

June
2017



**DRAFT Basic Assessment Report
Harding-Weza Water Supply Scheme (Reticulation)
uMuziwabantu and Ray Nkonyeni Local Municipalities
uGu District Municipality
EIA Ref: DC21/0005/2017**



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

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Executive Summary

The uGu District Municipality proposes to upgrade and expand the existing water supply scheme in rural areas within the uMuziwabantu and Ray Nkonyeni Local Municipalities. The project forms part of the larger Harding-Weza Water Supply Scheme with this application covering the village reticulation (i.e. no bulk infrastructure or reservoirs). The reticulation network covers an area of approximately 72 000 hectares across 12 wards. The proposed pipelines will be between 50 - 400mm in diameter and will be placed in trenches with a maximum width of 1m wide.

As far as possible, the new pipelines have been aligned alongside existing roads and footpaths, to reduce the level of disturbance during construction, however the cumulative clearance of indigenous vegetation triggers a Basic Assessment process. The pipeline crosses underneath a number of watercourses including the Weza, Nkondwana and Mzimkhulwana Rivers. This will result in the excavation and deposition of material into various watercourses, also requiring assessment through a Basic Assessment process. The pipeline will be placed underground and encased either in concrete or gabions. Design drawings of the watercourse crossings have been included under Appendix A of the Basic Assessment Report.

The following key impacts and mitigation measures were assessed:

- **Damage to watercourse banks, wetland areas, and riparian zones from construction activity:** The river crossings and wetland areas are to be treated as sensitive areas. No stockpiling is to occur directly adjacent or within 15m of watercourses. Any excavation is to be carried out by hand, where possible, to avoid vehicles travelling in the watercourse. The trench is to be kept to a minimum width to reduce the disturbance footprint.
- **Pipeline impeding or altering flow of the watercourses:** The pipes within the watercourse will be laid below the level of the river bed and encased in concrete. The top of the final encasement level will be the same as that of the adjacent undisturbed river bed. Gabion baskets will be used instead of the concrete casing where there are soft material watercourses encountered.
- **Loss of riparian vegetation during excavation across watercourses:** Vegetation clearing is to be kept to a minimum due to the small size of the pipe and associated trench. The trench is to be dug by hand through the watercourse, where possible, to prevent unnecessary clearance. The potential for erosion is to be monitored by the Contractor on an ongoing basis during clearing.
- **Encroachment of alien vegetation into areas disturbed during construction:** Disturbance associated with the construction, will result in an increase in alien invasive species in the area. The pipeline traverses largely natural vegetation and therefore alien encroachment within the construction footprint, must not be allowed to encroach onto the site and adjacent areas. Alien vegetation must be continually removed during construction as per the EMPr.
- **Clearance of indigenous vegetation from within an endangered ecosystem:** Approximately 1.5km of pipeline crosses through the Bazini Forest Complex ecosystem. In the preferred layout alternative, the pipeline has been aligned to follow existing roads and servitudes where the vegetation tends to be more disturbed and invaded by alien species. The small size of the trench (approximately 1m wide) means that very little vegetation will require clearing with no large trees falling within the construction footprint.
- **Damage to surrounding properties & services:** Construction could disrupt access to existing services, residential properties and associated subsistence farming areas. All services must therefore be identified prior to construction and the community in the area notified. The Contractor is to liaise with the affected community members prior to any crops being removed / damaged.
- **Improved services:** The Harding-Weza Water Supply Scheme will expand and improve service delivery to the area, increasing the reliance of a potable water supply. This is a positive impact.

These impacts can be mitigated by following the recommendations in this report and the Environmental Management Program (EMPr). Construction activities will be monitored on a monthly basis by an independent Environmental Control Officer (ECO) and controlled through the implementation of the attached EMPr (Appendix J).

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 Layout Alternative 2, be authorised.

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Section 1: Scope of Work and Location of Activity

1.1 Project Title

Harding-Weza Water Supply Scheme (Reticulation).

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

The uGu District Municipality propose to upgrade and expand the existing water supply scheme in rural areas within the uMuziwabantu and Ray Nkonyeni Local Municipalities. The project forms part of the larger Harding-Weza Water Supply Scheme which includes the construction of the Weza Dam, upgrading of the existing Water Treatment Works and the upgrading of the bulk infrastructure (all undergoing separate environmental authorisation processes). The scope of this application covers the village reticulation (i.e. no bulk infrastructure or reservoirs). The reticulation network covers an area of approximately 72 000 hectares across 12 wards.

Due to the large size of the scheme, the study area has been divided into three project areas for ease of reference. Project Area 1, directly west of Harding town, Project Area 2, south-west of Harding on the western side of the N2 and Project Area 3, south-east of Harding along the eastern side of the N2. Please refer to the topographical maps showing the three project areas attached under Appendix A.

The proposed reticulation has been split into three categories:

- Extensions to areas that are partially reticulated (909km of new pipeline);
- Upgrading of the existing pipelines in areas that are partially reticulated (147.5km of new pipeline); and
- Extensions on fairly reticulated areas which covers areas that are far from existing standpipes or not covered at all (47.3km of new pipeline).

The pipelines range from 50 - 400mm in diameter and will be laid in a trench of no wider than 1m and 1.2m deep (see Appendix A for layouts). As far as possible, the pipelines have been aligned alongside existing roads and footpaths in the preferred layout alternative.

The preferred pipeline route crosses a total of 152 watercourses. The main rivers crossed include the Weza, Nkondwana and Mzimkhulwana Rivers. All other watercourse crossings are tributaries and drainage lines associated with these river systems. The preferred pipeline route crosses 39 wetland hydrogeomorphic (HGM) units. All wetland HGM units are associated with the drainage lines and tributaries crossed by the pipeline. The wetland HGM units crossed are comprised of 28 channelled valley bottom wetlands (HGM A), five (5) unchannelled valley bottom wetlands (HGM B), and six (6) seepage wetlands (HGM E).

The watercourse crossings have been designed depending on the type of in-situ material associated with that specific watercourse. Where there is bed rock, the rock will be blasted and the pipes encased in concrete, with the top of the final encasement level the same as that of the adjacent undisturbed river bed. Soft material streams will be crossed in the same manner, except that gabions would be used instead of concrete encasements. The gabions will be placed just downstream of the pipe (please see engineering drawing showing typical watercourse crossings attached under Appendix A of the BAR).

Cumulatively, the reticulation pipelines will result in more than approximately 100m² of infrastructure being placed within 32m of watercourses within a rural area. Where the pipeline crosses a watercourse, this will result in the excavation and deposition of more than 10m³ of material in or from that watercourse. Approximately 1.5km of pipeline crosses through an area identified as "Bazini Forest Complex" in Project Area 1. The South African National Biodiversity Institute has classified this as an endangered ecosystem. Where the pipeline does not lie within the road reserve, there will be more than 300m² of indigenous vegetation (i.e. grasses) cleared from this endangered ecosystem however the preferred pipeline has been aligned in the road reserves avoiding the clearing of any forest / large trees (discussed further in section 2.3 of the BAR).

This report and the attached EMP, therefore primarily focus on the watercourse crossings as well as the clearance of vegetation, as these are the activities that trigger the Environmental Impact Assessment regulations and are considered the sensitive environmental areas.

1.3 Description Of Feasible Alternatives As Per Section 3(h)(i)

Site Alternatives

The aim of the project is to increase the reliability of the existing municipal potable water supply to rural areas in the uMuziwabantu and Ray Nkonyeni Local Municipalities. There are therefore no site alternatives. Different pipe materials were initially investigated however there is only one technology alternative as the pipe specifications need to fall within the appropriate design standards. Two layout alternatives have, however, been considered in the BAR and are discussed further below.

The initial alternative presented to the Environmental Assessment Practitioner (EAP) by the engineers was purely based on the engineering objectives and did not take into account the location of existing pipeline crossings, footpaths and previously disturbed areas. After consulting a number of maps and conducting site visits, sensitive environmental areas were identified by the EAP; steep slopes prone to erosion, indigenous grasslands/forests, wetlands and rivers. Various sections of the pipeline route were then adjusted to exclude the unnecessary clearance of indigenous vegetation or the crossing of additional watercourses, while still ensuring supply to all relevant households. The original pipe layout was also amended to increase the buffer zone around the Bazini Forest Complex in Project Area 1. Layout Alternative 1 is the original layout that was proposed, while Layout Alternative 2 is the amended, preferred layout.

Layout Alternative 1

The originally proposed pipeline route is provided in the drawing marked Layout Alternative 1 in Appendix A. The alternative layout included approximately 227 watercourse crossings and traversed steep topography that would be prone to erosion both during construction and operation. Sections of the alternative pipeline route travel through forested areas within the delineated Bazini Forest Complex (endangered ecosystem). Sections of the originally proposed route also crossed large areas of indigenous grassland (e.g. west of Project Area 1) and ran through wetland area (e.g. east of Project Area 1). These sections of the pipeline were therefore adjusted in the preferred layout to reduce the number of watercourse crossings and area of indigenous vegetation requiring clearing.

Layout Alternative 2 (Preferred Alternative)

Sections of the pipeline route were amended in the preferred alternative to reduce the number of watercourses crossed and the area of indigenous vegetation to be cleared. There are a total of 152 watercourse crossings in this preferred alternative. A small section of originally proposed pipeline was also amended to increase the buffer area around the Bazini Forest Complex. The figures below show examples of some of the amendments made to Layout Alternative 1.

Watercourses (Figure 1, 2 & 3) – Pipelines were originally positioned directly across watercourses to reach the various households; however, this could be avoided by extending the pipelines along existing roads and across the various ridges as opposed to traversing the valleys.

Bazini Forest buffer (Figure 4) – A section of pipeline towards the south-eastern boundary of Project Area 1 has been amended to lie further away from the protected and endangered Bazini Forest Complex Ecosystem, while still providing water to all the households in this ecosystem.

Steep Section (Figure 5) – The original pipeline route traversed a steep valley and largely natural / undisturbed area. In the preferred pipeline route, this steep gradient was avoided with the pipeline following an existing road on the other side of the valley.

The No Go Alternative

The upgrading of the Harding-Weza Water Supply Scheme will not go ahead. The communities will continue to have unreliable access to running water, which is currently sourced from a few standpipes in communal areas. There will be no associated construction activity near the watercourses; however without access to potable water the community will continue to place pressure on local rivers and boreholes for drinking water as well as for washing and cooking, which ultimately affects the water quality in these rivers. The construction of the new Weza Dam is scheduled to commence in 2017 however will not be able to effectively supply the communities with water until the reticulation network is upgraded and expanded accordingly.

Figure 1: Example of where a river crossing was avoided. Purple lines show removed pipeline and yellow is the re-routed section (source: Google Earth Pro, 2017).

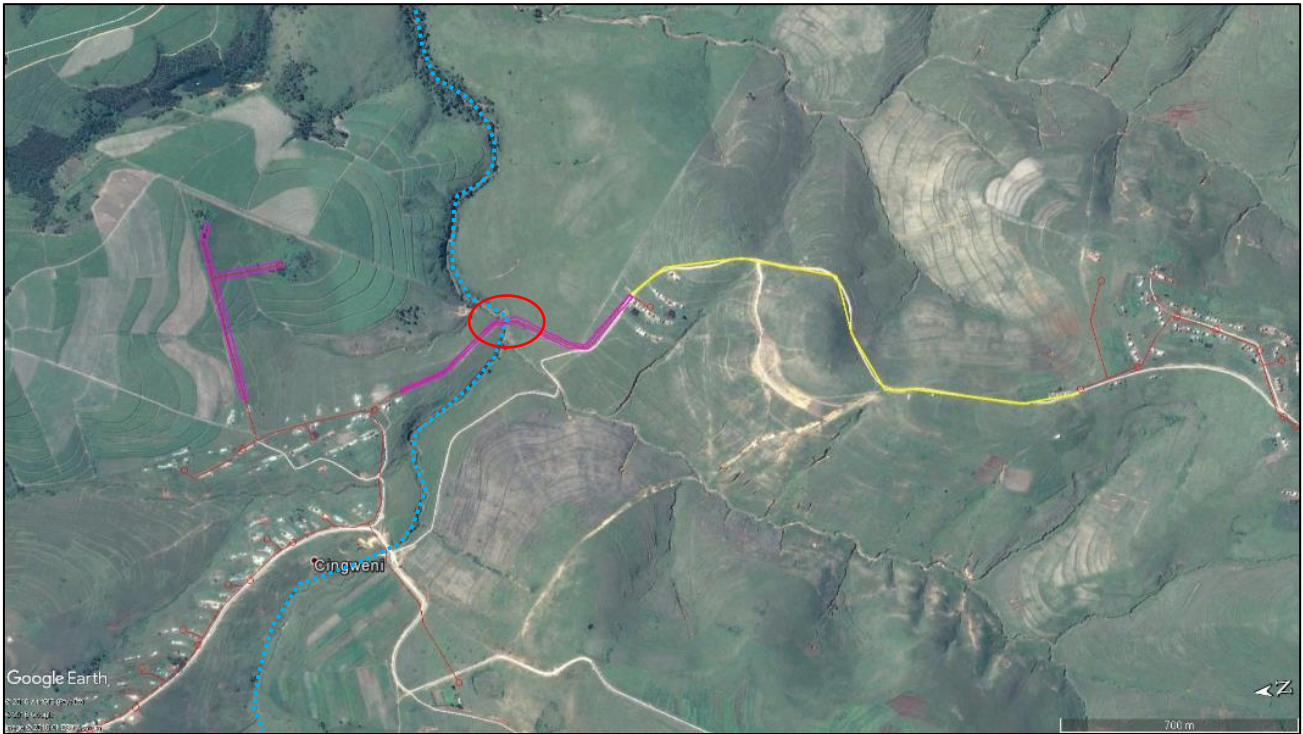


Figure 2: Example of where a river crossing was avoided (purple lines show removed pipeline) by rerouting the pipeline along an existing road (yellow line; source: Google Earth Pro, 2017).



Figure 3: Section of dense vegetation and a watercourse crossing which was avoided by rerouting the pipeline (purple lines show removed pipeline) along an existing road and fence line (yellow line; source: Google Earth Pro, 2017).



Figure 4: The original pipeline route through the Bazini forest was rerouted to avoid traversing through the forest and to provide a greater buffer zone between the forest edge and the pipeline. Layout Alternative 2, now follows existing roads and foot paths to reduce the impact on the Bazini forest (yellow line; source: Google Earth Pro, 2017).



Figure 5: Original pipeline route traversing a steep sloop was avoided (purple lines show removed pipeline; source: Google Earth Pro, 2017).



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

GNR	Activity Number	Activity as per the legislation	Activity as it applies to the proposal
GNR 327 Listing Notice 1; 07 th April 2017	9 (i)	<i>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.</i>	There is a total of 7.1kms of 400mm / 0.4m uPVC pipeline being constructed for the bulk transportation of water. Although the majority of the pipeline will fall within road reserves, cumulatively, more than 1000m will be located outside the road reserves.
GNR 327 Listing Notice 1; 07 th April 2017	12 (ii) (a) & (c)	<i>The development of- (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</i>	Although the majority of the pipeline will fall within road reserves, the proposed reticulation system will result in more than 100m ² of infrastructure being located within 32m of several watercourses.
GNR 327 Listing Notice 1; 07 th April 2017	19.	<i>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.</i>	The pipeline crosses the Weza, Nkondwana and Mzimkhulwana Rivers and numerous tributaries of these rivers. The excavations to allow pipes to be placed underground, will result in more than 10m ³ of material being removed and deposited within the various watercourses.
GNR 324 Listing Notice 3; 07 th April 2017	12 (d) (iv)	<i>The clearance of an area of 300 square metres or more of indigenous vegetation (d) In KZN: (iv) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in</i>	Although the majority of the project area is located outside of any critically endangered / endangered ecosystems, there is a small patch of Bazini Forest Complex located in the north-western section of Project Area 1, which has been classified as “endangered” by SANBI. Cumulatively, the area of

		<i>the National Spatial Biodiversity Assessment 2004.</i>	vegetation cleared for the pipeline will exceed 300m ² .
GNR 324 Listing Notice 3; 07 th April 2017	14 (ii) (a) & (c)	The development of – (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— <i>(a) within a watercourse;</i> <i>(c) If no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse.</i>	Although the majority of the pipeline will fall within road reserves, the proposed reticulation system will result in more than 10m ² of infrastructure being located within 32m of several watercourses.

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

District Municipality		uGu District Municipality.	
Local Municipality		uMuziwabantu and Ray Nkonyeni Local Municipality.	
Ward		uMuziwabantu – 1, 2, 4, 5, 6, 7, 8, 9, 10 Ray Nkonyeni – 34, 35, 36	
Area / Town / Village		Harding	
Co-ordinates:		Latitude	Longitude
Project Area 1			
	RC 1:	30°37'0.68"S	29°48'31.39"E
	RC 2:	30°38'13.13"S	29°49'17.52"E
	RC 3:	30°37'53.81"S	29°48'40.58"E
	RC 4:	30°38'13.85"S	29°47'59.28"E
	RC 5:	30°36'59.98"S	29°47'2.93"E
	RC 6:	30°38'39.58"S	29°44'14.97"E
	RC 7:	30°39'19.78"S	29°45'4.36"E
	RC 8:	30°37'17.21"S	29°44'47.88"E
	RC 9:	30°37'14.13"S	29°44'25.37"E
	RC 10:	30°37'16.98"S	29°44'8.37"E
	RC 11:	30°37'42.89"S	29°43'32.61"E
	RC 12:	30°37'41.15"S	29°43'36.06"E
	RC 13:	30°37'38.09"S	29°43'18.07"E
	RC 14:	30°37'20.96"S	29°43'44.68"E
	RC 15:	30°37'55.24"S	29°43'23.72"E
	RC 17:	30°38'37.78"S	29°41'48.50"E
	RC 18:	30°38'58.78"S	29°42'0.71"E
	RC 19:	30°39'6.70"S	29°41'56.59"E
	RC 23:	30°40'25.13"S	29°42'11.70"E
	RC 24:	30°40'25.86"S	29°42'11.32"E
	RC 25:	30°40'30.23"S	29°41'47.75"E
	RC 26:	30°40'28.16"S	29°41'58.05"E
	RC 27:	30°40'44.41"S	29°42'20.34"E
	RC 28:	30°41'26.70"S	29°42'26.36"E
	RC 29:	30°41'24.71"S	29°42'24.86"E
	RC 30:	30°41'17.44"S	29°42'23.14"E
	RC 31:	30°41'12.62"S	29°42'26.10"E
	RC 32:	30°41'12.34"S	29°42'27.76"E
	RC 34:	30°39'50.07"S	29°43'55.73"E
	RC 35:	30°39'31.76"S	29°44'10.40"E
	RC 36:	30°40'9.29"S	29°44'23.04"E
	RC 37:	30°40'6.55"S	29°44'19.30"E
	RC 38:	30°40'10.70"S	29°44'57.36"E
	RC 39:	30°40'12.72"S	29°45'0.00"E
	RC 40:	30°40'22.55"S	29°45'11.63"E
	RC 41:	30°40'45.72"S	29°44'38.95"E
	RC 42:	30°40'51.50"S	29°43'46.14"E
	RC 43:	30°41'43.53"S	29°44'22.74"E
	RC 44:	30°41'35.90"S	29°44'14.15"E
	RC 45:	30°41'42.69"S	29°45'26.66"E

	RC 46:	30°41'40.02"S	29°45'28.44"E
	RC 47:	30°41'12.06"S	29°45'45.27"E
	RC 48:	30°41'8.89"S	29°45'55.27"E
	RC 49:	30°41'8.26"S	29°46'1.44"E
	RC 50:	30°40'46.00"S	29°45'31.01"E
	RC 51:	30°41'33.96"S	29°48'30.40"E
	RC 52:	30°39'14.49"S	29°49'46.23"E
	RC 53:	30°39'0.88"S	29°49'12.46"E
	RC 123	30°40'22.48"S	29°42'12.90"E
	RC 157:	30°40'11.82"S	29°41'22.34"E
	Project Area 2		
	RC 54:	30°38'25.84"S	29°53'3.02"E
	RC 55:	30°38'28.22"S	29°52'59.84"E
	RC 56:	30°38'44.45"S	29°52'47.19"E
	RC 57:	30°38'46.81"S	29°52'46.25"E
	RC 58:	30°38'49.21"S	29°52'46.17"E
	RC 59:	30°39'4.83"S	29°52'44.88"E
	RC 60:	30°38'56.41"S	29°52'26.31"E
	RC 61:	30°38'53.28"S	29°52'19.32"E
	RC 62:	30°39'12.99"S	29°52'46.15"E
	RC 63:	30°40'32.92"S	29°52'24.18"E
	RC 64:	30°40'24.45"S	29°52'16.15"E
	RC 65:	30°41'14.18"S	29°52'38.10"E
	RC 66:	30°50'26.35"S	30° 2'35.21"E
	RC 67:	30°42'55.70"S	30° 1'42.23"E
	RC 68:	30°40'0.43"S	29°54'27.08"E
	RC 69:	30°40'0.32"S	29°54'35.61"E
	RC 70:	30°46'6.92"S	29°57'17.57"E
	RC 71:	30°50'16.93"S	30° 3'27.85"E
	RC 72:	30°50'16.42"S	30° 3'15.86"E
	RC 73:	30°49'13.23"S	30° 3'6.13"E
	RC 74:	30°49'58.85"S	30° 2'40.98"E
	RC 75:	30°50'50.72"S	30° 3'45.17"E
	RC 76:	30°42'30.11"S	30° 2'31.04"E
	RC 77:	30°42'31.06"S	30° 2'24.02"E
	RC 78:	30°41'55.09"S	30° 2'25.62"E
	RC 79:	30°42'1.90"S	30° 2'22.20"E
	RC 80:	30°43'14.16"S	30° 1'41.13"E
	RC 81:	30°43'19.83"S	30° 1'41.24"E
	RC 82:	30°42'53.30"S	30° 2'22.81"E
	RC 83:	30°42'51.11"S	30° 1'32.26"E
	RC 84:	30°42'51.60"S	30° 1'27.04"E
	RC 85:	30°42'49.89"S	30° 1'21.20"E
	RC 86:	30°42'45.46"S	30° 1'12.90"E
	RC 87:	30°43'16.15"S	30° 1'54.31"E
	Project Area 3		
	RC 88:	30°42'13.38"S	30° 7'38.11"E
	RC 89:	30°38'57.12"S	30° 7'10.52"E
	RC 90:	30°38'48.25"S	30° 7'12.41"E
	RC 91:	30°38'45.22"S	30°10'5.51"E
	RC 92:	30°37'41.07"S	30°11'30.00"E
	RC 93:	30°38'8.53"S	30°11'45.21"E
	RC 94:	30°38'23.93"S	30°11'44.74"E
	RC 95:	30°38'27.25"S	30°11'44.47"E
	RC 96:	30°38'58.85"S	30°11'43.63"E
	RC 97:	30°42'50.53"S	30° 4'39.30"E
	RC 98:	30°42'51.81"S	30° 4'37.73"E
	RC 99:	30°42'44.70"S	30° 4'21.16"E
	RC 100:	30°42'22.13"S	30° 4'6.78"E
	RC 102:	30°39'16.89"S	30° 3'7.80"E

RC 103:	30°39'16.98"S	30° 2'55.77"E
RC 104:	30°39'21.07"S	30° 2'22.13"E
RC 105:	30°39'17.99"S	30° 2'17.51"E
RC 106:	30°39'20.78"S	30° 2'3.29"E
RC 107:	30°38'19.69"S	30° 1'0.72"E
RC 108:	30°38'15.10"S	30° 1'4.02"E
RC 109:	30°39'5.58"S	30° 3'10.03"E
RC 110:	30°38'53.58"S	30° 4'25.11"E
RC 111:	30°38'38.13"S	30° 6'16.01"E
RC 112:	30°38'47.42"S	30° 5'58.16"E
RC 113:	30°38'42.05"S	30° 5'56.21"E
RC 114:	30°38'37.27"S	30° 7'11.92"E
RC 115:	30°38'29.91"S	30° 7'14.64"E
RC 116:	30°37'38.79"S	30° 7'22.30"E
RC 117:	30°37'40.72"S	30° 7'16.74"E
RC 118:	30°37'45.24"S	30° 7'11.30"E
RC 119:	30°37'48.08"S	30° 7'6.80"E
RC 120:	30°37'48.09"S	30° 7'4.31"E
RC 121:	30°37'50.79"S	30° 6'55.69"E
RC 122:	30°37'50.37"S	30° 6'29.17"E
RC 124:	30°37'51.33"S	30° 6'36.54"E
RC 125:	30°37'34.29"S	30° 7'30.52"E
RC 126:	30°37'25.68"S	30° 7'39.42"E
RC 127:	30°37'21.63"S	30° 7'47.60"E
RC 128:	30°37'14.90"S	30° 7'59.54"E
RC 129:	30°36'57.56"S	30° 5'48.23"E
RC 130:	30°36'6.17"S	30° 5'25.13"E
RC 131:	30°36'7.20"S	30° 5'21.81"E
RC 132:	30°36'7.01"S	30° 5'16.14"E
RC 133:	30°36'13.56"S	30° 4'59.76"E
RC 134:	30°36'12.49"S	30° 4'49.64"E
RC 135:	30°36'12.77"S	30° 4'47.89"E
RC 136:	30°36'4.48"S	30° 5'39.21"E
RC 137:	30°36'6.33"S	30° 5'43.69"E
RC 138:	30°36'8.43"S	30° 5'49.46"E
RC 139:	30°35'57.54"S	30° 5'38.59"E
RC 140:	30°35'21.91"S	30° 5'28.40"E
RC 141:	30°35'21.30"S	30° 5'25.82"E
RC 142:	30°35'10.88"S	30° 5'7.42"E
RC 143:	30°35'8.85"S	30° 5'3.89"E
RC 144:	30°35'3.79"S	30° 4'58.62"E
RC 145:	30°33'10.43"S	30° 6'11.16"E
RC 146:	30°32'50.47"S	30° 6'4.18"E
RC 147:	30°33'5.62"S	30° 6'32.34"E
RC 148:	30°33'36.62"S	30° 4'31.13"E
RC 149:	30°33'31.51"S	30° 4'10.46"E
RC 151:	30°30'53.81"S	29°59'53.77"E
RC 152:	30°30'57.09"S	29°59'52.35"E
RC 153:	30°31'45.79"S	30° 2'15.37"E
RC 154:	30°33'45.77"S	30° 1'29.64"E
RC 155:	30°33'42.46"S	30° 0'1.94"E
RC 156:	30°34'3.40"S	30° 0'21.71"E
RC 158:	30°37'34.55"S	30° 4'9.12"E
RC 159:	30°37'39.27"S	30° 4'6.75"E

* Please note that RC's avoided in the preferred layout have been removed from numbering.

Property Description:	Please see attached Spread Sheet with all property descriptions under Appendix A.
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Figure 6: 1:75 000 map (3029DA/DB) indicating the location of the Harding-Weza Water Supply Scheme Project Area 1 (outlined in red).

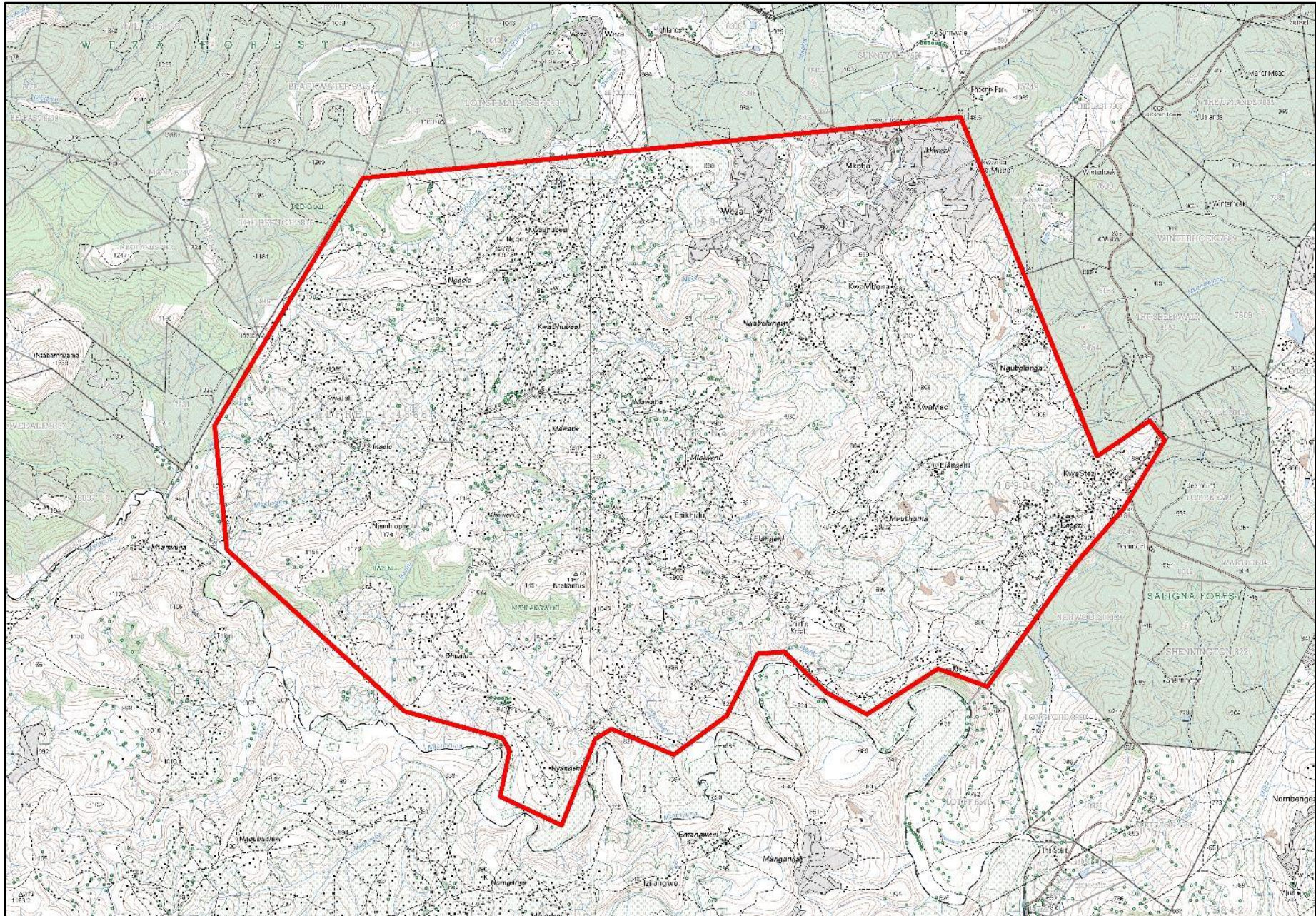


Figure 7: 1:115 000 map (3029DB/DD; 3030CA/CC) indicating the location of the Harding-Weza Water Supply Scheme Project Area 2 (outlined in red).

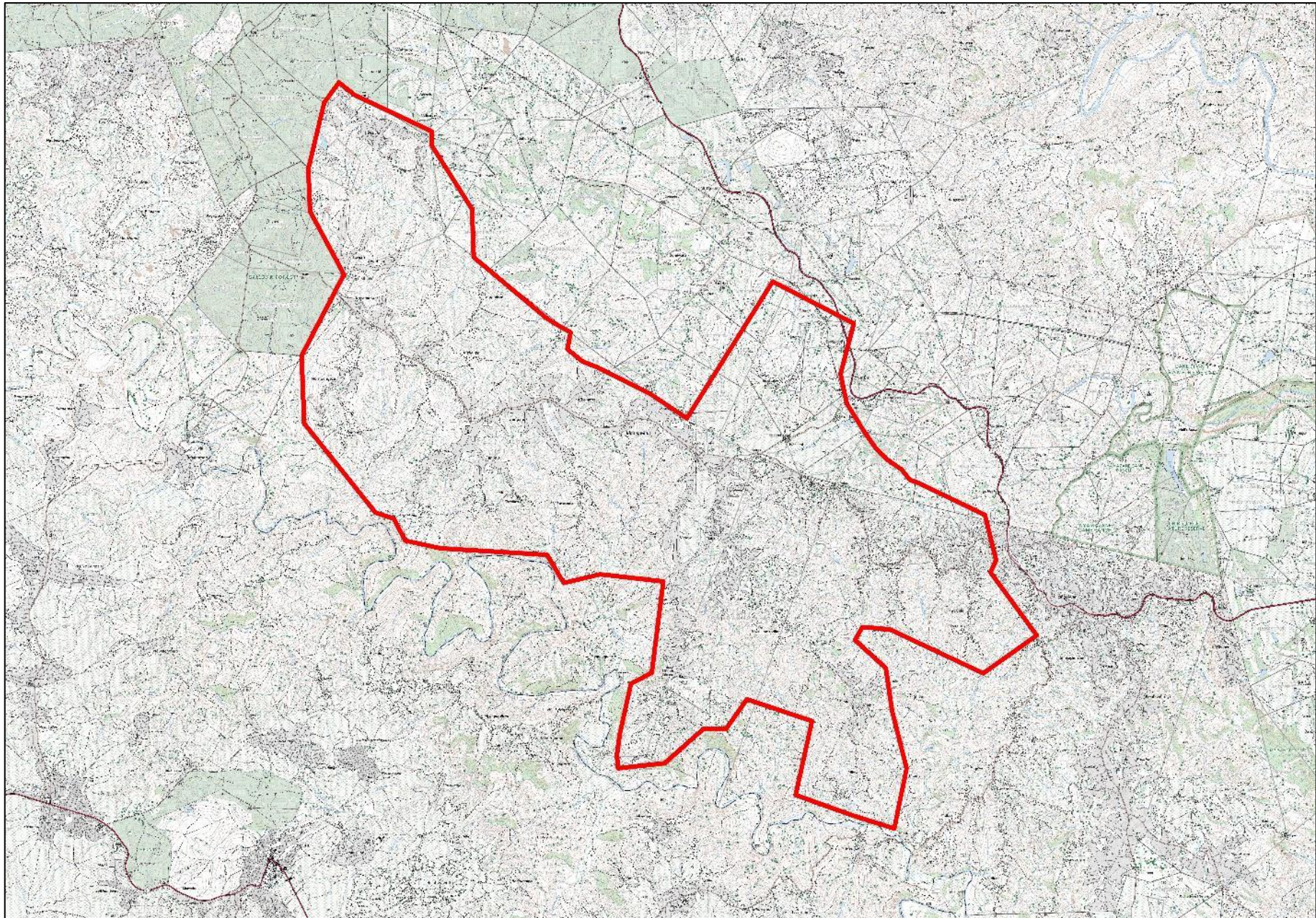
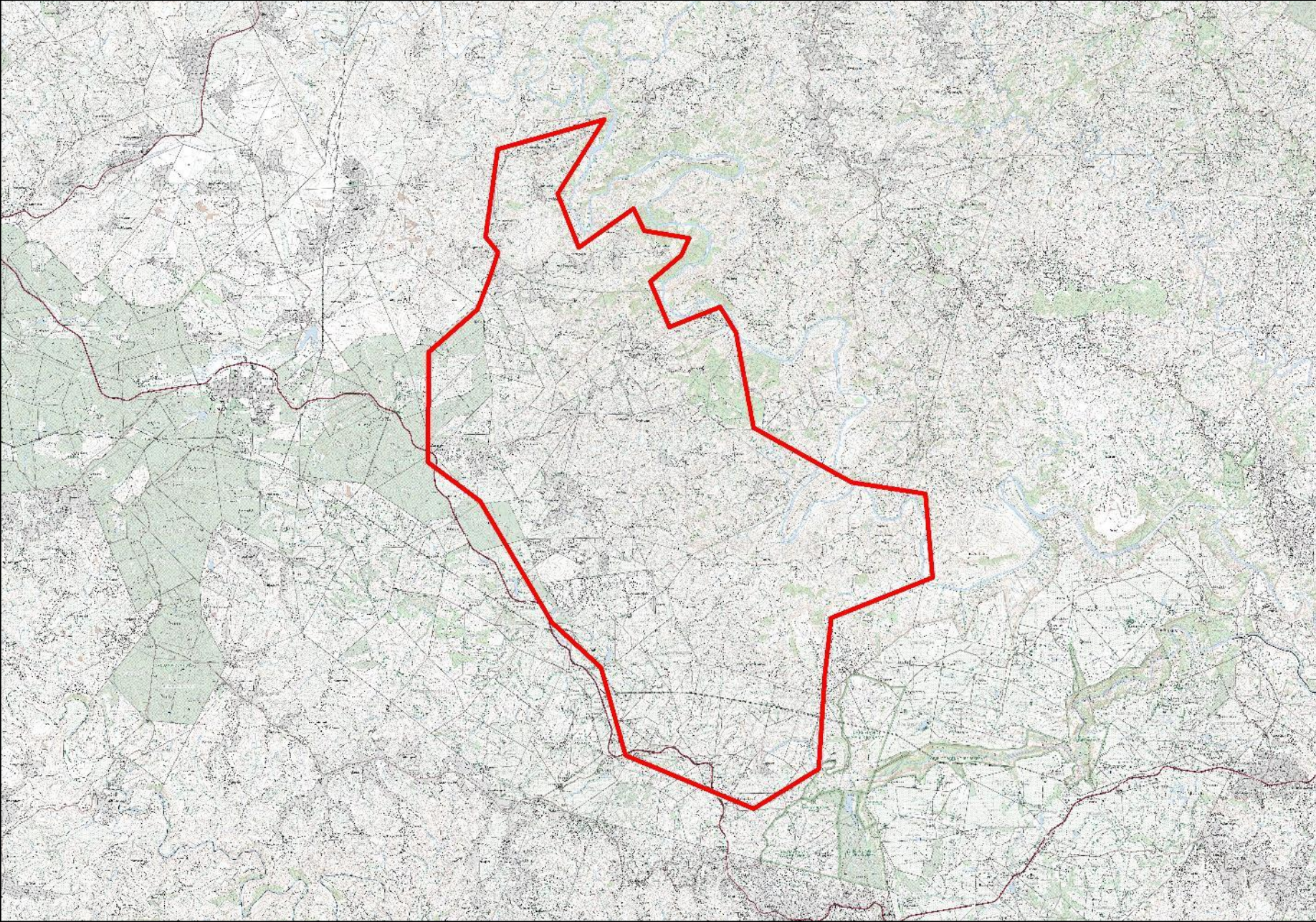


Figure 8: 1:120 000 map (3029DB; 3030AC/CA) indicating the location of the Harding-Weza Water Supply Scheme Project Area 3 (outlined in red).



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

2.1 Topography and Physical Characteristics of Site

The community surrounding Harding is located at an elevation ranging from 170m to 1150m above mean sea level, below the Ingeli mountain range. The area is dominated by rocky hills with steep surfaces characterised by shallow soils and rocky outcrops. The Harding-Weza Water Supply Scheme will mainly occur within the South-Eastern Uplands Ecoregion, with a section of the project falling within the North Eastern Coastal Belt Ecoregion¹. The pipeline extends along plateaus and ridges to reach most households, however, the gradient increases significantly in the valleys towards the various rivers and wetland areas throughout the project area. The area surrounding the proposed pipeline route consists of open mountain area, forestry, agricultural and livestock activities, and rural and urban settlements of varying sizes. Photographs taken within the project areas showing the surrounding topography are included in the sections below.

The gradient of the site is as follows:

Gradient	Description
Flat	None.
1:50 – 1:20	Along the larger ridge lines in the more densely populated regions of Project Areas 1, 2 and 3.
1:20 – 1:15	Nearing the periphery of the populated regions in all the project areas.
1:15 – 1:10	Nearing the periphery of the populated regions in all the project areas.
1:10 – 1:7,5	Where households are located within valleys near the watercourses.
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:

Topographical Feature	Description
Ridgeline	The majority of the site is situated on ridgelines.
Plateau	N/A
Side slope of hill/mountain	The pipeline extends along the side of the mountain to reach numerous households.
Closed valley	N/A
Open valley	The surrounding topography of Project Areas 1, 2 and 3 are open valleys.
Plain	N/A
Undulating plain/low hills	
Dune	N/A
Sea-front	N/A

2.2 Surface Water and Ground Water

The Harding-Weza Water Supply Scheme is located within the T40A, T40B, T40C, T40D, T40E, T52J, T52K and T52M Quaternary Drainage Regions, within the Mvoti to Umzimkulu Water Management Area (WMA 11). The region has a mean annual precipitation rate of 800 to 1 500 mm and is considered humid². The main rivers in these drainage regions include the Weza, Nkondwana, Mtamvuna, Mzimkhulwana and Mzimkhulu rivers. Due to the topography, the seasonal watercourses that intersect the pipeline drain in all directions throughout the project areas, feeding the main rivers in the drainage regions. The activities in the area and local land uses have had a moderate impact on the aquatic systems and visible disturbances were few during the site visits. Due to these activities, the aquatic specialist described the systems as ranging from largely natural to moderately modified³.

2.2.1 Watercourse

The pipeline crosses the Weza, Nkondwana and Mzimkhulwana River. The Weza River is crossed once by the pipeline at 30°37'17.21"S, 29°44'47.88"E (RC8; Figure 9). The site consisted of moderate fast flowing waters over stones and bedrock. Flow regimes consisted of riffles, runs and pools. The substrate consisted of stones in and out of current, bedrock with limited sand and gravel. Marginal vegetation was limited and characterised by stems/shoots and fallen trees in pools and runs (section 3 of the Aquatic Assessment in Appendix B).

¹ The Biodiversity Company "Wetland Assessment for the Proposed Harding Water Supply Scheme" (April 2017).

² The Biodiversity Company "Aquatic Assessment for the Proposed Harding Water Supply Scheme" (April 2017).

³ As above.

Figure 9: Photographs Showing the Conditions of the Weza River at RC8



(a): Image upstream of RC8 **(b):** Image downstream of RC8 **(c):** Overview image of the Weza River at RC8.

The Nkondwana River is crossed twice by the pipeline at 30°39'4.83"S, 29°52'44.88"E (RC59; Figure 10) and at 30°40'0.43"S, 29°54'27.08"E (RC68; Figure 11). The site was characterized by slow flowing waters over sand and mud substrate. Good aquatic and marginal vegetation was present (section 3 of the Aquatic Assessment in Appendix B).

Figure 10: Photographs Showing the Conditions of the Nkondwana River at RC59



(a): Image upstream of RC59 **(b):** Image downstream of RC59 **(c):** Image showing the structure crossing the Nkondwana River, to which the pipeline will be tied onto.

The Mzimkhulwana River is crossed three times by the pipeline at 30°42'1.90"S, 30° 2'22.20"E (RC79; Figure 12), at 30°42'50.53"S, 30° 4'39.30"E (RC97, Figure 13), and at 30°42'22.13"S, 30° 4'6.78"E (RC100, Figure 14). The site near RC79 was characterized by slow flowing waters over good stones habitat with sand, gravel and mud substrate. The site had good marginal vegetation present. The site near RC97 and RC100 was characterized by slow flowing waters over stones, bedrock, sand, gravel and mud substrate with adequate marginal vegetation present (section 3 of the Aquatic Assessment in Appendix B).

Figure 11: Photographs Showing the Conditions of the Nkondwana River at RC68



(a): Image upstream of RC68 **(b):** Image downstream of RC68, showing the structure the pipeline will be tied onto.

Figure 12: Photographs Showing the Conditions of the Mzimkhulwana River at RC79



(a): Overview image of RC79, crossing the Mzimkhulwana River **(b):** Image upstream of RC79.

Figure 13: Photographs Showing the Conditions of the Mzimkhulwana River at RC97



(a): Image upstream of RC97 **(b):** Image downstream of RC97 **(c):** Image showing the structure crossing the Mzimkhulwana River, to which the pipeline will be tied onto.

Figure 14: Photographs Showing the Conditions of the Mzimkhulwana River at RC100



(a): Image upstream of RC100 **(b):** Image downstream of RC8 **(c):** Overview image of the Mzimkhulwana River at RC100.

The remaining watercourse crossings are all minor tributaries or drainage lines associated with these main rivers. Photographs of all watercourse crossings have been provided in Appendix K of the BAR with aerial photographs showing the location of the pipeline and watercourses provided in Appendix A.

Pipelines will be placed underground, within existing road and infrastructure reserves in the project areas. The watercourse crossings have been designed taking into account the type of in-situ material associated with that specific watercourse. Where there is bed rock, the rock will be blasted and the pipes encased in concrete, with the top of the final encasement level the same as that of the adjacent undisturbed river bed. Soft material streams will be crossed in the same manner, except that gabions will be used instead of concrete encasements. The gabions will be placed just downstream of the pipe. An engineering drawing showing a typical cross section of the pipeline through the watercourse is included in Appendix A of the BAR.

2.2.2 Wetlands

The Wetland Assessment, carried out by The Biodiversity Company in March 2017, found that there were six National Freshwater Ecosystem Priority Areas (NFEPA) within 500m of the pipeline. Although the pipeline does not traverse any of these NFEPA wetlands it does cross other wetlands along its route.

The six wetland HGM units identified within 500m of the Harding-Weza Water Supply Scheme units are as follows:

- Channelled Valley Bottom (HGM A),
- Unchannelled Valley Bottom (HGM B),
- Flat (HGM C),
- Depression (HGM D),
- Seepage (HGM E), and
- Valleyhead Seep (HGM F)

The wetland specialist grouped the HGM units with the same hydrogeomorphic setting as the pipeline covers an extensive area. The proposed pipeline project will impact on channelled valley bottom (HGM A), unchannelled valley bottom (HGM B) and seepage wetlands (HGM E). The wetlands are shown in Figures 15, 16 and 17 below. These wetlands are in a *moderately modified* state owing to a number of impacts imposed on the systems (section 6.3 of the Wetland Assessment). The biggest impacts are the infilling of small portions of wetland at bridges and the increased surface runoff from roads. The establishment of houses on the slopes and crop fields have also altered the hydrological component of the wetland areas. The unchannelled valley bottom wetlands have been subjected to damming because of roads and blocked culverts. The catchment is within a rural area and the patches of bare soil reduce the health of the wetlands.

A buffer zone of 15m during the construction and the operational phase is recommended by the wetland specialist for the wetland areas. The proposed pipeline route traverses wetland areas and therefore the buffer will not mitigate impacts at these points, however, the buffer must be applied for secondary activities such as laydown areas, vehicle access, storage areas and camp areas.

The wetland specialist concluded that “the footprint of the pipeline at impact points will be minimal and the impacts will be short-lived taking backfilling and revegetation into consideration. No net loss of wetland is expected resulting from the project” (section 8 of the Wetland Assessment). Mitigation measures provided by the wetland specialist have been included in the EMPr (Appendix J) and are to be followed during construction, to ensure the construction does not have any negative impact on the wetlands. Taking into account that this project is for potable water, the significance of any impacts resulting from pipeline leaks and spillages is considered low (section 7 of the Wetland Assessment in Appendix B).

Figure 15: Delineated wetland areas associated with the pipeline (red) in Project Area 1 (source: QGIS with The Biodiversity Company overlay).

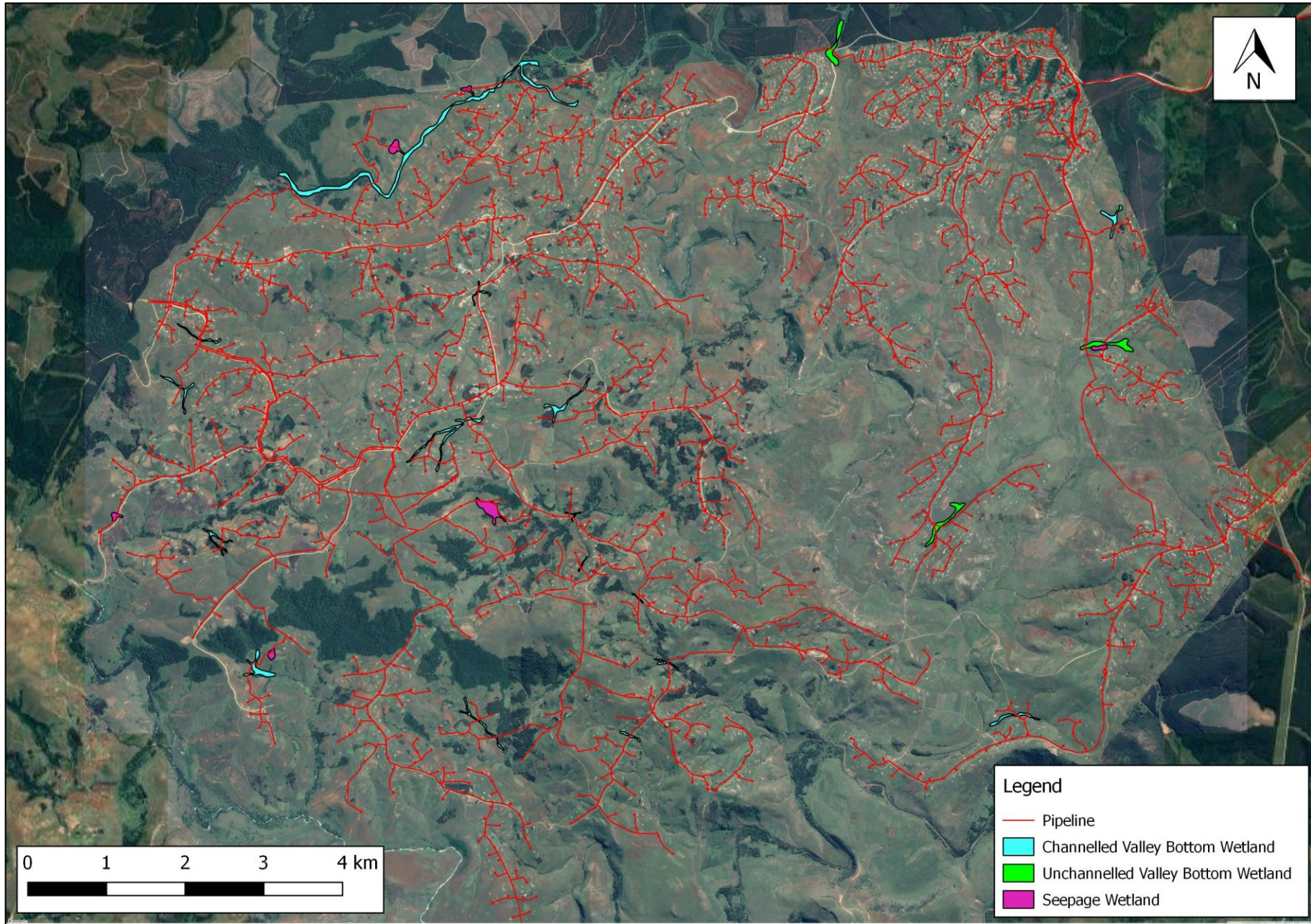


Figure 16: Delineated wetland areas associated with the pipeline (red) in Project Area 2 (source: QGIS with The Biodiversity Company overlay).

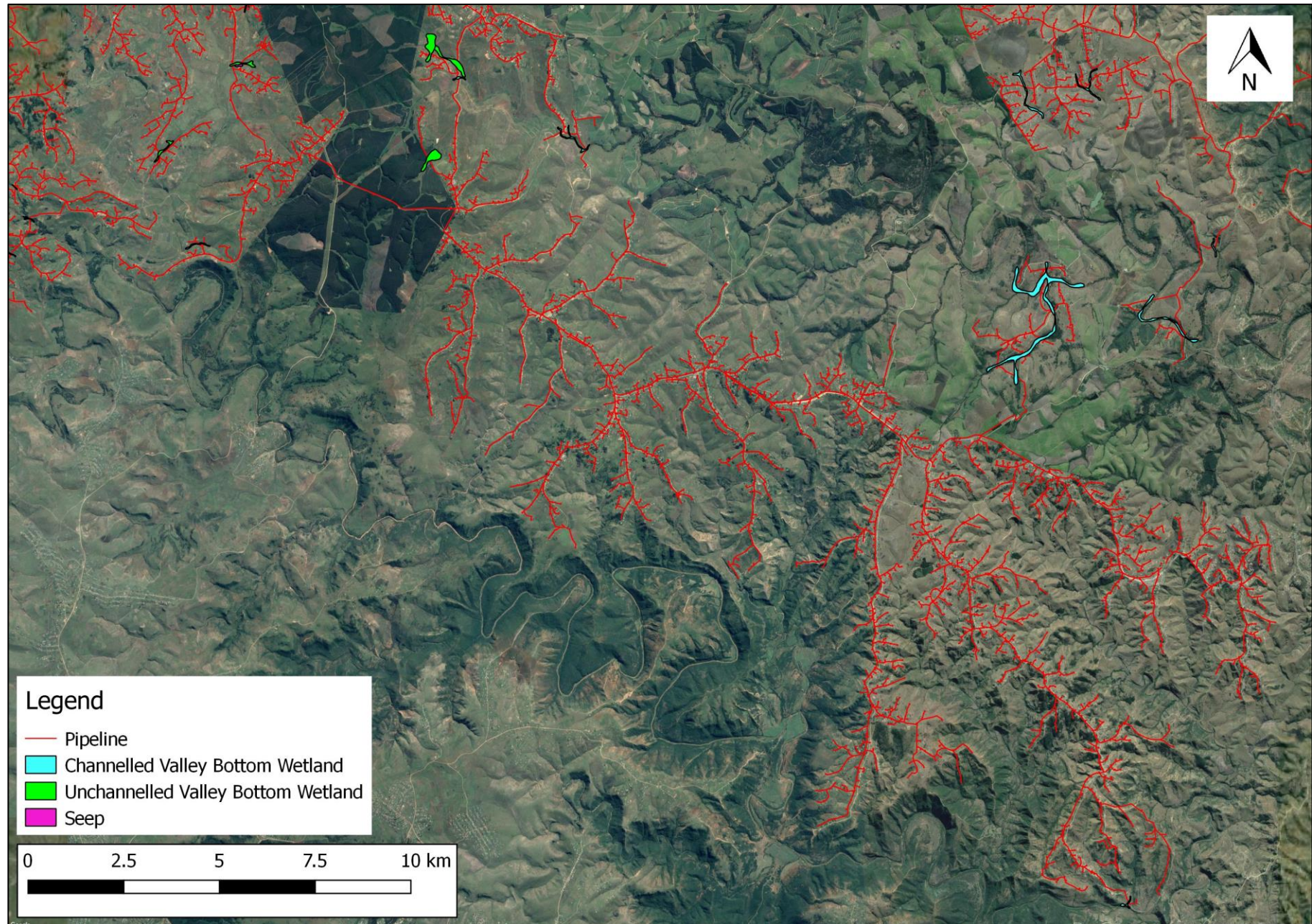
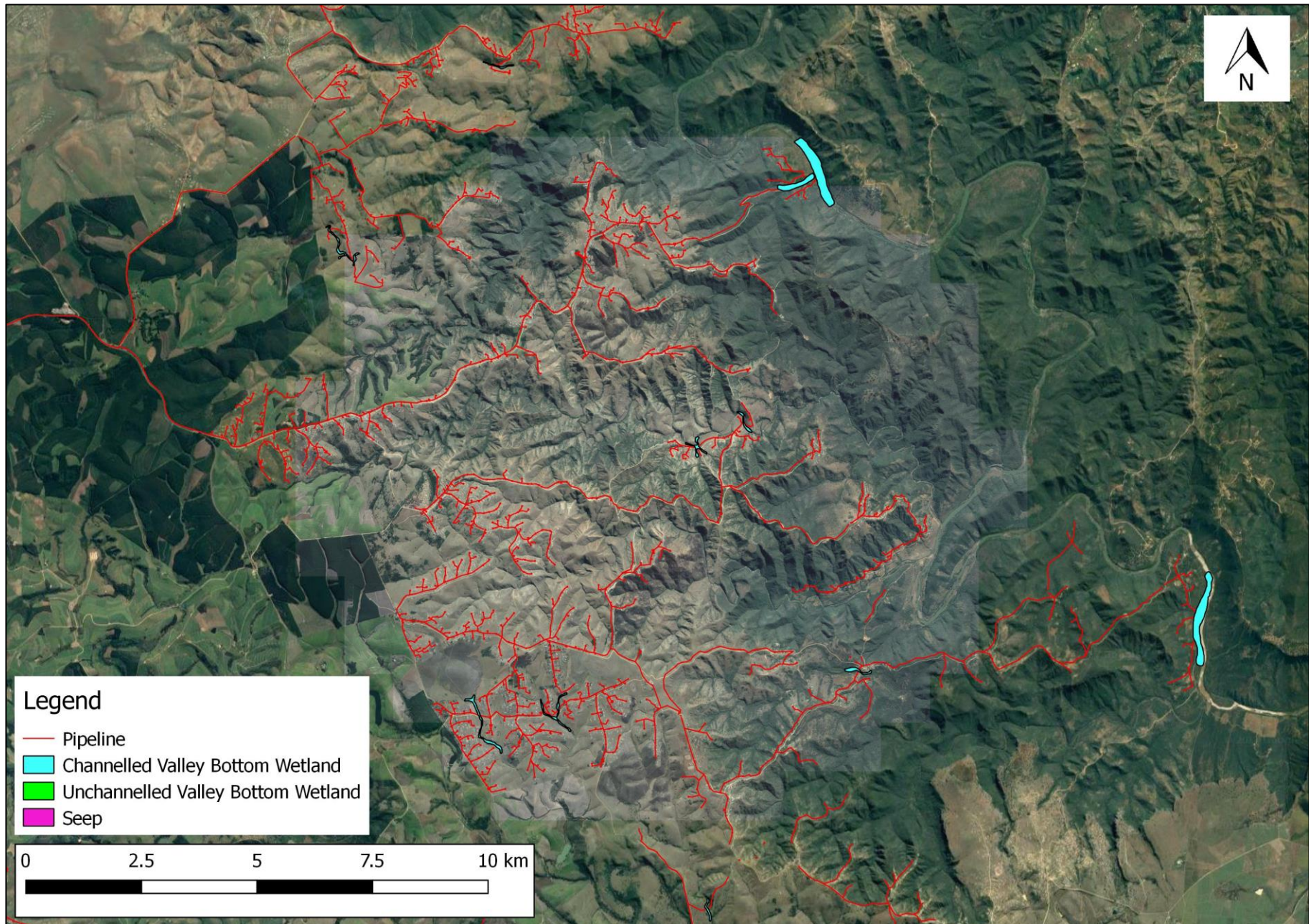


Figure 17: Delineated wetland areas associated with the pipeline (red) in Project Area 3 (source: QGIS with The Biodiversity Company overlay).

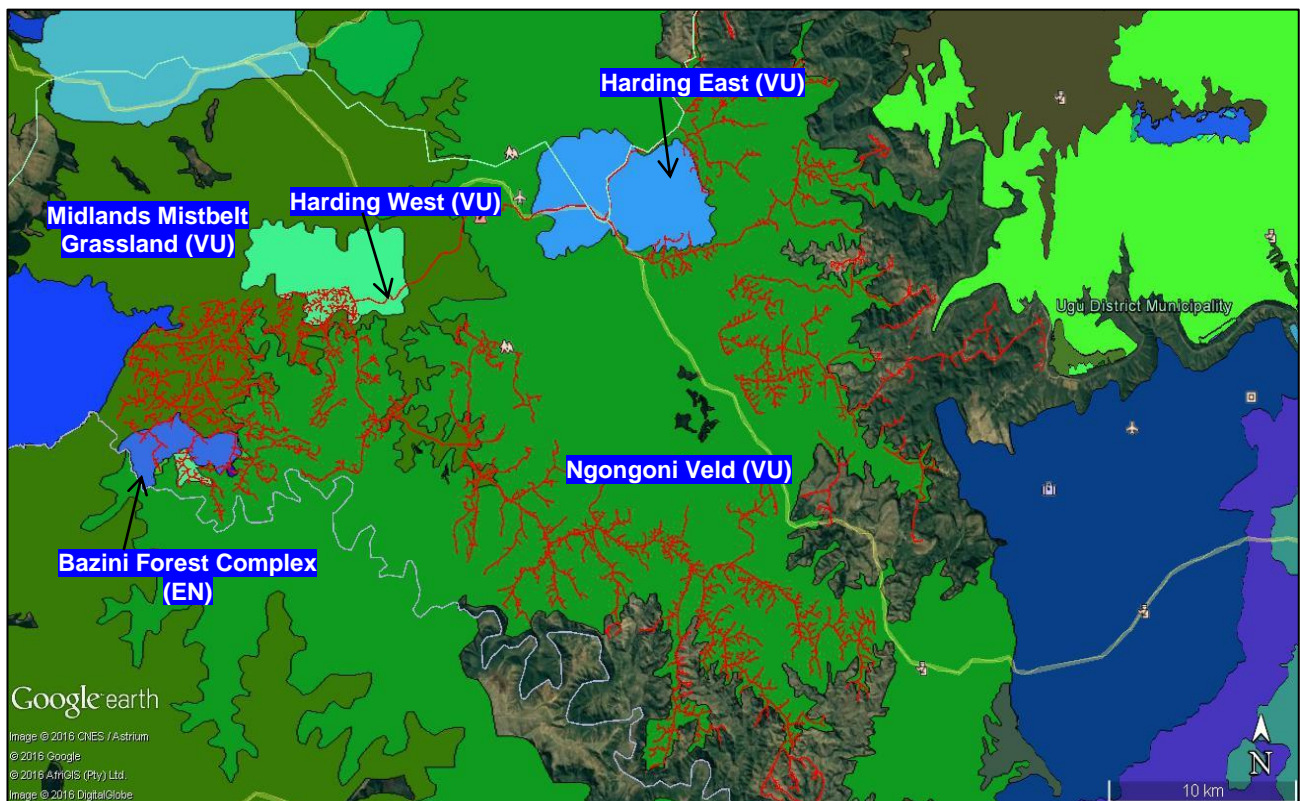


2.3 Fauna and Flora

The majority of the study area is located in a populated, rural area. The area is dominated by grazing lands and subsistence farming. Due to the large study area, the pipeline passes through a variety of ecosystems and vegetation types (see Figure 18). In order to avoid traversing largely natural areas, the preferred pipeline route has been aligned to follow road reserves, existing footpaths and previously disturbed areas. Some indigenous vegetation will however still be cleared during the trench excavations however the majority of the vegetation has been previously disturbed.

The vegetation noted along the majority of the pipeline route (along the existing road and infrastructure reserves) is mostly comprised of invasive alien species due to previous disturbance. The grassland areas associated with the communities has been modified by the construction of these rural houses and partly transformed through subsistence farming (section 6.1.1 of the Wetland Assessment in Appendix B).

Figure 18: Red lines show the proposed water pipeline. A section of the pipeline in the western portion of the study area will result in vegetation being cleared from within the endangered Bazini Forest Complex Ecosystem, shaded in purple (source: Google Earth Pro, 2017 with SANBI GIS overlay).



The vegetation within the project area is described as follows:

- Ecosystem Types: Ngongoni Veld, Midlands Mistbelt Grassland, Harding West, Harding East, and Bazini Forest Complex (indicated in Figure 18).
 - The Ngongoni Veld, Midlands Mistbelt Grassland, Harding West and Harding East ecosystems have been identified by the South African National Biodiversity Institute (SANBI) as “vulnerable”. While the Bazini Forest Complex has been identified by SANBI as “Endangered”.
 - The section of pipeline falling within the endangered Bazini Forest Complex (see Figure 18) was therefore assessed under section 6.1.1 of the Wetland Assessment by the specialist.
 - The ecosystem is comprised of grassland and a strip of scarp forest with a channel through it. Several species of plants that are sensitive to disturbances in the soil or surroundings were observed in this area by the specialist such as *Satyrium longicouda*, *Eucomis autumnalis* and *Satyrium macrophyllum*.
 - The specialist recommended that “the pipeline must follow the existing road and crossing to gain access to the residential areas”. The scarp forest has therefore been avoided, and a section of the pipeline re-routed to avoid the clearance of forest and large trees in Layout Alternative 2 (Preferred Alternative).

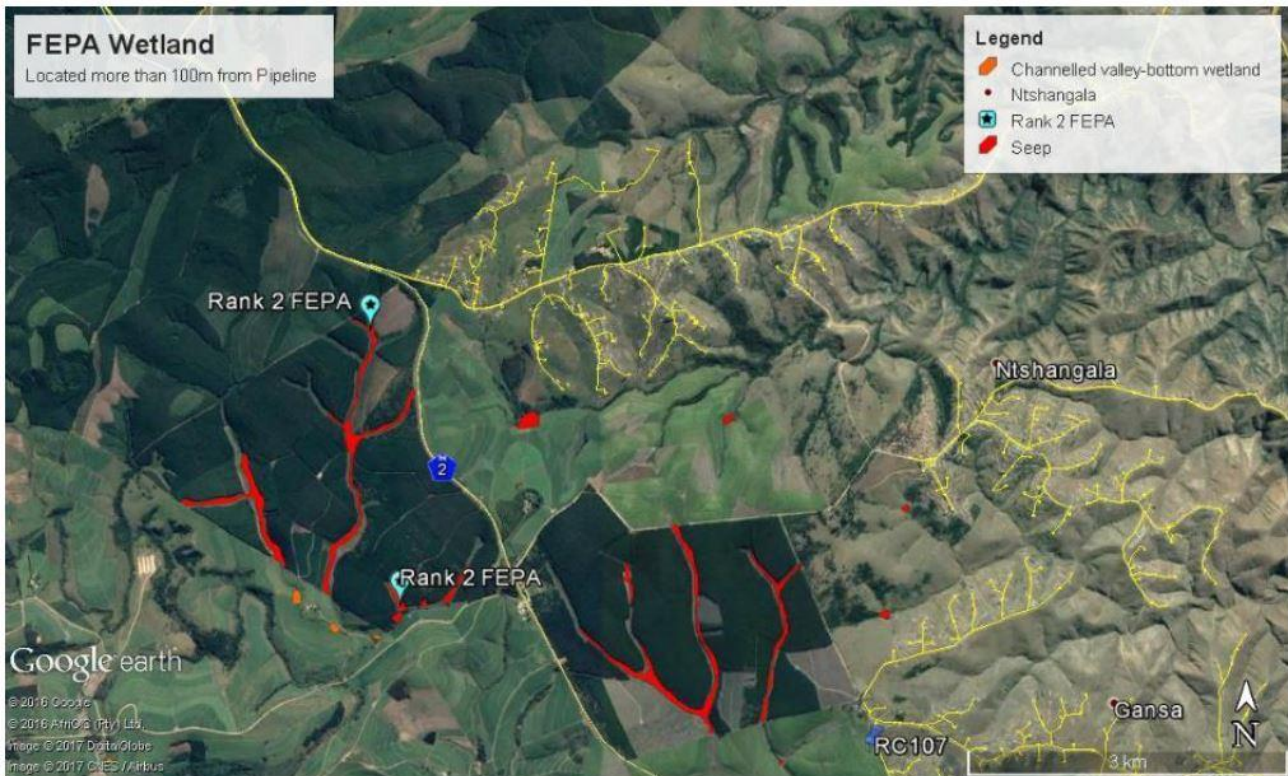
- Although the majority of the pipeline runs within road reserves, the vegetation types encountered within the three project areas are as follows⁴:
 - Ngongoni Veld (SVs 4);
 - The majority of the project area falls within this vegetation type (75%)
 - This vegetation type has been identified as “vulnerable”.
 - Dense, tall grassland overwhelmingly dominated by unpalatable, wiry Ngongoni grass (*Aristida juniciformis*), with this monodominance associated with low species diversity.
 - Only 1% of the unit is statutorily conserved in the Opathe and Vernon Crookes Nature Reserves. Some 39% has been transformed for cultivation, plantations and urban development.
 - Midlands Mistbelt Grassland (Gs 9).
 - The northern portion of the study area falls within this vegetation type (25%).
 - This vegetation type has been identified as “endangered”.
 - Hilly and rolling landscape mainly associated with discontinuous east-facing scarp formed by dolerite intrusions (south of the Thukela River). Dominated by forb-rich, tall, sour *Themeda triandra* grasslands transformed by the invasion of native ‘Ngongoni grass’ (*Aristida junciformis* subsp. *junciformis*).
 - Only a small fraction (about 0.5%) statutorily conserved in number of reserves such as Ngeli, Impendle, Blinkwater, Qudeni, Doreen Clark, Karkloof and Queen Elizabeth Park—still heavily underrepresented in conservation plans. More than half already transformed for plantations, cultivated land or by urban sprawl. Uncontrolled fires and poorly regulated grazing by livestock add to threats to this unique grassland. Some aliens (including *Solanum mauritianum*, species of *Rubus*, *Acacia*, *Pinus* and *Eucalyptus*) are of concern in places. Erosion is very low (68%) and low (24%).
 - Eastern Valley Bushveld (SVs 6)
 - Only the very southern portion of Project Area 3 falls within this vegetation type (5%)
 - This vegetation type has been identified as “least threatened”.
 - Semi-deciduous savanna woodlands in a mosaic with thickets, often succulent and dominated by species of *Euphorbia* and *Aloe*.
 - Only 0.8% statutorily conserved, mainly in the Luchaba Wildlife Reserve; small patches also conserved in the Oribi Gorge Nature Reserve. Some 15% transformed mainly by cultivation. Alien plant invasions are a serious threat, with *Chromolaena odorata*, *Lantana camara* and *Caesalpinia decapetala* being most problematic.

According to section 5.1.3 of the Aquatic Assessment, a total of 19 fish species were expected to occur within the watercourses associated with the study area, with two species of fish listed as Species of Conservation Concern. However, only seven (7) fish species were collected during sampling conducted. Four (4) of these species have an IUCN Status of least concern, one (1) of near threatened, and two species being of an exotic and invasive nature (section 6.2.5 of the Aquatic Assessment in Appendix B). A number of mitigation measures are provided by the aquatic specialist in sections 7.1 and 7.2 of the Aquatic Assessment, which will minimise the impact on the aquatic environments during construction.

Project Area 3 falls within 500m of NFEPA Rank 2 wetlands which are associated with crane habitat. The wetlands also falls in close proximity to a threatened bird habitat site (section 6.1.2 of the Wetland Assessment in Appendix B). The nearest section of pipeline that will be constructed is approximately 320m east of the Rank 2 NFEPA wetlands (see Figure 19). This section of the project area is associated with a populated area of the community where activity levels are currently high. It is therefore unlikely that breeding or nesting cranes will be impacted during this phase of the project. Due to the placement of the pipeline underground, there will be no impact on any bird species during the operational phase.

⁴ The vegetation of South Africa, Lesotho and Swaziland - Mucina and Rutherford (2006)

Figure 19: NFEPA Rank 2 Wetland shaded in red is associated with Crane habitat (source: TBC Wetland Assessment, 2016).



Arising out of KZN Wildlife's Mission Statement, which is to ensure the conservation and wise use of KZN's indigenous living resources (biodiversity) in partnerships with people⁵, KZN Wildlife have mapped "Critical Biodiversity Areas" (CBAs) across the province. Formally protected areas are not considered effective enough to achieve the aims of conserving biodiversity and therefore the CBAs identify natural / near-natural areas, outside of the formally protected areas, which are used as a tool for land-use planning and decision-making. Although these guidelines have not been officially adopted, the CBAs are used as a guideline to identify potentially high biodiversity areas.

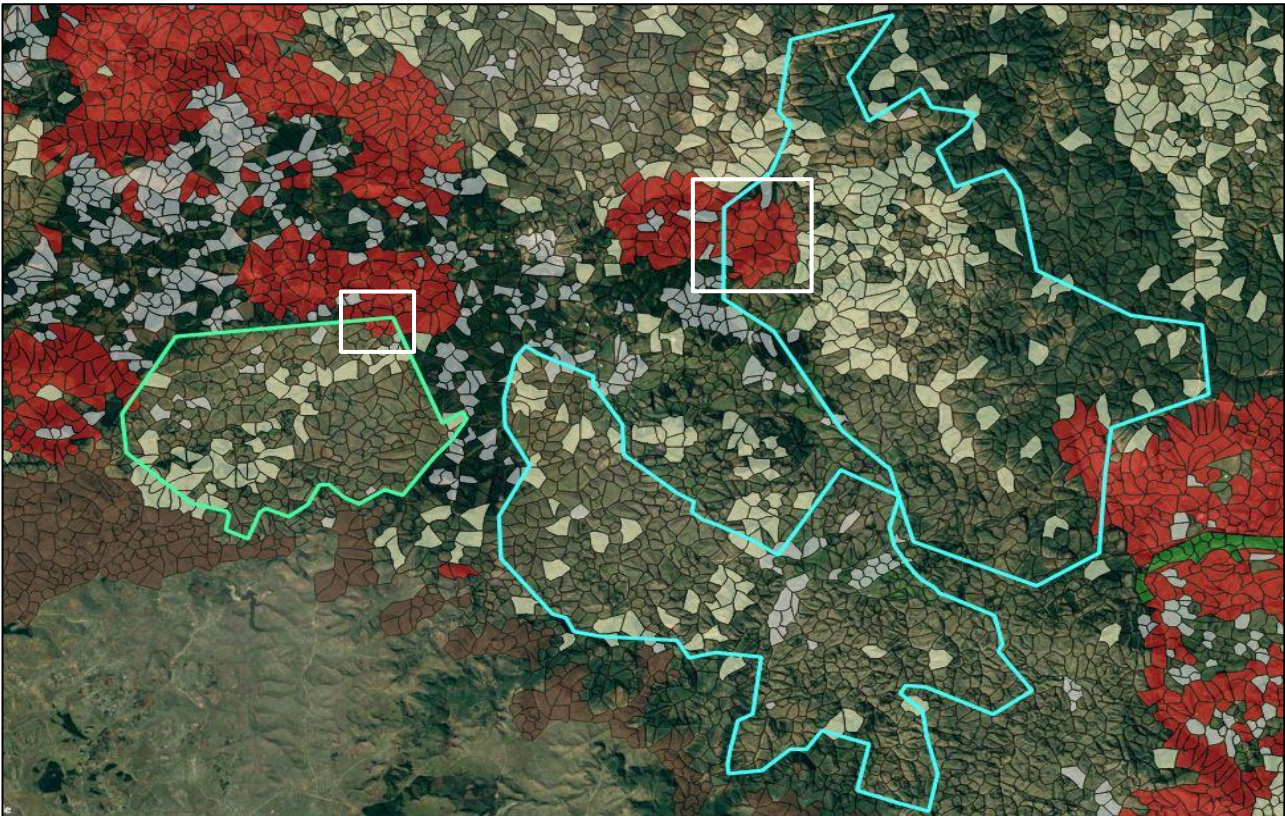
The north-eastern corner of Project Area 1 falls within a CBA (35 hectares) as well as approximately 365 hectares in the western portion of Project Area 3 (shown in Figure 20). The corner of Project Area 1 has been 100% transformed by the local community and road networks. The biodiversity value is therefore low. The important features falling within the CBAs in Project Area 3 are:

- *Hirundo atrocaerulea* (Blue Swallow);
- One Mollusc species;
- One grasshopper species and
- Two millipede species.

Although this area is more natural, the sections of pipeline within this area have been aligned to follow the existing road reserves. The reticulation serves the houses in the immediate area and are therefore confined to previously disturbed, highly active areas. Although construction will see a temporary increase in disturbance, the pipes are located below ground and will therefore not impact on the biodiversity of the area during the operational phase.

⁵ Ezemvelo KZN Wildlife website (www.kznwildlife.com). Accessed on the 13th April 2017.

Figure 20: Critical Biodiversity Areas shaded in red. The study area is outlined in blue with sections of the proposed pipeline traversing the CBA's, shown in the white squares (source: KZN Wildlife C-Plan overlaid on QGIS, 2017).



2.4 Heritage and Cultural Aspects

A Heritage Impact Assessment was carried out to determine if there were any significant heritage or cultural aspects associated with the pipeline route (attached under Appendix B). The specialist concluded that “although numerous graves occur in the greater project area none of them are situated closer than 30m to the proposed pipelines”. Since the pipeline will be placed in areas previously disturbed by construction activities (i.e. roads, farming, and servitudes), it is not anticipated that there is heritage or cultural value associated with the project area. Should any additional graves be identified within the project area, the heritage specialist recommends that a 20m buffer be maintained around the grave (section 6 of the Heritage Impact Assessment). Construction workers will however be cautioned to operate with care on site and should a culturally sensitive aspect be discovered on site that has not been previously identified, construction activities will be stopped temporarily and the issue assessed and the authorities (AMAFA) notified if need be.

2.5 Socio-Economic Environment

The project area is located in the uMuziwabantu and Ray Nkonyeni Local Municipalities, south of Harding town. The surrounding land uses include forestry, agriculture and livestock activities, and rural and urban settlements of varying sizes. All residential dwellings in the area are located outside the road reserves, where the majority of the construction activity will be taking place. The new reticulation water pipeline is a strategic project to facilitate community development within the local area and will therefore have a positive impact on the socio-economic environment.

2.6 Surrounding Environment and Land Uses

The environment and surrounding land uses within and adjacent to the pipeline are described as follows:

- Located within a rural area south of Harding town and north-west of Port Shepstone.
- Project area 1 and 2 are surrounded by forestry on their northern edges. Project area 3 is partially surround by forestry on the western edge.
- The area is predominantly used as grazing land for livestock and subsistence farming.
- The land is largely owned by the Ingonyama Trust Board with small private properties scattered amongst these portions of land.

The surrounding environment and land use will not be negatively affected by the water pipeline as the construction footprint will follow the same alignment as existing roads and servitudes. The pipeline will be located underground and will therefore not deter from the aesthetics of the area during operation.

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)

Legislation	Compliance of Activity
National Environmental Management Act 1998	<p>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 (EMPs) 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.</p> <p>The Environmental Impact Assessment (EIA) Regulations, 2014: GN R.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.</p> <p>Environmental authorisation is required for the construction of the pipe across the watercourses and the clearance of indigenous vegetation. Therefore this application is in line with the requirements of NEMA.</p>
National Water Act 1998	<p>The upgrade will result in alterations to the bed and banks of a watercourse and the site is located within 500m of wetlands. A Water Use Authorisation will therefore be required as per Section 21 (c) and (i) of the National Water Act. The applicant has been made aware of this requirement, which is running concurrently to the BAR.</p>
National Waste Management Act 2008	<p>Reforms the law regulating waste management to prevent pollution and ecological degradation.</p> <p>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.</p>
Environmental Conservation Act 1996	<p>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.</p>
National Environmental Management Biodiversity Act 2004	<p>To provide the framework, norms, and standards for the conservation, sustainable use and equitable benefit-sharing of South Africa's biological resources. Section 52 allows for the publication of a list of threatened ecosystems in need of protection. The list was published in Government Gazette No. 34809 Notice No. 1002 dated 9 December 2011.</p> <p>This site falls within the Bazini Forest Complex ecosystem type. This ecosystem type is 'endangered' and is considered a threatened under the NEMBA and requires authorisation to clear more than 300m² of vegetation within this ecosystem type.</p>
National Heritage Resources Act 25 of 1999	<p>For the protection of South African Heritage to nurture and conserve communities legacy. No archaeological significant artefacts will be disturbed during this project therefore no permits will be required from the provincial heritage authority, AMAFA.</p>
Mineral & Petroleum Resources Development 28 of 2002	<p>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).</p>

	The material used during the construction phase must be obtained from a licensed site.
Water Services Act (Act No. 108 of 1997)	Ugu District Municipality is authorised as the Water Services Authority for its area of jurisdiction. In terms of this Act, the District has a duty assigned to it to progressively ensure efficient, affordable, economical and sustainable access to water services for all consumers or potential consumers.
Municipal Planning Framework	
uMuziwabantu Reviewed IDP 2016/2017	Water backlog in rural areas and partially operational water systems were raised as concerns by all rural wards during the Basic Service Delivery Analysis under section C5 of the IDP. This project aims to address these concerns.
Ray Nkonyeni Reviewed IDP 2016/2017	One of the key performance areas for the Back-to-Basics approach is Basic Services whereby decent living conditions must be created. The planning, implementation and maintenance of basic infrastructure is critical for sustaining basic standards of living and economic activity in our towns and cities. Furthermore, the Back to Basic policy states that Municipalities are expected to perform basic activities, which include water and sanitation provision (section 3.6.1 of the Ray Nkonyeni IDP).

Section 4: Motivation, Need and Desirability

4.1 Need and Desirability as Per Section 3(F)

The Harding-Weza Water Supply Scheme aims to provide a reliable source of water over a large rural area between Harding and Izingolweni. The entire Harding-Weza Water Supply Scheme includes the construction of the new Weza Dam, the upgrading of the existing Water Treatment Works and the upgrading of the bulk pumping mains and reservoirs. This BAR assess the upgrading and expansion of the reticulation network, which is the final phase of the Harding-Weza Water Supply Scheme.

The reticulation pipelines will supply safe and reliable potable water to residential households within several wards of the uMuziwabantu and Ray Nkonyeni Local Municipalities. This area, south of Harding, currently has limited access to a reliable, clean water source, which is mainly accessed through communal standpipes. Where the reticulation needs to be upgraded, this is because some of the pipes are either undersized to meet the RDP standard or are damaged.

The proposed infrastructure has been designed considering future population growth, future increase in water supply demand and terrain in the area. Having carried out a capacity analysis, the engineers are confident that all of the proposed infrastructure will be able to serve the communities and have taken into account future predicted increases in water demand.

The Ugu District Municipality acknowledge the existence of gaps in the level of services within the District. This includes a rural/urban national design standard which affects the rural areas more and more because the level of service required in the rural area increases annually. However, actual level of service cannot keep up with the demand. This trend will continue until service levels are equalised, hence, the importance of implementing the Harding Weza Water Supply Scheme. Ugu District Municipality is capable of achieving this goal in association with Umgeni Water for the provision of potable water.

4.2 Motivation for Preferred Site, Activity and Technology Alternative

The aim of the project is to increase the reliance of the municipal potable water supply to rural areas in the uMuziwabantu and Ray Nkonyeni Local Municipalities. There are therefore no site alternatives. Different pipe materials were initially investigated however there is only one technology alternative as the pipe specifications need to fall within the appropriate design standards. Layout Alternative 2 is the preferred layout alternative as a result of the following:

- Sections of the pipeline route were amended to reduce the number of watercourse crossings from 227 to 152.
- A section of pipeline towards the south-eastern boundary of Project Area 1 has been amended to lie within an existing road reserve instead of passing through a narrow section of the Bazini Forest Complex. Construction activities will therefore take place further away from the protected and endangered Bazini Forest Complex Ecosystem, while still providing water to all the households in this area.

- The original pipeline route traversed a steep valley and largely natural / undisturbed area. In the preferred pipeline route, this steep gradient was avoided with the pipeline following an existing road on the other side of the valley.

It is therefore the opinion of the EAP that the environmental impacts have been reduced in the preferred layout and that there are no significant environmental impacts that cannot be mitigated against. The preferred Layout Alternative 2 should be authorized.

Section 5: Public Participation

The communities are mainly traditional and rural. In such communities, there are Tradition Leaders who have their own subordinate structures of governance. On the other hand, there are political leaders (Ward Councillors) who are in close communication with their communities. The project already has a Project Steering Committee that comprises Stakeholders of the project. To ensure that the communities are fully aware of Ugu District Municipality's intentions with regards to the proposed implementation of a sustainable water reticulation system, additional Public Participation Workshops will be conducted by the appointed social facilitators prior to the actual construction phase of the project.

5.1 Notification of Interested and Affected Parties

- 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;*

Ten Noticeboards (in isiZulu and English) were placed along the pipeline route during the month of March 2017. Due to the large size of the study area, the notice boards were strategically erected next to schools / community meeting places where foot traffic was anticipated to be higher. The noticeboard detailed uGu Municipality's proposed plan to construct the water reticulation pipeline, subject to a Basic Assessment. See Appendix C for proof of placement of the notice boards.

- 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 project is located within a rural area with strong traditional ties, therefore the public participation method used had to ensure that existing channels of communication were used in order to notify surrounding stakeholders to avoid creating any offense. Surrounding stakeholders rely on direct means of communication through the elected officials, which in this case is the local Ward Councillor. A map showing an overview all the effected wards has been attached under Appendix D. Meetings were held with the uMuziwabantu and Ray Nkonyeni Ward Councilors on the 22nd February 2017. Pamphlets were handed to each of the Ward Councilors for distribution in the various affected areas. The Ward Councilors will be given opportunity to review complete copies of the Basic Assessment report and relay information back to the community.

The majority of the pipeline will be constructed on land belonging to the Ingonyama Trust Board. There are eight (8) traditional authorities affected by this project (please refer to Traditional Authority map attached under Appendix D). The Ward Councilors advised that, although the Amakhosi sit in on the ward committee meetings, they should be notified separately about the project. EnviroPro therefore attended a meeting hosted by the Ugu Municipality on the 11th May 2017. A number of the Ward Councilors, Amakhosi and representatives of the traditional leaders were present at the meeting (see meeting register attached under Appendix D). The Amakhosi had also previously been notified of the project and the EIA through the Project Steering Committee.

With regards to authority communications, all relevant authorities have been notified of the application and have been provided with copies of this BAR. It is to be noted that the pipeline will be placed in the Department

of Transport (DoT) Road Reserves and therefore DoT have been included in the I & AP list to receive more information on the project (see proof of notification under Appendix D).

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;*

Due to the rural nature of the project, signboards were placed along the main pipeline routes near schools and highly populated residential areas where there was anticipated to be significant foot traffic. An advert was also published in the South Coast Herald. 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);and*

An advert was placed in the South Coast Herald local newspaper on the 24th February 2017 detailing the proposed project, Basic Assessment process and providing contact details of EnviroPro should anyone wish to register as an I & AP. See Appendix E – 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 that 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 44.

- 1) *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.*
- 2) *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 copy of the original comments has been provided together with the Comments and Response Table. This report has been provided to the uMuziwabantu and Ray Nkonyeni Local Municipality, Ugu District Municipality, the Department of Water & Sanitation, the Department of Forestry & Fisheries and KZN Wildlife for comment.

See Appendix G – 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 against 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 affect 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.

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 1 and 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	1 - 5 = low. 6 -10 = medium. 11 -14 = high.
Significance after application of Mitigation Measures	A score of between 1 and 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 Site and Layout Alternative 2 (preferred alternative)

See Appendix H for the full impacts scoring matrix which assesses the impacts on the above system. The below impacts relate to the site location and Layout Alternative 2 (*preferred*).

Nature and Consequences of impact	Significance rating of impacts ⁶ :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
Construction			
General Construction			
1. Dusty conditions generated during construction and by construction vehicles.	4 (low)	<p>Since the pipeline will be placed adjacent to dirt roads, there is likely to be dust generated by construction vehicles accessing the area. The dust generation will however be a temporary impact i.e. the site will be worked continuously for a few months until construction is completed. Further to this:</p> <ul style="list-style-type: none"> • Water carts must be used on site should dust levels elevate to a nuisance level. • Water cart will be utilised to dampen dusty surfaces and suppress dust from road surfaces. • Shade cloth is to be utilised for stockpiled materials where required. <p>This impact can be managed and mitigated to a large degree with the implementation of the EMPr. The applicant must comply with the National Dust Regulations (Government Notice R827, 2013) with regards to dust levels produced on site.</p>	2 (low)
2. Generation of emissions from construction vehicles.	5 (low)	<p>Due to the rural location of the study site and the small scale of the project, emissions generated from construction vehicles will be negligible and are not expected to significantly affect the surrounding environment. Measures to reduce emissions have however been incorporated into the EMPr. All construction vehicles will however be fitted with the appropriate silencers and exhausts.</p> <p>This impact can be managed and mitigated.</p>	2 (low)
3. Impact on existing services i.e. power lines, water pipes, infrastructure, etc.	5 (low)	<p>As standard construction practice the engineer and contractor will identify all existing services that may be affected along the route prior to construction. Any infrastructure that is removed must be replaced and</p>	2 (low)

⁶ See Appendix H for more details.

		any damage caused from construction must be repaired. This impact can be managed and mitigated.	
4. Damage to properties, fencing and subsistence farming plots during laying of pipework.	8 (med)	For the most part the pipeline will be laid within the road reserves however if any properties or crops are likely to be affected, the contractor will liaise with the landowner. The pipeline trenches will be approximately 1m and 1.2m deep, thereby limiting the area of the excavation and damage that could be caused by large vehicles. This impact can be avoided and mitigated.	5 (low)
5. Temporary increase in waste and litter due to the construction process.	6 (med)	The construction phase of the project will see an increase in workers on site and therefore an increase in waste in the area. <ul style="list-style-type: none"> 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 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. Waste management will be controlled through the implementation of the EMP. This impact can be managed and mitigated.	4 (low)
6. Insufficient number of toilet facilities on site resulting in the contamination of the environment.	8 (med)	The increase of construction personnel during the construction phase will require an appropriate number of toilet facilities for the site. <ul style="list-style-type: none"> Appropriate and sufficient toilet facilities (1 toilet per 15 employees) must be provided by the contractor; Toilet facilities are to be placed at intervals across the project areas; All toilet facilities must be checked on a daily basis; All toilet facilities must be emptied and cleaned on a weekly basis. A registered waste removal contractor must remove effluent waste from site or effluent waste must be disposed of at a permitted Waste Water Treatment Site; 	4 (low)

		<ul style="list-style-type: none"> • Safe disposal slips for the disposal of effluent waste must be obtained and kept on site as proof of safe disposal. <p>This impact can be managed and mitigated.</p>	
7. Contamination of the receiving environment due to inappropriate storage and usage of hazardous materials and substances (cement, fuel etc.).	7 (med)	<p>It is unlikely that there will be many hazardous materials used during construction however any potentially hazardous substances (including cement and paint) will be stored within a secured area in the construction camp. No storage of material is to occur within 15m of any watercourse. The storage area will be a hard surfaced, bunded and covered area. Cement mixing must be done on a hard surface that is protected from stormwater runoff.</p> <p>This impact can be prevented by managing the storage.</p>	4 (low)
8. Construction vehicles and personnel creating a nuisance to the surrounding area and businesses.	5 (low)	<p>Sections of the pipeline run close to small towns and businesses as well as through 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.</p> <p>This impact can be avoided and managed.</p>	3 (low)
9. Erosion of exposed soil prior to the rehabilitation of the construction area (i.e. trenches).	10 (med)	<p>Exposed soil is very susceptible to erosion and therefore erosion control is critical, especially around the watercourse crossings.</p> <ul style="list-style-type: none"> • Exposed areas will be rehabilitated and re-vegetated as soon as possible during construction. • Cleared areas may not be left exposed for long periods of time and should be re-vegetated in stages on completion of a section of the pipework. • Small inspection holes may be left open along the route but the rest of the trench must be closed once the pipe has been laid. • In certain steeper sections additional precautions to manage erosion will be required (e.g. sand bags or gabions). • During the excavation of trenches, flows must be diverted around the active work areas to prevent channelled flow. • Temporary stormwater channels and preferential flow paths should be filled with 	8 (low)

		<p>aggregate and/or logs (branches included) to dissipate and slow flows thereby limiting erosion.</p> <p>This impact is to be monitored during construction and can be mitigated.</p>	
10. Trenches remaining open for long periods of time, causing them to collapse, creating an erosion and safety hazard.	7 (med)	<p>Trenches must not remain open indefinitely. Trench work must be completed in sections and then closed once the pipe has been laid in that section. Small inspection holes may be left open along the route but the rest of the trench must be closed. Cleared areas may not be left exposed for long periods of time and must be re-vegetated as each stage of pipework is completed. Trenches must not remain open during building shut down periods i.e. over Christmas and Easter. Trench work must be planned so that trenches are closed before these shut down periods as there is a risk that the trenches will either collapse or fill with water if left unattended and this can create a hazard for children and animals. Trenches must be demarcated.</p> <p>This impact can be avoided.</p>	5 (low)
11. Incorrect filling of trenches on completion creating points of erosion, especially on slopes and near watercourses.	8 (med)	<p>Care must be taken to ensure that when closing trenches, soil is compacted sufficiently and left so that the level of the trench is slightly higher than the surrounding land, to allow settling. Should soil settle below the level of the surrounding land, it will leave a depression along which water will travel and this could create a focal point for erosion. This can be especially problematic on sloped sections where water will follow the depression along the pipeline route, building up speed down steeper sections and creating furrows. If this occurs near watercourses, it will erode the river banks and cause them to collapse. Rehabilitation through replanting of indigenous grass species soon after closure will aid in stabilising soil and preventing erosion and will also assist in dust control.</p> <p>This impact can be avoided and mitigated.</p>	5 (low)
12. Excavations within the community impacting on features with heritage value (i.e. graves).	6 (med)	<p>Since the pipeline will be placed in areas previously disturbed by construction activities (i.e. roads, farming, and servitudes), it is not anticipated that there is heritage or cultural value associated with the project area. A Heritage Impact Assessment was carried out and</p>	1 (low)

		<p>confirmed these findings however, should any graves be identified within the project area, a 20m buffer be maintained around the grave. Construction workers will however be cautioned to operate with care on site and should a culturally sensitive aspect be discovered on site that has not been previously identified, construction activities stop temporarily and the issue assessed and the authorities (AMAFA) notified if need be.</p>	
Watercourses			
<p>13. Deposition of eroded material into water bodies when laying pipe across the 152 watercourses impacting water quality (increased turbidity, reduction of dissolved oxygen).</p>	<p>8 (med)</p>	<p>Caution needs to be exercised when working near the watercourse crossings. The following mitigation measures will be carried out and are included in the EMPr:</p> <ul style="list-style-type: none"> • All construction activities occurring within the watercourses must be done with extreme care to avoid damage to the watercourse and associated wetland area. • No heavy vehicles will be permitted to work in any watercourse unless exceptionally hard material is encountered and the trench cannot be dug by hand. Pipework around these sensitive areas should be laid by hand. • No storage of materials will be permitted within these areas or within 15m of these areas, which will be agreed on and demarcated before construction begins on each section. • Where stream crossings are required, the type of in-situ material will be confirmed. In places with bed-rock, the rock will be blasted such that the water pipes could be encased in concrete and the top of the encasement at the same level of the undisturbed river bed. Soft material stream would be crossed the same except gabions will be used instead of concrete (gabions paced downstream of pipe; see typical section through the river crossing attached under Appendix A). • The contractor must ensure that stream bed work is carried out in the dry season when flow rates are low to non-existent (i.e. June – August). 	<p>4 (low)</p>

		<ul style="list-style-type: none"> • It is unlikely that any of the streams will need to be temporarily diverted however if this is the case, a suitably qualified contractor will be appointed to handle the temporary stream diversion work to ensure that the flow rate and stream morphology are taken into account. • In order to prevent long-term deposition of material into the watercourses, areas exposed to erosion must be protected through the use of sand bags, gabions, berms and efficient construction processes i.e.: limiting the extent (footprint) and duration period that areas are exposed. <p>This impact can be managed and mitigated.</p>	
<p>14. Physical damage to wetland areas associated with the numerous rivers and tributaries during excavation.</p>	<p>7 (med)</p>	<p>Construction activities are to be restricted to the pipeline route across the wetlands (i.e. no wider than 1m and 1.2m deep). The rest of the surrounding area must be demarcated as 'no-go areas' to prevent workers from unintentionally encroaching into wet areas. Furthermore:</p> <ul style="list-style-type: none"> • The pipeline is to run as close to all existing roads and footpaths as possible to reduce the disturbance footprint. • The pipe must be tied to existing structures at the watercourse, where feasible to reduce the amount of construction activities within the watercourse (e.g. RC68). • No storage of material, vehicles or equipment is permitted within the wetland areas; • Apart from where the pipeline crosses the wetlands, a buffer of 15m is to be maintained around wetland areas; • No heavy vehicles will be permitted to work in the wetland areas unless exceptionally hard material is encountered and the trench cannot be dug by hand. Pipework around these sensitive areas should be laid by hand. • No dumping of material or waste may occur within these areas. All material and waste must be taken back to the construction camp at the end of the day. 	<p>4 (low)</p>

		<ul style="list-style-type: none"> Designated stockpile storage areas must be established outside of the wetland areas. <p>This impact can be managed during construction through the implementation of the EMPr.</p>	
Fauna & Flora			
15. Clearing of indigenous vegetation during the laying of the pipeline and temporary access points.	6 (med)	<p>The majority of the pipeline will be placed in road reserves and adjacent to existing servitudes and footpaths which means that the vegetation has been previously disturbed. In order to minimise the amount of vegetation cleared, the following measures have been included in the EMPr:</p> <ul style="list-style-type: none"> The relatively small trench size (1m) should result in the loss of only a narrow strip of vegetated area, which must then be re-vegetated on completion of construction. Clearing of vegetation and excavating of the trench in close proximity to the watercourses will need to be done by hand, where possible. Vehicle access will be restricted as there is a higher risk of damage and disturbance to surrounding vegetation. All access routes are to follow the existing roads / access tracks. The contractor must ensure that invasive species do not gain a foothold along the cleared route until the indigenous vegetation has had time to re-establish. Cleared surfaces are to be re-vegetated with <i>Cynodon dactylon</i>, <i>Sporobolus aficana</i> and <i>Eragrostis curvula</i>. <p>This impact can be managed and minimised.</p>	4 (low)

<p>16. Encroachment of alien vegetation into disturbed areas during construction.</p>	<p>8 (med)</p>	<p>Alien vegetation and weeds were noted near many of the watercourse crossings due to previous disturbance associated with construction of roads, stormwater infrastructure and foot paths. The Contractor is to ensure that the alien vegetation does not further establish within the disturbed areas associated with the excavation of the trench.</p> <ul style="list-style-type: none"> • Alien vegetation within the construction footprint must not be allowed to encroach onto the site and must be continually removed during construction. <p>This impact can be managed and mitigated.</p>	<p>5 (low)</p>
<p>17. Loss of riparian vegetation during excavation for pipework crossings on watercourses, leading to erosion and damage to stream banks.</p>	<p>8 (med)</p>	<p>Most watercourses are already crossed by roads or services, which have previously disturbed and transformed the riparian habitat at these points. Furthermore, the drainage lines have little riparian vegetation due to the non-perennial nature of the watercourse and the frequent disturbance through foot traffic and animal activities. Where clearing of riparian vegetation is required, it will be kept to a minimum due to the small size of the pipe and associated trench (1m). The key impact that requires attention is the potential for erosion, which is to be monitored by the Contractor on an ongoing basis. Erosion can be reduced by keeping any vegetation associated with the banks of the watercourses intact.</p> <p>This impact can be avoided and managed.</p>	<p>5 (low)</p>
<p>18. Clearance of vegetation from within the Bazini Forest Complex (endangered).</p>	<p>9 (med)</p>	<p>A section of the pipeline passes through an area identified as Bazini Forest Complex in the south-west of Project Area 1. The forest has been avoided in the preferred layout with no forest / trees requiring clearing. The pipe has been aligned alongside an existing road, which has been previously disturbed. A section of the pipeline route was also re-routed to avoid any construction activities taking place in the forest areas.</p> <p>This impact has therefore been avoided and mitigated.</p>	<p>5 (low)</p>

<p>19. Disturbance to nesting / breeding cranes in the western section of Project Area 3 (as shown in Figure 19 above).</p>	<p>7 (med)</p>	<p>There are three species of Crane in South Africa; the Grey Crowned Crane, the Wattled Crane and the Blue Crane. The Cranes depend on wetlands and grassland for nesting and foraging⁷. The nearest section of pipeline to the crane habitat, identified in the Wetland Assessment, is approximately 320m away. This section of the project area is associated with a populated area activity levels are currently high (vehicles and pedestrians). The pipeline also runs in road reserves thereby avoiding open grassland areas. It is therefore unlikely that cranes will be breeding or nesting in close proximity to the construction footprint. Due to the placement of the pipeline underground, there will be no impact on any bird species during the operational phase. This impact can be avoided.</p>	<p>4 (low)</p>
<p>Operation</p>			
<p>20. Upgrading and constructing the reticulation water supply to the local area.</p>	<p>0</p>	<p>This is a positive impact.</p>	<p>0</p>
<p>21. Long-term erosion around watercourses and damage to watercourse banks where pipe crossings have been placed.</p>	<p>8 (med)</p>	<p>Since the pipeline will be placed in line with the bed of the watercourses, it is unlikely to cause a long-term erosion impact. Where watercourses have been crossed, a concrete block will be constructed in the river bank to anchor the pipeline in place during high flow conditions. Gabions / reno mattresses may be included in the design to stabilize the banks and prevent erosion of the banks during high flow events. It must also be ensured that trench rehabilitation has been effectively carried out before contractors leave the site. Soil in the trenches must be compacted effectively to the same level or slightly higher than the surrounding land to prevent settling which could create depressions for water to travel along, creating erosion funnels and exposing the pipeline. It must be ensured that indigenous vegetation is planted after the soil has been compacted and that this vegetation has taken successfully before contractors leave the site. This impact can be avoided during the construction phase.</p>	<p>5 (low)</p>
<p>22. Placement of pipes in the beds of watercourses impacting the flow regime of the rivers.</p>	<p>7 (med)</p>	<p>Due to the small size of the pipes and tributaries as well as the placement of the pipeline underneath the bed of</p>	<p>4 (low)</p>

⁷ KZN Crane Foundation (www. <http://kzncrane.co.za/about-cranes/>). Accessed on 29th June 2017.

		<p>the watercourses, the construction will not impact the flow regime of the rivers. The pipes will be tied to existing structures, where possible or placed underneath the stream bed. Please refer to drawing in Appendix A.</p> <p>This impact can be prevented during the construction phase.</p>	
<p>23. Water pipes bursting resulting in localised flooding and erosion.</p>	<p>8 (med)</p>	<p>The design criteria was developed using guidelines from “The Red Book – The Human Settlement, Planning and Design”. Various measures to ensure pipe integrity will be implemented including:</p> <ul style="list-style-type: none"> • Scour valves to control the supply of water. They are used to stop supply when any repairs are carried out on a section of pipeline. • Non-Return Valves (spring loaded) will be placed along the pipeline length which effectively break the line into smaller sections thereby decreasing the overpressures. These valves have been designed for placement on long pump mains (over and above the mandatory placing at pump stations). Double purpose (RBX) air valves would be installed either side of the valve. • Vacuum Breaker / Air Release Valves designed to accommodate air intake and release during normal operation and in the event that the pump trips or the line is being filled or scoured. These valves will be installed at apexes along the pipelines at distances of not more than 600m and also before and after isolation valves and non-return valves. <p>This impact can be prevented and mitigated.</p>	<p>5 (low)</p>
<p>24. Illegal connections resulting in damage to pipework, flooding, erosion and loss of water supply.</p>	<p>6 (med)</p>	<p>Since most of the households in the area will have easy access to water, there is unlikely to be illegal connections however the pipeline will be laid in trenches 1.5m deep. The water service provider is to monitor the pipeline, through routine inspections with any leaks being repaired as soon as they are reported.</p> <p>This impact can be prevented and managed.</p>	<p>1 (low)</p>
<p>Decommissioning</p>			

25. Rubble, soil and material left on site and in close proximity to the watercourses.	7 (med)	It is unlikely that the pipeline and reservoir will be decommissioned however should this be required, all rubble and pipework area to be removed from the site and disposed of at a registered landfill site. Where the pipe is removed from the watercourses, the trench is to be filled with stones and rehabilitated to its current condition to prevent pooling in this section. This impact can be managed and mitigated.	2 (low)
Cumulative			
26. General pollution and sedimentation within the catchment.	7 (med)	Provided that the Contractor is compliant with the measures included in the attached EMP, waste management and erosion control will be sufficiently managed to prevent this cumulative impact.	2 (low)
27. Pressure on water resources in the Harding area.	6 (med)	This project is part of the Harding-Weza Water Supply Scheme, which includes the construction of the new Weza Dam and upgrading of the existing treatment works. Water will be supplied to these communities from the new Dam, which has been designed to take into account this increase in supply area. This impact has been avoided.	3 (low)
28. Improved service delivery to the local area.	0	This is a positive impact.	0

6.3 Layout Alternative 1 (Alternative Layout)

See Appendix H for the full impacts scoring matrix which assesses the impacts on the above system. The below impacts relate to the site location and Layout Alternative 1 (*alternative* layout).

Nature and Consequences of impact	Significance rating of impacts ⁸ :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
Construction			
General Construction			
1. All general construction related impacts remain the same for the preferred and alternative layouts. Impacts 1 – 12 therefore remain the same as the above table.	-	Mitigation measures for impacts 1 – 12 remain the same for the preferred and alternative layout.	-
Watercourses			

⁸ See Appendix H for more details.

2. Impacts 13 and 14 remain the same for both layout alternatives however the significance of the risk is slightly higher since there are more watercourses and wetlands crossed by the pipeline in the alternate route (227 watercourses compared to 152 in the preferred layout).	12 (high)	Mitigation measures for impacts 13 and 14 remain the same for the preferred and alternative layout. The significance of the risk, after mitigation, is slightly higher due to the greater amount of watercourses and wetlands crossed in the alternate layout.	10 (med)
Fauna & Flora			
3. Impacts 15 and 16 remain the same for both layout alternatives since a similar amount of indigenous vegetation will require clearing.	-	Mitigation measures for impacts 15 and 16 remain the same for both alternatives.	-
4. Loss of riparian vegetation during excavation for pipework crossings on watercourses, leading to erosion and damage to stream banks.	10 (med)	The same mitigation measures apply as the preferred alternative however the significance is slightly higher since there are more watercourses crossed in the alternate layout.	9 (med)
5. Clearance of vegetation from within the Bazini Forest Complex (endangered).	13 (high)	A section of the initially proposed pipeline route passed through a narrow undisturbed patch of Bazini Forest Complex (south-west of Project Area 1). Approximately 1200m ² of forest would need to be cleared to accommodate the pipeline. A permit from DAFF would need to be acquired and the area suitably rehabilitated post-construction. This forested area has been avoided in the preferred layout. This impact has therefore been avoided in the preferred layout.	12 (high)
6. Impact 19 remains the same for both layout alternatives.	-	Mitigation measures remain the same for both alternatives.	-
Operation			
7. Operational impacts 19 – 23 remain the same for both layout alternatives however the significance of the risk is slightly higher since there are more watercourses and wetlands crossed by the pipeline in the alternate route.	10 (med)	Mitigation measures for impacts 19 - 23 remain the same for the preferred and alternative layout. The significance of the risk, after mitigation, is slightly higher due to the greater amount of watercourses and wetlands crossed in the alternate layout.	7 (med)
Decommissioning			
8. Decommissioning impacts remain the same for both the preferred and alternate layouts.	-	Mitigation measures remain the same for the preferred and alternate layouts.	-
Cumulative			
9. Cumulative impacts 25 - 27 remain the same for both the preferred and alternate layouts.	-	Mitigation measures remain the same for the preferred and alternate layouts.	-

6.4 Environmental Impact Statement as per section (l)

The key impacts associated with the Harding-Weza Water Supply Scheme relate to those during the construction period. Issues such as the clearing of indigenous vegetation, physical damage to the watercourses and wetlands and managing erosion need to be addressed by the contractor. These impacts can be best managed by clearly demarcating the area requiring clearing (i.e. width of the trench), treating the watercourses as sensitive areas where no vehicles are allowed to excavate near and implementing effective erosion control measures at the crossings (i.e. gabions or reno-mattresses). All construction activity is to be confined to the side of existing roads, footpaths and servitudes, where feasible. All vehicles must remain on the existing roads and operate within the existing routes. No ad hoc roads/ turning circles may be created in the surrounding indigenous vegetation.

Once construction is complete there should be no significant impacts related to the operation of the water pipeline. Taking into consideration the above impacts and mitigation measures, it is the EAP's opinion that the Harding-Weza Water Supply Scheme (Reticulation) be authorised, as per the preferred Alternative Layout 2 in Appendix A.

6.5 Impact Management Objectives and Outcomes for the Development for Inclusion in the EMP 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 watercourse.
 - 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 to come.

6.6 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 Heritage, Aquatic and Wetland assessments. The design drawings and typical cross sections through the watercourses, have been provided to the EAP by the engineer. The EAP is therefore satisfied that there are no gaps in knowledge relating to this assessment.

6.7 Period for Which Authorization Is Required, Proposed Monitoring and Auditing and Post Construction Requirement's

Environmental authorisation is required for the construction of the water scheme towards the end of 2017 / beginning of 2018. It is therefore recommended that the authorization be valid for a period of five 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. The ECO is to comment on the status of the vegetation associated with all disturbed areas to ensure that rehabilitation has been conducted effectively. As recommended in the Aquatic Assessment, cleared surfaces are to be re-vegetated with *Cynodon dactylon*, *Sporobolus aficana* and *Eragrostis curvula*.

6.8 Financial Provisions as Per Section 3(s)

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

6.9 EAP Opinion on Whether or Not to Authorize Activity and Recommendations & Conditions for Authorisation as Per Section 3(n) and (p)

Impacts associated with the construction and operation of the pipeline have been rated as 'low' after mitigation (see Table 1 above) however the following conditions are recommended for inclusion in the authorisation:

Stakeholders, Properties & Services

- As standard construction practice the engineer and contractor should identify all existing services that may be affected prior to construction.
- Any structures that need to be removed, should be replaced and any damage repaired.
- The pipeline route must run adjacent to existing roads, footpaths and services, wherever feasible.
- Environmental induction at the start of the construction is to be conducted and proof retained in the site file.

Traffic & Construction Vehicles

- Appropriate signage and trench demarcation must be used to cordon off construction areas.
- All construction vehicles should be fitted with the appropriate silencers and exhausts.
- Speed limits must be obeyed.
- Existing roads must be used with no ad hoc roads being created.

Housekeeping, waste management, storage and materials handling

- Littering must not be permitted on site.
- All hazardous materials and substances should 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.
- 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 15m of any watercourses.

Dust and erosion control

- A water cart should be available to dampen dusty surfaces and suppress dust, if necessary.
- Exposed areas should be rehabilitated and re-vegetated as soon as possible during construction.
- Areas exposed to erosion must be protected through the use of sand bags, berms and efficient construction processes i.e.: limiting the extent (footprint) and duration period that areas are exposed.

Stormwater management

- The engineer/contractor must ensure that only clean stormwater runoff enters the environment. Any contaminated run off must be collected and disposed of.
- No excavated material or fill material may be stored within or directly adjacent to the watercourses / wetlands.
- Only the area directly in the path of the trench may be cleared of vegetation.
- The contractor must ensure that invasive species do not gain a foothold along the cleared route until the indigenous vegetation has had time to re-establish itself.
- Heavy vehicles should avoid working near the watercourses as much as possible. Trenches to preferably be dug by hand.
- Once construction is complete, it must be ensured that no material whatsoever is left in the stream channels or near the banks where it may be washed into the watercourses in a high flood event. It is recommended this material be removed from site entirely if it is not used in the construction process.
- During the excavation of trenches, flows must be diverted around the active work areas to prevent channelled flow.

Trenching

- Only the minimum area required for the trench may be cleared.
- Trenches must not remain open indefinitely.
- Trench work must be completed in sections and then closed once the pipe has been laid in that section.
- Cleared areas may not be left exposed for long periods of time and must be re-vegetated at each stage of pipework is completed.
- Trenches must not remain open during building shut down periods i.e. over Christmas and Easter.
- Soil in the trenches must be compacted effectively to the same level or higher than the surrounding land to prevent settling which could create depressions for water to travel along, creating erosion funnels and exposing the pipeline.
- Indigenous grasses must be replanted after the soil has been compacted and that this vegetation has taken successfully before contractors leave the site.
- Trench rehabilitation must be effectively carried out before contractors leave the site, especially where approaching the watercourse crossings and on steeper hills.

- No large trees and forests are to be cleared from the western section of Project Area 1 where the pipeline passes through the Bazini Forest Complex Ecosystem.

Watercourse crossings

- All watercourses (including wetlands) must be identified and demarcated at the start of construction.
- Work in stream beds should preferably be carried out during winter when flow rates are lower.
- Erosion protection features (i.e. gabions) must be installed at the watercourse crossings if there are no existing structures.
- Pipework must be laid in the river bed flush with the bedrock or the stream bed so as not to create a point for erosion.
- A buffer of 15m is to be maintained around the watercourses and wetlands (excluding the actual crossings).

Protection of Heritage Resources

- A buffer of 20m is to be maintained around any graves that are encountered during construction.
- Attention is drawn to the South African Heritage Resources Act, 1999 and the KwaZulu-Natal Heritage Act which, requires that operations that expose archaeological or historical remains should cease immediately, pending evaluation by the provincial heritage agency.

Appendix A: Drawings & Maps

Appendix B: Specialist Reports

Appendix C: Proof of Placement of Notice Board

Appendix D: Proof of Notification

Appendix E: Advert

Appendix F: Registered I &Aps

Appendix G: Comments and Responses Received

Appendix H: Impacts Scoring Matrix

Appendix I: EAP Declaration and Curriculum Vitae

Appendix J: Environmental Management Programme

Appendix K: Photographs