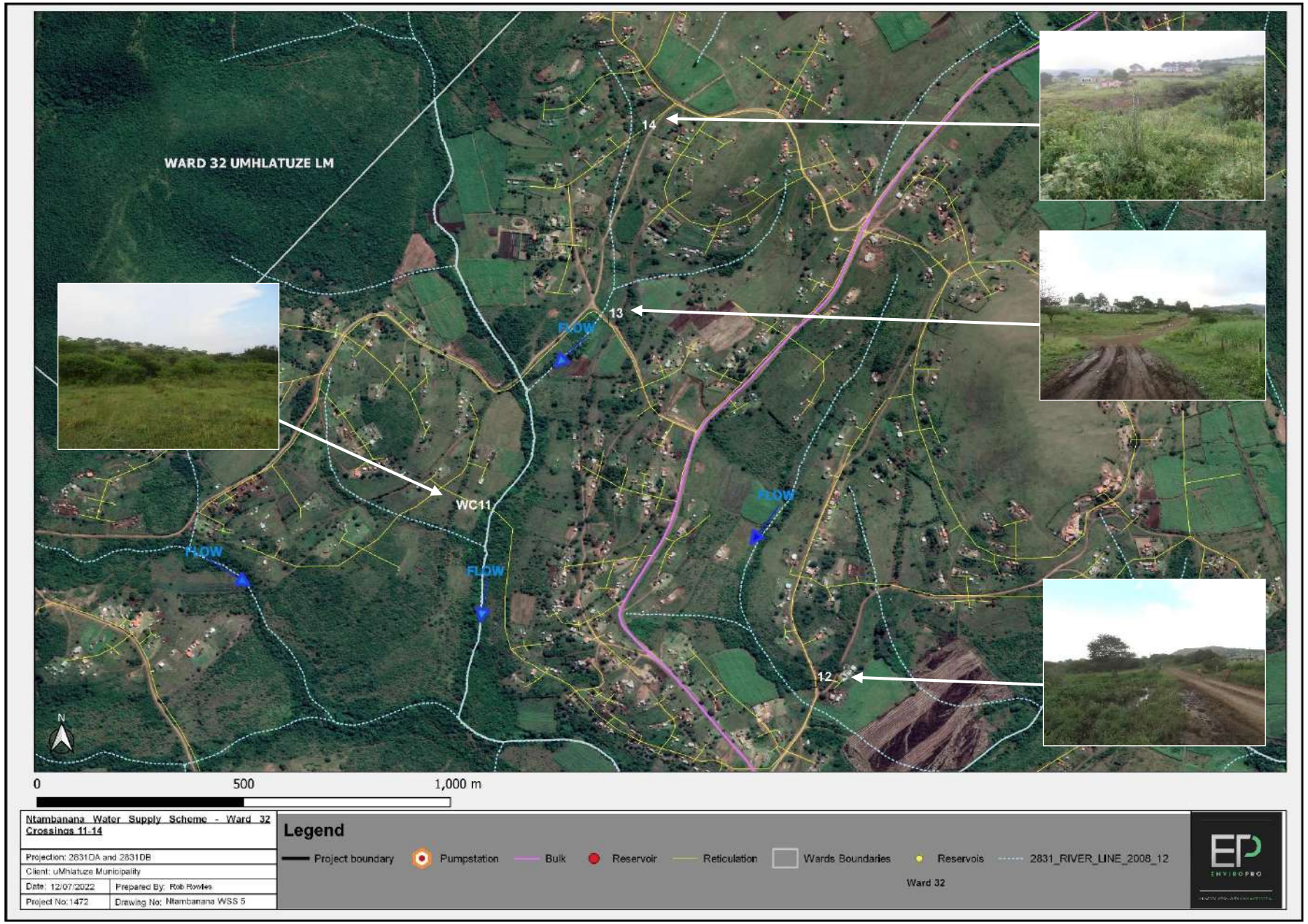


Figure 7: Aerial Photograph Showing Watercourse Crossings 15 - 17 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

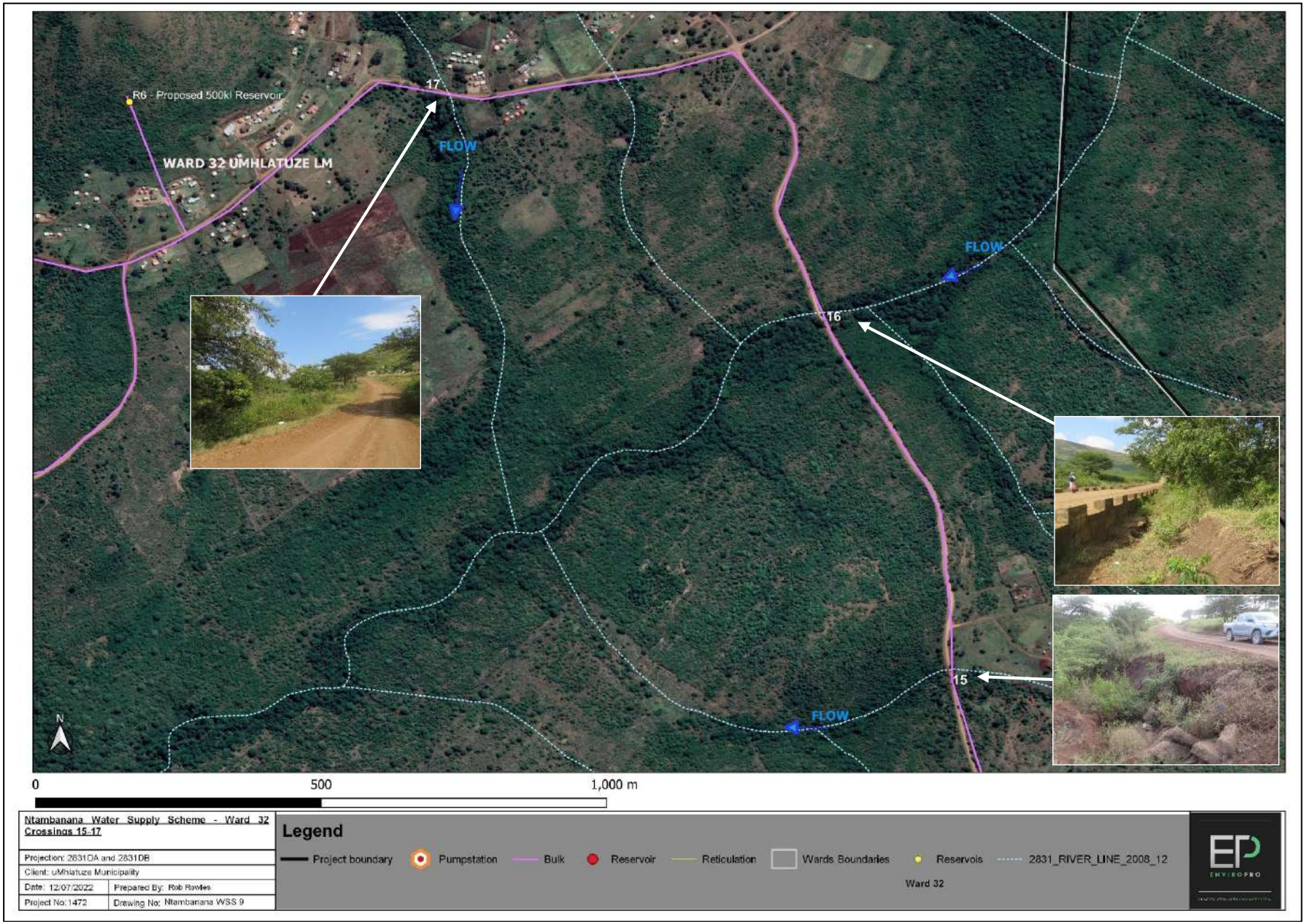


Figure 8: Aerial Photograph Showing Watercourse Crossings 18 - 21 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

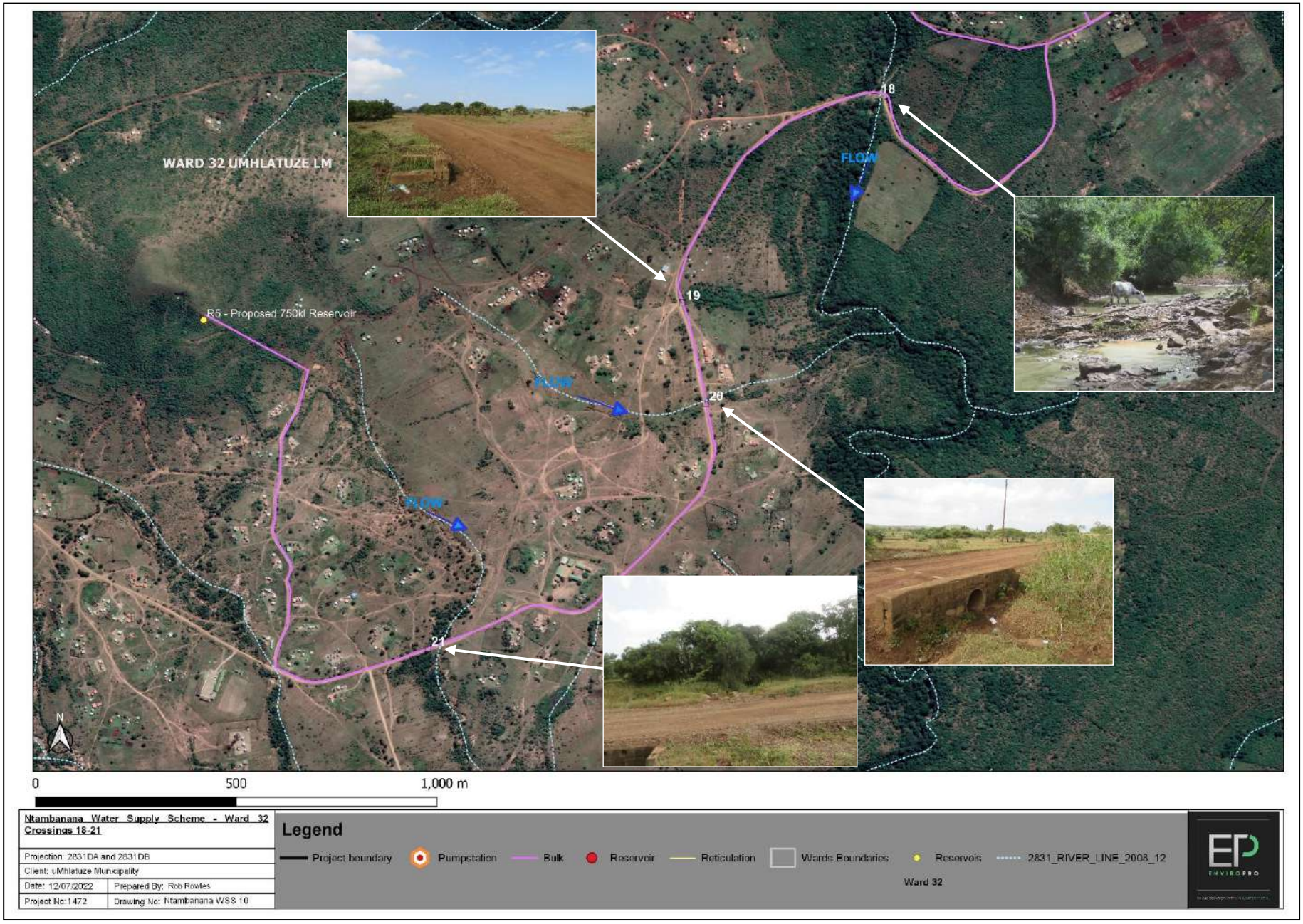


Figure 9: Aerial Photograph Showing Watercourse Crossings 22 - 25 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

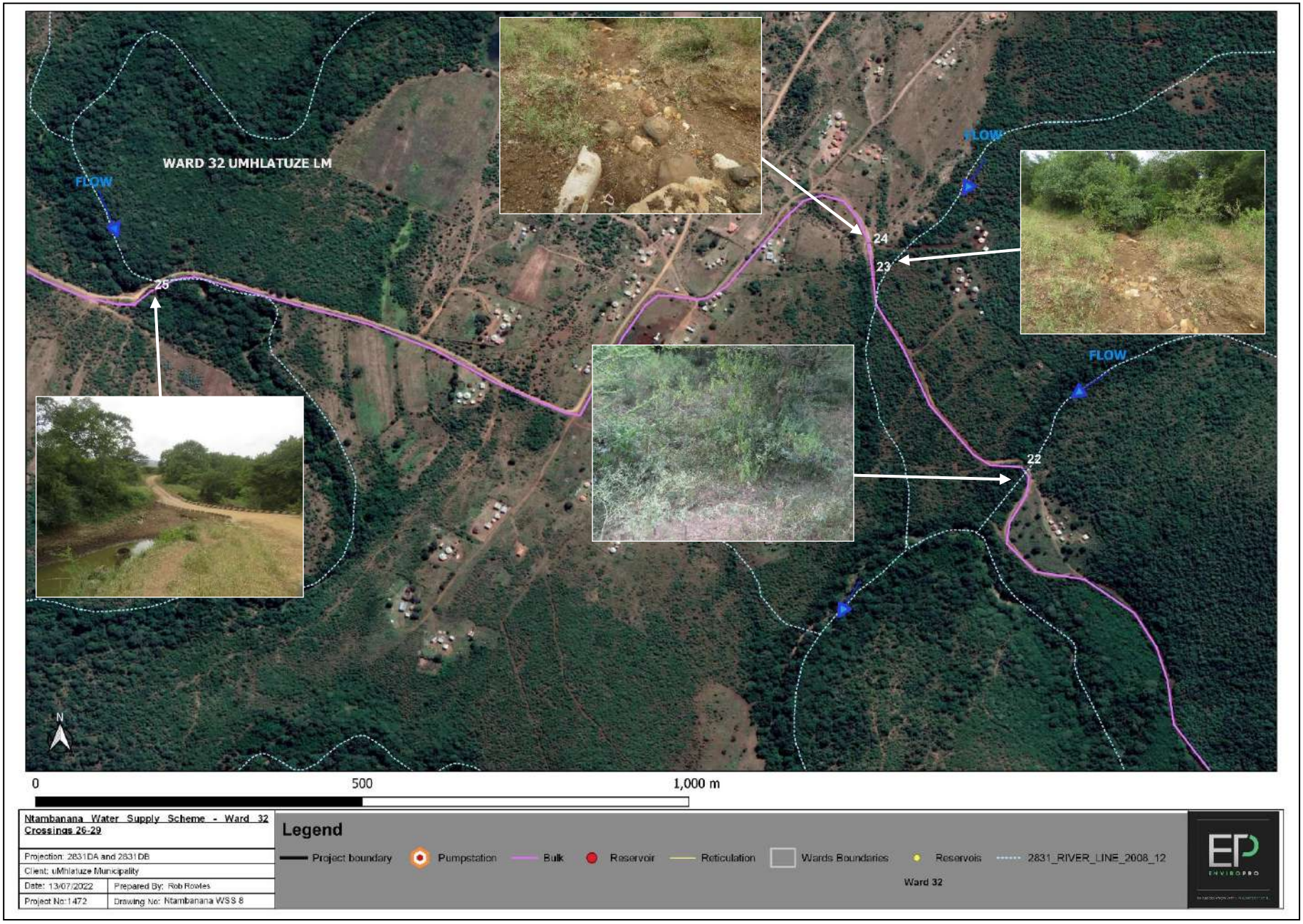


Figure 10: Aerial Photograph Showing Watercourse Crossings 26- 30 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

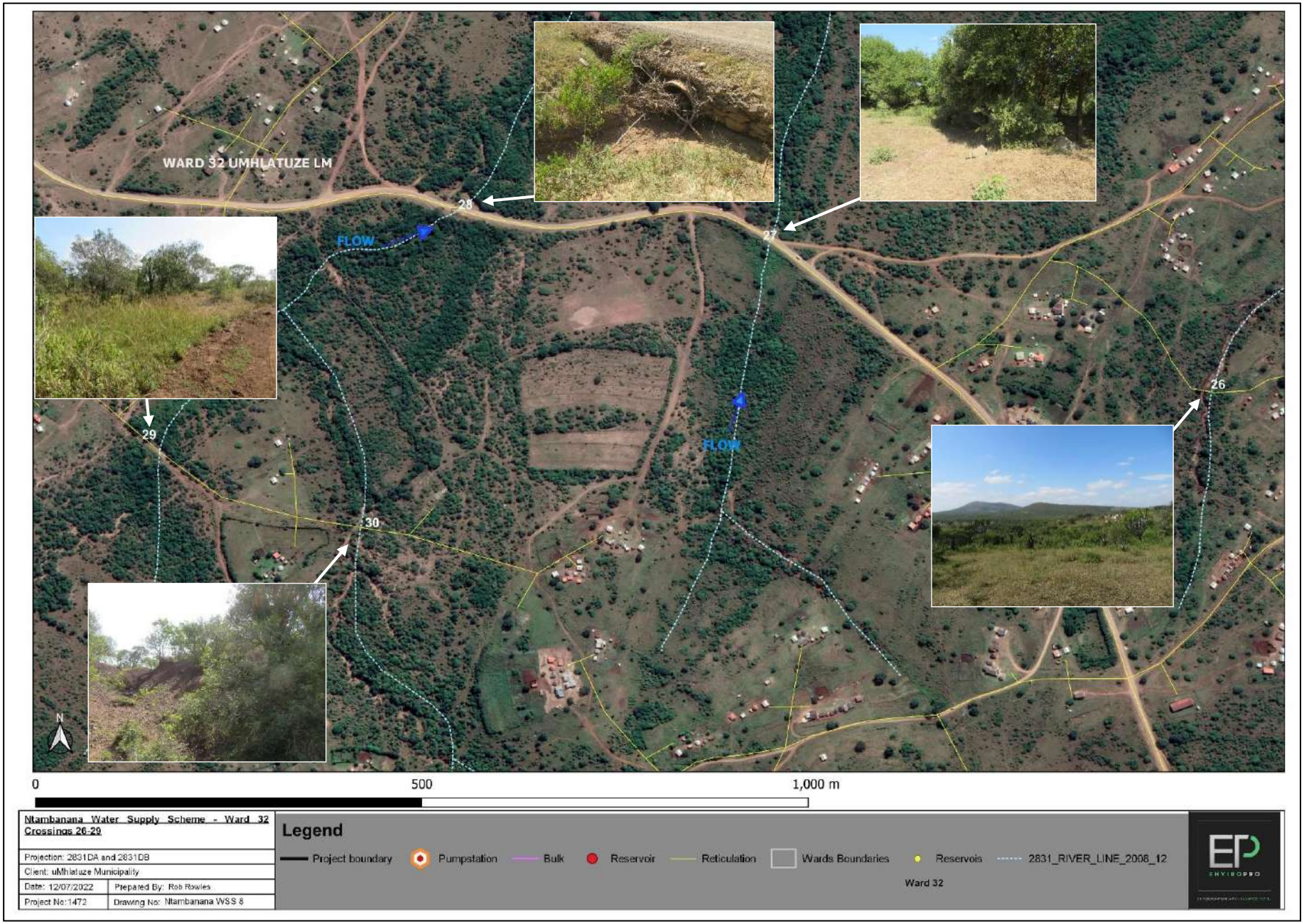


Figure 11: Aerial Photograph Showing Watercourse Crossings 31 in Ward 32 of uMhlatuze Local Municipality. Google Earth Image, 2022

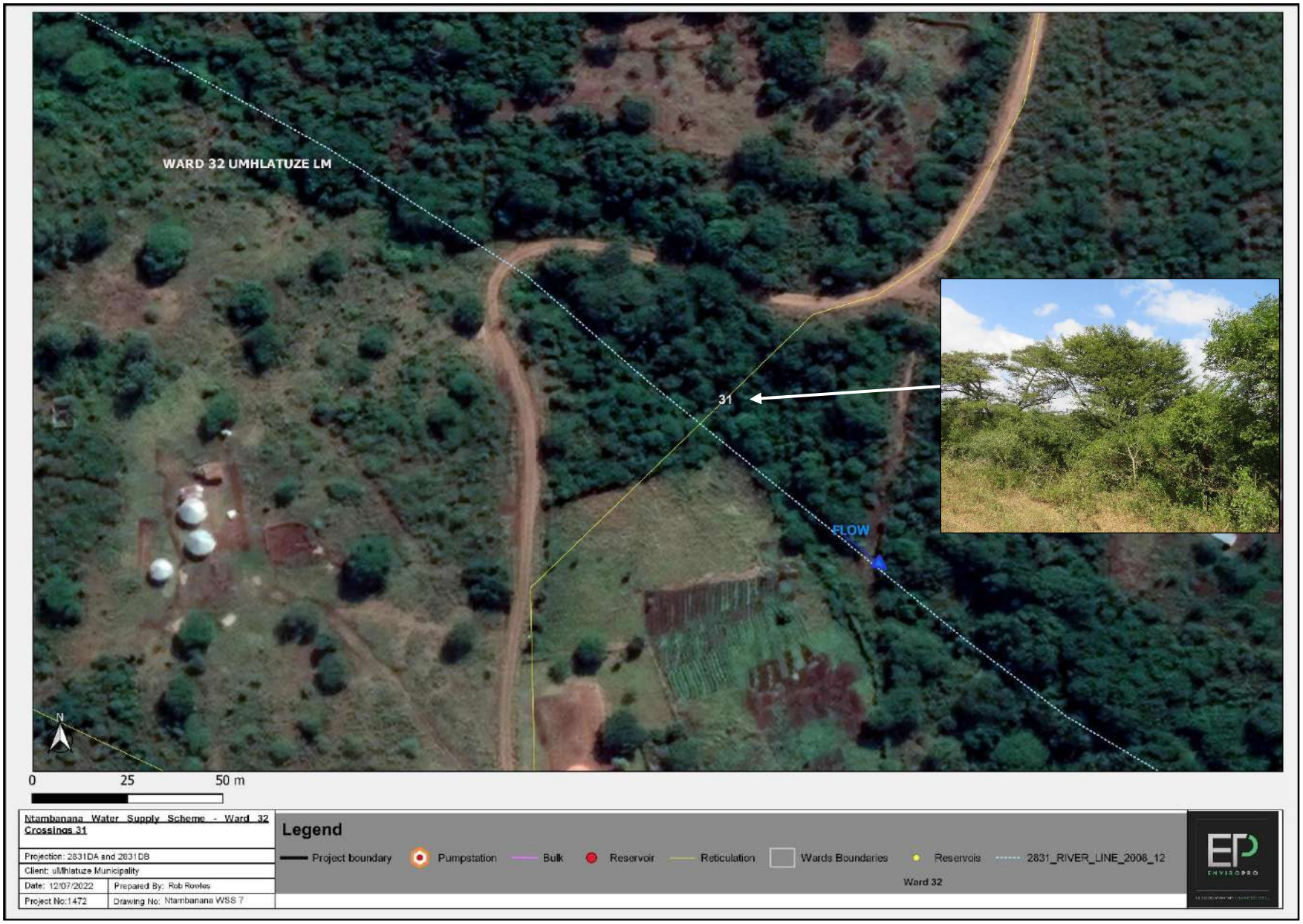


Figure 12: Aerial Photograph Showing an overview of Watercourse Crossings 1-7 in Ward 33 of uMhlatuze Local Municipality. Google Earth Image, 2022

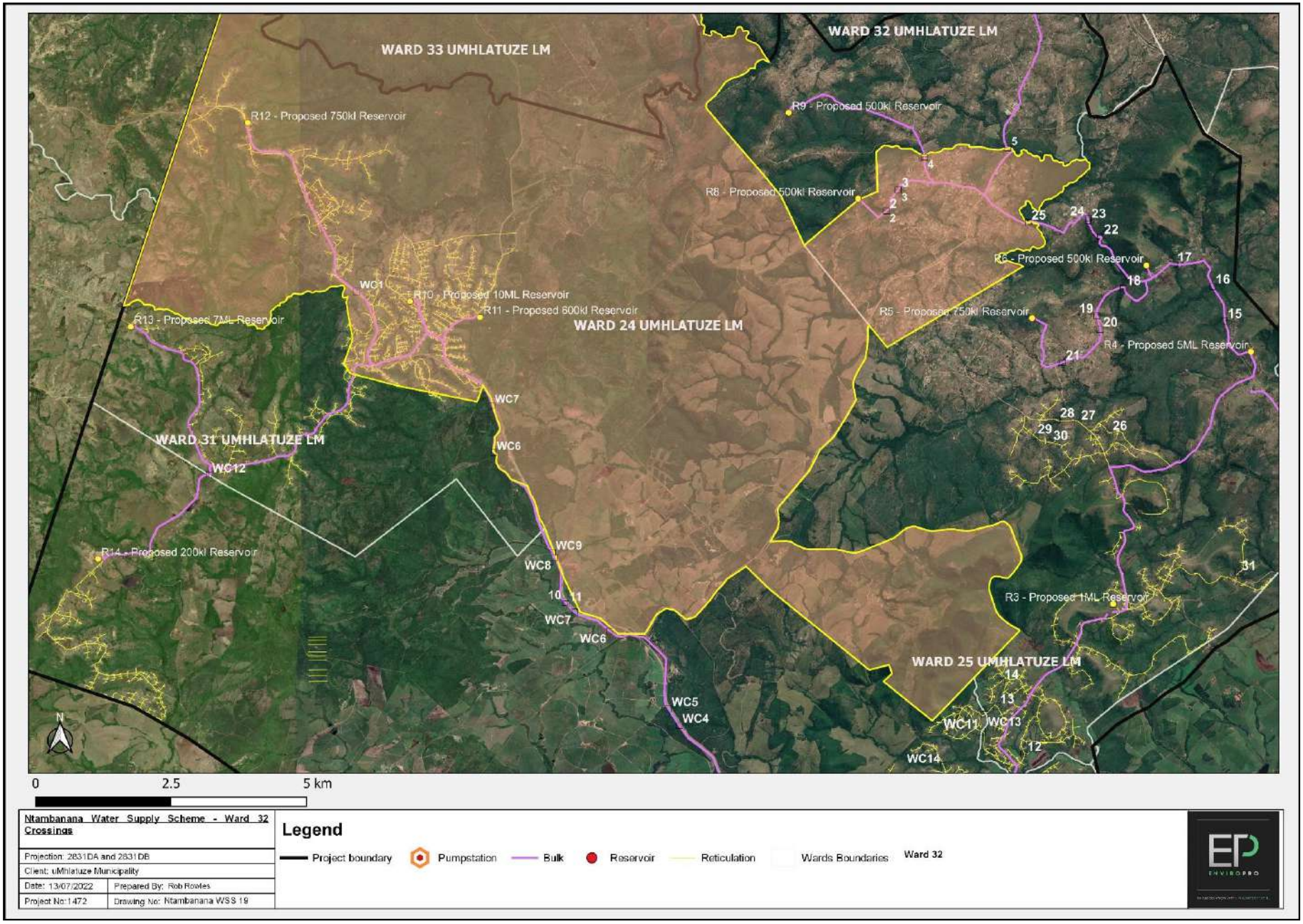


Figure 13: Aerial Photograph Showing Watercourse Crossings 1 in Ward 33 of uMhlatuze Local Municipality. Google Earth Image, 2022

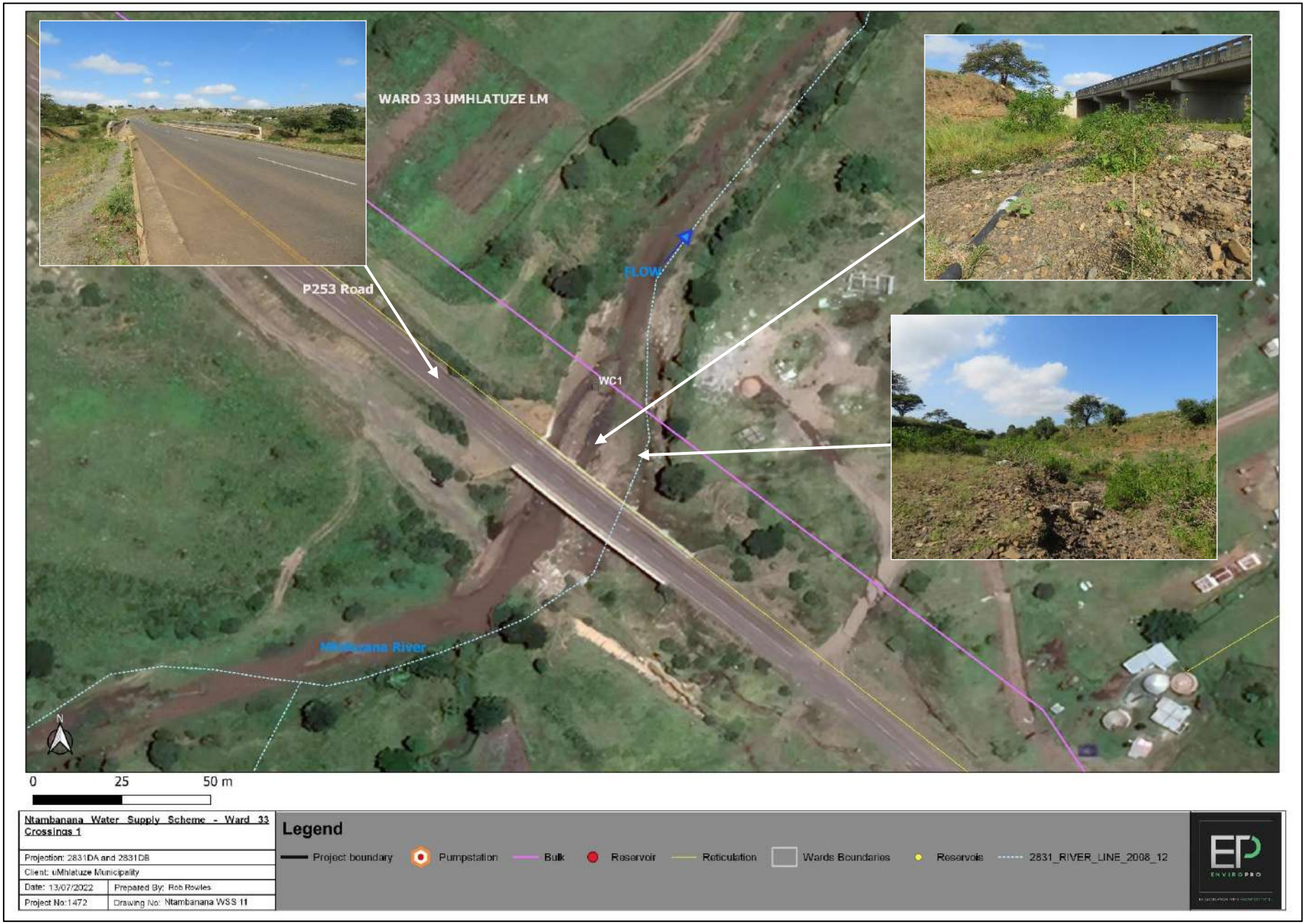


Figure 14: Aerial Photograph Showing Watercourse Crossings 2-5 in Ward 33 of uMhlatuze Local Municipality. Google Earth Image, 2022

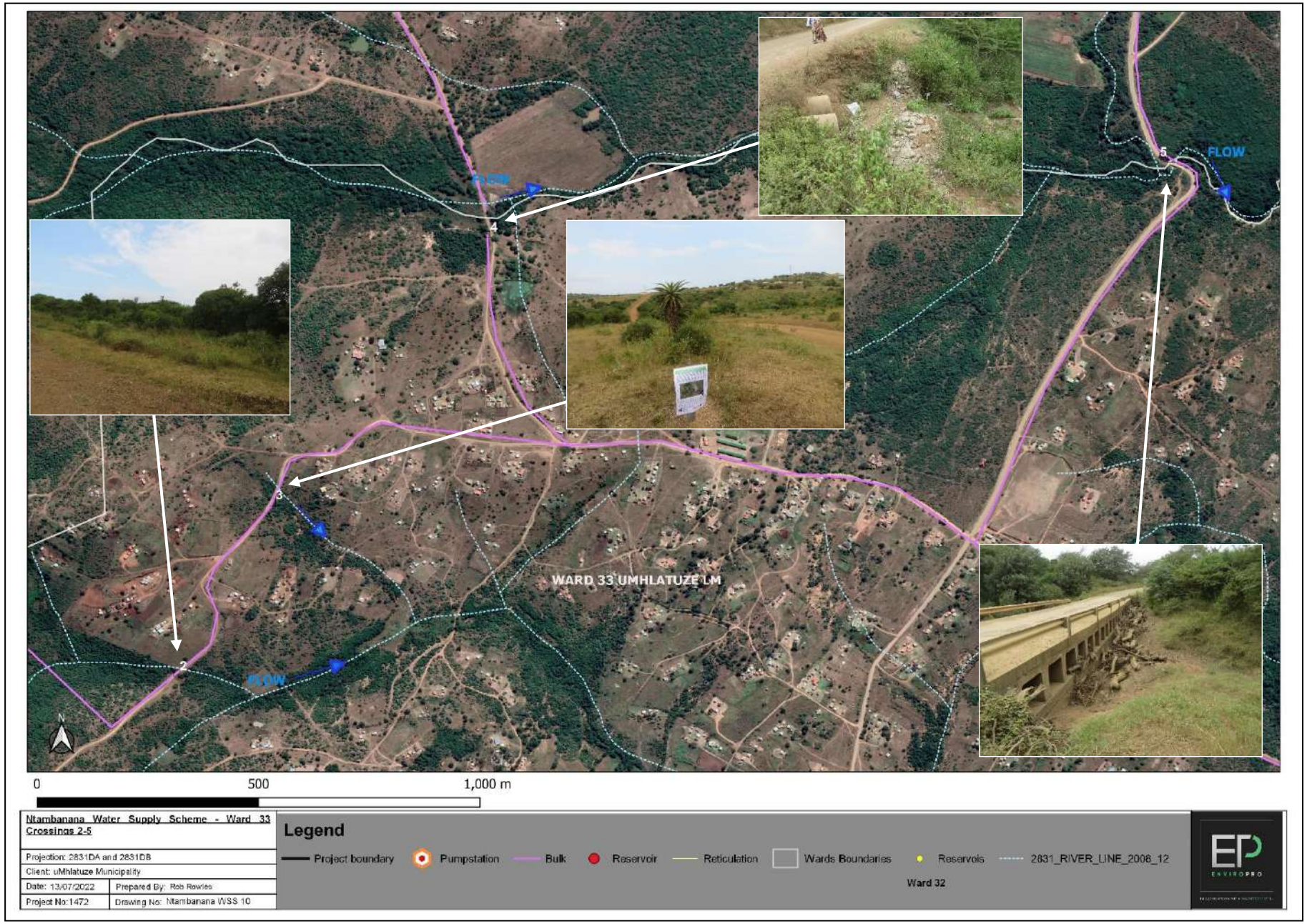


Figure 15: Aerial Photograph Showing Watercourse Crossings 6-7 in Ward 33 of uMhlatuze Local Municipality. Google Earth Image, 2022

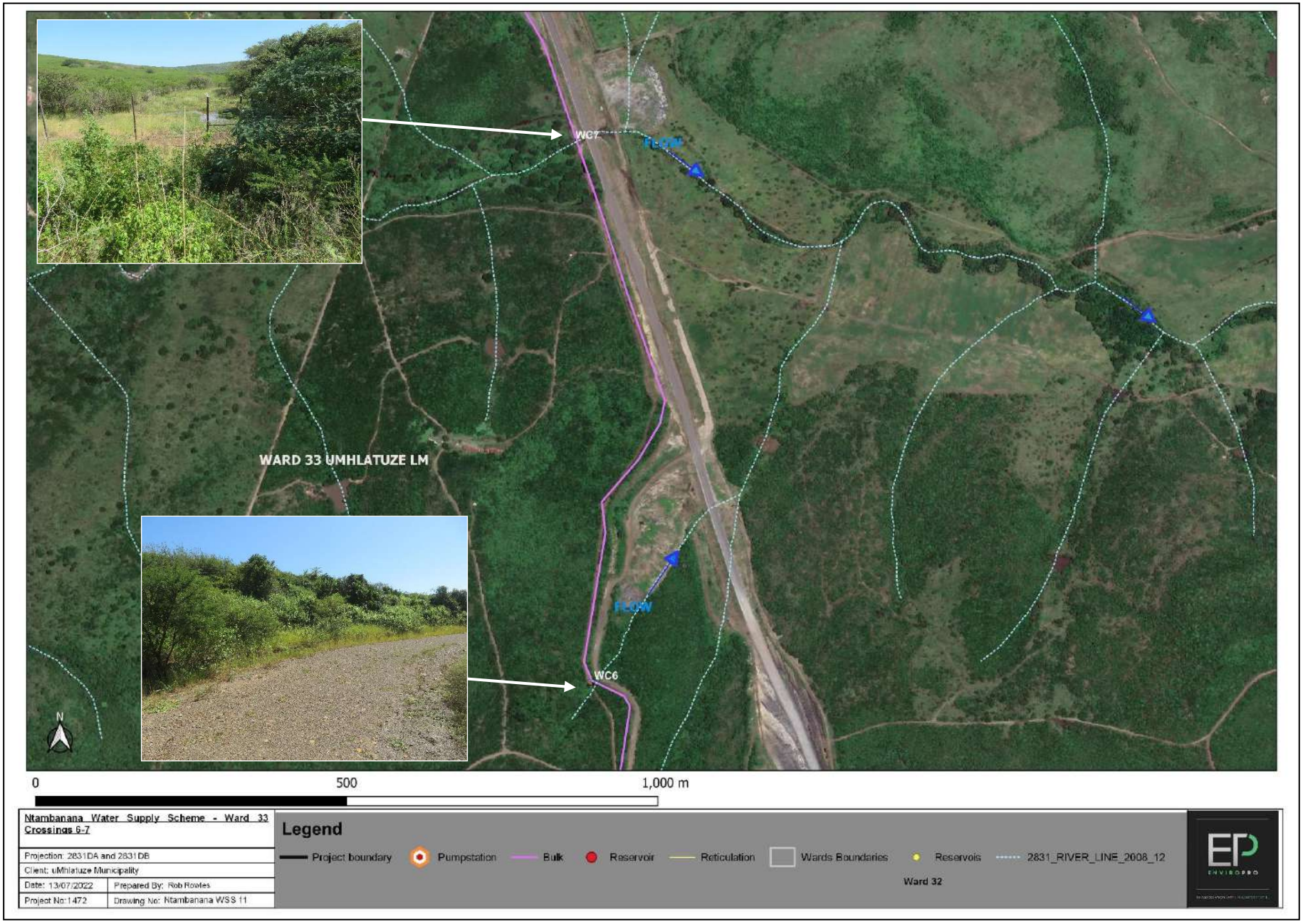


Figure 16: Aerial Photograph Showing Watercourse Crossings 1-21 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

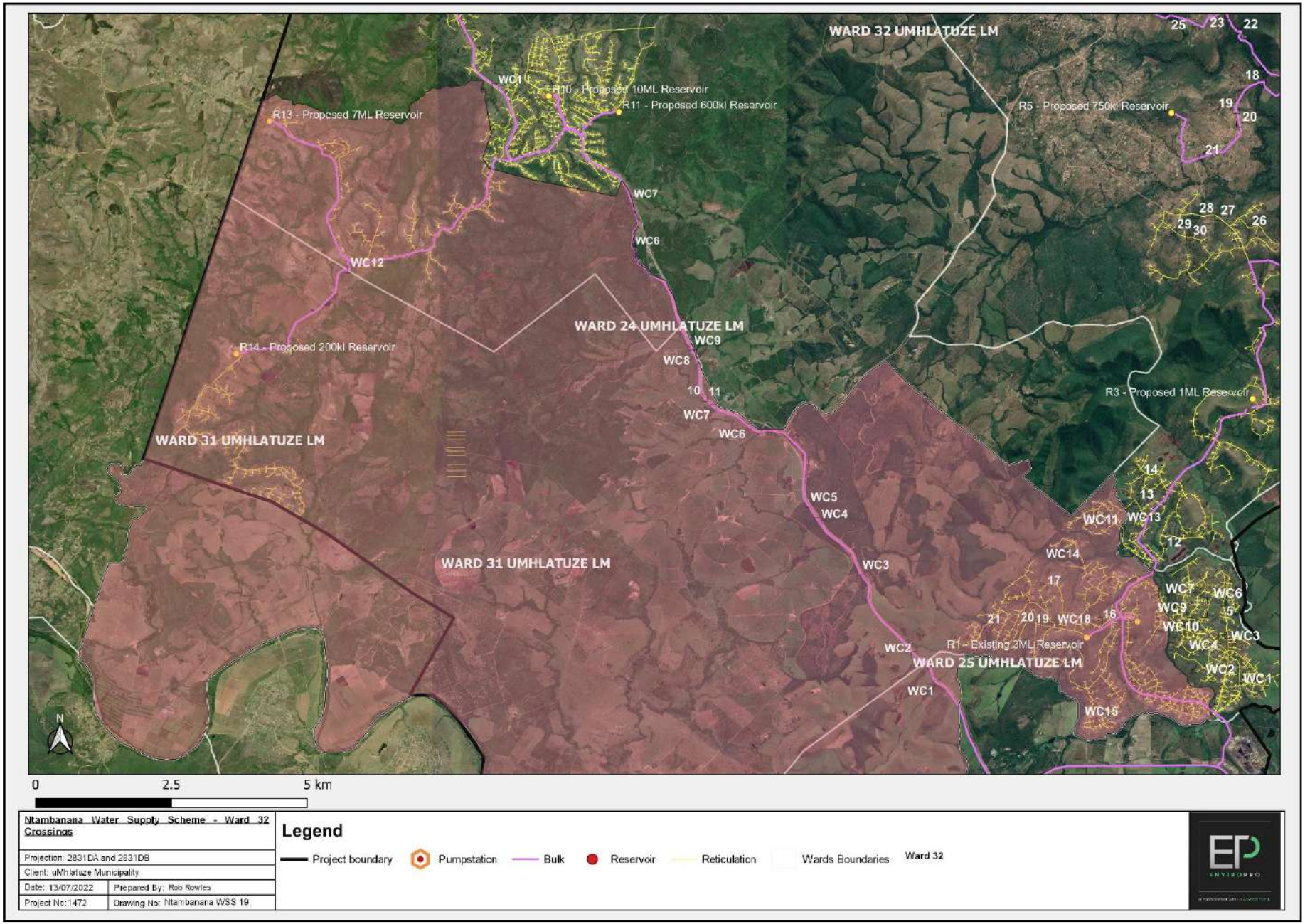


Figure 17: Aerial Photograph Showing Watercourse Crossings 1-2 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

Figure 18: Aerial Photograph Showing Watercourse Crossings 3-5 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

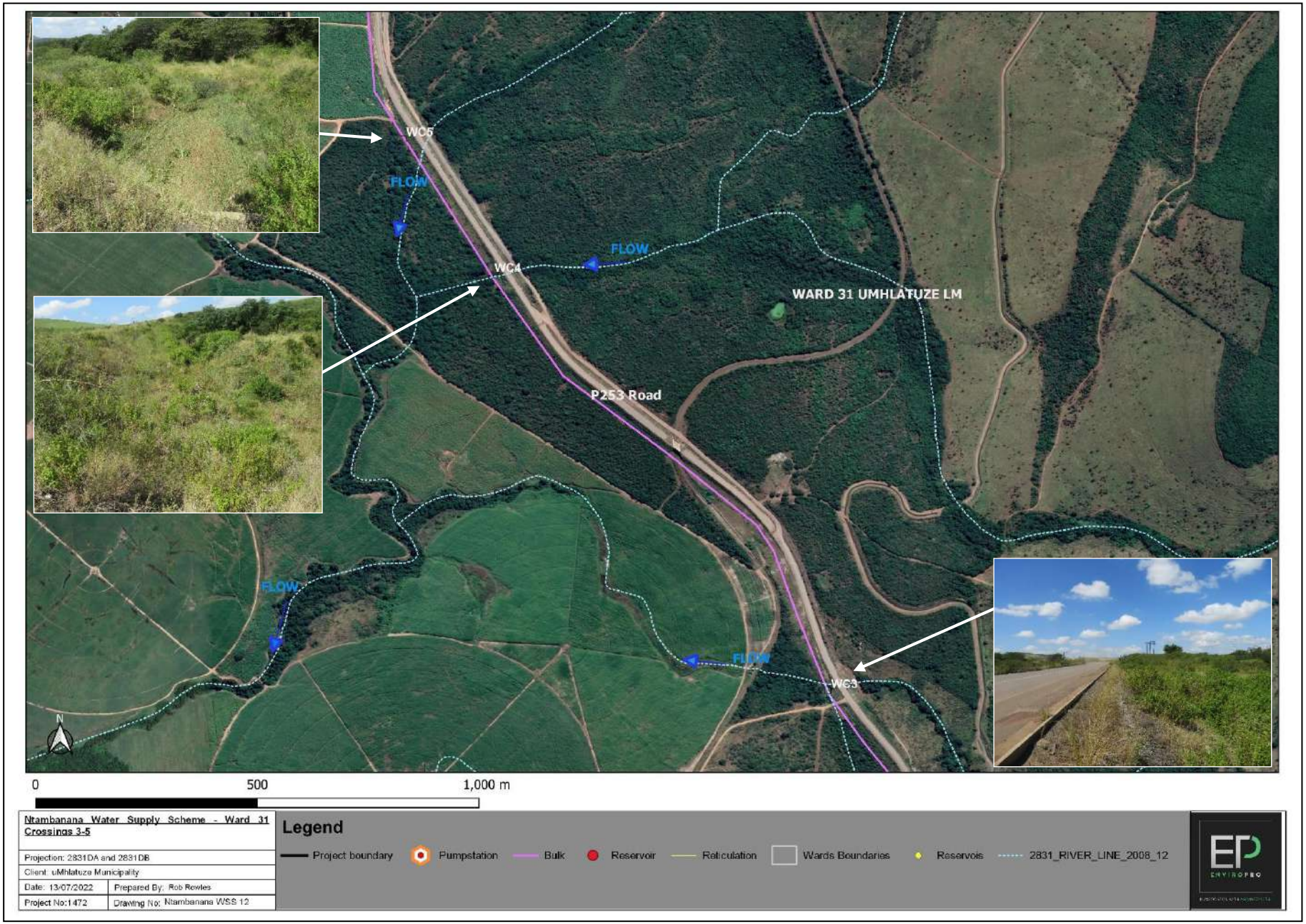


Figure 19: Aerial Photograph Showing Watercourse Crossings 6-11 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

Figure 20: Aerial Photograph Showing Watercourse Crossings 12 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

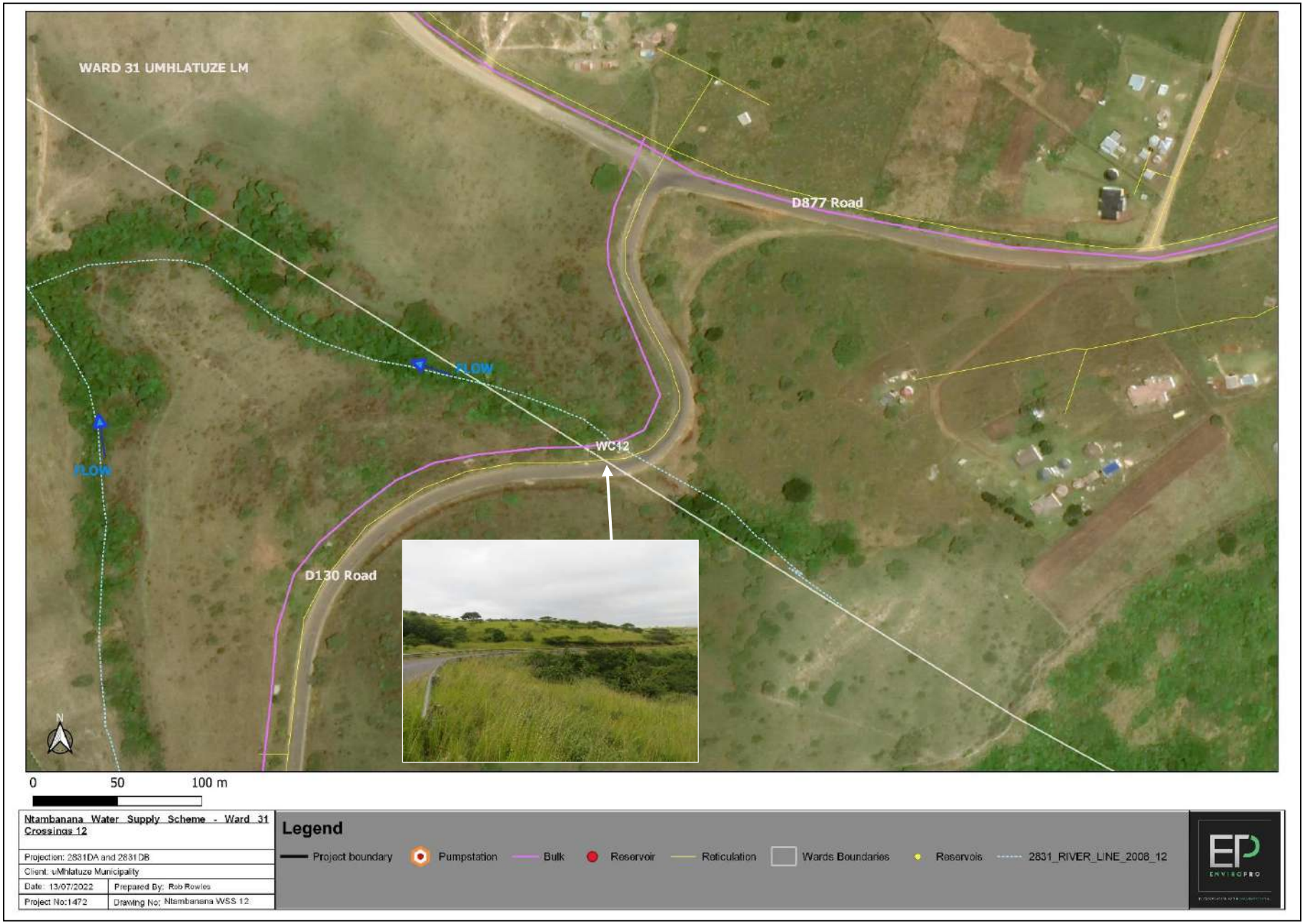


Figure 21: Aerial Photograph Showing Watercourse Crossings 13 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

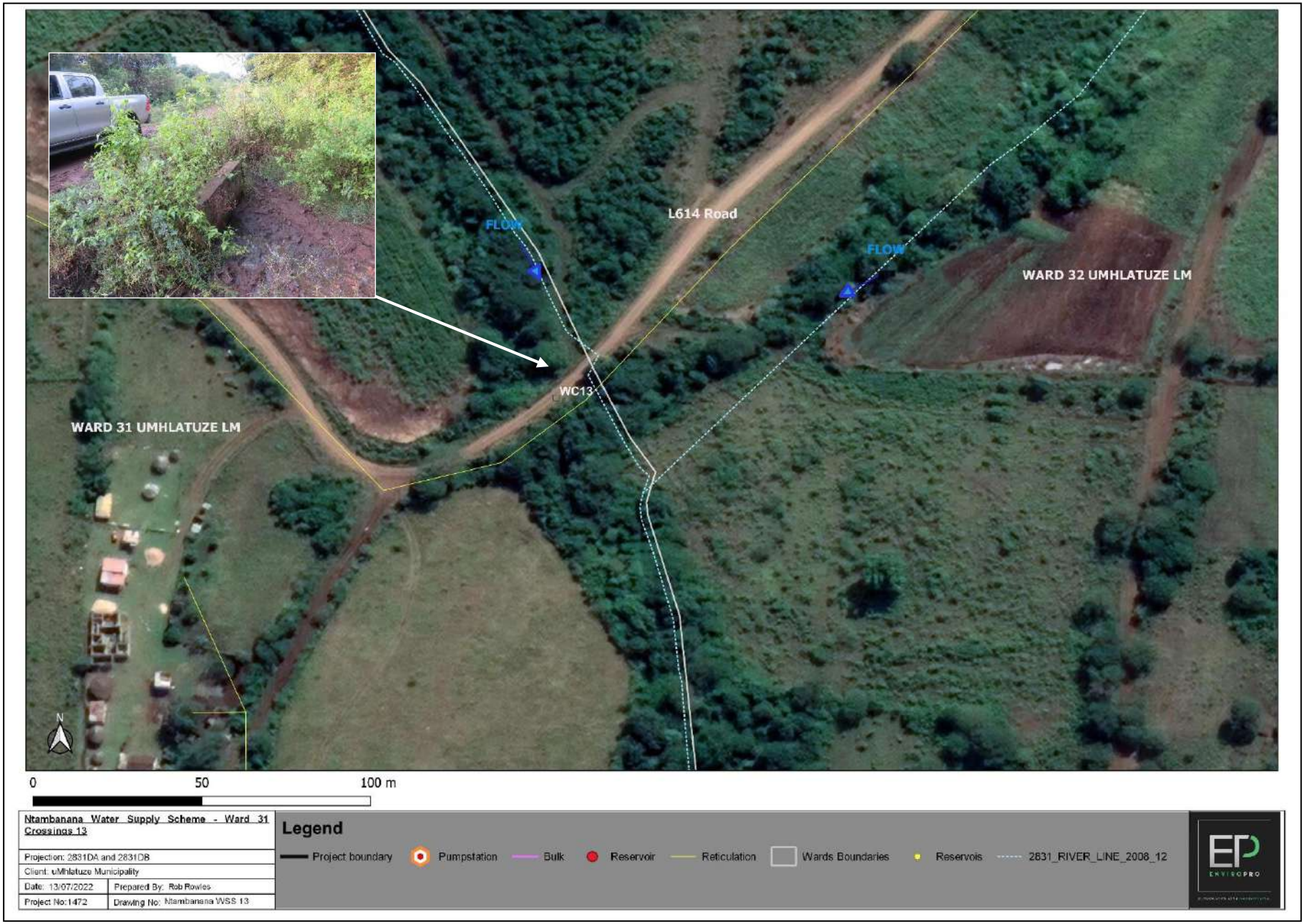


Figure 22: Aerial Photograph Showing Watercourse Crossings 14 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

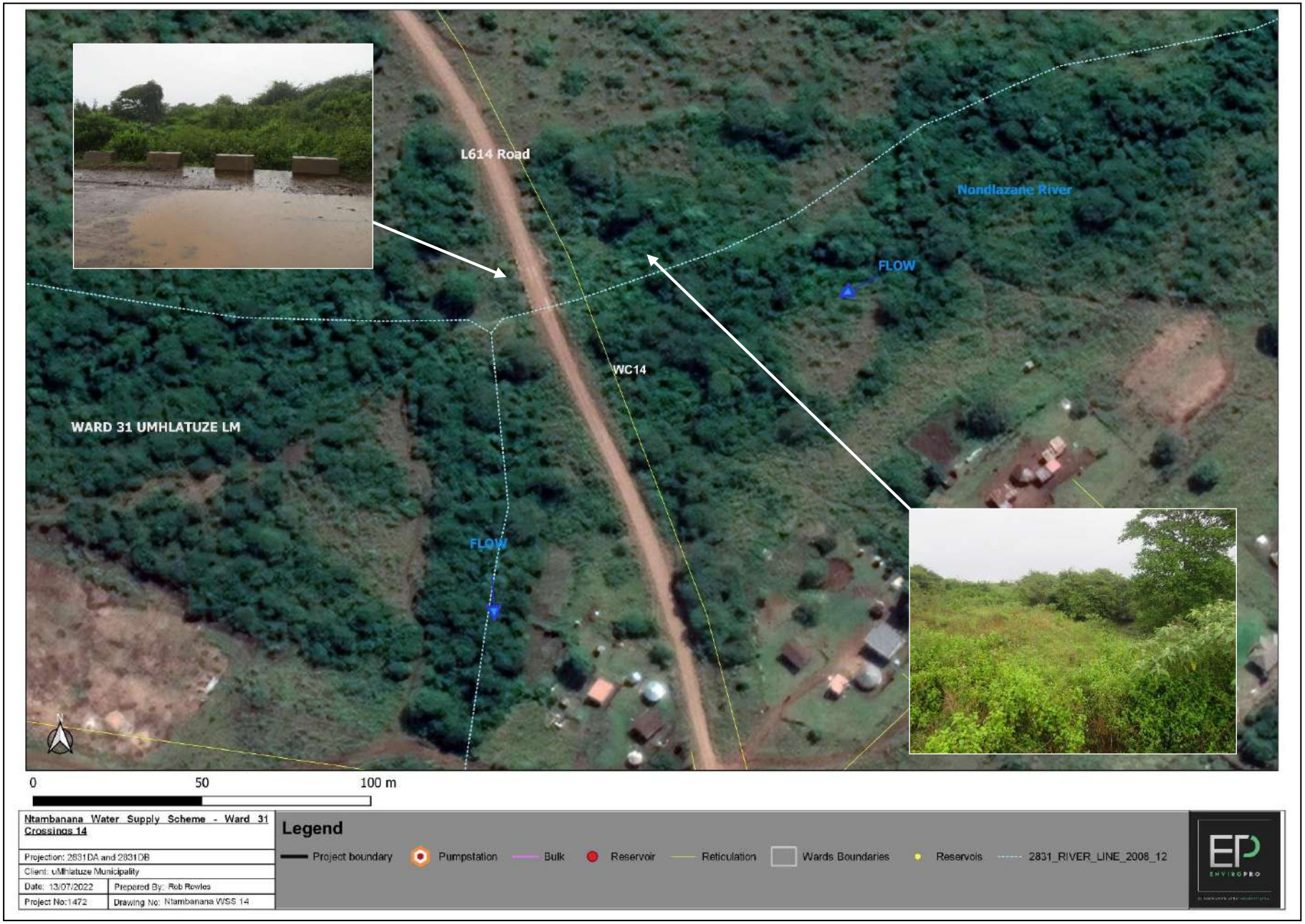


Figure 23: Aerial Photograph Showing Watercourse Crossings 15 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

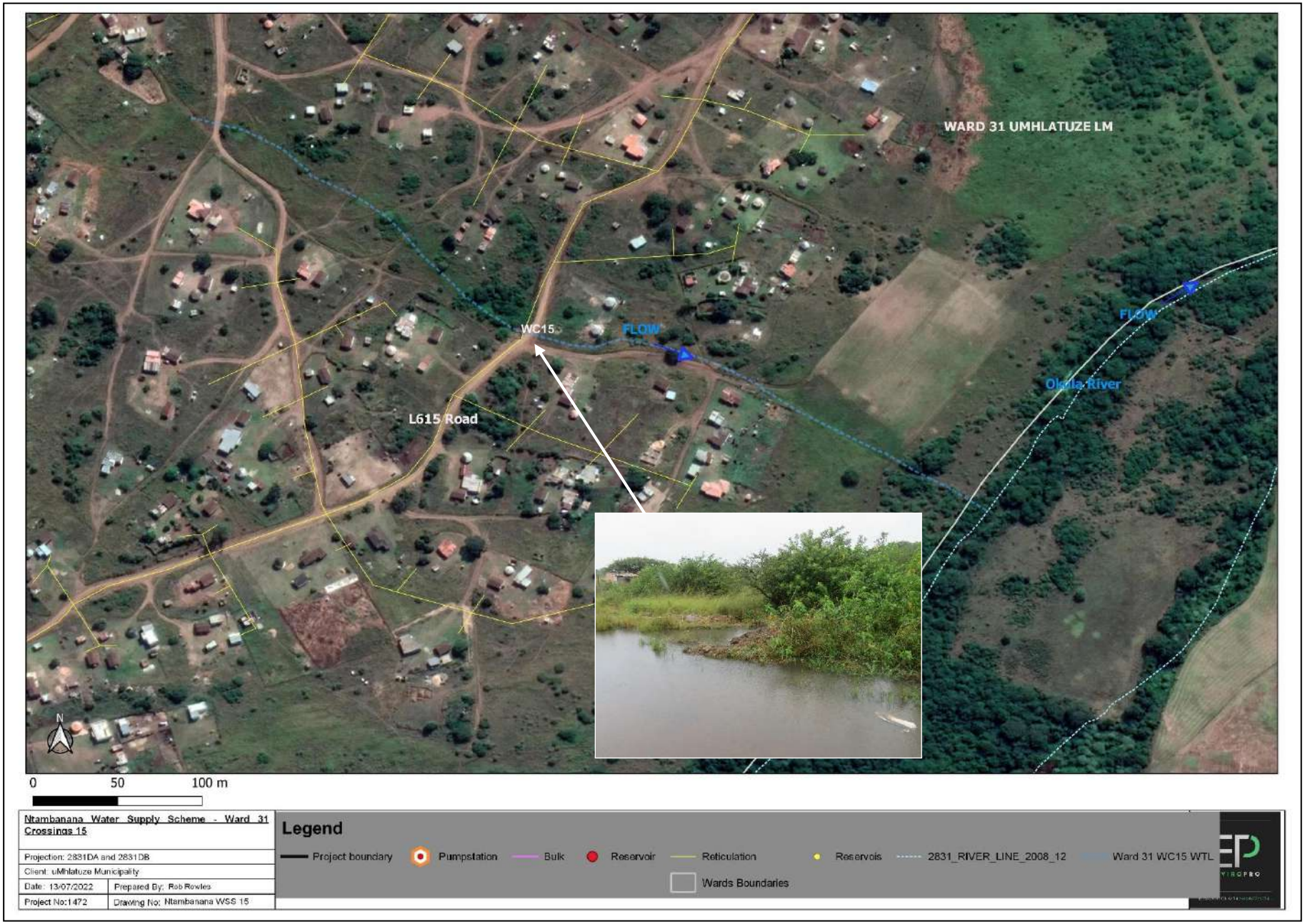


Figure 24: Aerial Photograph Showing Watercourse Crossings 16 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

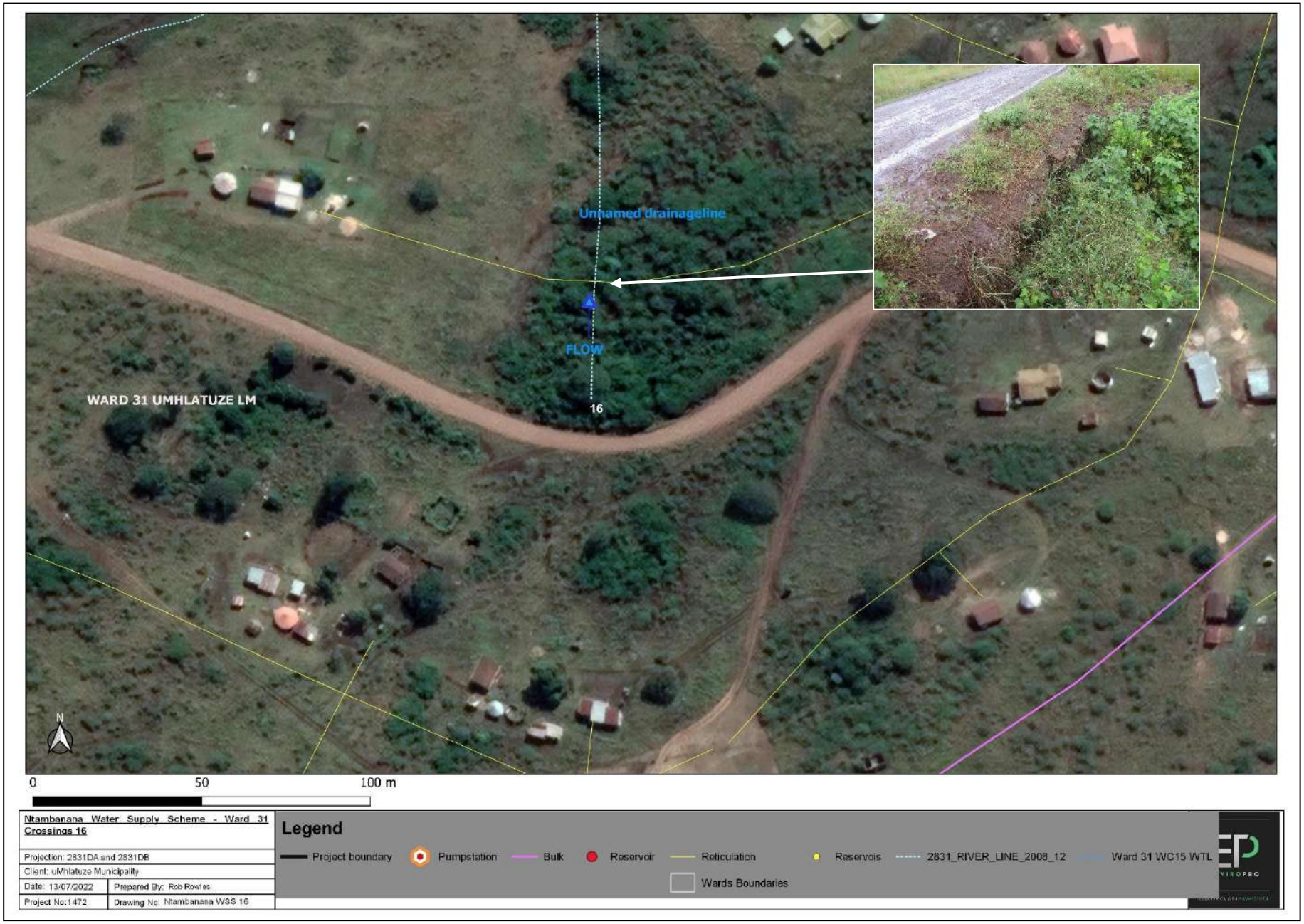


Figure 25: Aerial Photograph Showing Watercourse Crossings 16-20 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

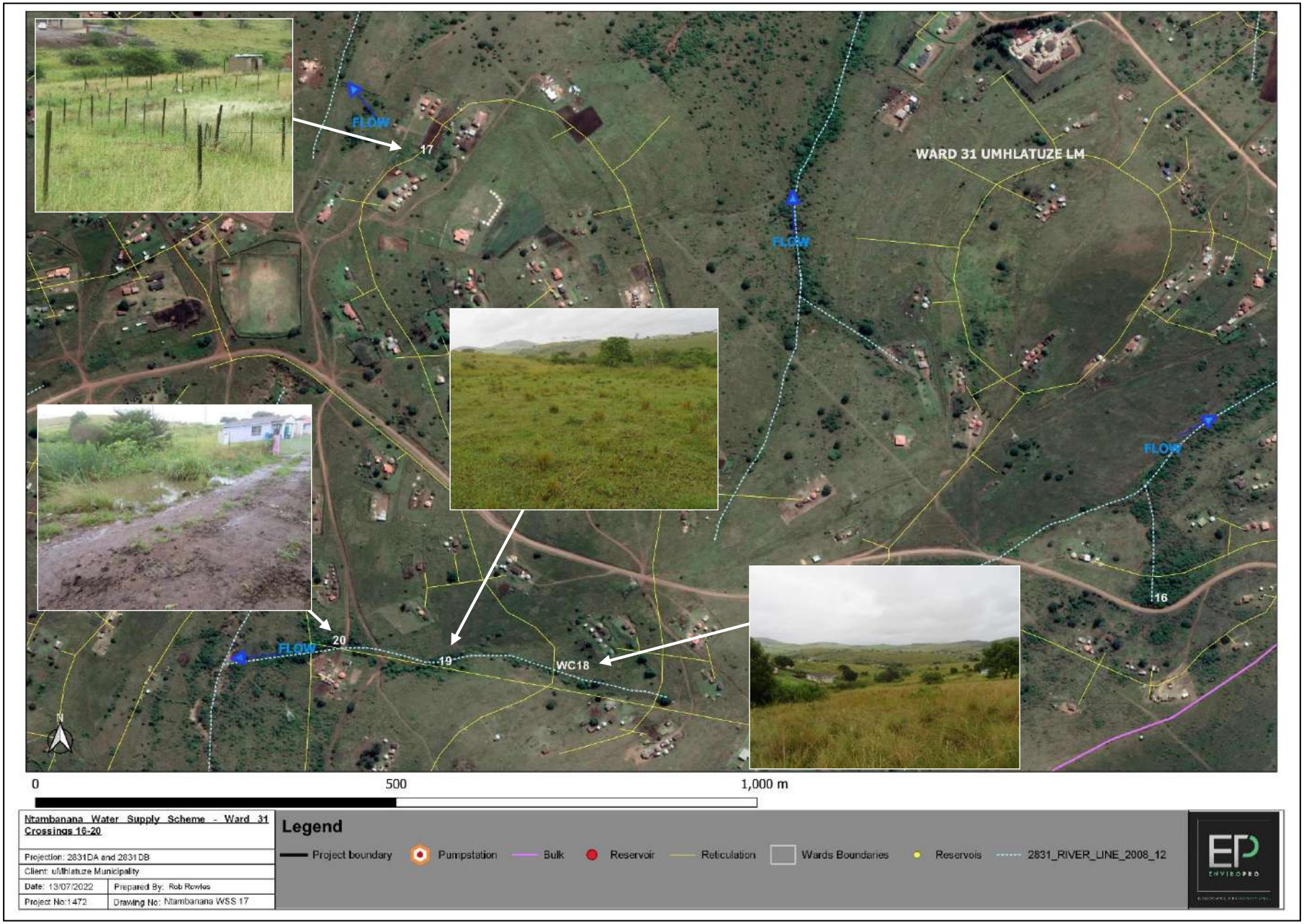


Figure 26: Aerial Photograph Showing Watercourse Crossings 21 in Ward 31 of uMhlatuze Local Municipality. Google Earth Image, 2022

Section 2: Surrounding Land Use as per section 3(h)(iv) and (k)

2.1 DEFF Screening Report

A Screening Report was generated via the DFFE Screening Tool (please refer to Appendix B for the full DFFE report). This details potential specialist reports that may be required based on a desktop level assessment conducted by the screening tool. Table 3 below summarises the screening tool recommendations. It indicates whether they are applicable to the specifics of the project and site and shows the sections of the BAR where these have been addressed. As per the Screening Tool Guidelines, it is the responsibility of the EAP to confirm this list and to motivate in the BAR the reason for not including any of the identified specialist studies by providing photographic evidence of the site situation.

Table 3: National Screening Tool Specialist Requirements and Comments

Specialist Assessment	Conducted	Reason
Agricultural Assessment	No	No significant agricultural areas will be negatively impacted by the construction of the Ntambanana Water Supply Scheme pipeline and related infrastructure.
Archaeological and Cultural Assessment	Yes	A heritage assessment has been undertaken for this assessment. Provisions have been made in the EMPr should any aspect of cultural or archaeological significance be discovered during construction. The specialist Report has been included in Appendix B.
Palaeontology Impact Assessment	Yes	UMLANDO has conducted a Palaeontology Impact Assessment (PIA) (see Appendix B).
Terrestrial Biodiversity Assessment	No	The screening report indicated that the proposed construction footprint intersects areas of high sensitivity. However, the area has been greatly disturbed by livestock, human and vehicular traffic. No sensitive species were observed at the time of the site visits or assessments. The proposed construction won't result in widescale clearance of vegetation in undisturbed areas. The pipeline route will primarily follow existing infrastructure. Therefore, significant impacts are not anticipated on surrounding terrestrial biota and specialist study not deemed necessary.
Aquatic Biodiversity Assessment	Yes	The screening report referred to the area of interest having a high sensitivity. A Water Resources Assessment which covers aquatic ecology has been conducted to inform this assessment.
Geotechnical Assessment	Yes	A geotechnical assessment was carried out for this assessment.
Socio-Economic Assessment	No	The Water Supply Scheme aims to supply the community of Ntambanana with access to potable water. As this area is currently relying on water delivery by water tankers, the construction of this WSS will have a positive socio-economic impact. The construction of the Water Supply Scheme infrastructure will also provide temporary work for both skilled and unskilled workers within the surrounding area. As the project is providing positive socio-economic impacts further assessment was deemed unnecessary.
Plant Species Assessment	No	The screening report indicated a medium sensitivity for the area. As the infrastructure will mainly follow existing road servitudes (see Appendix B) and requires only minimal vegetation clearance a plant species assessment was not deemed necessary.
Animal Species Assessment	No	Terrestrial animal species have been dispersed and greatly disturbed by human and livestock activity within the rural Ntambanana area. Therefore an Animal Species Assessment was not deemed necessary.

2.2 Surrounding Environment

Photographs of the sensitive areas identified in the Ntambanana WSS taken on 05-07 April 2022 have been provided below. Further photographs of each crossing that requires environmental authorization have been provided in Appendix A. This assessment focusses on the impact to the watercourses from the construction of the larger pipelines that will remove or infill more than 10m^3 of material from a watercourse. The photos below and in App A show each watercourse that will be crossed by a pipeline that requires environmental authorization under NEMA.

Figure 27: Photographs of the Sensitive Areas identified within Ward 24

(a) View of WC1 on the Okula River and wetland; **(b)** The section of wetland that the bulk pipeline will traverse has been cleared recently for the construction work on the new bridge and road alignment.

(c) The existing crossing structure at WC2; **(d)** There is an existing concrete pipe culvert at this crossing. Little to no impact to the wetland or wetland vegetation is anticipated.

(e) The dense vegetation and wetland associated with WC3; **(f)** An existing concrete 3 pipe culvert is present at WC3.

(g) Overview of indigenous vegetation at WC4; **(h)** The existing concrete pipe culvert associated with WC4.

(i) The indigenous vegetation in the drainage line associated with WC5; **(j)** The dense indigenous vegetation within the Drainage line that will be crossed by the bulk pipeline.

Figure 28: Photographs of the Sensitive Areas identified within Ward 31

(a) View of the thick vegetation associated with the WC1 crossing in Ward 31; **(b)** A photo showing the thick vegetation and road servitude associated with this pipe crossing location.

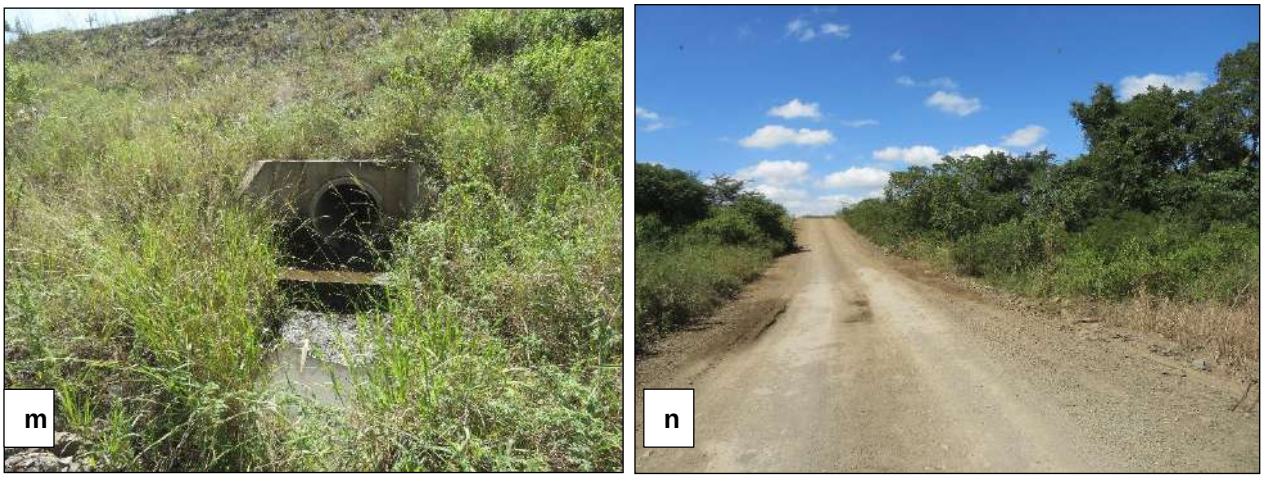
(c) View of a wetland adjacent to WC2.; **(d)** View of three pipe culvert crossing at WC2.

(e) The dense vegetation and wetland associated with WC3; **(f)** The pipeline will run within the road servitude at this crossing.

(g) View of railway crossing on the bulk water pipeline route approximately 600meters south WC4.; **(h)** View of vegetation of WC4.

(i) The dry sandy channel associated with WC5; **(j)** The road servitude within which the WC5 pipe will be placed.

(k) The channel associated with WC6; **(l)** The drainageline is surrounded by sugarcane.



(m) The concrete pipe associated with WC7.; **(n)** The dense vegetation associated with WC7 in Ward 31.

(o) The watercourse crossing associated with WC8; **(p)** The dense alien vegetation within the wetland at WC9.

(q) The standing water within the watercourse at WC10.; **(r)** The dense vegetation at WC11.

(s) The head of the drainageline associated with WC12; **(t)** The grassland vegetation associated with the proposed Reservoir 14, a 200kl reservoir.

(u) The WC13 pipe culvert crossing in Ward 31; **(v)** The dense vegetation associated with WC13.

(w) The bridge associated with WC14.; **(x)** The dense vegetation associated with the watercourse crossing at WC14.

(y) The drainageline associated with WC14; **(z)** The dense vegetation associated with WC16 drainageline.

(aa) The wetland associated with WC17 located between households in Ward 31.; **(h)** The top of the draiangeline associated with the WC18 pipe crossings. The reticulation pipes will cross this drainageline in four locations.

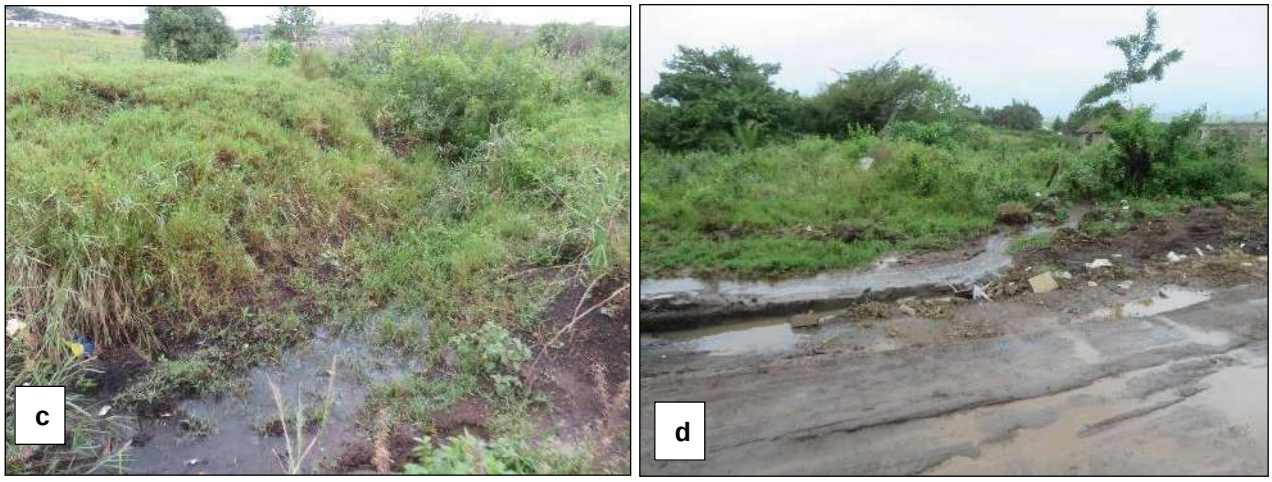
(cc) The dense vegetation in the wetland/drainageline at WC19; **(dd)** The wetland associated with the reticulation pipe crossing at WC20.

(ee) View of two pipe culverts crossing Manzakata river downstream of WC21; **(ff)** The road servitude and dense vegetation associated with WC21.

Figure 29: Photographs of the Sensitive Areas identified within Ward 32.

Heavy rainfall was experienced the day this site work was conducted thus the watercourses appear wetter than they would normally appear in dry conditions.

(a) View of a drainage line facing upstream of WC1 within Ward 32; **(b)** The wetland and grassland vegetation associated with the drainageline at WC2 in Ward 32.



(c) View of a drainage line and channelled valley bottom wetland associated with both WC 3 and 4 facing upstream. .; **(d)** Image showing a wetland facing upstream of WC5.

(e) The wetland and drainageline associated with WC6; **(f)** The wetland associated with WC7.

(g) View of a the drainage line and wetland facing upstream of WC8 and 9.; **(h)** View of a wetland facing upstream of WC10. There was alien vegetation growing in this watercourse

(i) View of a Nondlazane river tributary facing upstream of WC11.**(j)** View of a wetland at WC12 that will be crossed by 110mm and 32mm pipes.

(k) The wetland associated with WC13. Sugar cane crops are growing in this wetland; **(l)** The road servitude in which the pipeline will traverse this wetland at WC13.

(m) The view of the incised drainageline and wetland associated with WC 14 through which 40mm reticulation will be installed.; **(n)** The erosion gully associated with WC15 in ward 32.

(o) The 5ML Hlaza Reservoir construction in progress. This reservoir was authorised in 2019; **(p)** The bridge and dry river bed associated with WC16.

(q) The watercourse crossing associated with WC17 in Ward 32**.**; **(r)** View of a bridge crossing the Makholwase river of WC18.

(s) View of the rocky Makholwase river downstream of WC18.; **(t)** The drainageline at WC19 that will be crossed with the bulk pipeline.

(u) Overview of the pipe culvert crossing the Makholwase river tributary of WC20; **(v)** the downstream view of the drainageline at WC20 that will be crossed with the bulk line.

(w) The drainageline and vegetation associated with WC21.; **(x)** Aloes are prevalent in this particular area.

(y) Overview of alien vegetation upstream of WC22; **(z)** The indigenous vegetation down stream of the WC23 crossing. The vegetation adjacent to the road servitude appears to have been cleared previously, possibly for similar pipeline linear services.

(aa) The dense vegetation associated with the drainageline at WC24.; **(bb)** The sandy riverbed crossing over the Nseleni River at WC25. The pipe will be trenched and encased in concrete at this crossing.

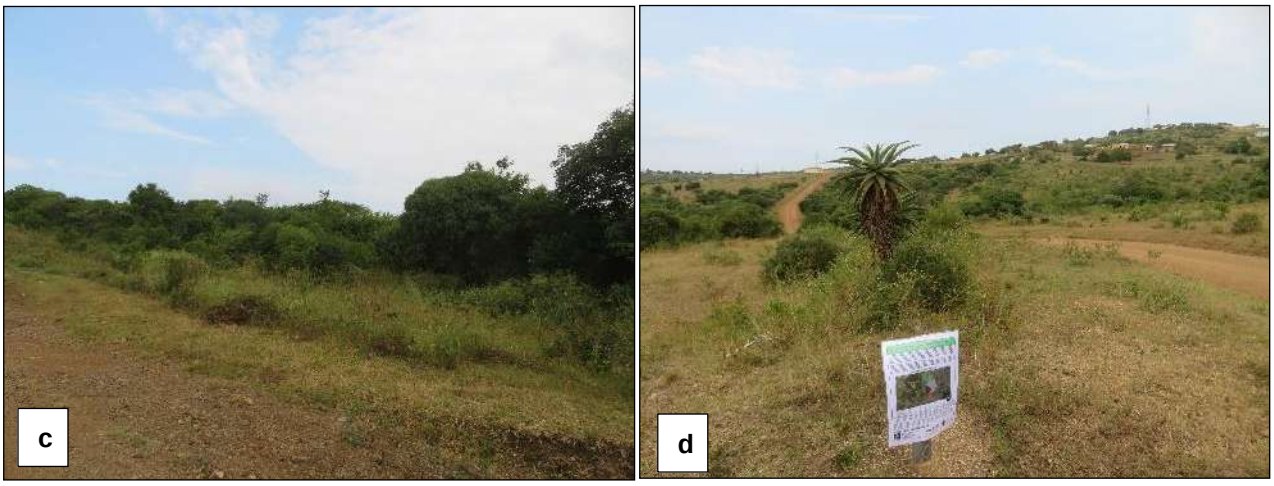
(cc) View of the drainage line facing downstream of WC26; **(dd)** View of a drainage line facing downstream of WC27.

(ee) View of a two pipe culvert facing downstream of WC28.; **(ff)** Overview of the drainage line facing upstream of WC29

(gg) Image showing soil erosion facing upstream of WC30; (**ee)** Overview of a drainage line facing downstream of WC31..

Figure 30: Photographs of the Sensitive Areas identified within Ward 33.

(a) View of the bulk pipeline crossing point through the Nseleni River (WC1) within Ward 33. The river crossing was characterised by low flow, a wide channel and rocky/ sandy river bed; **(b)** The river bed at WC1.



(c) The thick vegetation associated with the drainageline of WC2.; **(d)** Image showing some indigenous vegetation associated with the drainageline at WC3.

(e) The rocky crossing in the channel at WC4. There is a 2 pipe culvert in place for the road crossing in this watercourse.; **(f)** View of a bridge crossing over Jenga River at WC5.

(g) View of bulk water pipeline route following the road through the draingeline at WC6**.**; **(h)** View of the Ntambanana river facing downstream of WC7 where the bulk pipeline will be constructed.

2.3 Topography and Physical Characteristics of Site

The following applies to the area surrounding the sites as per the Figures 1-3 above. This WSS pipeline network involves more than 500km of pipeline network being installed in 4 different wards. The topography of the project area varies dramatically from hilltops to valley bottoms. The section below provides a high level overview of the topography of the project area.

Table 4: Gradient of The Site

Gradient	Description
Flat	Some of the crossings are associated with flat topography
1:50 – 1:20	There are sections of pipeline that run up gentle gradient hillsides.
1:20 – 1:15	There are sections of pipeline that run up moderate gradient slopes.
1:15 – 1:10	There are sections of pipeline that run up and down steep gradient slopes.
1:10 – 1:7,5	There are sections of pipeline that run up and down very steep gradient slopes. The reservoir sites are typically associated with very steep slopes as they are located on top of the hillsides in order to allow for gravity fed reticulation.
1:7,5 – 1:5	N/A
Steeper than 1:5	N/A

The topographical features and landforms of the site and surrounding area are as follows:

Table 5: Topographical Features and Landforms of The Site

Topographical Feature	Description
Ridgeline	N/A
Plateau	The pipeline network traverses plateaus.
Side slope of hill/mountain	The pipeline network traverses the side slopes of both hillsides and mountains.
Closed valley	The pipeline network traverses closed valleys.
Open valley	The pipeline network traverses open valleys.
Plain	The pipeline network traverses gentle plains with wetland and drainagelines.
Undulating plain/low hills	The pipeline network traverses undulating hillsides.
Dune	N/A
Sea-front	N/A

The Figures below illustrate the ranging gradients and straight line length the pipeline network will be navigating per ward.

Figure 31: Elevation Profile for Ward 24 from WC1-WC7 (Source: Google Earth Pro, 2022).

Figure 32: Elevation Profile for Ward 31 from WC 1- 31(Source: Google Earth Pro, 2022).

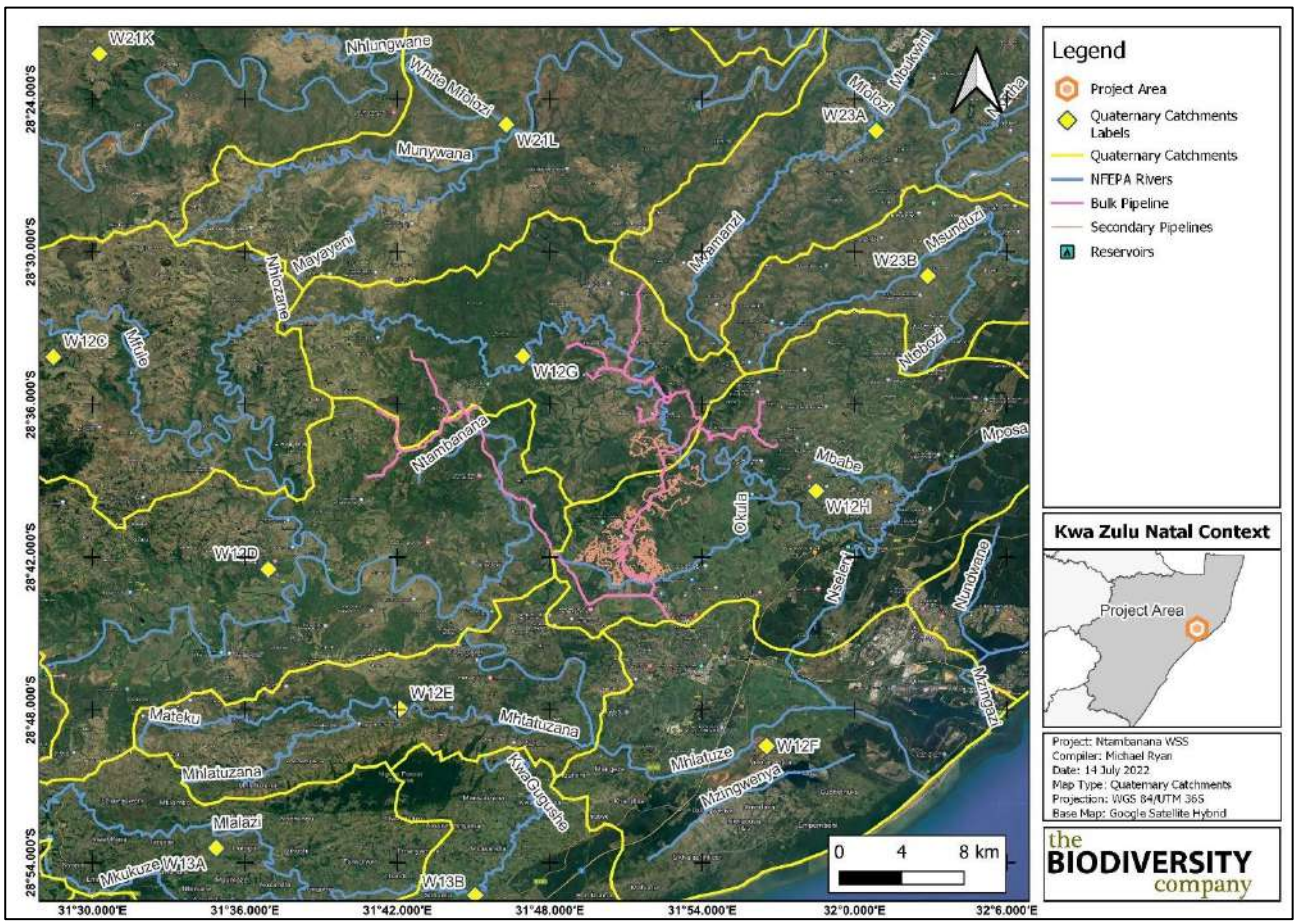
Figure 33: Elevation Profile for Ward 32 from WC1 – WC20 (Source: Google Earth Pro, 2022).

Figure 34: Elevation Profile for Ward 33 from Reservior 12 -WC 5 (Source: Google Earth Pro, 2022).

2.4 Surface Water and Ground Water

The pipeline network for this WSS crosses multiple watercourses in four different catchment areas. These include the W12D – 03375, W12D – 03346, W12G – 03229 and W12H – 03401 Sub Quaternary Reaches (SQR's) as well as multiple tributaries of these systems. The hydrological setting of the project area is presented in Figure 35 below. The Ntambanana Water Supply Scheme Project is situated in the W12D, W12E, W12G and W12H quaternary catchments, within the Pongola – Mtamvuna Water Management Area (WMA-4).

Figure 35 Hydrological Catchment Areas (Source;TBC, 2022)



2.4.1 Status of Sub-Quaternary Reaches (SQR)

Four separate SQR's were identified for the project area. The desktop PES category of the Ntambanana River and Nseleni River reaches was classed as moderately modified (class C), while the PES category of the Mhlatuze River and Okula River reaches was classed as largely modified (class D). The state of these reaches is based on impacts to instream habitat, wetland and riparian zone continuity, flow modifications and moderate potential impacts on physico-chemical conditions (water quality)1.

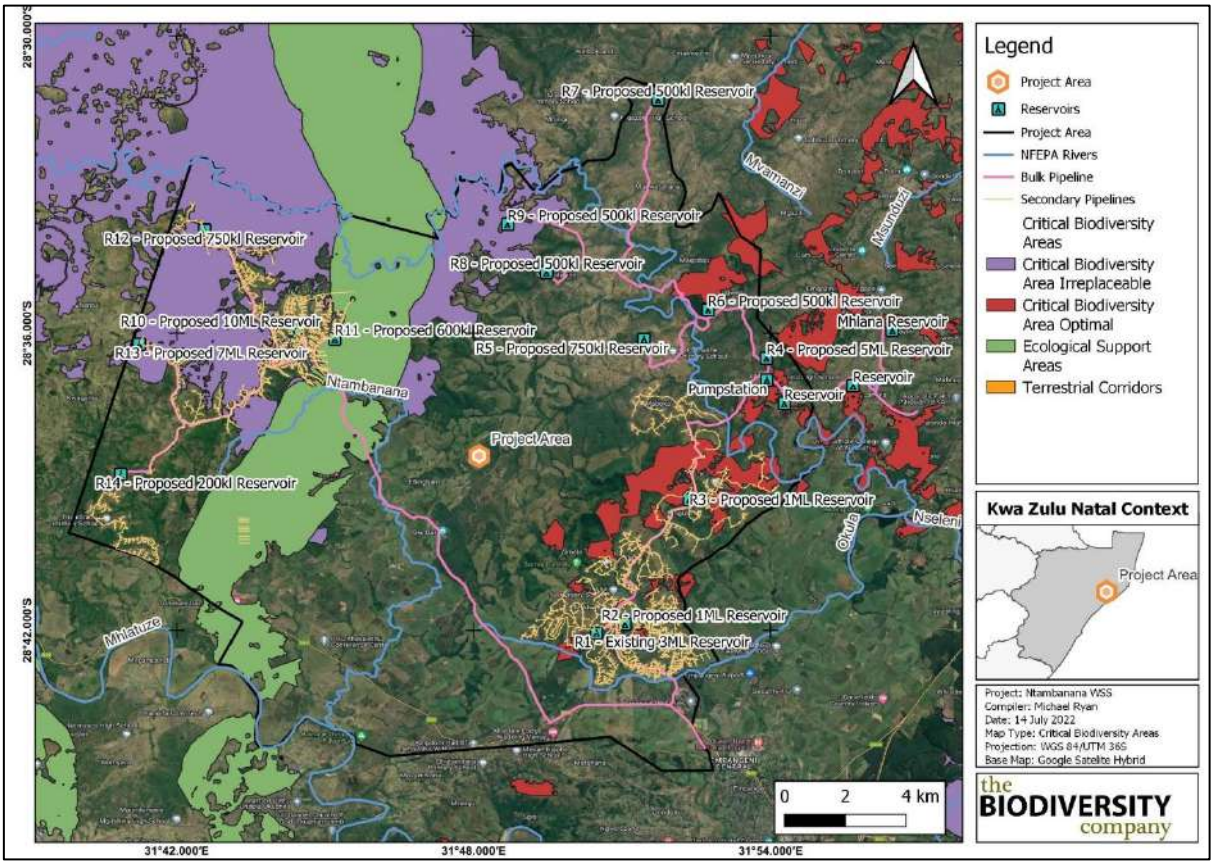
2.4.2 Strategic Water Source Areas

Strategic Water Source Areas are areas that supply a disproportionate amount of mean annual runoff to a geographical region. The areas supplying ≥ 50% of South Africa's water supply (which were represented by areas with a mean annual runoff of ≥ 135 mm/year) represent national Strategic Water Source Areas (SANBI, 2013). According to the Strategic Water Source Areas (SWSAs) of South Africa, Lesotho and Swaziland, the project area is not located within the SWSAs however sections of SWSAs are located upstream of the project area however will not be affected by the proposed development[1].

2.4.3 Freshwater Critical Biodiversity Area

According to the KwaZulu Natal Biodiversity Planning Project for the freshwater biodiversity assessment of the KwaZulu Natal Province (SANBI, 2008), the watercourses and pipeline network within the project area traverse multiple different regions of varying sensitivity. The Nseleni River crosses Irreplaceable Critical Biodiversity Areas and Ecological Support Areas in the west as well as Optimal Critical Biodiversity Area in the east. The Ntambanana River crosses Irreplaceable Critical Biodiversity Area and Ecological Support Areas in the west. The Mhlatuze River crosses Ecological Support Areas in the west. The Okula River crosses small sections of Optimal Critical Biodiversity Area in the east. CBAs are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. CBAs are areas of high biodiversity value and need to be kept in a natural state, with no further loss of habitat or species (MTPA, 2014). Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met[2]. The management of these sensitive areas is of utmost importance[1]. The CBAs within the project area have been provided below in Figure 36.

Figure 36 Freshwater Critical Biodiversity Areas within the project area (TBC, 2022 APP B; SANBI, 2008)



The sections of the WSS that pass through Irreplaceable and Optimal CBA areas are as follows:

Table 6: CBA WSS Interception Areas

Optimal CBA Areas			
Irreplaceable CBA Areas			
No.	**Latitude**	**Longitude**	**Area**
Ward 31			
1	28°37'17.53"S	31°43'27.42"E	5300m²
	28°37'28.50"S	31°43'17.61"E	
2	28°37'9.48"S	31°43'24.10"E	4410m²
	28°37'16.78"S	31°43'20.35"E	
Ward 32			
1	28°41'20.56"S	31°51'27.25"E	5140m²
	28°41'8.85"S	31°51'44.87"E	
2	28°39'31.14"S	31°52'55.18"E	3040m²
	28°39'22.91"S	31°53'1.41"E	
3	28°39'11.64"S	31°53'58.55"E	7870m²
	28°39'4.24"S	31°53'33.36"E	
4	28°38'45.33"S	31°52'21.30"E	4830m³
	28°38'33.25"S	31°52'28.06"E	
Ward 24 - None			
Ward 33 - None			

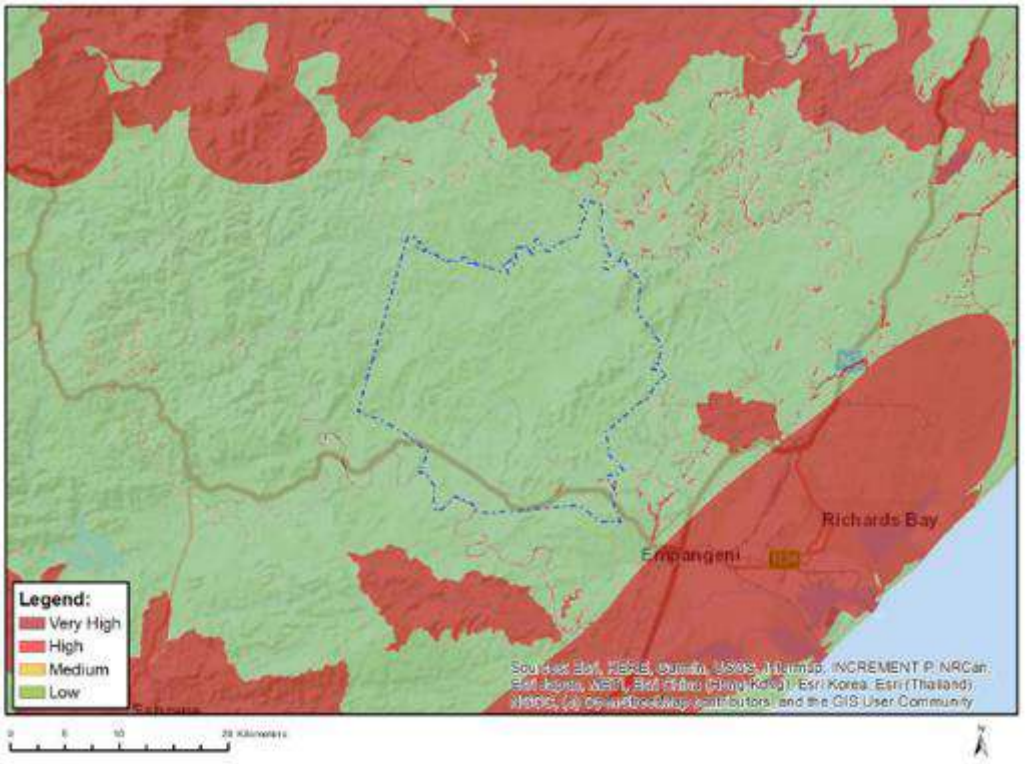
Reservoirs Associated with the Water Supply Scheme				Area Affected
Reservoir 2	28°36'13.67"S	31°41'14.49"E	Proposed 1ML Reservoir in Ward 31	233m²

Reservoir 3	28°39'21.60"S	31°52'21.61"E	Proposed 1ML Reservoir in Ward 32	152m^2

2.5 Aquatic Biodiversity

The aquatic biodiversity and sensitivity of this area is considered to be “low”. No sensitive biodiversity was observed during the specialist assessments.

Figure 37 Aquatic Biodiversity Combined Sensitivity (National Web based Environmental Screening Tool)



2.5.1 Aquatic Assessment (Appendix B)

Twenty four (24) aquatic assessments were carried out in the project area. *In situ* water quality for the tributaries of the Okula and Ntambanana Rivers indicate largely natural conditions. pH for all measured sites were within TWQR and largely neutral in nature, ranging from 6.0 at site WC5 (Ward 24) to 7.08 at site 5 within the tributaries of the Okula River and 6.54 at site WC6 (Ward 31) to 6.94 at site WC5 (Ward 31) within the tributaries of the Ntambanana River. The temperature measured was within TWQR as well as expected range for the regional context. There is no TWQR set for Electrical Conductivity (EC) however measured concentrations are considered elevated. EC ranged between 863 µS/cm at site WC3 (Ward 24) to 2477 µS/cm at site WC1 (Ward 24) within the tributaries of the Okula River and 434 µS/cm at site WC5 (Ward 31) to 1279 µS/cm at site WC6 (Ward 31) within the tributaries of the Ntambanana River. The elevated dissolved solids within the system are suspected to be a result of surrounding landuse from agriculture as well as rural and urban runoff[1] (Appendix B).

2.5.2 Wetland Assessment (Appendix B)

Desktop delineations for this project area attempted to identify the location of wetland areas within the project area. The desktop findings were groundtruthed (where possible), making use of soil forms, soil wetness and hydromorphic vegetation to delineate the wetland areas. A number of wetland units were identified; namely, hillslope seeps, channelled and unchannelled valley bottoms, depression and flat wetlands. The majority of the riparian areas identified across the WSS areas have been delineated as wetland areas[1].

The dominant wetland vegetation identified were *Typha capensis, Phragmites australis, Cyperus fastigiatus, and Cyperus dives*.

The aquatic specialist recommended that where possible, the pipeline delineations must be re-routed outside of the wetland crossings on existing structures. The impact that the pipeline construction through the wetland systems post-mitigation was considered as “low” (TBC, 2022. Appendix B).

2.6 Habitat Integrity Assessment

A desktop habitat assessment was carried out for the WSS Scheme area by The Biodiversity Company in 2022 (Appendix B). Anthropogenic activities are the prime source of habitat destruction which results in habitat fragmentation and displacement of fauna and flora as well as potential direct loss through altered water quality. Land clearing for landuse change directly destroys local habitat and alters the topography and associated surface hydrology which can lead to the degradation and/or loss of local rivers, streams and drainage lines, or other locally important biological features. The removal of natural vegetation surrounding drainage features is known to reduce the buffering capacity of the watercourses to impacts from adjacent land use activities, notably with a lowered resilience against erosion and water quality impacts. This in turn is likely to reduce aquatic and terrestrial fauna and flora populations and species compositions within the local area and potentially those downstream[2].

The W12D - 03346 SQR (Ntambanana River) has experienced modification from roads which have crossed the systems and resulted in channel modification as bridges and culverts hinder the natural migration of the system across the landscape. The tributaries of the system have multiple dams which have been constructed and have resulted in inundation of the tributaries as well as flow and bed modification of the Ntambanana River reach. These dams were created for the extensive agriculture surrounding the watercourse which present a source of water quality modification as a result of runoff from the cultivation as well a source of alien invasive vegetation encroachment in disturbed areas[1].

The W12H – 03401 SQR (Okula River) experiences extensive modification from cultivation in the form of sugarcane as well as dryland agriculture with large instream dams in the downstream section of the reach as well as multiple dams within the tributaries of the Okula River reach. These dams form large sources for abstraction used for the irrigation of surrounding cultivation. Water quality modification has resulted from a combination of surrounding agriculture, urban runoff from the town of Empangeni as well as industrial activities in the form of heavy minerals smelting plants. Channel and bed modification has also resulted from developments along and through the watercourse and associated tributaries from the town of Empangeni and associated road networks[1].

The W12G - 03229 SQR (Nseleni River) has sections of habitat well preserved as a result of Fundimvelo Nature Reserve however experiences modification in other sections of the reach. Similar to the other two river systems agriculture is the major source of modification the system with dams in the tributaries used for irrigation – forming a source of abstraction. Subsistence farming is a concern along the reach as overgrazing as occurred on large sections with cattle resulting in erosion and bank collapse of sections of the reach. Rural developments without appropriate infrastructure or services represent sources of water quality modification from sewage discharge to solid waste[1].

The large systems discussed above have well developed channels with well-established riparian areas. These systems (Figure 38 - Figure 40) are resilient to modification as a result of their large scale as well as volume and consistent flow. The focus of the assessment was therefore on the smaller tributary systems which are smaller in stature as well as many systems observed were comprised of pools only with no continuity through surface flow. Due to encroachment the riparian areas of these systems have been modified with alien invasive species seizing disturbed areas. The Ntambanana River tributaries are marked by well-established narrow meandering channel which flow through the landscape. The channels are cut through the landscape forming steep eroded banks on the savannah with patches of woody vegetation forming canopy sections. The tributaries of the Nseleni River are predominantly wide dry channels with small pools forming in depressions. The bed is dominated by cobbles due to the high flows in storm events. The riparian areas are well established with large tree species. The tributaries of the Okula River are dominated by woody vegetation creating a canopy with sections which open up forming flat floodplains with wetland vegetation and difficult to discern channels[1]. Photos of these habitats have been provided in Figure 38 - Figure 40 below from the TBC Water Resource Report (Appendix B).

Figure 38 Ntambanana River habitats

Figure 39 Nseleni River Habitat

Figure 40 Okula River Tributaries

2.7 Ecological Importance

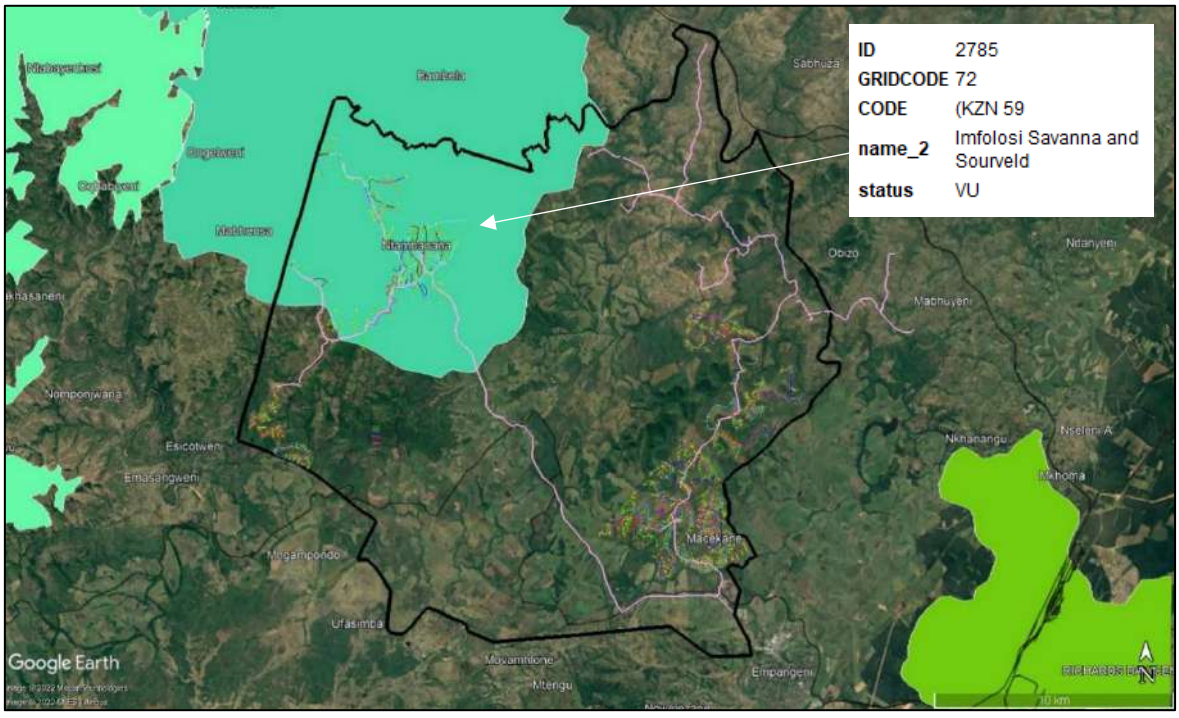
The ecological importance of the habitat and ecosystems assessed for this project were largely associated with the watercourse and wetland systems. The site as a whole has been prescribed an ecological importance of "High" value by the aquatic ecologist[1].

The project area has a High probability of CR, EN, VU or Extremely Rare species with three Near Threatened (NT) species *in Anguilla bicolor (shortfin eel), Anguilla bengalensis (*The mottled eel) and *Micropanchax myaposae* (Natal Top Minnow) as well as two Vulnerable (V) species in *Oreochromis mossambicus* (Mozambique tilapia) and *Enteromius gurneyi.(Redtail Barb)* expected in the project area. The functionality of the systems is considered "Medium" as the system is considered to be least threatened and poorly protected. The resilience of these systems especially the small tributaries is low and therefore the site ecological importance of these systems is considered "High"[2].

2.8 Ecosystem Type

Only one threatened Ecosystem Type is present within the project footprint. The Imfolosi Savanna and Sourveld Ecosystem Type (KZN 59) is present within the Noth Western corner of the project area in the Ntambanana Area. This ecosystem type is listed at "Vulnerable" by SANBI.

Figure 41: Threatened Ecosystem Types within the project area



No listed activities under NEMA are triggered for the clearing of vegetation for linear projects in rural areas within this ecosystem type or greater project footprint. Therefore the clearing activity for the pipeline reticulation for this project does not require Environmental Authorisation under NEMA.

2.9 Flora

2.9.1 Vegetation Type [7]

The WSS is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

- Seasonal precipitation; and
- (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006). The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved (microphyllous) savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by microphyllous woody plants of the Mimosaceae family (Common genera include Acacia and Albizia) and a generally dense herbaceous layer (Scholes & Walker, 1993).

There are three different vegetation types found within the project area according to Mucina and Ruthaford[7]. The Zululand Coastal Thornveld vegetation type (SVl 24), the Zululand Lowveld (SVI 23) and the Northern Zululand Sourveld (SVI 22). These vegetation types are characterised as follows:

Zululand Coastal Thornveld vegetation type (SVl 24)

- **Conservation**

This vegetation type is Endangered. None of the this vegetation type is protected in statutory conservation areas. It is highly transformed (58%), mostly from cultivation. This is considered high-potential agricultural land a lot of which has been transformed to sugar cane. Most of the area is rural communal land. Large areas close to towns (e.g. Mtubatuba) are becoming an urban sprawls. Very little of the natural plant communities remains intact here. Heavy grazing has depleted the grasslands and wood harvesting has depleted the bush clumps, reducing them to only the resistant and less useful species. Stunted forms of many of the woody species (e.g. *Euclea, Diospyros, Gymnosporia, Maytenus*) invade the grass-lands in many places as a result of over grazing. It is rare to find a site still with its natural plant composition. Alien plant invasions are a threat, with *Chromolaena odorata* being the most problematic[7].

- **Distribution**

This vegetation type is found only within KwaZulu-Natal Province: Immediately west of Mtubatuba (in the north) and Empangeni (in the south) bisected by the iMfolozi River, extending westwards for 10–20 km. Altitude 40–300 m.

- **Vegetation & Landscape Features**

This vegetation type is typically found on gently rolling landscapes supporting wooded grassland dominated by *Themeda triandra*. The bush clumps are a strong feature and are more numerous on deeper soils, with *Phoenix reclinata and Gymnosporia senegalensis* usually dominant. These plant communities are species-rich relative to the surrounding vegetation units. They grade into dense Acacia woodland on dry slopes and riverine bushland thickets and FOa 1 Lowveld Riverine Forest in valley bottoms[7].

- **Geology & Soils**

The area is situated almost entirely on Letaba Formation basalts of the Karoo Supergroup. Soils are mainly black with a high (35–55%) clay content and depth in the range 200–300 mm.

- **Important Taxa**

Small Trees: *Acacia natalitia, A. nilotica* and *Phoenix reclinata.*
Succulent Trees: *Euphorbia tirucalli (d)* and *E. ingens.*
Tall Shrubs: *Diospyros lycioides subsp. sericea (d), Euclea divinorum (d), Gymnosporia senegalensis (d), Abutilon angulatum, Clutia abyssinica, Euclea schimperi* and *Gymnosporia buxifolia.*
Low Shrubs: *Acalypha peduncularis, Clutia cordata, Sida cordifolia, S. dregei* and *Thunbergia atriplicifolia.*
Herbaceous Climbers: *Rhynchosia minima* and *R. totta.*

[7] Mucina, L. & Rutherford, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

Graminoids: *Eragrostis capensis (d), Panicum maximum (d), Sporobolus pyramidalis (d), Themeda triandra (d), Tristachya leucothrix (d), Aristida congesta, Eragrostis curvula, E. racemosa, Heteropogon contortus, Hyparrhenia hirta, Schizachyrium sanguineum, Setaria sphacelata* and *Trachypogon spicatus.*
Herbs: *Berkheya setifera, B. speciosa, Centella asiatica, Eriosema cordatum, E. distinctum, Gerbera viridifolia, Helichrysum nudifolium var. pilosellum, Hypericum aethiopicum, Indigofera hilaris, I. sanguinea, Pentanisia prunelloides, Ruellia patula, Senecio erubescens, S. inornatus, Spermacoce natalensis, Vernonia oligocephala* and *Vigna unguiculata.*
Geophytic Herbs: *Hypoxis rigidula and Pelargonium luridum.*

Zululand Lowveld (SVI 23)

- **Conservation**

This vegetation type is Vulnerable. Roughly 11% of this vegetation type is statutorily conserved, mainly in the Hluhluwe-iMfolozi Park and Phongolapoort Nature Reserve. Almost 1% is protected in the private Masibekela Wetland. About 26% of the area has been transformed, mostly from cultivation. Erosion is variable from low to high in these areas[7].

- **Distribution**

This vegetation type is found in KwaZulu-Natal, Swaziland and Mpumalanga. The main areas are found around Big Bend south to Mkuze, Hluhluwe, Ulundi to just north of the Ongoye Forest. An isolated patch is found on the Swaziland–Mpumalanga border[7].

- **Vegetation & Landscape Features**

This vegetation type is found on land scapes that are flat or only slightly undulating landscapes supporting complexes of bushveld units ranging from dense thickets of *Dichrostachys cinerea* and *Acacia* species, through park-like savanna with flat-topped *A. tortilis* to tree-dominated woodland with broad-leaved open bushveld with *Sclerocarya birrea subsp. caffra and A. nigrescens*. Tall grassveld types with sparsely scattered solitary trees and shrubs form a mosaic with the typical savanna thornveld, bushveld and thicket patches[7].

- **Geology & Soils**

The soils associated with this vegetation type are typically black-clay soils and duplex soils derived from a distinct variety of clastic sediments of the Dwyka, Ecca, Beaufort and igneous rocks of the Lebombo Groups (all of the Karoo Supergroup)[7].

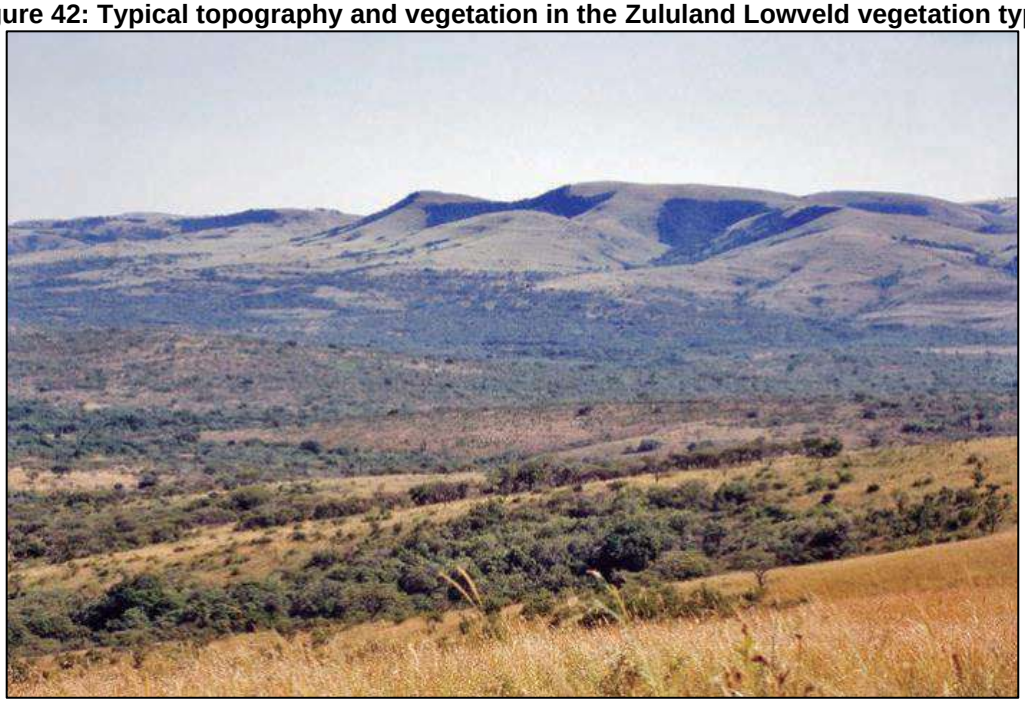
- **Important Taxa**

Tall Trees: *Acacia burkei (d), A. nigrescens (d), Sclerocarya birrea subsp. caffra (d). Small Trees: Acacia tortilis subsp. heteracantha (d), A. gerrardii, A. natalitia, A. nilotica, A. senegal var. rostrata, A. welwitschii subsp. welwitschii, Boscia albitrunca, Combretum apiculatum, C. molle, Ozoroa paniculosa, Phoenix reclinata, Schotia brachypetala, Spirostachys africana, Teclea gerrardii* and *Ziziphus mucronata.*
Succulent Trees: *Aloe marlothii subsp. marlothii, Euphorbia grandidens* and *E. ingens.*
Tall Shrubs: *Dichrostachys cinerea (d), Euclea divinorum (d), Coptosperma supra-axillare, Crotalaria monteiroi, Euclea crispa subsp. crispa, E. schimperi, Galpinia transvaalica, Gardenia volkensii, Gymnosporia maranguensis, G. senegalensis, Jatropha zeyheri, Lycium acutifolium, Olea europaea subsp. africana, Tarchonanthus parvicapitulatus, Tephrosia polystachya, Triumfetta pilosa var. tomentosa. Low Shrubs: Barleria obtusa, Crossandra greenstockii, Felicia muricata, Gymnosporia heterophylla, Indigofera trita subsp. subulata, Justicia flava, J. protracta subsp. protracta, Melhania didyma, Orthosiphon serratus, Pearsonia sessilifolia, Ruellia cordata, Sida serratifolia* and *Tetraselago natalensis.*
Succulent Shrubs: *Euphorbia grandicornis, E. trichadenia* and *E. vandermerwei.*
Soft Shrub: *Pavonia columella.*
Herbaceous Climber: *Fockea angustifolia.*
Graminoids: *Dactyloctenium australe (d), Enteropogon monostachyus (d), Eragrostis capensis (d), E. curvula (d), E. racemosa (d), Heteropogon contortus (d), Panicum maximum (d), Sporobolus pyramidalis (d), Themeda triandra (d), Aristida bipartita, A. congesta, Bothriochloa insculpta, Chloris mossambicensis, Cymbopogon caesius, Digitaria natalensis, Leptochloa eleusine, Panicum deustum, Schizachyrium sanguineum, Setaria incrassata, Sporobolus nitens, Trachypogon spicatus* and *Tristachya leucothrix.*
Herbs: *Acrotome hispida, Argyrolobium rupestre, Aspilia mossambicensis, Chamaecrista biensis, C. mimosoides, Corchorus asplenifolius, Felicia mossamedensis, Gerbera ambigua, Helichrysum rugulosum, Hibiscus pusillus, Kohautia virgata, Lotononis eriantha, Senecio latifolius, Stachys aethiopica, Tragia meyeriana* and *Vernonia capensis.*
Succulent Herb: *Aloe parvibracteata.*

- **Biogeographically Important Taxa:**

Small Tree: *Acacia theronii* (Broadly disjunct distribution).
Tall Shrub: *Lycium shawii* (Southern distribution limit).

Figure 42: Typical topography and vegetation in the Zululand Lowveld vegetation type.



The Northern Zululand Sourveld (SVI 22).

The Northern Zululand Sourveld can be seen as a northern extension of the SVs 4 Ngongoni Veld[7].

- **Conservation**

This vegetation type is considered to be "Vulnerable". Only 4% of this vegetation type is statutorily conserved, mainly in the Hluhluwe-iMfolozi Park and Ithala Game Reserve. 22% of this vegetation type is already transformed, mainly from cultivation and plantations. Erosion is generally moderate to high.

- **Distribution**

This vegetation type is found in KwaZulu-Natal Province and Swaziland: From the Lusthof area in Swaziland southwards with scattered patches in northern Zululand in the surrounds of Hlomohlomo, east of Louwsburg, Nongoma and the vicinity of Ulundi including Nkandla. In the Hluhluwe-iMfolozi Park it occurs at highest altitudes in the park. Altitude mainly 450–900 m.

- **Vegetation & Landscape Features**

The dominant structural vegetation type is wooded grassland. The terrain is mainly low, undulating mountains, sometimes highly dissected, and also some moderately undulating plains and hills.

- **Geology & Soils**

The soils in this vegetation type are typically well-drained and shallow soil forms (Glenrosa and Mispah forms) derived from various lithologies; predominantly, Dwyka Group diamictites, but also shale, siltstone and sandstone from the Madzaringwe and Pietermaritzburg Formations, all of the Karoo Supergroup.

- **Important Taxa**

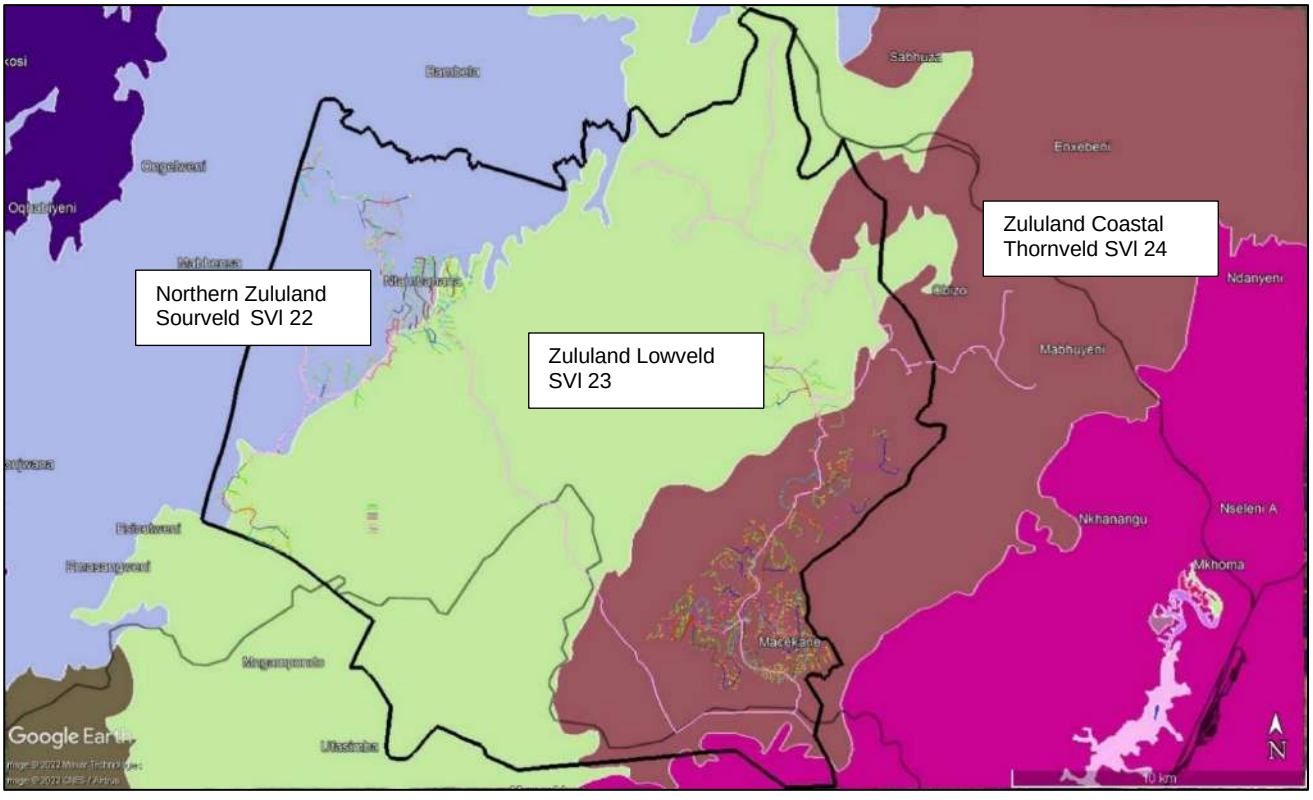
Small Trees: *Acacia sieberiana var. woodii (d), A. natalitia, A. nilotica, A. tortilis subsp. Heteracantha* and *Plectroniella armata.*
Tall Shrubs: *Gardenia volkensii, Gnidia caffra* and *G. kraussiana.*
Low Shrubs: *Agathisanthemum bojeri, Chaetacanthus burchellii, Crossandra fruticulosa, C. greenstockii, Diospyros galpinii, Phyllanthus glaucophyllus, Ruellia cordata, Syncolostemon argenteus* and *Tetraselago natalensis.*
Succulent Shrub: *Aloe vanbalenii.*
Woody Climber: *Cryptolepis oblongifolia*.
Herbaceous Climber: *Cyphostemma schlechteri.*
Graminoids: *Eragrostis curvula (d), Hyparrhenia hirta (d), Microchloa caffra (d), Themeda triandra (d), Tristachya leucothrix (d), Alloteropsis semialata subsp. semialata, Digitaria argyrograpta, D. tricholaenoides, Diheteropogon amplectens, Elionurus muticus, Loudetia simplex* and *Trachypogon spicatus.*
Herbs: *Alepidea longifolia, Argyrolobium adscendens, Aster bakerianus, Berkheya speciosa, Chascanum hederaceum, Crabbea hirsuta, Gazania krebsiana subsp. serrulata, Gerbera ambigua, Helichrysum mixtum, H. nudifolium var. pilosellum, Hemizygia pretoriae subsp. pretoriae, Hermannia grandistipula, Hypericum*

aethiopicum, Lichtensteinia interrupta, Pimpinella caffra, Senecio glaberrimus, S. latifolius, Stachys nigricans, Vernonia galpinii and *V. oligocephala.*
Geophytic Herbs: *Hypoxis hemerocallidea* and *Pachycarpus concolor.*
Succulent Herbs: *Aloe minima, A. parvibracteata* and *Senecio oxyriifolius*.
Geoxylic Suffrutex: *Salacia kraussii.*

Figure 43: Typical topography and vegetation in the Northern Zululand Sourveld vegetation type.

Figure 44 below illustrates the location of the different vegetation types discussed above.

Figure 44: The Vegetation types within the Project Area



2.9.2 Riparian Habitat

Riparian areas have high conservation value and can be considered the most important part of a watershed for a wide range of values and resources. They provide important habitat for large numbers of wildlife for foraging, breeding, nesting and refugia and often forage for domestic animals. The vegetation they contain are an important part of the water balance for the hydrological cycle through evapotranspiration. They are crucial for riverbank stability and in preventing erosion within the channel and its embankments (Elmore and Beschta, 1987). Intact riparian areas offer buffering ecoservices to adjacent land uses and improve the water quality through phytoremediation (cleaning of water by plants) and the more intact a riparian zone is the greater the buffering capacity offered (Macfarlane, et al., 2014). Therefore, they are considered as high priority areas and clearing activity in these areas should be avoided at all costs[1].

2.9.3 Aloe Find protocol

There are areas where aloes are prolific in and near the pipeline route. In instances where the project team has demarcated the pipeline and knows there will be aloes that need to be removed, a permit must be obtained from KZN Wildlife prior to plant removal. Aloes are protected plants and cannot (by law) be removed without a permit. All aloes that are or will be cleared for construction must be re-planted adjacent to the pipeline.

2.9.4 Placement of Site Camp and Site Access

The location of the site camps must be approved by both the engineer and the ECO and must be on land that is previously disturbed or within the construction footprint. All vegetation clearing will take place under the supervision of the ECO and Engineer. Access to site must make use of the existing access tracks. Heavy vehicles and construction equipment must stay within the construction footprint.

2.10 Fauna

The most sensitive aspects of this project area are that of the aquatic systems that will be crossed by the pipeline network. There are a number of sensitive aquatic species that may be affected by a disturbance to the watercourse crossings during construction. The project area has a High probability of CR, EN, VU or Extremely Rare species with three Near Threatened (NT) species *in Anguilla bicolor (shortfin eel), Anguilla bengalensis (*The mottled eel) and *Micropanchax myaposae* (Natal Top Minnow) as well as two Vulnerable (V) species in *Oreochromis mossambicus* (Mozambique tilapia) and *Enteromius gurneyi.(Redtail Barb)* expected in the project area. The functionality of the systems is considered “Medium” as the system is considered to be least threatened and poorly protected. The resilience of these systems especially the small tributaries is low and therefore the site ecological importance of these systems is considered “High”[2].

A list of expected fish species that may be found in the aquatic systems associated with the WSS has been provided by the aquatic ecologist, and is presented in Table 7 below.

Table 7 A list of expected Fish Species

Species	Common Name	IUCN Status (2022)	Mhlatuze River	Ntambanana River	Nseleni River	Okula River
Acanthopagrus berda	Picnic Seabream	LC	X	X		
Anguilla bicolor	Shortfin Eel	NT	X	X		X
Anguilla bengalensis	Indian Mottled Eel	NT			X	X
Anguilla marmorata	Marbled Eel	LC	X	X	X	X
Anguilla mossambica	African Longfin Eel	LC	X	X	X	X
Aplocheilichthys johnstoni	Johnston's Topminnow	LC	X	X		X
Awaous aeneofuscus	Freshwater Goby	LC	X	X	X	X
Clarias gariepinus	African Catfish	LC	X	X	X	X
Clarias theodorae	Snake Catfish	LC				X
Coptodon rendalli	Red Breast Tilapia	LC	X	X		X
Ctenopoma multispine	Many Spined Climbing Perch	LC				X
Engraulicypris brevianalis	Hyphen Barb	LC			X	
Enteromius gurneyi	Redtail Barb	VU	X	X	X	X

Species	Common Name	IUCN Status (2022)	Mhlatuze River	Ntambanana River	Nseleni River	Okula River
Enteromius paludinosus	Straightfin Barb	LC	X	X	X	X
Enteromius trimaculatus	Threespot Barb	LC	X	X	X	X
Enteromius viviparus	Bowstripe Barb	LC	X	X	X	X
Gilchristella aestuaria	Estuarine Round Herring	LC	X	X	X	X
Glossogobius callidus	River Goby	LC	X	X	X	X
Glossogobius giuris	Bareye Goby	LC	X	X	X	X
Labeobarbus natalensis	KwaZulu-Natal Yellowfish	LC	X	X	X	X
Labeo cylindricus	African Carp	LC	X	X		X
Labeo molybdinus	Leaden Labeo	LC	X	X	X	X
Marcusenius pongolensis		LC	X	X	X	X
Micropanchax katangae	Striped Topminnow	LC	X		X	X
Micropanchax myaposae	Natal Topminnow	NT	X	X	X	X
Redigobius Dewaali	Checked Goby	LC				X
Oreochromis mossambicus	Mozambique Tilapia	VU	X	X	X	X
Pseudocrenilabrus philander	Southern Mouth-Brooder	LC	X	X	X	X
Tilapia sparrmanii	Banded Tilapia	LC	X	X	X	X
Total Expected			24	23	21	27

2.11 Heritage and Cultural Aspects [8]

A heritage and palaeontological impact assessment were conducted in April 2022 (Appendix B). The HIA recorded 35 heritage sites that occur within 50m of the pipeline footprint. Some of these will require the pipeline to be re-aligned between 5-20m. A prescribed 20m buffer must be placed around all graves that occur near the pipeline in which no construction work whatsoever is undertaken within 20mn of a gravesite[9].

Should any human remains be uncovered during construction, then a 20m radius around that area must be delineated and all work must stop in that specific area: work may continue either side of the remains. The SAPS and KZNARI need to be informed and the remains may only be removed once KZNARI has granted permission and has supplied the relevant permits. These are graves outside of a formal cemetery and are thus protected by the KZNARI Act of 2018[9].

Similarly, some trees, such as *the Euphorbia ingens*, *Erythrina spp*. And *Ziziphus spp*., are traditional grave markers. Other trees, such as the Marula tree are used for muthi, and are thus cultural resources. All of these types of trees should be avoided. Young/new *E. ingens* will not be associated with graves as this custom has not been used for a few decades[9].

The following aspects that were identified in the HIA (Appendix B) are within 20m of the proposed WSS footprint and require mitigation (pipe design deviation).

Table 8 HIA Findings that require mitigation (Appendix B).

ASPECT	COORDINATES	DISTANCE FROM PIPELINE	MITIGATION REQUIRED
Khoz 578 – H35 House	28°36'55.76"S 31°53'40.85"E	3m from bulk pipeline	Divert the bulk pipeline to the other side of the road.
Khoz 582 – H31 House	28°37'47.11"S 31°52'59.12"E	10m from 25mm pipe	Divert this reticulation pipe more than 10m away from the historical house.
Khoz 500 - House	28°37'20.81"S 31°52'15.14"E	8m from a 50mm pipe	Divert this reticulation pipe more than 10m away from the historical house.
Khoz 499 – E Ingens Tree	28°37'10.35"S 31°52'25.07"E	4m from a 50mm pipe	Divert this reticulation pipe more than 20m away from the historical house.
Khoz 498 – Marula tree	28°37'10.84"S 31°52'24.19"E	1m from a 50mm pipe	Divert this reticulation pipe more than 20m away from the historical house.
Khoz 577 – Muti tree	28°36'45.53"S 31°53'54.74"E	59m from blulk line	Demarcation during construction, no deviation required.
Khoz 575 - graves	28°36'45.58"S 31°53'57.29"E	6m from proposed bulk line.	Divert the bulk pipeline to the other side of the road, more than 20m from the grave sites.
Khoz 576 - graves	28°36'45.19"S 31°53'57.04"E	2m from proposed bulk line.	Divert the bulk pipeline to the other side of the road, more than 20m from the grave sites.
NTA 334 – E Ingens 2	28°35'13.31"S 31°44'20.86"E	20m from a pipe that will be disconnected.	Disconnect the pipe in question but do not removed the old pipeline. Leave the ground intact.
NTA 332 - cemetery	28°36'8.29"S 31°44'59.58"E	10m from the bulk line	Divert bulk line to opposite side of the road or place the bulk line in the road servitude 15m from the site. Erect demarcation of the cemetery pre construction to prevent accidental damage during construction.
NTA 314 – Gr6	28°42'30.14"S 31°50'56.27"E	18m from the bulk line on the opposite side of the road.	Demarcate the grave with snow netting during construction. No deviation required.
NTA 313 – Gr6	28°42'42.34"S 31°51'43.03"E	1m from a 50mm pipe	Divert this reticulation pipe more than 20m away from the grave.
NTA 308 - Gr7	28°42'40.58"S 31°51'41.63"E	1m from a 50mm pipe	Divert this reticulation pipe more than 20m away from the grave.

The PIA survey noted four areas that require on-site monitoring during construction phase.[9].

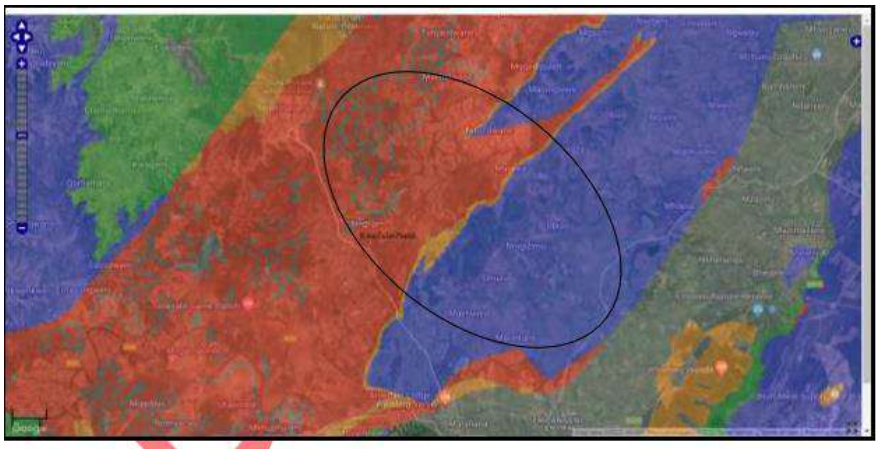
2.12 Palaeontology

The study area is in a sensitivity zone of zero to very high palaeontological sensitivity. Dr Alan Smith, a paleontologist undertook a desktop and field survey of the area. Twenty-eight sensitive areas were visited and assessed in terms of significance. Of these areas, five require monitoring during construction activity by a suitably qualified paleontologist. Four of these areas will require monitoring for approximately 100m, while the fifth site will require monitoring for as long as is deemed necessary.

A “Chance Find Protocol” that must be included into the EMPr of the project and upgraded continuously during the construction phase when excavations of deeper than 1.5m are planned for this project. The ‘Chance Find Protocol’ requires that a PIA undertakes a site visit during construction to determine if any fossils have been exposed in the designated sensitive areas. This will not hinder construction time since most of the soil samples will be on the side of the trench already.

Figure 45: Desktop SAHRIS Database Palaeo Sensitivity Map of the Project Area (Source: SAHRIS, 2022).

9 HIA For The Upgrade Of Water Supply Infrastructure For Ntambanana Supply Area, KZN. For Civtech Engineers: 17 April 2022. By Gavin Anderson Umlando: Archaeological Surveys and Heritage Management.



COLOUR	SENSITIVITY	REQUIRED ACTION
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Section 3: Policy and Legislative Context

3.1 Identification of All Legislation, Policies, Plans, Guidelines, Spatial Tools, Municipal Development Planning Frameworks And Instruments As Per Section 3(e) (i) And Compliance Of Proposed Activity With Legislation And Policy 3(e) (ii)

Table 9: Legislation Table

Legislation	Compliance of Activity
The Constitution of South Africa (No. 108 of 1996)	The Constitution cannot manage environmental resources as a standalone piece of legislation; hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations is designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld on an on-going basis throughout the country. In terms of Section 24, the constitution gives every person the right to an environment that is not harmful to their health and wellbeing.
National Environmental Management Act (Act 107 of 1998)	The National Environmental Management Act (Act 107 of 1998) (NEMA) is South Africa's overarching environmental legislation. It includes a set of principles that govern environmental management and against which all Environmental Management Programmes (EMPr) and actions are measured. These principles include and relate to sustainable development, protection of the natural environment, waste minimisation, public consultation, the right to an environment that is not harmful to one's health or wellbeing, and a general duty of care. The Environmental Impact Assessment (EIA) Regulations, 2014: GNR.982, R.983, and R.985 under Section 24 of the NEMA define the activities that require Environmental Authorisation and the processes to be followed to assess environmental impacts and obtain Environmental Authorisation. The construction of the Ntambanana Water Supply Scheme pipeline infrastructure over the various watercourses triggers Activity 19 of Listing Notice 1. The proposed development thus requires EA in the form of a BA process. The associated EMPr includes mitigation measures as recommended by specialists, which must be implemented to ensure that environmental resources are protected.

National Water Act (Act 36 of 1998)	NWA states that a person may only use water if the water use is authorised by a license under NWA or if the responsible authority has dispensed with a license requirement if it is satisfied that the purpose of the NWA will be met by the granting of a license, permit or other authorisation under any other law. The construction of the pipeline route will cross multiple watercourse and wetland systems causing alterations to the bed and banks of a watercourses. Therefore, a water use authorisation will be required as per Section 21 (c) and (i) of the National Water Act.
National Environmental Management: Waste Act (Act 59 of 2008)	To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement, and to provide for matters connected therewith. Section 19 allows the Minister to publish a list of activities, which require a Waste Management License. The most recent list is published in Government Gazette 37083 Notice No. 921 dated 29 November 2013. It is unlikely that any activities carried out by the development will trigger a Waste Management Activity.
National Environmental Management: Air Quality Act (Act 39 of 2004)	To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government; for specific air quality measures; and for matters incidental thereto. It is unlikely that any activities carried out by the development will impact on the local and regional air quality.
National Environmental Management: Protected Areas Act (Act 57 of 2003)	The National Environmental Management: Protected Areas intends to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes, for the establishment of a national register of all national, provincial and local protected areas, for the management of those areas in accordance with national norms and standards, for intergovernmental co-operation and public consultation in matters concerning protected areas, and for matters in connection therewith. The proposed development will not have an impact on any protected areas.
National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008)	The National Environmental Management: Integrated Coastal Management Act aims to establish a system of integrated coastal and estuarine management in the Republic, including norms, standards and policies, in order to promote the conservation of the coastal environment, and maintain the natural attributes of coastal landscapes and seascapes, and to ensure that development and the use of natural resources within the coastal zone is socially and economically justifiable and ecologically sustainable, to define rights and duties in relation to coastal areas, to determine the responsibilities of organs of state in relation to coastal areas, to prohibit incineration at sea, to control dumping at sea, pollution in the coastal zone, inappropriate development of the coastal environment and other adverse effects on the coastal environment, to give effect to South Africa's international obligations in relation to coastal matters and to provide for matters connected therewith. The proposed development will not have an impact on any coastal areas.
National Forest Act (Act 84 of 1998)	To reform the law on forests as the government recognises that everyone has the constitutional right to have the environment protected for the benefit of present and future generations. Natural forests and woodlands form an important part of that environment and need to be conserved and developed according to the principles of sustainable management. Plantation forests play an important role in the economy, have an impact on the environment and need to be managed appropriately. The State's role in forestry needs to change; and the economic, social and environmental benefits of forests have been distributed unfairly in the past.

	The proposed development will not have an impact on any forest areas.
Environmental Conservation Act (Act 43 of 1996)	This Act makes provisions for the application of general environmental principles for the protection of ecological processes, promotion of sustainable development and the protection of the environment. This Act has mostly been repealed by NEMA.
National Environmental Management: Biodiversity Act (Act 10 of 2004)	The National Environmental Management: Biodiversity Act intends, to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998, the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources, the establishment and functions of a South African National Biodiversity Institute and for matters connected therewith. The site is not located within a NEMBA section 52 endangered or critically endangered ecosystem types.
National Heritage Resources Act (Act 25 of 1999) KwaZulu-Natal Heritage Act (Act 4 of 2008)	The National Heritage Act (No. 25 of 1999) aims to promote good management of the national estate in order to preserve the country's unique heritage for current and future generations. The KwaZulu-Natal Heritage Act (Act No. 4 of 2008) provides for the conservation and preservation of the physical and intangible heritage resources of the KwaZulu-Natal province. No significant archaeological artefacts will be disturbed during this project as long as the small relocation of the pipeline segments as per the HIA report are adhered to. A chance find protocol for palaeontological aspects must be adhered to during construction. There are some short sections of pipe that must be constructed under the supervision of a qualified palaeontologist; At this stage, no permits will be required from the provincial heritage authority, AMAFA.
Mineral & Petroleum Resources Development (Act 28 of 2002)	To provide for the sustainable development of the nation's mineral and petroleum resources which includes activities carried out for the winning of any mineral on, in or under the earth (i.e. the use of borrow pits). The material used to construct the pipeline must be obtained from licensed and legal sources.
Occupational Health and Safety Act (Act 181 of 1993)	These regulations provide for the health and safety of persons at work, including aspects which are hazardous to health and safety. In terms of major hazardous installation, the regulations shall apply to employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a major hazard installation or a quantity of a substance which may pose a risk that could affect the health and safety of employees and the public. During both the construction phase of this development all the requirements of Occupational Health and Safety Act 1993 will need to be adhered to.
Hazardous Substances Act (Act No. 15 of 1973)	This Act aims to provide for the control of substances which may cause injury or ill-health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitizing or flammable nature or the generation of pressure thereby in certain circumstances, and for the control of certain electronic products, to provide for the division of such substances or products into groups in relation to the degree of danger; to provide for the prohibition and control of the importation, manufacture, sale, use, operation, application, modification, disposal or dumping of such substances and products and to provide for matters connected therewith. A Spill Contingency Plan will be compiled for managing spills during the construction of the proposed Development.
National Building Regulations and Building Standards Act (Act 103 of 1977)	This Act aims to provide for the promotion of uniformity in the law relating to the erection of buildings in the areas of jurisdiction of local authorities and for the prescribing of building standards.
Guideline on Need and Desirability (2017)	Guideline considered determining the need and desirability of proposed development.
Municipal Planning Framework	
City of uMhlatuze, Fifth Generation IDP 2022/2027	This project falls in line with the Municipality's mission to "*strive to provide good health, human development, sustainable environment through the provision of adequate infrastructure in partnership with Traditional Leadership and other stakeholders".* This project will contribute to water service delivery and infrastructure within the municipal area.

King Cetshwayo District Municipality Integrated Development Plan 2020/21	This project falls in line with the King Cetshwayo District Municipality's goal of "Championing an economically viable district which strives to promote sustainable development by 2035" by providing better services in the district and sustainable water delivery. The King Cetshwayo District Municipality is the Water Services Authority for the whole district. The Ntambanana Water Supply Scheme is in line with the municipality's water and sanitation strategy to address water backlogs.

Section 4: Motivation, Need and Desirability

4.1 Need and Desirability as Per Section 3(F)

The following table has been prepared as per the 2017 Integrated Environmental Management Guideline: Guideline on Need and Desirability compiled by the Department of Environmental Affairs.

Table 10: Need and Desirability as per the 2017 Guideline on Need and Desirability

"Securing ecological sustainable development and use of natural resources"	
How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?	The construction of the Ntambanana Water Supply Scheme infrastructure will require digging works, soil stockpile management and operation of equipment and machinery. It will also result in the infill of more than 10m^3 of material in numerous watercourses for the pipeline crossing points in order to supply water to various areas and homesteads. The majority of the pipeline network will follow existing road and bridge infrastructure. The impact on the ecological integrity of the area has been rated as low during both the construction and operational phases. The route with the least impact (location of the current road servitudes) was selected.
How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? *What measures were explored to firstly avoid these negative impacts and, where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts?* *What measures were explored to enhance positive impacts?*	The proposed development will result is some clearance and disturbance of the landscape, watercourses and vegetation. The ecologist rated the impact of the pipeline installation as "low". The pipeline will be re-routed outside of wetlands and green field crossing points wherever possible. Existing road servitudes and crossing structures will be utilised where possible. The construction of the bulk water infrastructure doesn't offer much opportunity to enhance biological diversity but the proposed route does seek to avoid areas where construction would have the highest impact.
How will this development pollute and/or degrade the biophysical environment? *What measures were explored to firstly avoid these impacts and, where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts?* *What measures were explored to enhance positive impacts?*	Apart from risk of spills etc. during construction which can be managed and mitigated, the development and watercourse crossing will not pollute and/or degrade the biophysical environment during operation. The EMPr details measures to manage hazardous materials and fuels used on site during construction and details measures to put in place to ensure that pollution is prevented. Any potential leakages from the pipeline during operation will only result in clean water entering the environment. By providing households with access to potable drinking water at their homes, the project could reduce the pedestrian traffic in and around watercourses and also reduce the need for people to wash clothing, vehicles and dishes in the watercourses, thereby reducing impacts on water quality.
What waste will be generated by this development? *What measures were explored to firstly avoid waste and, where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste?*	Small volumes of general waste and a small amount of hazardous waste, such as oil spills, will be generated during construction. This will be temporary. No waste will be generated during operation. An EMPr has been provided to ensure waste is properly stored and managed on site and the appropriate disposal of

What measures have been explored to safely treat and/or dispose of unavoidable waste?	waste is also addressed. Measures for the separation and recycling of waste are addressed in the EMPr.
How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? *What measures were explored to firstly avoid these impacts and, where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts?* *What measures were explored to enhance positive impacts?*	There are potential negative impacts on some cultural heritage sites along the pipeline network. The proposed pipeline route comes within 20m of a number of grave sites and culturally valuable trees. In these instances, the pipeline will be moved 5-20m away from these identified sensitive sites. A heritage and paelaeo impact assessment was conducted for the entire site footprint.
How will this development use and/or impact non-renewable natural resources? *What measures were explored to ensure responsible and equitable use of the resources?* *How have the consequences of the depletion of the non-renewable natural resources been considered?* *What measures were explored to firstly avoid these impacts and, where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts?* *What measures were explored to enhance positive impacts?*	The construction process will make use of quarried materials to produce cement and fuels to operate the vehicles. The EMPr addresses the responsible sourcing of materials and use of permitted sites only. The project will not significantly deplete non-renewable natural resources. These impacts cannot be completely avoided but the EMPr addresses appropriate measures to ensure sustainable sourcing. The pipeline doesn't offer much opportunity to enhance positive impacts related to non-renewable resources.
How will this development use and/or impact renewable natural resources and the ecosystem of which they are part? *Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds?* *What measures were explored to firstly avoid the use of resources or, if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?* • *Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)* • *Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative)?* • *Do the proposed location, type and scale of development promote a reduced dependency on resources?*	The development is not expected to impact on any renewable natural resources on site. The project will however, ease the demand for potable water in the region. Water supply is a basic human need and therefore use of the resource cannot be avoided, however implementation of a formal scheme does allow proper management and monitoring of water use and can ensure that impacts are mitigated through formal management as opposed to the impacts caused by local communities accessing local water resources in an informal and uncontrolled manner.
How was a risk-averse and cautious approach applied in terms of ecological impacts?	The existing road servitude routes that have been previously cleared/ disturbed will have the least impact on the environment have been selected for the majority of the

• *What are the limits of current knowledge? (note: the gaps, uncertainties and assumptions must be clearly stated)* • *What is the level of risk associated with the limits of current knowledge?* • *Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?*	pipeline route. Therefore, substantial unnecessary impacts on vegetated area clearing have been avoided. There are very few if any gaps in knowledge. It is possible there are grave sites that were not identified within the project footprint. A risk averse and cautious approach has been followed by avoiding previously undisturbed areas where possible. The impact on the ecological integrity of the area has therefore been rated as low during the construction phase. During operation, there will be very little impact.
How will the ecological impacts resulting from this development impact on people's environmental right in terms following • *Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but, if avoidance is not possible, to minimise, manage and remedy negative impacts?* • *Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?*	The proposed development will have very little negative impact on the community's environmental rights. There may be some nuisance and disturbance and access constraints during construction as well as associated noise and dust. The long-term impacts will be positive as the construction of the Ntambanana Water Supply Scheme Infrastructure will improve access to potable water which is a natural resource and will allow better management and monitoring of water usage.
Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)	As this is a rural area the local community relies on the open spaces around them for a number of services including grazing for cattle and goats; subsistence agriculture; in some cases, wood gathering for fires and cooking and where water access is limited the community use the local watercourses for water provision and cleaning. The proposed development will have a limited ecological impact and will have a positive impact on the community by providing a long-term potable water supply. The development will have limited to no impact on the other ecological services provided during construction and no impact during operation.
Based on all of the above, how will this development positively or negatively impact ecological integrity objectives/targets/considerations of the area?	The development should have no significant negative impact on ecological integrity based on the understanding that the Municipality will construct and operate the water supply infrastructure in line with the conditions of the EMPr.
Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations.	Due to the nature of the development, no other feasible site alternatives could be considered, please refer to Section *1.3* and *4.2.* In terms of design alternatives, the preferred alternative will have a smaller construction impact on the watercourse in terms of construction work in the bed and banks, and will have less impact in the long term, post-construction (less sedimentation of the downstream watercourse).
Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area.	The construction works for the new pipeline through the watercourse crossings will increase sedimentation and disturbance within the catchment during construction. This will ultimately impact on downstream users. It can however be mitigated by following the measures indicated in the EMPr. Due to the nature of the project, there are no identified positive cumulative ecological/biophysical impacts.
"Promoting justifiable economic and social development"	
What is the socio-economic context of the area based on, amongst other considerations, the following considerations: • *The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area?*	The project is located in a rural area characterised by agriculture, lower income and informal residences and road infrastructure. The area is therefore targeted for development and provision of services in order to improve quality of life, health and access to services.

• *Spatial priorities and desired spatial patterns (e.g. need for integrated or segregated communities, need to upgrade informal settlements, need for densification, etc.)?* • *Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.)? and* • *Municipal Economic Development Strategy ("LED Strategy")?*	
Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?	The identified positive socio-economic impacts are as follows: • Improved access to a potable water supply to the Ntambanana community. • Infrastructure that will serve to satisfy the increasing water demand within the project area. • Provision of an economically efficient solution to the water supply problem. • Reduced water services backlog and uplifted standards of living in Ntambanana. • Provision of employment for local labour.
How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	The new Bulk Water infrastructure will aid in improving potable water supply for the community of Ntambanana. This will have a direct positive impact on sanitation and health.
Will the development result in inequitable (intra- and inter-generational) impact distribution, in the short- and long-term?	No, as the proposed development is a municipal infrastructure project, it will benefit the public in general and will not result in inequitable (intra- and inter-generational) impact distribution.
Will the impact be socially and economically sustainable in the short- and long-term?	Yes, the development will be socially and economically sustainable as there have not been any significant negative socio-economic impacts identified. The Bulk Infrastructure will have a positive long-term social impact on all residents in the Ntambanana area.
In terms of location, describe how the placement of the proposed development will: • *result in the creation of residential and employment opportunities in close proximity to or integrated with each other* • *reduce the need for transport of people and goods* • *result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport?)* • *compliment other uses in the area* • *be in line with the planning for the area* • *for urban related development, make use of underutilised land available within the urban edge* • *optimise the use of existing resources and infrastructure* • *opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement)* • *discourage "urban sprawl" and contribute to compaction/densification* ▪ *contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs* ▪ *encourage environmentally sustainable land development practices and processes* ▪ *take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.)*	The construction of the watercourse crossings will result in a small number of employment activities during the construction phase. With the increased access to potable water supply to the Ntambanana community, additional employment and housing opportunities will be created. The increase in the potable water supply will allow these communities to grow, providing further economic development to the area.

▪ *the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential)* ▪ *impact the sense of history, sense of place and heritage of the area and the socio-cultural and* ▪ *cultural-historic characteristics and sensitivities of the area, and* ▪ *in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement*	
How were a risk-averse and cautious approach applied in terms of socio-economic impacts? • *What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?* • *What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?* • *Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?*	As the project is for the provision of basic services i.e. water supply, there are no negative socio- economic risks associated with the proposed development. Therefore, a risk-averse and cautious approach was not required.
How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: • *Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts but, if avoidance is not possible, to minimise, manage and remedy negative impacts?* • *Positive impacts. What measures were taken to enhance positive impacts?*	The proposed development will not negatively impact on people's environmental rights. In fact, the development will have a positive impact, the improved supply of potable water to households and will aid in improving the standard of living for all in the project area.
Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)	As this is a rural area, the local community relies on access to services, such as transport, electricity and running water. The proposed development will have a limited ecological impact and will have a positive impact on the community by providing a long-term potable water supply. The development will have limited to no impact on the other ecological services provided during construction and no impact during operation. There will be an unavoidable increase in use of water from the supply catchment.
What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	As the development is for the improved provision of potable water, no other alternatives were considered from a socio-economic point of view. The proposal of constructing the bulk water supply infrastructure is the "best practicable environmental option".
What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries) and is the development located appropriately?	There have been no identified impacts which will adversely affect vulnerable and/or disadvantaged persons. The project will in fact have a positive impact by addressing the lack of basic services in the Ntambanana community.
Considering the need for social equity and justice, do the alternatives identified allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Yes, the best practicable environmental option is selected.
What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	The development will not impact on anyone's access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing. It will, in fact, improve water supply into the area.
What measures were taken to ensure that the responsibility for the environmental health and safety	The EMPr includes conditions which have been developed to manage operational impacts. Upon receipt of the EA, the EMPr will become legally binding. Therefore, the Municipality

consequences of the development has been addressed throughout the development's life cycle?	will be bound to the conditions of the EMPr throughout the life cycle of the water supply scheme.
What measures were taken to: • *ensure the participation of all interested and affected parties?* • *provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation?* • *ensure participation by vulnerable and disadvantaged persons?* • *promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means?* • *ensure openness and transparency, and access to information in terms of the process?* • *ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition was given to all forms of knowledge, including traditional and ordinary knowledge?* • *ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein would be promoted?*	The following steps were followed during the public participation process: • Fifteen (15) noticeboards detailing the project were erected at strategic points along the WSS pipeline route on the 05, 06 and 07 April. • An English and IsiZulu advertisement was published in the Ilanga newspaper on the 24th April 2022. • All relevant authorities were notified via email of the application on 08 April 2022. • All adjacent landowners and interest groups were notified electronically on the 08 April 2022. • Meetings were held with the various ward councillors on the: • 01/03/2022 - Ward 31 • 01/03/2022 – Ward 32 • 09/03/2022 – Ward 33 • 06/04/2022 – Ward 25 • Meetings were held with the respective tribal councils on the: • 01/03/2022 – Mambuka Tribal Council • 01/02/2022 – Somopho Tribal Council • 09/03/2022 – Obuka Tribal Council • 05/04/2022 – Ubizo Tribal Council All relevant authorities and registered I&APs will be given the opportunity to review complete copies of the Draft BAR. The Draft BAR will be circulated for a legislated 30-day comment period Please refer to *Section 5* describing the public participation carried out for the project. Appendices C – E provide proof of the public participation process.
Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g.. a mixture of low-, middle- and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area).	As the proposed development is a municipal water supply project, it will benefit the public in general and will not result in inequitable impact distribution.
What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	During construction and operation, a full health, safety and environmental induction will be conducted with all employees. This induction brings to the attention of the employees all potential human health hazards and environmental dangers associated with the workings of the site. Inductions also indicate that all employees have a right to work in a clean and safe environment.
Describe how the development will impact job creation in terms of, amongst other aspects: • *the number of temporary versus permanent jobs that will be created* • *whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area?)* • *the distance from where labourers will have to travel* • *the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits) and* • *the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).*	There will be the provision of temporary jobs during construction. However, there will only be a limited amount of new employment opportunities created during the operational phase. This is due to the nature of the development being a water supply scheme with only general maintenance required over its life cycle.
What measures were taken to ensure:	The proposed project falls under the jurisdiction of the King Cetshwayo District Municipality and as such there was no inter-governmental coordination required.

• *that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment?* • *that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?*	
What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	The proposed development is to take place on a public owned and tribal authority land; however, it will not negatively impact on people's common heritage with respect to the environment.
Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	All of the mitigations proposed by the EAP and specialists are realistic and practical.
What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	The EMPr will designate responsibility for all conditions. This document will be legally binding and as such any non-compliance with the conditions of the EMPr will effectively be breaking the law, therefore, the City of uMhlatuze Municipality will prioritise these items.
Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations.	Due to the nature of the development, no other feasible site alternatives could be considered, please refer to *Section 1.3* and *4.2.* In terms of design alternatives, the preferred alternative will have a smaller construction impact on the watercourse in terms of construction work in the bed and banks and will have less impact in the long term, post-construction. Due to post-construction impacts being permanent this design is seen as more favourable when considering ecological impacts.
Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area.	The proposed project will have a positive cumulative socio-economic impact. An improved access to potable water will ultimately allow for greater hygiene and improved health of residents.

4.2 Motivation for Preferred Site, Activity and Technology Alternative

4.2.1 Site Alternatives

4.2.1.1 Pipe Alignment Alternative 1 (Preferred Site Alternative)

Two pipeline alternatives have been considered in this assessment for the water course crossings. The preferred alignment alternative is to construct the pipelines adjacent to and within portions of the existing road servitude. This will allow the pipeline to follow previously disturbed areas thereby reducing the impact of vegetation clearing and excavation from the construction activities.

Realigning the pipeline outside the existing servitudes will result in the transformation of previously undisturbed areas which will have a significantly larger environmental impact than the preferred alignment alternative. Therefore, only one site alternative was considered in this application.

4.2.2 Design Alternatives

4.2.2.1 Design Alternative 1 (Preferred Design Alternative)

The preferred design alternative is to construct the pipeline watercourse crossings under the river beds, encased in concrete at each watercourse crossing point, as recommended in the engineering report[10]. This alternative will involve the placement of the new bulk pipeline watercourse crossings along existing road servitudes (where possible), tracks, and footpaths below the river bed of the watercourses. This crossing technique will have a smaller construction footprint and less impact on the surrounding environment than crossing the watercourses in new locations outside existing road and service servitudes. The pipelines once constructed, will not block or impede the flow of water in the watercourse as they will be below the surface of the river bed. Please see Appendix A for design drawings.

4.2.2.2 Design Alternative 2

Alternative 2 is to construct a pipe bridge over the watercourses. This would entail building pier structures into the watercourse beds to support the pipeline above-ground. This approach will have a larger environmental and visual impact with the above-ground pipes being very visible. Constructing piers in each watercourse would potentially create long term water flow impedance if piers are located in the watercourse beds and banks. This technique would make the pipe susceptible to damage during flood events when the water levels rise, and make the pipes vulnerable to vandalism and theft, which would result in more infrastructural maintenance and repair for the Municipality and ultimately threaten the consistent supply of potable water for all users in this area.

4.2.3 The No Go Alternative

The new Ntambanana Water Supply Scheme Infrastructure will not be constructed leaving the residents of this community without a consistent potable water supply. The use of water tankers for delivery of potable water will continue. This will increase the cost imposed on the municipality due to continued fuel and maintenance requirements of the water tankers and related plant. This will lead to insufficient water capacity for the projected demand and compound the existing feelings of frustration in these communities regarding consistent water supply.

Section 5: Public Participation

5.1 Notification of Interested and Affected Parties

[10] City of uMhlatuze, Upgrade of Water Supply Infrastructure for Ntambanana Supply Area (Upper Nseleni Supply). Feasibility Report (rev1) March 2022.

1) *Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of:*
    i. *the site where the activity to which the application or proposed application relates is or is to be undertaken and*
    ii. *any alternative site*

Fifteen (15) noticeboards detailing the project were erected at strategic points along the WSS pipeline route on the 05, 06 and 07 April 2022.See Appendix C – Proof of Placement of Notice Board.

2) *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. *the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area*
    iii. *the municipality which has jurisdiction in the area*
    iv. *any organ of state having jurisdiction in respect of any aspect of the activity, and*
    v. *any other party as required by the competent authority*

The following steps were followed during the public participation process:

- Fifteen (15) noticeboards detailing the project were erected at strategic points along the WSS pipeline route on the 05, 06 and 07 April 2022
- An English and IsiZulu advertisement was published in the Ilanga newspaper on the 24th April 2022.
- All relevant authorities were notified via email of the application on 08 April 2022.
- All adjacent landowners and interest groups were notified electronically on the 08 April 2022.
- Meetings were held with the various ward councillors on the:
    - 01/03/2022 - Ward 31
    - 01/03/2022 – Ward 32
    - 09/03/2022 – Ward 33
    - 06/04/2022 – Ward 25
- Meetings were held with the respective tribal councils on the:
    - 01/03/2022 – Mambuka Tribal Council
    - 01/02/2022 – Somopho Tribal Council
    - 09/03/2022 – Obuka Tribal Council
    - 05/04/2022 – Ubizo Tribal Council

All relevant authorities and registered I&APs will be given the opportunity to review complete copies of the Draft BAR. The Draft BAR will be circulated for a legislated 30-day comment period.

See Appendix D – Proof of Notification.

    i. *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;*

E-mail notifications were sent out to all I&APs on the 08 April 2022. See Appendix D – Proof of Notification.

3) *Placing an advertisement in:*
    i. *one local newspaper; or*
    ii. *any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;*
4) *Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii)*

An English and IsiZulu advertisement was placed in the Ilanga newspaper on the 25th April 2022 detailing the proposed project, Basic Assessment requirements and to prove contact details of EnviroPro should anyone wish to register as an I&AP. See Appendix D – Proof of Advert Placement.

5.2 Registered Interested and Affected Parties

42. A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contain the names, contact details and addresses of:

(a) all persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP

(b) all persons who have requested the proponent or applicant, in writing, for their names to be placed on the register and

(c) all organs of state which have jurisdiction in respect of the activity to which the application relates.

The contact details of all I&APs who have registered have been provided in the Registered I&AP list in Appendix F.

5.3 Comments

Comments of interested and affected parties to be recorded in reports and plans.

5) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.

6) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to-

i. a lack of skills to read or write
ii. disability or
iii. any other disadvantage
iv. reasonable alternative methods of recording comments must be provided for.

All comments received from I&APs have been recorded in the comments and response table. The original comments provided have been included together with the C&R table. This report has been provided to the Local Municipality and District Municipality for comment. See Appendix F – Comments and Response table and Comments Received.

Section 6: Impact Assessment

6.1 Methodology to Determine and Rank Significance and Consequences of Impacts Associated With All Alternative as Per Section 3(h) (vi)

Impacts are assessed qualitatively and quantitatively, looking at the duration / frequency of the activity and likely impacts associated with that activity during both construction and operation. If the activity happens frequently, the risk of the associated impact occurring is much higher than if the activity happens less frequently. The geographical extent of the impact is assessed - i.e. will the impact be restricted to the point of occurrence or will it have a local or regional effect. Impacts are also reviewed looking at severity levels and consequences should the impact occur - i.e. will the severity be low, medium or high and then probability of the impact occurring is taken into account.

Whether or not the impact can be mitigated and the extent to which it can be avoided, managed, mitigated, or reversed is assessed - i.e. the probability of occurrence after mitigation has been applied. This also takes into account likelihood of human error based on construction and operational auditing experience - i.e. even though spills can be completely mitigated and prevented, there is always a small chance that spills will still occur (residual risk). Based on all of these factors, the impact is then rated to determine its significance -for example, an impact can have a regional effect with severe environmental implications; however the probability of it occurring is very low, and the implementation of the proposed mitigation measures means that the ultimate rating is medium or low.

Please see below a description of the scoring. The full impact scoring tables detailing how the significance rating was calculated can be found in Appendix H.

Table 11: Scoring of Impacts

Scoring of Impacts	
Duration / Frequency of activity likely to cause impact	0 = No impact 1 = short term / once off 2 = medium term / during operation

	3 = long term / permanent
Geographical Extent	0 = No impact 1 = point of impact / restricted to site 2 = local / surrounding area 3 = regional
Severity (level of damage caused) if impact were to occur	0 = No impact 1 = minor 3 = medium 5 = major
Probability of impact without mitigation	1 - 5 = low. 6 -10 = medium. 11 -14 = high.
Significance before application of Mitigation Measures	A score of between 1and 5 is rated as low. A score of between 6 and 10 is rated as medium. A score of between 11 and 14 is rated as high.
Will activity cause irreplaceable loss of resources?	10 = Yes 0 = No
Mitigation measures	0 = No impact - 5 = can be fully mitigated - 3 = can be partially mitigated -1 = unable to be mitigated
Probability of impact after mitigation	0 = No impact 1 = Low 2 = Medium 3 = High
Significance after application of Mitigation Measures	A score of between 1and 5 is rated as low. A score of between 6 and 10 is rated as medium. A score of between 11 and 14 is rated as high.

6.2 Impact Assessment of the Site and Design Alternatives

See Appendix G for the full impacts scoring matrix, which assesses the impacts on the below identified sensitive environmental aspects. The specific activities and associated impacts identified in Table 10 below are site-specific and relate to the Preferred Site and Design Alternatives.

Table 12: Specific Impacts Associated with Site Alternative 1 (Preferred Site Alternative) and Design Alternative 1 (Preferred Design Alternative)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[11]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
Construction				
A. Clearing and earthworks within the watercourse	**1)** Direct Impact: The construction of the Ntambanana Water Supply Scheme pipeline and infrastructure within the watercourse crossings will result in more than 10m^3 of material being infilled and excavated within numerous watercourses.	9 (Medium)	This impact is unavoidable. However, the pipeline and related infrastructure are going to be constructed along the existing road servitudes and previously cleared sections of watercourse crossing points for the majority of the pipeline network. The watercourse has been previously disturbed at these locations thereby limiting the amount of disturbance to new areas that would impact the watercourse. The following measures must be carried out to mitigate the disturbance of the watercourse area: • Construction work within the watercourse (riparian area) areas must be strictly limited to the construction footprint only. A construction corridor of 10m within each watercourse must be maintained. A construction footprint width of 15m may be used outside the riparian areas. • No areas may be excavated outside of the project footprint. • No soil stockpiles may be placed within 32m of a watercourses. All stockpiles must have sufficient erosion protection measures to ensure sediment is not dislodged as runoff resulting in erosion and sedimentation. • The areas outside of the watercourse areas must be demarcated as no go areas with snow netting. • The watercourse area must be rehabilitated as soon as the installation of the pipeline has been completed. • A dry work area is required for the installation of the pipe and pouring of the concrete. Minor diversions may be required within the channel of the rivers. Water will be diverted around the work area. It is recommended that large sand bags are used for the diversion. This enables the contractor to shift the work as construction progresses.	6 (Medium)
	2) Cumulative Impact: Potential for cumulative impact on the system as a whole from the disturbance in the aquatic systems.	6 (Medium)	It is expected that the disturbance to the watercourses and riparian systems will be temporary (less than 2 weeks) in each watercourse. The following measures must be carried out to mitigate the disturbance of watercourse area: • Construction work within the watercourse area areas must be strictly limited to the construction footprint only. • No areas may be excavated outside of the project footprint. • The areas outside of the watercourse areas must be demarcated as no go areas with snow netting.	4 (Low)

[11] See Appendix G for more details.

Aspect	Nature and Consequences of impact	Sig. rating of impacts[11]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
			• The watercourse area areas must be rehabilitated as soon as the pipelines have been completed.	
	3) Direct Impact: Increase in sediment inputs and turbidity in the watercourse.	9 (Medium)	The following measures must be carried out to mitigate against erosion, siltation and turbidity within the watercourse crossing points along the pipeline network: • The areas not within the direct project footprint must be demarcated as 'no-go' areas. The recommended "no-go" buffer of 15m must be established prior to construction. • Earth berms or sand bag barriers must be used as storm water and soil barriers below the cut and toe slopes to prevent eroded material from entering the surrounding watercourse areas. • No soil stockpiles may be placed within 32m of a watercourses • When erosion, siltation and turbidity are observed within the watercourse areas, effort must be made to prevent further erosion in that area. Sand bags and pack rock may be used within these areas to limit the duration period that areas are exposed. • All areas upstream and downstream of the construction footprint must be demarcated as a 'no-go' zone for the duration of the construction process. No site staff are permitted to enter these areas. The recommended buffer of 15m must be implemented. • No excavated material or fill material may be stored within 32m of a watercourse. Sandbags or pack rock must be placed below the soil stockpiles as berms should erosion start to occur from these areas. • Bedding material that will be used must not be stored within 32m of a watercourse before it is used. • An approved storm water plan (drafted by the engineer/contractor and signed off by the ECO) must be adhered to during construction. • Provided that the Contractor is compliant with the measures included in the attached EMPr, waste management and erosion control will be sufficiently managed to prevent this cumulative impact.	5 (Low)
	4) Direct impact: Erosion in the watercourse and loss of material leading to sedimentation and deposition of material downstream of the affected watercourses.	7 (Medium)		5 (Low)
B. Placement of the pipeline in the watercourse.	**5)** Direct Impact: Temporary impact on watercourse areas during the placement of the pipeline and encasement in concrete.	6 (Medium)	The following measures must be carried out to avoid potential alteration of flow dynamics within the watercourse: • The contractor must build the pipeline crossing as per the approved design.	2 (Low)
	6) Direct Impact: Incorrect placement of the pipeline could alter the flow dynamics of the watercourse.	10 (Medium)	When constructed/placed correctly the pipeline is not anticipated to impact the flow regime of the any watercourse during operation. Placing the pipeline deep enough to be compacted and backfilled lower than the river beds is essential.	5 (Low)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[11]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
C. Operation of construction vehicles and undertaking construction activities within the watercourse and surrounding areas during the pipeline construction.	**7)** Cumulative Impact: Vehicle activity in the watercourse could result in direct and cumulative damage to the watercourse.	8 (Medium)	The following measures must be carried out to mitigate against potential damage to the watercourse area during construction of the pipeline: • There will be construction work required within the watercourse areas as per the layout, however the sensitive areas around the watercourses not within the construction footprint must be demarcated as no-go areas; • Heavy vehicles must avoid working near the watercourse areas as far as possible. Where heavy vehicles are required to work in the watercourse during the construction of the pipeline, these vehicles must remain in the authorised pipeline footprint. There must be no haphazard entry into / exit from the watercourse along the route. i.e. construction plant and vehicles may only travel along existing access routes, and may only use a single point of entry into and out of the watercourse buffer zone. • The contractor must limit in-stream work to minimize streambank and bed disturbance. • Construct the pipeline in the larger watercourses in the dry season (between early May and late September) where possible when water levels will be lowest and the risk of erosion and downstream siltation is lowest. • Any disturbed areas within the construction footprint must be rehabilitated within a month of occurrence to the satisfaction of the ECO and or EDTEA Compliance Authorities. • All activity within the watercourse must be strictly according to the prescribed engineering designs and approved drawings. • The pipeline must be constructed according to approved engineer gradients to allow for the free flow of water over the pipeline. • Reno-mattresses or large aggregate must be used for energy dissipation in the channel downstream of the pipeline to reduce the likelihood of scouring the watercourse bed and prevent downstream sedimentation of the catchment. It is preferable that larger aggregate be used to avoid flows removing aggregate material from the site. • Erosion prevention and temporary sediment control measures must be implemented in areas prone to channelled flow and erosion. Temporary and permanent erosion control methods may include silt fences, interceptor ditches, seeding and sodding, riprap of exposed embankments, and mulching. • Any stockpiles within 32m of a watercourse area must have sufficient erosion protection measures to ensure sediment is not dislodged into the watercourses.	6 (Medium)
	8) Indirect Impact: Damage to the surrounding community infrastructure such as residences, electricity distribution lines etc.	9 (Medium)	• The locations of all infrastructure and services which may be impacted on by the operation of construction plant and related construction activities must be identified and demarcated prior to commencement of construction. • Access to site must make use of the existing access roads. • Heavy vehicles and construction equipment must not impact on the existing. • All construction activity must stay within the predetermined construction footprint and avoid areas with pre-existing infrastructure.	5 (Low)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[11]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
			• Construction vehicles must only use existing tracks to access the watercourse crossing locations. • If damage occurs to the irrigation scheme and farming projects, remediation must occur immediately.	
D. Draining excavated areas during construction.	**9)** Direct Impact: Draining the excavated areas can cause major siltation of the downstream watercourse.	11 (High)	The draining of the excavated areas during construction is essential in order for construction activity to take place for the foundations of the structure within the watercourse (such as pouring concrete). The following mitigation measures must be carried out: • Where possible, all excavated areas must be drained into a temporary settling pond before releasing the water into the downstream watercourse area, • Where this is not possible or practical, the pumped water must be released onto reno-mattresses or pack rock to prevent the scouring and resultant downstream erosion from the pumped pipe outflow. • Silt screen can also be used to prevent sediment laden water entering the river.	7 (Medium)
E. Clearing of vegetation for the construction of the pipeline.	**10)** Direct Impact: This will result in the loss of vegetation within the Zululand Lowveld, Zululand Coastal Thornveld, and Northern Zululand Sourveld vegetation types.	9 (Medium)	Vegetation clearing must be kept within the construction footprint. The impact of vegetation clearing associated with the pipeline crossing is therefore low. The following measures must be carried out to mitigate against excessive vegetation clearing along the pipeline's construction footprint on either side of the watercourses: The construction footprint is 10m wide within the watercourses and 15m wide outside of the watercourses. • The vegetation that will be cleared must be restricted to the construction footprint of the pipelines. No vegetation may be cleared other than that is required for access to the site or for the construction activities associated with the construction of the Ntambanana Water Supply Infrastructure. • Contractors must avoid damaging any vegetation that is not within the construction footprint. • The ECO must be consulted should a tree or any vegetation require clearing outside of the designated construction footprint area.	7 (Medium)
	11) Direct Impact: Removal of alien invasive vegetation found along the pipeline.	0 (Positive)	This is a positive impact.	0 (Positive)
	12) Direct Impact: Damage to culturally sensitive aspects such as graves. Trees and paeleontological artifacts	11 (High)	The HIA recorded 35 heritage sites that occur within 50m of the pipeline footprint. Some of these will require the pipeline to be re-aligned between 5-20m (section 2.11). A prescribed 20m buffer must be placed around all graves that occur near the pipeline in which no construction work whatsoever is undertaken within 20mn of a gravesite.	5 (Low)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[11]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
			Should any human remains be uncovered during construction, then a 20m radius around that area must be delineated and all work must stop in that specific area: work may continue either side of the remains. The SAPS and KZNARI need to be informed and the remains may only be removed once KZNARI has granted permission and has supplied the relevant permits. These are graves outside of a formal cemetery and are thus protected by the KZNARI Act of 2018. Similarly, some trees, such as *the Euphorbia ingens*, *Erythrina spp*. And *Ziziphus spp*., are traditional grave markers. Other trees, such as the Marula tree are used for muthi, and are thus cultural resources. All of these types of trees should be avoided. Young/new *E. ingens* will not be associated with graves as this custom has not been used for a few decades. During construction, all grave sites within 20m of the pipelines, as identified above, must be demarcated clearly with snow netting or survey poles for the duration of construction in that area. Twenty-eight paleontological sensitive areas were visited and assessed in terms of significance. Of these areas, **five require monitoring during construction activity by a suitably qualified paleontologist.** Four of these areas will require monitoring for approximately 100m, while the fifth site will require monitoring for as long as is deemed necessary.	
F. Construction activity in areas with no vegetated cover.	**13)** Direct Impact: Erosion on exposed banks and areas resulting in scouring and the siltation of the watercourse.	7 (Medium)	This impact is partially unavoidable as the construction activity will need to take place over cleared exposed areas. The following mitigation measures must however be applied: • Exposed banks that are susceptible to erosion within 32m of the edge of any watercourse must not be left exposed for more than 1 months at any time. • Erosion/ storm water protection measures must be implemented above and below the slope in the form of sand bag berms, pack rock berms or even vegetation berms to slow runoff down the slope. • Any accumulated siltation that enters a watercourse must be removed by spade and shovel (by hand). • Exposed cut and fill slopes near the watercourse area areas must be top soiled, hydro seeded or have grass sods planted within 4 weeks of being cut.	4 (Low)
G. Constructing the pipeline through areas	**14)** Indirect Impact: The habitat for fauna living within the construction footprint will be modified	8 (Medium)	The following measures must be carried out to mitigate against excessive habitat destruction within the Ntambanana Water Supply Scheme area: • The areas outside of the project footprint must be managed as no go areas for the duration of construction.	6 (Medium)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[11]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
of natural habitat.	due to the clearing activities taking place within the watercourse and riparian areas during construction.		• Any animal found within the project construction area must be removed unharmed from the site. • Erosion prevention and sediment control measures must be implemented. Temporary and permanent erosion control methods may include silt fences, interceptor ditches, seeding and sodding, riprap of exposed embankments, and mulching; • The project footprint must be kept as small as possible; • Heavy machinery must not be permitted to move beyond the demarcated footprint. The recommended buffer of 32m must be implemented. • Sand and aggregate for concrete must not be obtained from any watercourse but must be sourced from a permitted source; • Contamination of the river system with unset cement must be prevented as it is detrimental to aquatic biota. Due to the potential presence of vulnerable fish species, construction activities need to consider fish migrations (fish ways) when constructing the pipeline and associated infrastructure within the larger watercourses[8]. The proposed pipeline crossing will not result in the creation of any additional fish migration barriers as the pipeline will be below the surface of the river bed. However, any temporary diversion could impact fish movement and must ensure that water flow is only redirected and not blocked. Any activity affecting the water quality could affect fish within the river.	
H. The construction period of the Bulk Infrastructure.	**15)** Indirect impact: This is a positive impact for the community for the availability of local employment.	0 (Positive)	This is a positive impact.	0 (Positive)
I. Constructing temporary diversion infrastructure i.e. canals, within the watercourse.	**16)** Indirect Impact: The habitat for fauna living within the construction footprint will be modified due to the temporary diversion within the watercourse.	8 (Medium)	The following measures must be carried out to mitigate against excessive disturbance to the Rivers and larger watercourses within the Ntambanana Water Supply Infrastructure construction footprint: • Erosion prevention and sediment control measures must be implemented. Temporary and permanent erosion control methods may include silt fences, interceptor ditches, seeding and sodding, riprap of exposed embankments, and mulching; • The project footprint must be kept as small as possible; • Contamination of the river system with unset cement must be prevented as it is detrimental to aquatic biota. Due to the potential presence of vulnerable fish species, construction activities need to consider fish migrations (fish ways) when constructing the pipeline and associated infrastructure within the watercourse[8]. The proposed pipeline crossing will not result in the creation of any additional fish migration barriers as the pipeline will be below the surface of the river bed. However, any temporary diversion could impact fish movement and must	4 (Low)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[11]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
			ensure that water flow is only redirected and not blocked. Any activity affecting the water quality could affect fish within the river.	
Operation				
J. Operation of the pipeline.	**17)** Direct Impact: Alteration of the flow dynamics within the watercourse systems due to poor maintenance of the pipeline.	9 (Medium)	The following measures must be carried out to avoid ongoing issues with the operation of the pipeline crossing: • Conduct bi-annual inspections on the pipeline crossing to ensure no damages have occurred. • Conduct quarterly inspections of the whole pipeline for any signs of failure, damage, or leaks. • During maintenance the working area must be cordoned off to prevent unnecessary intrusion into the watercourse and spill contingency measures applied.	5 (Low)
K. Operation of the Ntambanana Water Supply Infrastructure.	**18)** Direct Impact: Improved supply of potable water and service delivery into the Ntambanana community.	0 (Positive)	This is a positive impact.	0 (Positive)
	19) Cumulative Impact: Constructing the pipeline will be a positive operational impact. The community will benefit from the supply of potable water.	0 (Positive)	This is a positive impact.	0 (Positive)
	20) Indirect Impact: Failure of the water pipeline leading to localised flooding and erosion.	8 (Medium)	Various measures to ensure pipe integrity must be implemented including: • Scour valves will be used to control the supply of water. These are used to stop supply when any repairs are carried out on a section of pipeline. • Isolating, Air and Scour Valves will be placed along the pipeline length. These will effectively break the line into smaller sections thereby decreasing the overpressures. These valves have been designed for placement on long pump mains.	4 (Low)
	21) Indirect Impact: Illegal connections leading to damage to the pipework, flooding, erosion and loss of water supply.	6 (Medium)	Since most of the households in the area will have easy access to water, there are unlikely to be illegal connections, however the pipeline will be laid in trenches and all watercourse crossing will be in-cased in concrete across the watercourses and related tributaries. The water service provider must monitor the pipeline through routine inspections with any leaks being repaired as soon as they are reported.	2 (Low)
	22) Cumulative Impact: Increased water demand putting pressure on water resources in the District	11 (High)	The project will increase the demand for potable water in the region. There is more than enough capacity at the Hillview reservoir in Empangeni to cater for the Ntambanana WSS. Out of the 7.2ML/day availability at the Hillview Reservoir, only 3ML/day is required for the Ntambanana WSS.	7 (Medium)

Table 13: Site Specific Impacts Associated with Design Alternative 2

See Appendix H for the full impacts scoring matrix, which assesses the impacts on the above system. The impacts relating to the Design Alternative 1(Preferred Design Alternative) and Design Alternative 2 are very similar, therefore the impacts below include the impacts which differentiate the most between the two Design Alternatives.

Aspect	Nature and Consequences of impact	Sig. rating of impacts[12]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
Construction				
L. Larger construction footprint associated with pier bridge construction.	**23)** Direct Impact: Greater infill and removal of material in the watercourse due to pier construction and excavation required.	10 (Medium)	The following measures must be carried out to mitigate the disturbance of watercourse area: • Construction work within the watercourse areas must be strictly limited to the construction footprint only. • No areas may be excavated outside of the project footprint. • Any stockpiles within 32m of a watercourse area must have sufficient erosion protection measures to ensure sediment is not dislodged into the watercourses. • The areas outside of the watercourse areas must be demarcated as no go areas with snow netting. • The watercourse area must be rehabilitated as soon as the pipelines have been completed. • A dry work area is required for the installation of the bridge crossings and pouring of the concrete. Minor diversions will be required within the macro channel of the river system. Water will be diverted around the current work area. It is recommended that large sand bags are used for the diversion. This enables the contractor to shift the work as construction progresses. • When erosion, siltation and turbidity are observed within the watercourse area, effort must be made to prevent further erosion in that area. Sand bags and pack rock may be used within these areas to limit the duration period that areas are exposed. • All areas upstream and downstream of the construction footprint must be demarcated as a 'no-go' zone for the duration of the construction process. No site staff are permitted to enter these areas. The recommended buffer of 30m must be implemented. • No excavated material or fill material may be stored within 30m of the watercourse. Sandbags or pack rock must be placed below the soil stockpiles as berms should erosion start to occur from these areas. • Bedding material that will be used must not be stored within 30m of the watercourse before it is used. The recommended buffer of 30m must be implemented. • An approved storm water plan (by the ECO) must be adhered to during construction.	9 (Medium)
		10 (Medium)	This impact cannot be mitigated	10 (Medium)

[12] See Appendix G for more details.

Aspect	Nature and Consequences of impact	Sig. rating of impacts[12]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
	24) Indirect Impact: Increased construction complexity and costs due to the pier bridge construction methodology which will increase strain on the Municipality			
Operation				
M. Operation of the pipeline pier bridge crossing.	**25)** Direct Impact: Larger habitat for fauna living within the construction footprint will be modified due to the construction activities taking place within the watercourse.	9 (Medium)	The following measures must be carried out to mitigate against excessive habitat destruction within the pipeline construction corridors: • The areas outside of the project footprint must be managed as no go areas for the duration of construction. • Any animal found within the project construction area must be removed unharmed from the site. • Erosion prevention and sediment control measures must be implemented. Temporary and permanent erosion control methods may include silt fences, interceptor ditches, seeding and sodding, riprap of exposed embankments, and mulching; • The project footprint must be kept as small as possible; • Heavy machinery must not be permitted to move beyond the demarcated footprint. The recommended buffer of 30m must be implemented. • Sand and aggregate for concrete must not be obtained from any watercourse but must be sourced from a permitted source; • Contamination of the river system with unset cement must be prevented as it is detrimental to aquatic biota. Due to the potential presence of vulnerable fish species, construction activities need to make impacts minimal and consider fish migrations (fish ways) when constructing the pipeline pier bridge and associated infrastructure within the watercourse.	8 (Medium)
	26) Direct Impact: Improper placement of piers to support the pipe across the watercourse causing permanent impact on the flow regime of the watercourse.	9 (Medium)	The following must be implemented to mitigate against any permanent impact on the flow regime: • The contractor must build the pipeline crossing as per the approved design, as it has been designed to ensure that the natural flow of the system is not interrupted and the least disturbance to the watercourse occurs. • The number of concrete piers located in the watercourse must be limited. • Piers must be placed outside of preferential flow paths with the least number of pier structures used as possible. • Where possible the pipeline should span across the entire width of the watercourse, therefore, negating the need for any piers in the watercourse.	4 (Low)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[12]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
	27) Indirect Impact: Exposure to flood damage and consequential ongoing maintenance and service disruption	7 (Medium)	The following must be implemented to mitigate against any damage from flood events: • The pipeline must be raised above the 1:100-year flood line level to avoid flood damage. • The raised pipe must include additional reinforcement for protection from weathering.	4 (Low)

Table 14: Standard Construction Impacts Associated with Site Alternative 1 (Preferred) and Design Alternative 1 (Preferred) and Design Alternative 2

See Appendix H for the full impacts scoring matrix, which assesses the generic impacts associated with project and to all site and design alternatives.

Aspect	Nature and Consequences of impact	Sig. rating of impacts[13]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
Construction				
N. Exposure of soils as a result of the construction activity.	**28)** Direct Impact: On site erosion due to improper management of storm water by the contractor during construction.	7 (Medium)	Areas exposed to erosion must be protected. The following apply to erosion control on site: • Sand bags, berms, stone pitching must be used to control erosion from forming during construction. • No excavated material or fill material may be stored within the watercourse or within the recommended buffer of 30m of the watercourse. • Bedding material that will be re-worked may not be stored within 10m of the watercourse before it is used. • Temporary stormwater measures should be implemented to ensure that material does not wash off the surface into any watercourse during construction.	4 (Low)
O. Sourcing of material.	**29)** Indirect Impact: Sourcing material from unlicensed borrow pits and sand mines in an illegal and unplanned manner can be dangerous to the surrounding community and detrimental to the local environment at the site of the operation.	9 (Medium)	Bedding material is often sourced from local borrow pits of sand mines. The following criteria must be adhered to: • Any local borrow pit or sand mine used must be a permitted source through DMR. • The contractor excavating the material must do so within the parameters of the mining permit, adhering to the EMPr conditions for that particular site. • The borrow pit and sand mine must be shaped post excavation.	5 (Low)
P. Operation of construction vehicles and plants in and around the	**30)** Direct Impact: Generation of dusty conditions impacting on air quality affecting community members	9 (Medium)	There will be increased dust generated during the construction phase; however, this will be on a temporary basis i.e. the site will be worked continuously for a few months until construction is completed. Further to this: • Vehicle speed limits within the construction areas must be reduced to 40km/hr to reduce the amount of dust raised along the gravel roads to and from the site.	6 (Medium)

[13] See Appendix G for more details.

Aspect	Nature and Consequences of impact	Sig. rating of impacts[13]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
construction area; i.e. heavy trucks, cement mixers, bulldozers, TLBs, generators, drills etc.	and fauna along the construction route.		• The material being transported to the site in the back of the trucks must be covered. • Water carts must be used on site should dust levels elevate to a nuisance level. • Shade cloth is must be utilised for stockpiled materials where required. • The applicant must comply with the National Dust Regulations (Government Notice R827, 2013) with regards to dust levels produced on site.	
	31) Direct Impact: Creating a nuisance to the surrounding residents.	7 (Medium)	• Sections of the pipeline run close to residential areas. The work area is to be designated to prevent trespassing onto adjacent farms/properties. Speed limits will be obeyed and enforced by the contractor. A complaints register will be kept on site in the environmental file. • This impact can be avoided and managed.	3 (Low)
	32) Direct Impact: Impacting existing traffic conditions and pedestrians.	6 (Medium)	The construction activity will pose an increased risk to pedestrians and traffic. This cannot be avoided as traffic will increase during the construction phase temporarily (for a few months) until construction is completed. • Appropriate construction safety signage must be erected to notify of construction activities and potential hazards on site; • Appropriate barriers must be used to cordon off construction excavations, hazardous areas, and areas undergoing construction. • Flagmen must be in attendance to direct traffic where required.	2 (Low)
	33) Indirect Impact: Emissions from construction vehicles associated with the construction activity.	6 (Medium)	The construction phase of the project will see the increase in vehicles moving through the area which will result in the increase of emissions into the atmosphere. All construction vehicles operating on the site must be fitted with the appropriate silencers and exhausts in order to reduce the emissions and noise into the atmosphere.	3 (Low)
	34) Direct Impact: Excessive noise pollution on site.	7 (Medium)	The construction phase of the project will see the increase in vehicles moving through the area which will result in the increase of noise. • All construction vehicles operating on site must be fitted with standard silencers to reduce the noise levels produced.	4 (Low)
	35) Direct Impact: Hydrocarbon spills can occur through careless management of fuel operated machinery such as pumps and generators.	9 (Medium)	• All fuel storage areas must be located on hard surfaced areas and bunded to 110% capacity of the containers stored therein. • Drip trays must be used under all fuel operated machinery at all times.	5 (Low)
Q. Clearing and excavations required for pipeline construction.	**36)** Direct Impact: Unidentified existing services (i.e. powerlines, water pipes etc.) being impacted on site.	8 (Medium)	Services have been identified on the site; however, any unidentified services that will be impacted on must follow: • As standard construction practice, the engineer and contractor must identify any potential existing services that may be affected before construction. • Any infrastructure that is removed must be replaced, and any damage caused by construction must be repaired.	3 (Low)

Aspect	Nature and Consequences of impact	Sig. rating of impacts[13]:	Proposed mitigation and Extent to which impact can be reversed/avoided, managed or mitigated:	Sig. rating of impacts after mitigation:
R. Generation, storage and disposal of waste during construction.	**37)** Direct Impact: Improper storage of waste on site resulting in littering and impact on environment on site affecting surrounding community.	5 (Low)	The construction phase of the project will see an increase in workers on site and therefore an increase in waste in the area. • Littering will not be permitted in the study area; • Designated waste storage areas with appropriate waste receptacles must be set up within the construction site camp; • Waste management will be controlled through the implementation of the EMPr. This impact can be managed and mitigated.	1 (Low)
	38) Direct Impact: Incorrect disposal of waste leading to pollution at the dump site or at sites where waste may be illegally disposed of.	9 (Medium)	• Waste will be removed from site and disposed of at a registered waste disposal site; • Safe disposal slips for the disposal of all waste must be obtained and kept on site as proof of safe disposal. • A registered waste removal contractor must remove sewage waste from site or sewage waste must be disposed of at a permitted Waste Water Treatment Site; • Safe disposal slips for the disposal of effluent waste must be obtained and kept on site as proof of safe disposal.	5 (Low)
S. Construction staff working on site	**39)** Direct Impact: Construction staff making use of the surrounding areas for ablutions, resulting in contamination of the environment.	7 (Medium)	The increase in construction personnel during the construction phase will require an appropriate number of toilet facilities for the site. • Appropriate and sufficient toilet facilities (1 toilet per 15 employees) must be provided by the contractor; • All toilet facilities must be checked on a daily basis; • All toilet facilities must be emptied and cleaned on a weekly basis. • All toilet facilities on site utilised by the construction personnel must be checked on a daily basis and emptied on a weekly basis by the contactor.	4 (Low)
T. Construction work impacting properties outside the construction footprint.	**40)** Direct Impact: Damage to adjacent properties during construction.	7 (Medium)	The following mitigation measures must be adhered to: • All services must be identified prior to construction through notifying surrounding stakeholders prior to any potential traffic congestion; • The contractor must create alternative access routes to the properties where required; • The contractor must be aware of the stakeholders' movements and where possible, disruptive activities must be scheduled outside of peak traffic hours; • Surrounding land owners and stakeholders must be notified prior to disruptive activities during construction; • Any infrastructure that gets removed must be replaced and any damage caused from construction must be repaired.	3 (Low)

6.3 Environmental Impact Statement as per section (l)

The impacts associated with the new Ntambanana Water Supply Scheme Infrastructure relate to those during the construction period, specifically the construction of pipeline infrastructure within watercourses that will require the infill and excavation of more than $10m^3$ and the construction of the pipeline within 20m of sensitive heritage sites. The majority of the crossing points that will require more than $10m^3$ of excavation are associated with the bulk pipeline route. There are very few negative operational impacts anticipated for the pipeline infrastructure as the pipelines will be below the river bed depth and encased in concrete. The associated impacts with constructing the pipeline network across sensitive watercourses can be partially mitigated by implementing and enforcing stringent no-go areas outside of the pipeline footprint, implementing effective stormwater management measures and limiting the clearing of vegetation to the construction footprint. A positive impact resulting from the construction of the Ntambanana Water Supply Scheme is the provision of improved service delivery and potable water to the Ntambanana greater area.

All construction activities must be confined to the proposed construction footprint areas. All vehicles must use the existing road and operate within the existing routes. All identified impacts can be mitigated if all conditions stipulated in the EMPr are adhered to during both the construction and operational phases of the project. Once construction is complete there should be no significant impacts related to the operation of Ntambanana Water Supply Scheme and the associated watercourse crossings.

Taking into consideration the above impacts and mitigation measures, it is the EAP's opinion that the proposed Ntambanana Water Supply Scheme be authorised.

6.4 Impact Management Objectives and Outcomes for the Development for Inclusion in the EMPr as Per Section 3(m)

The following objectives and outcomes must be considered for this project:

- Objectives:
  - For there to be no lasting negative impacts on the environment once construction is complete, specifically within the watercourses associated with the Ntambanana WSS area.
  - To practice responsible construction, 'best practice' with regards to housekeeping on site during construction (outlined within the EMPr) and enforce the polluter pays principle. The applicant / contractor must be responsible for their actions on site during construction and the rehabilitation of the site post construction.
- Outcomes:
  - To promote sustainable development. Create infrastructure and an environment that is healthy and sustainable for future generations. Access to potable water will reduce the impact of domestic water use in the greater Ntambanana Area.

6.5 Assumptions, Uncertainties and Gaps in Knowledge Relating To the Assessment and Mitigation Measures Proposed As Per Section 3(o)

The information in this report is based on findings of the Water Resources Assessment and Heritage Impact Assessment Report. The pipeline layout and design drawings have been provided to the EAP by the engineer. A site visit and assessment was conducted by the EAP. A basic vegetation screening of the riparian habitat has been included in the water resources assessment to inform this assessment regarding the vegetation species and types that may be encountered within the pipeline route. Given the minimal clearing of vegetation required for the project and the temporary nature of construction within existing infrastructure servitudes, no further specialist input with regards to vegetation was deemed necessary for this assessment.

6.6 Period for Which Authorization Is Required, Proposed Monitoring and Auditing and Post Construction Requirements

Environmental Authorisation is required for the construction of the Ntambanana Water Supply Scheme within the 2012/2024 business plan for the King Cetshwayo District Municipality; therefore, the authorization would need to be valid for a period of five-ten years, within which time construction would need to commence.

Given the nature of this project, it is recommended that monthly ECO audits be carried out for the duration of the construction phase of this project. One post construction audit should be conducted once construction is complete.

The EMPr details the post construction, rehabilitation, and closure objectives which will be monitored by the ECO and compliance authorities.

6.7 Financial Provisions as Per Section 3(s)

The contractor is responsible for and must ensure that the site has been rehabilitated in full before leaving the site. No upfront financial provision is required for this project.

6.8 EAP Opinion on Whether Or Not to Authorise Activity and Recommendations and Conditions for Authorisation as Per Section 3(n) and (p)

With respect to the design alternatives, it is recommended that preferred design alternative 1 be authorised. The significance of the impacts associated with the project are considered to be 'low'.

6.9 Summary of Additional Recommendations To Be included As Part of the Amended Environmental Authorisation:

Stakeholders, Properties & Services

- As standard construction practices, the engineer and contractor must identify all existing services that may be affected before construction.
- The contractor must liaise with local community members regarding restriction of access during construction.

Traffic & Construction Pedestrians

- The contractor must take into consideration the potential movements of the surrounding stakeholders.

- Appropriate signage and barriers must be used to cordon off construction areas.
- All construction vehicles must be fitted with the appropriate silencers and exhausts.
- Speed limits must be obeyed.

Housekeeping, waste management, storage, and materials handling

- Littering must not be permitted on site.
- All hazardous materials and substances must be stored within a secured area in the construction camp. The storage area should be a hard-surfaced, bunded, and covered area.
- Cement mixing must be done on a hard surface that is protected from stormwater runoff.
- Contractors must be required to dispose of construction rubble at an appropriate landfill site. Delivery notes and safe disposal certificates to prove appropriate disposal should be available.
- Appropriate and sufficient toilet facilities must be provided by the contractor.
- Toilet facilities must be provided by a registered company and all sewage must be disposed of at an appropriate facility. Safe disposal certificates must be kept on record.
- Toilet facilities must not be located within 32m of any watercourse.

Dust and erosion control

- Water carts or Tankers, of sufficient capacity must be used to dampen dusty surfaces and suppress dust.
- Exposed areas must be rehabilitated and revegetated as soon as possible during construction.
- Areas exposed to erosion must be protected through the use of sandbags, berms and efficient construction processes - i.e.: limiting the extent (footprint) and duration period that areas are exposed. The contractor must ensure that any blockages created during construction are resolved.

Stormwater management and protection of the watercourse

- The engineer/contractor must ensure that only clean stormwater runoff enters the environment. Any contaminated runoff must be collected and disposed of at an appropriate waste facility.
- All watercourses must be identified and demarcated at the start of construction.
- No excavated material or fill material may be stored within the drainage line or 32m of any watercourse.
- Only the area directly in the path of construction may be cleared and excavated. The remainder of the watercourse must be demarcated as a ‘no-go’ area.
- Heavy vehicles must avoid working near the watercourse as much as possible.
- Stormwater must not be channelled directly into any water body without the flow velocity being slowed. Channelled flows must be diffused.

Protection of Heritage Resources

- Attention is drawn to the South African Heritage Resources Act, 1999 (Act No. 25 of 1999) and the KwaZulu-Natal Heritage Act (Act no 4 of 2008) which require that operations that expose archaeological or historical remains should cease immediately, pending evaluation by the provincial heritage agency.

Specific conditions

- The construction footprint (15m outside the watercourses and 10m within them) must be demarcated, and the recommended 15m “no-go” buffer on all the watercourses must be implemented.
- Ensure that the construction activities and temporary stream diversion do not interrupt flow even during low flow periods.
- Vehicles must only use the designated crossing points.
- Heavy vehicles must remain outside the 32m recommended buffer unless required for construction purposes.
- No storage may occur within the 32m recommended buffer and;
- Any additional stormwater outlets must be fitted with erosion protection features to diffuse flow.

Appendix A: Drawings and Maps

Appendix B: Specialist Reports

No.	Prepared By	Authors	Professional Registrations	Title of Report	Date of Report
1	TBC	Andrew Husted Michael Ryan	Pr Sci Nat registered (400213/11) (Cand. Sci. Nat. 125128)	Riverine Baseline Study & Risk Assessment for the Proposed Ntambanana Water Supply Scheme Project, KwaZulu-Natal Province	July 2022
2	Davies Lynn & Partners	N. D. Tonkin / A. J. Greet		REPORT ON THE RESULTS OF A GEOTECHNICAL INVESTIGATION FOR THE NTAMBANANA BULK WATER SUPPLY – PHASE 4 VOLUME 1: HILLVIEW RESERVOIR PUMPSTATION	July 2022

Appendix C: Public Participation – Noticeboard

Appendix D: Public Participation – Notification

Appendix E: Registered I&APs

Appendix F: Comments and Response Report

Appendix G: Impact Scoring Matrix

Appendix H: EAP Declaration

Appendix I: EMP

Environmental Management Programme