ETHEKWINI MUNICIPALITY: WATER AND SANITATION

CONSTRUCTION OF NORTHERN AQUEDUCT AUGMENTATION PIPELINE DEVIATION AND RESERVOIR

Draft Basic Assessment Report

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Author:	Michelle Guy
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Checked by:	Tarryn Curtis
Approved by:	Tarryn Curtis
Signature:	
For:	SiVEST SA (Pty) Ltd.

Confidentiality Statement

ETHEKWINI MUNICIPALITY: WATER AND SANITATION

CONSTRUCTION OF NORTHERN AQUEDUCT AUGMENTATION PIPELINE DEVIATION AND RESERVOIR

DRAFT BASIC ASSESSMENT REPORT

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EXECUTIVE SUMMARY

INTRODUCTION AND PROJECT DESCRIPTION

SiVEST SA (Pty) Ltd has been appointed by Aurecon, on behalf of the eThekwini Municipality: Water and Sanitation Department, to undertake the Basic Assessment (BA) Process for changes/deviations to Phase 3 of the Northern Aqueduct Augmentation (NAA) Pipeline in line with the National Environmental Management Act, 1998 (Act 107 of 1998).

This project as a whole (Phase 1, 2 and 3) was authorised by the Department of Agriculture and Environmental Affairs (DAEA) in August 2012. While Phase 3 of the NAA was approved in principle as part of an initial EIA application, amendments to this portion of the pipeline are required. A significant portion of the preliminary pipeline route for Phase 3 of the NAA was proposed within Provincial, District or Local road servitudes or reserves. However, more recent discussions with the Department of Transport (DoT) indicate that future road expansion plans may be impacted by the proposed horizontal pipeline alignment, and the pipeline needs to be realigned to run outside of the road reserve in order to avoid the future road plans proposed by DoT. This readjustment necessitated a deviation in the pipeline across a new watercourse.

The changes requiring approval in this Basic Assessment include:

- Change in location of the 20ML Ntanda Reservoir which will be a reinforced concrete reservoir with a full supply level of 410 metres above sea level (masl) or lower;
- The construction of a booster pump station to pump water to a proposed 1ML break pressure tank/reservoir;
- The construction of a DN 350 steel pipeline which will link to the booster pump station and run across the valley to connect back into the already approved pipeline to the 1ML break pressure tank/reservoir.

Note: The break pressure tank/reservoir has already been approved as part of the initial application and will not form part of this approval.

The DN steel 600 pipeline (already approved) will terminate at the inlet valve chamber located immediately upstream of the Ntanda Reservoir, which is a 20ML reinforced concrete reservoir. The booster pump station will be constructed to pump water to a reservoir/break pressure tank (already approved) situated 3km away. The distance of the deviation from the pump station to connect into the already approve line is approximately 400m long.

Please refer below to a layout of the changes requiring approval (layout attached in **Appendix C**):

Figure 1: Reservoir and pipeline deviation requiring approval

APPLICABILITY OF NEMA EIA REGULATIONS, 2014 (AS AMENDED IN 2017)

The following listed activities have been triggered:

Table 1: Listed activities triggered by the development

Listing Notice	Activity	Description
GNR 327, April 2017 (Listing Notice 1)	<u>Activity 12</u> The development of (ii) infrastructure or structures with a physical footprint of 100 square metres or more;	The reservoir will be partially constructed within the 32m buffer of the wetland. An area of 1396.47m^2 (comprising of the reservoir and associated

Listing Notice	Activity	Description
	Where such development occurs (a) Within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; Excluding: (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared	earthworks) will be developed within the buffer. The site is situated within a rural area.
GNR 327, April 2017 (Listing Notice 1)	Activity 19 The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;	A 350DN pipeline will cross a narrow part of the Mzinyathi stream.

Listing Notice	Activity	Description
	but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; [or] (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.	
GNR 324, April 2017 (Listing Notice 3)	<u>Activity 12</u> The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (v) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans (xii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority	Patches of CBA have been identified in and around the pipeline deviation. For the most part the pipeline will follow an already existing walking path and therefore there is not likely to be large disturbance to the vegetation on site.

DETAILS OF ALTERNATIVES CONSIDERED

Four reservoir alternatives were investigated, including a position in which the reservoir was located outside of the wetland and buffer area. While this option was optimal considering the fact that it would be positioned outside of the buffer, as well as the fact that no additional approvals would have been required, it would have involved the expropriation of three families and was therefore considered an unfeasible option.

There are also a number of other considerations in choosing a site for a reservoir. The proposed 20 Mℓ Ntanda Reservoir is fed under gravity from the Northern Aqueduct pipeline. Based on the available pressure at the Ntuzuma off-take, the reservoir site needs to be selected so that the full supply level of the reservoir is 410 metres above sea level (masl) or lower. It is also preferable that the full supply level be above 380 masl to limit the pumping head required to the 1 Mℓ break pressure tank. This can be achieved with the reservoir location that the applicant is seeking approval for.

The topography of the selected reservoir site also took into account the option where minimum earthworks would be required to create the platform for the reservoir and booster pump station, i.e. sites located on steep slopes are not considered feasible. The selected site was also required to be close to the approved pipeline route and should be easily accessible for maintenance purposes.

The location of existing structures relative to the proposed reservoir position was also an important consideration to mitigate the risk of land expropriation or relocation of houses, as stated above. While it is the intention that no additional families will be relocated with the chosen reservoir position, discussion with property owners will need to be undertaken to obtain their consent.

The chosen pipeline deviation across the valley was confirmed once the correct positioning of the reservoir was finalised. The line chosen is through a narrow section of the drainage line and up an already existing footpath to ensure minimal disturbance to the environment.

Please refer to **Appendix C** for a map of the alternatives sites previously under investigation.

PUBLIC PARTICIPATION PROCESS UNDERTAKEN

The Public Participation Process has been undertaken in line with Chapter 6 of the EIA Regulations 2014 (as amended 2017).

SiVEST notified I&AP's via email of the availability of the report. Site notices were be placed around the vicinity of the site on 16th of April 2019. Adverts will be placed in the ezaseGagasini Metro and the Isolezwe.

Registered stakeholders will be provided with a further opportunity to provide comments. The Draft BAR will be made available for a 30 day comment period. The documents will also be made available on SiVEST's website (www.sivest.co.za/Downloads.aspx) for review and comment.

All issues that are raised during the review period for the DBAR (this report) will be recorded and addressed by the Environmental Assessment Practitioner (EAP) in a Comments and Responses Report (C&RR) attached to the Final BAR and the Final Report will be amended, as necessary based on issues or concerns raised (to be attached as **Appendix E** of the FBAR).

The Final BAR will be submitted to the ETDEA with all comments received and responses sent during the public comment period.

RECEIVING ENVIRONMENT

The Northern Aqueduct Augmentation Pipeline deviation is located in Nongweni in the Inanda area of the eThekwini Municipality, approximately 45km north of the Durban CBD. The main access is off the Curnick Ndlovu Highway/M25, onto Amatikwe Road and Mzunjani Drive before the tar road ends and becomes a dirt road for approximately 3.5km to the site.

The site is rural in nature with major impacts to the wetland systems including alien invasive plant encroachment within the wetland and its catchment as well as overgrazing by livestock.

IMPACT METHODOLOGY USED

The SiVEST Impact Assessment method, dated 28 July 2017 (attached as **Appendix G**) has been utilised to assess the following potential impacts identified in the assessment phase and presented in the following sections.

The method used in this impact assessment determines significance (can be both positive and negative) of an impact by multiplying the value of the environmental system or component affected by the magnitude of the impact on that system or component (System or Component Value x Impact Magnitude).

In this method, all significant impacts on the natural or biophysical environment are assessed in terms of the overall impacts on the health of ecosystems, habitats, communities, populations and species. Thus, for example, the impact of an increase in stormwater runoff generated by a development can only be assessed in terms of the impact on the health of the affected environmental systems.

Similarly, all significant impacts on the social and socio-economic environment are assessed in terms of the overall impacts to the quality of life, health and safety of the affected population, communities and/or individuals, with the exception of impacts on resources that are assessed on their own.

IMPACTS AND RISKS IDENTIFIED FOR THE PREFERRED ALTERNATIVE

Table 2: Summary of impacts and risks

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
Vegetation / Biodiversity Loss	The construction of the pipeline will result in the loss of vegetation however the loss will be minimal. The pipeline will cross the drainage line at a very narrow point and run up an already existing footpath. According to the wetland specialist, the drainage lines and wetland area is heavily invaded by alien invasive species. The construction of the reservoir and pipeline will also result in the clearance of a small amount of vegetation.	<u>Excavation</u> • The physical disturbance footprint (including moving and parking of machinery) must not encroach into any of the identified wetland habitat. • The physical disturbance footprint of construction, including moving and parking of vehicles and machinery must be limited to the smallest area possible • The alignment of the pipelines, together with the adjacent working area, must be clearly demarcated prior to the commencement of the excavations. The width of the working area within the freshwater ecosystems must be kept to a minimum (12m) to ensure that impacts on these systems are minimised. All activities must be restricted to within the demarcated working area. • The offset for the 12m wide working area must be as follows: o 2m for topsoil stockpile; o 2m for trench; o 2m for the sub- soil stockpile; and o 6m for the movement of a tracked excavator on only ONE side of the corridor <u>Trenching</u> • The vegetation must be carefully removed by hand in sods and suitably stored for replanting upon the completion of the backfilling process. • The size of the excavation of the crossing must be kept to a	Low Negative Impact	Medium Cumulative Impact	Local/District	Barely Reversible	Probable

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		minimum in order to minimise the extent of the disturbance to the freshwater ecosystems i.e. the minimum allowable width and depth must be implemented. <u>Revegetation</u> • It is critical that vegetation is established immediately after the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process must be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture must be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful. • The grass must be watered on a regular basis until the vegetation has established and adequate cover is achieved (should the wetland become drier during the dry season). • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture.					
Siltation/Erosion	Impact of erosion during construction	Erosion control methods must be implemented to ensure that erosion of the disturbed areas is kept to a minimum. The following recommendations must be	Low Negative Impact	Medium Cumulative Impact	Local area/district	Medium Term	Probable

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		implemented to prevent erosion and the generation of sediment: • It is critical that vegetation is established immediately after the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process must be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture must be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful. • The grass must be watered on a regular basis until the vegetation has established and adequate cover is achieved (should the wetland become drier during the dry season). • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. • The horizontal spacing between the diversion structures/berms will be determined by the gradient of the approach slopes. The number of berms to be constructed must be specified by the Environmental Control Officer (ECO) in consultation with an environmental engineer during construction; however, it is anticipated that approximately					

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		3 to 4 berms per approach should suffice. • The diversion berms must divert the water off the trench towards the downslope side of the wetland. Care must be taken to discharge water to areas where erosion will be minimised e.g. vegetated areas or existing formal drains. • Bio-degradable erosion control blankets must be considered to stabilise the disturbed areas on the steeper approaches to the wetlands where the risk of erosion of the soils is higher. The erosion control blankets must be implemented according to the supplier's specification. <u>Trenching</u> • The topsoil must be removed and stockpiled separately from the underlying sub-soil on either side of the trench. • The excavation must be carried out immediately prior to the laying of the pipeline foundations in order to minimise the time during which the trench remains open. • The excavated material must be protected from erosion if it is anticipated that it will remain exposed for any length of time. Stockpiles of this material must be positioned on either side of the trenches, keeping the top soil and the sub-soil separate.					
Development of hardened surfaces	Impact of hardened surfaces on biophysical components during construction	Erosion control methods must be implemented to ensure that erosion of the disturbed areas is kept to a minimum. The following recommendations must be implemented to prevent erosion and the generation of sediment: • It is critical that vegetation is established immediately after	Low Negative Impact	Low Cumulative Impact	Site	Long term	Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process must be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture must be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful. • The grass must be watered on a regular basis until the vegetation has established and adequate cover is achieved (should the wetland become drier during the dry season). • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. • The horizontal spacing between the diversion structures/berms will be determined by the gradient of the approach slopes. The number of berms to be constructed must be specified by the Environmental Control Officer (ECO) in consultation with an environmental engineer during construction; however, it is anticipated that approximately 3 to 4 berms per approach should suffice. • The diversion berms must divert the water off the trench towards the downslope side of the					

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		wetland. Care must be taken to discharge water to areas where erosion will be minimised e.g. vegetated areas or existing formal drains. • Bio-degradable erosion control blankets must be considered to stabilise the disturbed areas on the steeper approaches to the wetlands where the risk of erosion of the soils is higher. The erosion control blankets must be implemented according to the supplier's specification. <u>Trenching</u> • The topsoil must be removed and stockpiled separately from the underlying sub-soil on either side of the trench. • The excavation must be carried out immediately prior to the laying of the pipeline foundations in order to minimise the time during which the trench remains open. • The excavated material must be protected from erosion if it is anticipated that it will remain exposed for any length of time. Stockpiles of this material must be positioned on either side of the trenches, keeping the top soil and the sub-soil separate.					
Installation of pipeline: Impoundment of flows	Installation of pipeline: impoundment of flows	Where the proposed infrastructure crosses the wetland habitat, the following needs to be considered: • Where the infrastructure is unable to be aligned with existing services, the crossing must be planned at a narrow section and be perpendicular to the flow direction, minimising the amount of disturbance to the freshwater ecosystem and the risks of headward erosion. • Diversion structures must be constructed across the surface of the trenches to reduce runoff	Low Negative Impact	Medium Cumulative Impact	Site	Long Term	Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. <u>Backfilling</u> • The backfilling is to be carried out immediately after the necessary trench construction has been finalised. • The backfill material must be returned in the same order that it was removed i.e. the sub-soil replaced first, followed by the topsoil material closer to the surface. • The material must be well moistened and compacted in 100mm layers to ensure that a similar bulk density to surrounding areas is achieved. • The backfill material must be compacted to the same height as the natural ground profile i.e. the trenching activities must in no way alter the natural surface flows.					
Installation of pipeline: alteration of subsurface flows	Impact of installation of pipeline – alteration of subsurface flows	Where the proposed infrastructure crosses the wetland habitat, the following needs to be considered: • Where the infrastructure is unable to be aligned with existing services, the crossing must be planned at a narrow section and be perpendicular to the flow direction, minimising the amount of disturbance to the freshwater ecosystem and the risks of headward erosion.	Low Negative Impact	Medium Cumulative Impact	Site	Long term	Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		• Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. <u>Excavation</u> • The alignment of the pipelines, together with the adjacent working area, must be clearly demarcated prior to the commencement of the excavations. The width of the working area within the freshwater ecosystems must be kept to a minimum (12m) to ensure that impacts on these systems are minimised. All activities must be restricted to within the demarcated working area. • The offset for the 12m wide working area must be as follows: o 2m for topsoil stockpile; o 2m for trench; o 2m for the sub- soil stockpile; and o 6m for the movement of a tracked excavator on only ONE side of the corridor <u>Trenching</u> • The vegetation must be carefully removed by hand in sods and suitably stored for replanting upon the completion of the backfilling process. • The size of the excavation of the crossing must be kept to a					

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		minimum in order to minimise the extent of the disturbance to the freshwater ecosystems i.e. the minimum allowable width and depth must be implemented. <u>Backfilling</u> • The backfilling is to be carried out immediately after the necessary trench construction has been finalised. • The backfill material must be returned in the same order that it was removed i.e. the sub-soil replaced first, followed by the topsoil material closer to the surface. • The material must be well moistened and compacted in 100mm layers to ensure that a similar bulk density to surrounding areas is achieved. • The backfill material must be compacted to the same height as the natural ground profile i.e. the trenching activities must in no way alter the natural surface flows.					
Biodiversity: Loss of habitat for flora	The clearing of land reduces the available habitat for floral species. Fauna is reliant on flora, as vegetation provides food and refuge for faunal species. This results in a local scale loss in ecosystem functionality and biodiversity and potentially reduces available habitat for red data species. Mitigation measures can reduce inevitable environmental damage to a state where long terms losses are negated.	• Footprint of the activity needs to be strictly adhered to. • A site specific Environmental Management Programme needs to be developed for the construction and operation phases. • An Environmental Control Officer (ECO) needs to be appointed for the duration of construction. • A search and rescue operation needs to be conducted by a suitably qualified ecologist to collect/capture species and species of special concern. • Permits for plants and animal collection/removal need to be obtained prior to search and rescue operations.	Low Negative Impact	Medium cumulative impact	Site	Long term	Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		• Strictly no removing of any floral species without the valid permits in place. • Clearance in the construction phase is to be remove in a phased approach, as and when it becomes necessary. • Sensitive areas need to be demarcated clearly before construction commences. • Where possible, construction should occur in the dry season to prevent soil loss through stormwater. • Where possible, manual clearance of the line and vegetation should be done so as to prevent the movement of machinery. • The contractor should implement an alien invasive control programme, particularly in areas where soil disturbance occurs. • Soil stockpiles need to be grassed with an indigenous mix or covered with shadecloth to prevent soil loss through wind and water erosion. • Strictly no trapping or hunting is allowed. • Rehabilitation should take place as soon as construction of the section of line is complete. • Strictly no littering. The contractor should highlight this at daily toolbox talks and site clean-ups should occur on a daily occasion. • A mix of indigenous grass species, should be used for rehabilitation.					
Biodiversity: Habitat fragmentation	The loss of habitat and lack of habitat continuity may lead to habitat fragmentation. This will result in an edge effect. Ecological corridors, through Ecological	• Ecological corridors need to be monitored and maintained for establishment of alien invasive plants and erosion. • Six monthly checks of the area should take place for the emergence of species.	Low negative impact	Medium cumulative impact	Local/district	Medium term	Probable

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
	Support Areas aim to reduce edge effects. The edge effect can be mitigated with linear activities and if rehabilitated correctly, the habitat can return to its former state in minimal time.						
Air/Dust Pollution	Dust could become a problem during construction, especially on windy days. This is as a result of the developments proximity to residential areas. Air pollution may occur in the vicinity of the site and the immediate surrounds during the construction phase as a result of: • Exhaust fumes from heavy vehicles and machinery, in particular poorly serviced vehicles • Dust from exposed surfaces and soil stockpiles picked up by wind • Dust on haulage and access roads emitted into the air by construction vehicles • Odours downstream of inappropriate and mismanaged chemical toilets	• All exposed stockpiles must be covered with hessian sheeting when not in use or dampened by a watercart at regular interval if in use. • The site must be dampened at regular intervals and more frequently during windy conditions. • Exposed areas where no construction will take place must be vegetated as soon as possible. • Dust generating construction activities must be avoided during strong winds. • Management (including storage, transport, handling and disposal) of hazardous substances that have the potential to become airborne during construction must be carefully managed. • Un-surfaced construction roads and bare surfaces within the construction site must be regularly wetted during dry conditions. A suitable dust palliative must be applied if wetting is ineffective. • Soil loads in transit must be kept covered or wetted. • Servicing of vehicles must occur off site to limit gaseous emissions. • Chemical toilets must be placed on site and must be maintained on a daily basis. • Burning of waste is forbidden.	Low Negative Impact	Negligible Cumulative Impact	Site	Short Term	Probable

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
		• The maximum speed limit for construction vehicles travelling on un-surfaced construction roads within the site is 25km/hour. • A dust complaints register must be kept within the camp site offices for the entire construction phase. • These measures are contained within the EMP and must be monitored to ensure compliance.					
Noise	The generation of noise (from earth moving machinery, piling works etc.) during the construction phase may result in the disturbance to neighbouring residents. Noise generated by delivery vehicles, earth moving machinery, piling works and the workforce have the potential to impact negatively on people living and/or working along the property boundaries and in relatively close proximity to the proposed development. The negative impacts could result in an increase in stress and frustration and associated health implications. Disturbance may also be caused by construction starting too early or finishing too late. However, this impact is likely to be sporadic and relatively short.	• Construction activities must only take place within agreed working hours. • A complaints register must be kept at all times. • Construction staff must be provided with training regarding noise prevention and antisocial behaviour/conduct.	Low Negative Impact	Negligible Cumulative Impact	Site	Short Term	Possible
Job Creation	A number of jobs will be created during the construction phase of the project.	The construction process should use a local labour force as much as possible.	Medium Positive Impact	High Cumulative Impact	Medium	Short Term	Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
	For those unemployed in the area, should local labour be utilised, the creation of short-term construction jobs would improve their economic well-being for the period of construction and may lead to further employment opportunities through skills enhancement and experience. Economic well-being is generally regarded as an important contributor of individual quality of life, especially for those unemployed and struggling to makes ends meet. The positive impacts of the aqueduct extension will largely be centred on the construction process and the employment and income multiplier effects that will result from it. These can be calculated by examining the cost of the pipe and average man hours required to lay each section of the pipe. The aqueduct extension will not create any permanent employment but will create a temporary injection of employment and income into areas through which the pipe is laid.						
Land Expropriation/Relocation of households	There is the potential for three households to be re-located during the construction of the reservoir. The earthworks from the reservoir extend approximately 10m away from existing structures	The location of the reservoir was chosen to minimize the number of household that would have to be removed. The current reservoir location and earthworks is approximately 10m away from any households and the need to relocation is therefore unlikely. However,	High Negative Impact	High Cumulative Impact	Medium	Permanent	Unlikely

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
	and do not directly impact their properties. Discussions with property owners still have to be undertaken to obtain their consent.	discussions with landowners will still need to be undertaken to obtain their consent. While the relocation of households is a high negative impact, alternative housing will be made available for people should this become a reality.					
Risk of rupture of pipeline to the environment	A rupture in the pipeline has the potential to cause localised damage to the area surrounding the rupture. Steel pipelines seldom rupture in a dramatic fashion, and water loss is usually a gradual event as opposed to a single large event. There are a number of factors that can contribute to pipe failure. These include inherent flaws in the pipe, operational faults, and third party damage. There will be a number of management policies in place to ensure that the pipe integrity is maintained. Pipelines are now designed with a factor of safety enabling pipes to withstand pressure much higher than that which it is subjected to. The steel pipelines which are to be used in projects of this nature are catholically protected to prevent pipelines from eroding thereby decreasing the risk of rupture. The pipe will be coated and lined to prevent corrosion. Pipe material, design, construction and maintenance will be in accordance with all	• Requires effective project management • Requires stringent testing prior to operation • Requires regular maintenance and management Set notification, warning and contingency plans and emergency procedures	Low Negative Impact	High Cumulative Impact	Site	Short Term	Possible

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
	applicable South African standards, guidelines and legislation, as well as certain international specifications. Potable water is not considered a pollutant in the event of pipe rupture. Pipe rupture is unlikely to cause any environmental pollution, but may cause significant environmental and infrastructural damage (unrelated to ground water).						
Provision of basic services	Once the NAA is complete through Ogunjini the positive impacts of having access to higher water availability in the area will have a positive impact the potential business growth of the area. As access to basic municipal services is an important contributor to overall quality of life, it is likely that households will experience a substantial improvement in their living conditions and quality of life.	n/a	Very High Positive Impact	High Cumulative Impact	Very High	Permanent	Definite
Loss of opportunities for provision of basic services	The benefits of the proposed NAA will be largely social and economic in nature, and are considered to be very important positive impacts given South Africa's need to improve the basic services to peripheral communities. If Phase 3 of the NAA does not go ahead, the provision of bulk water infrastructure necessary in the long term to eventually ensure	n/a	Very High Negative Impact	High Cumulative Impact	Very High	Definite	Definite

Environmental Aspect	Summary of Implications and Mitigation		Assessment of Environmental Impacts				
	Potential Impacts	Mitigation	Significance after mitigation	Consequence	Extent	Duration	Probability
	adequate potable water supply to the communities within the north eastern portion of Durban will not be realised.						
No requirement for land expropriation/relocation of households	While the need for land expropriation for the construction of the reservoir is unlikely and not yet confirmed, should the pipeline not go ahead, no households will have to be relocated and can continue to live as they have been.	n/a	High positive impact	High Cumulative Impact	Medium	Permanent	Definite

POSITIVE AND NEGATIVE IMPACTS OF THE NORTHERN AQUEDUCT PIPELINE DEVIATIONS

Table 3: Summary of impacts of NAA deviations

Impact	Pre-mitigation	Post-mitigation
Impacts on Biophysical Systems / Components during the construction phase		
Vegetation/Biodiversity Loss	Medium negative impact	Low negative impact
Soil Erosion	Medium negative impact	Low negative impact
Development of hardened surfaces: Flow changes and/or erosion	Low negative impact	Low negative impact
Installation of pipeline: Impoundment of flows	Medium negative impact	Low negative impact
Installation of pipeline: Alteration of subsurface flows	Medium negative impact	Low negative impact
Biodiversity: Loss of flora	Medium negative impact	Low negative impact
Biodiversity: Habitat fragmentation	Medium negative impact	Low negative impact
Impacts to Socio-Economic Component during the construction phase		
Air / dust pollution	Low negative impact	Low negative impact
Noise	Low negative impact	Low negative impact
Job creation	Medium positive impact	No mitigation required
Land expropriation/relocation of households (if applicable)	High negative impact	No mitigation possible
Impacts to Biophysical Systems/components during the operational phase		
Rupture of pipeline	Medium negative impact	Low negative impact
Impacts to Socio-Economic component during the operational phase		
Provision of basic services	Very high positive impact	No mitigation required
No-go Alternative		
Loss of opportunities for provision of basic services	Very high negative impact	No mitigation possible
No requirements for land expropriation	High positive impact	No mitigation required

ENVIRONMENTAL IMPACT STATEMENT:

The existing Northern Aqueduct system has reached capacity on various sections of the trunk mains as a result of growth in demand over the years. The eThekwini Municipality Water and Sanitation Department (EWS) have recognised the need to meet the predicted water demands of consumers within the north eastern portion of the eThekwini Metropolitan boundary. In order to achieve these demands, the Northern Aqueduct Augmentation project was initiated by the EWS Department. This project was authorised in three Phases by the Department of Agriculture and Environmental Affairs (DAEA) in August 2012. Phase 1 and 2 have already been constructed.

Phase 3 has been approved for construction, with the exception of a minor deviation in the pipeline routing and change in location of a reservoir.

The changes requiring approval in this Basic Assessment include a minor deviation with a new watercourse crossing and the change in location of a reservoir and associated infrastructure. The changes are described as follows:

- Change in location of the 20ML Ntanda Reservoir which will be a reinforced concrete reservoir with a full supply level of 410 metres above sea level (masl) or lower;
- A booster pump station will be constructed to pump water to a proposed 1ML break pressure tank/reservoir;
- A DN 350 steel pipeline which will link to the booster pump station and run across the valley to connect back into the already approved pipeline to the 1ML break pressure tank/reservoir.

The DN steel 600 pipeline (already approved) will terminate at the inlet valve chamber located immediately upstream of the Ntanda Reservoir, which is a 20ML reinforced concrete reservoir. The booster pump station will be constructed to pump water to a reservoir/break pressure tank (already approved) situated 3km away. The distance of the deviation from the pump station to connect into the already approve line is approximately 400m long.

According to the EThekwini Municipalities SDP, at the end of November 2016, the water backlog stood at 56 388 households. The National Development Plan requires that all municipalities in South Africa prioritise development in rural areas, similar to the area in which the pipeline and reservoir have been located. The provision of basic services is a critical element in the national developmental agenda. Water, electricity, sanitation and social amenities are key and critical services which have been identified by communities that are required to meet their basic needs. Limited funding and exponential growth in the municipality has increased the levels of backlogs.

Projects such as the Northern Aqueduct Augmentation pipeline are critical as a step towards meeting the needs of the communities in terms of supplying basic services and reducing the service backlogs. The desirability of the NAA project stems from the fact that it successfully addresses many of the constraints present and anticipated in the future for water shortages in the north of eThekwini municipality. The initial positive impacts of the aqueduct extension will largely be centred on the construction process and the employment and income multiplier effects that will result from it. The aqueduct extension will not create any permanent employment but will create a temporary injection of employment and income into areas through which the pipe is laid.

Once the NAA is complete through Ogunjini the positive impacts of having access to higher water availability in the area will have a positive impact on the potential business growth of the area. While the majority of impacts are temporary in nature, the over-arching benefit of the total project – the significant increase in local supply of potable water, will have a longer term positive impact on the socio-economic spheres.

A Wetland Assessment was undertaken (refer **Appendix F**) to identify the extent of wetland in the area surrounding the deviation as well as the impact of the development on the wetland systems. Two wetland systems were identified within the study area that will be directly impacted upon by the proposed pipeline infrastructure. The proposed reservoir and pump station will not have any direct impact upon any wetland systems, however,

the infrastructure will be located within the catchment area of a wetland unit. Both wetland units have been impacted upon by alien invasive plant encroachment, overgrazing and minor channel incision in the catchment.

It was identified that, from a biodiversity point of view, the wetlands within the study area are considered to be of low value as they are generally dominated by disturbance tolerant and alien invasive plant species. The proposed development will not impact upon the service provision of any of the HGM units within the study area. This is largely due to the proposed location of the reservoir and pump station, which is not directly within any wetland habitat. The proposed pipeline will cross both HGM Unit 1 and 2. However, due to the limited extent and magnitude of the impact, it is not anticipated to impact the ecosystem service provision of the effected wetlands.

The wetland systems associated with the proposed development would be a D category. A D category indicates that the wetlands have a low/marginal ecological importance and sensitivity. The post-development scenario, indicates that there will be no loss of wetland habitat. Pipelines, like all linear features, tend to have spatially limited impacts unless they interrupt driving processes that shape freshwater ecosystems.

The specialist recommended that, in order to avoid unnecessary loss of wetland habitat, it is important that the prescribed construction phase mitigation measures, as included in the EMP and appropriate leak detection systems are adopted. This is especially important given the close proximity of the proposed pump station and reservoir to HGM Unit 1.

A Vegetation Assessment was undertaken to identified any species of biodiversity significance. A total of 108 plant species were recorded during the field survey, of which 46 were alien. Six (6) plant species protected by Provincial Legislation were noted within the development site. Although the general vegetation type is classified as endangered, the ground-truthing exercise identified the area as transformed from natural and exhibits a Medium-low conservation value. If mitigation measures for the pipeline routing are correctly implemented and the rehabilitation of the pipeline and reservoirs is successful, minimal disturbance of environment will be seen. The provincially protected species will need to be removed or relocated and permits for their removal will need to be obtained from Ezemvelo KZN Wildlife and DAFF.

A Heritage Impact Assessment was undertaken for the entire pipeline in June 2011. No red flag heritage sites were identified along the route, however it was identified that permits would be required for the partial destruction of three sites along the route. The updated information, including a layout of the new reservoir location and pipeline deviation was uploaded onto the Sahris Online Applications Website for comment from Amafa. Amafa confirmed that they have no objection to the proposed deviation but requires new permit applications relating to the identified resources as they have expired. New permit applications have been submitted to Amafa for approval.

Under natural conditions, the surrounding landscape and study area would have been characterised by particular vegetation types. The historical dominant vegetation type present would have been the KwaZulu-Natal Coastal Belt (CB3), which falls under the Indian Ocean Coastal Belt (CB) Group 2 bioregion (Nel et al. 2011; Mucina and Rutherford 2006).

A small amount of Critical Biodiversity Area (CBA): Irreplaceable was identified on site; however the pipeline for the most part avoids this area. The line where the DN350 pipeline runs up the valley to re-connect to the already approved pipeline is an existing walking path and therefore already highly disturbed. No DMOSS was identified

in the vicinity of the deviation area. In terms of the vegetation identified in and around the wetland units, the wetland specialist has noted for all wetland units that the major impacts to the systems include alien invasive plant encroachment.

A layout of overall site sensitivities is included in **Figure 2** below.

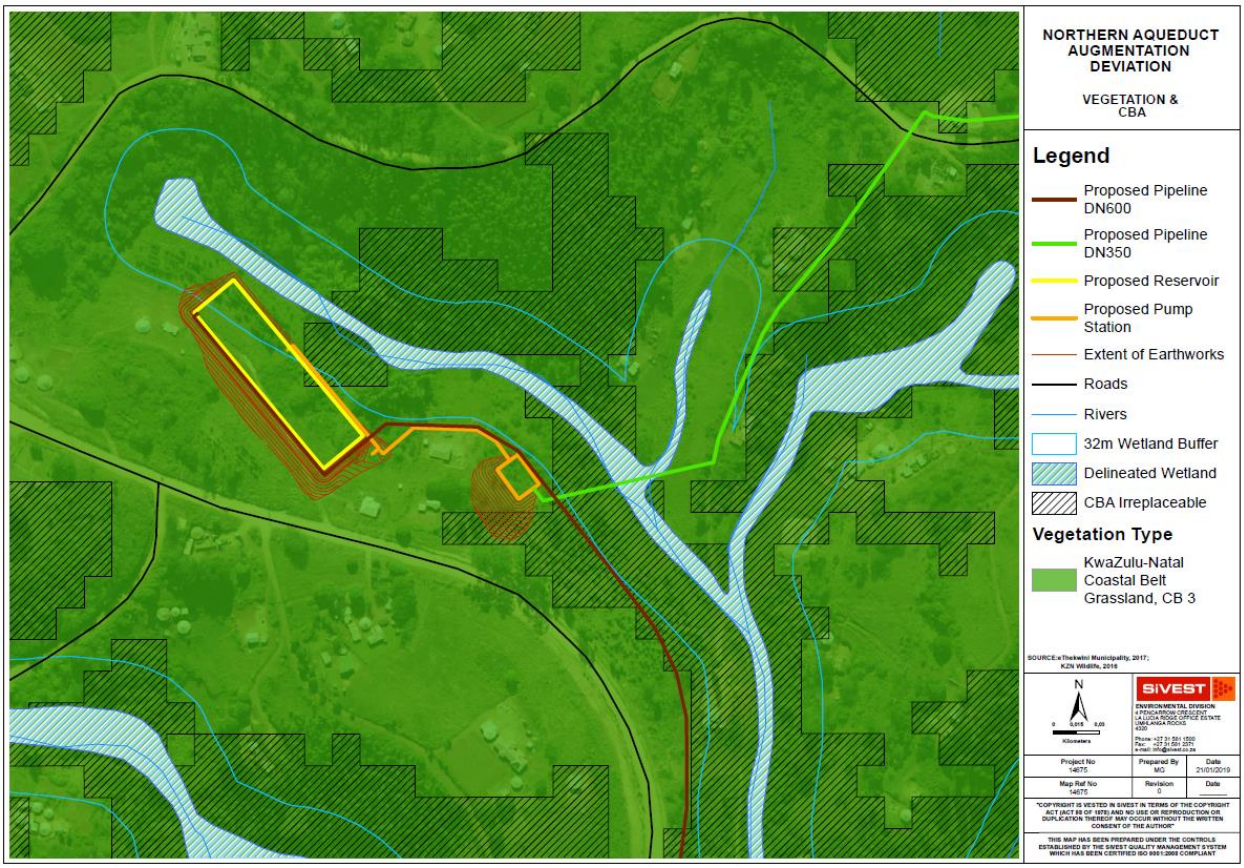

Figure 2: Site Sensitivities

In terms of impacts to biophysical systems during construction (i.e. impacts to vegetation and wetlands), the impacts were mostly medium negative impacts. However, with adherence to the mitigation measures, which have been include in the EMPr, all biophysical impacts during the construction phase can be mitigated to low negative impacts. In terms of socio-economic impacts during construction, one impact, the potential for land expropriation, was rated as a high negative impact with no possibility of mitigation. However, the location of the reservoir was chosen to avoid the need for land expropriation and it is the intention of the applicant to avoid this process if possible. Consultation with the households living adjacent to the reservoir needs to be undertaken. The creation of temporary jobs was rated as a medium positive impact during construction. During the operational phase, the provision of basic services was rated as a very high positive impact.

In terms of the No-Go Alternative, the loss of opportunities for the provision of basic services was rated as a very high negative impact. The proposed Ntuzuma scheme is a sub-phase of the larger Northern Aqueduct scheme

that is developed to ensure a sustainable and assured water supply for the increasing water demands. eThekwini Municipality currently experiences frequent water shortages in the areas to be served by the Ntuzuma scheme as the existing infrastructure has reached its capacity. Not implementing the scheme would result in eThekwini Municipality not being able to deliver basic services to the residents within the project area.

ETHEKWINI MUNICIPALITY: WATER AND SANITATION

CONSTRUCTION OF NORTHERN AQUEDUCT AUGMENTATION PIPELINE DEVIATION AND RESERVOIR

DRAFT BASIC ASSSESSMENT REPORT

1. INTRODUCTION

SiVEST SA (Pty) Ltd has been appointed by Aurecon, on behalf of the eThekwini Municipality: Water and Sanitation Department, to undertake the Basic Assessment (BA) Process for changes/deviations to Phase 3 of the Northern Aqueduct Augmentation Pipeline in line with the National Environmental Management Act, 1998 (Act 107 of 1998).

The current water supply to the north eastern portion of the eThekwini Municipalities jurisdiction is via the existing Northern Aqueduct system. The Northern Aqueduct is operated by eThekwini Water and Sanitation and is a network of bulk supply pipelines that serve the eThekwini municipal area that generally lies north of the Umgeni River, south of the Ohlanga River and east of Ntuzuma.

The existing Northern Aqueduct system has reached capacity on various sections of the trunk mains as a result of growth in demand over the years. The eThekwini Municipality Water and Sanitation Department (EWS) have recognised the need to meet the predicted water demands of consumers within the north eastern portion of the eThekwini Metropolitan boundary. In order to achieve these demands, the Northern Aqueduct Augmentation project was initiated by the EWS Department. This project was authorised by the Department of Agriculture and Environmental Affairs (DAEA) in August 2012 (refer **Appendix I** for a copy of the Environmental Authorisation), and Phase 1 and 2 have already been constructed. The total length of the pipeline is 50km which was split into three phases.

Phase 1: Mainline, Phoenix 2 Reservoir to Umhlanga, Blackburn & Waterloo, Nyaninga Link & Phoenix 1 Reservoir Link (complete)
Phase 2: Mainline, Emachobeni – Phoenix 2 Reservoir (complete)
Phase 3: Ntuzuma to Ogunjini Pipeline, 20Ml Reservoir, Pump Station and 1Ml Surge Tank

While Phase 3 of the NAA was approved in principle as part of the initial application, amendments to this portion of the pipeline are required. A significant portion of the preliminary pipeline route for Phase 3 of the NAA was proposed within Provincial, District or Local road servitudes or reserves. However, more recent discussions with the Department of Transport (DoT) indicate that future road expansion plans may be impacted by the proposed horizontal pipeline alignment, and the pipeline needs to be realigned to run outside of the road reserve in order to avoid the future road plans proposed by DoT.

The proposed pipeline will be constructed through dense rural/informal residential settlements as well as low density residential settlements and runs predominantly through Ingonyama Trust land. The realignment

of the pipeline outside of the road reserve means that some unavoidable land expropriation and resettlement of residents will be required. All residents will be accommodated following the expropriation process. The realignment has been undertaken to ensure the least amount of expropriation occurs and where possible every effort has been taken to avoid this or minimise the impact. The realignment of the pipeline outside of the road reserve also means that the crossing points of watercourses will be shifted from their initial positions.

Following a meeting with EDTEA on the 21st of June 2018, as well as further email correspondence, it was confirmed that a Part 1 Amendment could be submitted for the majority of the 20km pipeline in which a small shift from the initial location is required. This amendment was submitted to EDTEA on the 17th of July 2018 and approved on the 3rd of October 2018 (approval attached in **Appendix I**).

An enquiry was submitted for the other changes required, which are described as follows:

- Change in location of a reservoir
- Shift in pipeline across a valley to re-connect to the approved pipeline, with the crossing of one new watercourse.

The outcome of the enquiry concluded that a Basic Assessment would be required for the length of pipeline crossing a new watercourse (and the resultant infilling) and the change in reservoir location as it is located within a rural area as well as within the buffer area of a wetland. These changes are the subject of this Basic Assessment.

The proposed changes triggers three activities in terms of the EIA Regulations of 2014 (as amended in 2017). The listed activities triggered are discussed in Section 7.2 below.

2. PROJECT TITLE

Northern Aqueduct Augmentation (NAA) Pipeline Deviation

3. DETAILS OF APPLICANT

3.1 Name and contact details of the Applicant

Table 4: Name and contact details of Applicant:

Business Name of Applicant	EThekwini Municipality: Water and Sanitation
Physical Address	3 Prior Road, Durban
Postal Address	P.O. Box 1038, Durban
Postal Code	4000
Telephone	031 311 8796
Fax	031 311 8699
Email	Devashan.govender@durban.gov.za

4. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTIONER AND SPECIALISTS

4.1 Name and contact details of the Environmental Assessment Practitioner (EAP)

Name and contact details of the EAP who prepared this report:

Table 5: Name and contact details of EAP

Business Name of EAP	SiVEST SA (PTY) Ltd
Physical Address	4 Pencarrow Crescent, La Lucia Ridge Office Estate
Postal Address	PO Box 1899, Umhlanga Rocks
Postal Code	4320
Telephone	031 581 1500
Fax	031 566 2371
Email	michelleg@sivest.co.za

4.2 Names and expertise of representatives of the EAP

Table 6: Names and details of the expertise of each representative of the EAP

Name of representative of the EAP	Educational Qualifications	Professional Affiliations	Experience (years)
Tarryn Curtis	BSc. Honours (Geography and Environmental Management)	IAIA	11
Michelle Nevette	MEnvMgt. (Environmental Management)	IAIA	19
Michelle Guy	MSc (Environmental Science)	IAIA	6.5

CV's of SiVEST personnel is attached in **Appendix A.** The EAP declaration is attached in **Appendix A**.

4.3 Names and expertise of the specialists

Table 7: Name and expertise of specialists

Name of representative of specialist	Position	Educational Qualifications	Experience (years)
Umlando Consulting	**Heritage Study**		
Gavin Anderson	Heritage Specialist	Masters of Philosophy in Archaeology/Social Psychology: 1996, UCT	24
Groundtruth	**Wetland Study**		
Matt Janks	Wetland Specialist	M.Sc (Botany) Pr Sci Nat: Ecological Science	4.5
Urban Econ Development Economists	**Socio-Economic Study**		

Name of representative of specialist	Position	Educational Qualifications	Experience (years)
Talia Feigenbaum	Socio-Economic Specialist	Master of Arts (M.A.) Development Studies (Economics), Development Economics and International Development	13
SiVEST Environmental	**Vegetation Assessment**		
Liandra Scott-Shaw	Vegetation Specialist	Bachelor of Science (Honours) Ecological Science: University of KwaZulu-Natal, 2009	6

The specialist studies and declarations are attached in **Appendix F**.

5. LOCATION OF THE ACTIVITY

5.1 21 Digit Surveyor General Code of the site

The Surveyor General code for the site is: N0FT00000000467500000.

5.2 Physical Address of the site

The site is located within the eThekwini Municipality, approximately 45km north-west of the Durban CBD. The main access is off the Curnick Ndlovu Highway/M25, onto Amatikwe Road and Mzunjani Drive before the tar road ends and becomes a dirt road for approximately 3.5km to the site. The site locality is attached in **Appendix B.**

5.3 Coordinates of the site

The coordinates for the site are as follows:

Latitude: 29°36'56.14"S
Longitude: 30°54'0.49"E

6. SITE DEVELOPMENT PLAN

The Site Development Plan (also included below) and sensitivity map is attached in **Appendix C**.

Figure 3: Site Development Plan

7. ACTIVITY INFORMATION

7.1 Project Description

The project as a whole comprises the following main components:

- A connection to the existing Northern Aqueduct pipeline at Ntuzuma;
- A DN 600 steel pipeline, approximately 14km long, that terminates at the proposed 20ML Ntanda Reservoir;
- The DN 600 steel pipeline will have a number of cross-connections to existing bulk water infrastructure to improve the level of assurance of supply to the Ntuzuma area;
- The 20ML Ntanda Reservoir will be a reinforced concrete reservoir with a full supply level of 410 metres above sea level (masl) or lower;
- At the same site as the 20ML Ntanda Reservoir is constructed, a booster pump station will be constructed to pump water to a proposed 1ML break pressure tank/reservoir

- A DN 350 steel pipeline, approximately 3 km long, will link the booster pump station and the 1ML break pressure tank; and
- A DN 300 steel pipeline, approximately 3 km long will be constructed from the 1ML break pressure tank to the existing Ogunjini Reservoir

The changes requiring approval in this Basic Assessment include:

- Change in location of the 20ML Ntanda Reservoir which will be a reinforced concrete reservoir with a full supply level of 410 metres above sea level (masl) or lower;
- A booster pump station will be constructed to pump water to a proposed 1ML break pressure tank/reservoir;
- A DN 350 steel pipeline which will link to the booster pump station and run across the valley to connect back into the already approved pipeline to the 1ML break pressure tank/reservoir.

Noted: The break pressure tank/reservoir has already been approved and will not form part of this approval.

The DN steel 600 pipeline (already approved) will terminate at the inlet valve chamber located immediately upstream of the Ntanda Reservoir, which is a 20ML reinforced concrete reservoir. The booster pump station will be constructed to pump water to a reservoir/break pressure tank (already approved) situated 3km away. The distance of the deviation from the pump station to connect into the already approve line is approximately 400m long.

The intention is to construct the pipeline by means of open trench excavation. The construction sequence would be as follow:

- Remove the topsoil layer (up to a depth of 500 mm) and stockpile;
- Excavate the rest of the trench to approximately 400 mm below the pipe invert level;
- Install a 300 mm thick layer of 19 mm stone to be wrapped in bidim (this is to allow permeability across the pipe trench);
- Install a 100 mm layer of sand;
- Install the DN 350 pipeline and backfill the trench with clean sand to a depth of 300 mm above the top of the pipe;
- Backfill the trench with the in-situ material from the trench excavation to a depth of 500 mm below the natural ground level and compact lightly;
- Backfill the balance of the trench with top soil material

7.2 NEMA Listed Activities

The amended EIA Regulations promulgated under Section 24(5) of the National Environmental Management Act, Act 107 of 1998 and published in Government Notice No. R. 326 list activities which may not commence without environmental authorization from the Competent Authority. The proposed activity is identified in terms of Government Notice No. R. 327 and Government Notice No. R. 327 for activities that must follow the Basic Assessment Process. The project will trigger the following listed activities:

Table 8: Listed activities triggered

Listing Notice	Activity	Description
GNR 327, April 2017 (Listing Notice 1)	Activity 12 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; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; Excluding: (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves; or (ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared	The reservoir will be partially constructed within the 32m buffer of the wetland. An area of 1396.47m^2 (comprising of the reservoir and associated earthworks) will be developed within the buffer. The site is situated within a rural area making this activity applicable.
GNR 327, April 2017 (Listing Notice 1)	Activity 19 The infilling or depositing of any material of more than 10 cubic metres	A 350DN pipeline will cross a narrow part of the Mzinyathi stream.

Listing Notice	Activity	Description
	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; but excluding where such infilling, depositing, dredging, excavation, removal or moving— (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; [or] (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies; (d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or (e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.	
GNR 324, April 2017 (Listing Notice 3)	Activity 12 The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. (v) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans (xii) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority	Patches of CBA have been identified in and around the pipeline deviation. For the most part the pipeline will follow an already existing walking path and therefore there is not likely to be large disturbance to vegetation on site.

8. KEY LEGAL AND ADMINISTRATIVE REQUIREMENTS RELATING TO THE PROPOSED DEVELOPMENT

The relationship between the project and certain key pieces of environmental legislation is discussed in the subsections to follow.

8.1 The Constitution of South Africa

The Constitution of the Republic of South Africa, Act 108 of 1996 sets the legal context in which environmental law in South Africa occurs and was formulated. All environmental aspects should be interpreted within the context of the Constitution, National Environmental Management Act 107 of 1998 and the Environment Conservation Act 73 of 1989.

The Constitution has enhanced the status of the environment by virtue of the fact that an environmental right has been established (Section 24) and because other rights created in the Bill of Rights may impact on environmental management through, for example, access to health care, food and water and social security (Section 27). An objective of local government is to provide a safe and healthy environment (Section 152) and public administration must be accountable, transparent and encourage participation (Section 195(1) (e) to (g)).

8.2 National Environmental Management Act, 1998 (Act No. 107 of 1998)

According to Section 2(3) of the National Environmental Management Act (NEMA) (Act No. 107 of 1998), “development must be socially, environmentally and economically sustainable”, which means the integration of these three factors into planning, implementation and decision-making so as to ensure that development serves present and future generations.

The proposed construction of the Northern Aqueduct Augmentation Pipeline Deviation requires authorisation in terms of NEMA and the Basic Assessment (BA) Process is being undertaken in accordance the EIA Regulations 2014 (as amended in 2017) that consist of the following:

- Listing Notice 1 - GN No. 327 (7 April 2017);
- BA procedure - GN No. 326 (7 April 2017);

The project triggers activities under Listing Notice 1 and thus needs to be subjected to a Basic Assessment Process. The listed activities are explained in Section 7.2 above.

8.3 The National Heritage Resources Act 1999 (25 of 1999)

The National Heritage Resources Act promotes good management of the heritage resources of South Africa which are deemed to have cultural significance and to enable and encourage communities to ensure that these resources are maintained for future generations.

The aim of the Act is to introduce an integrated, three-tier system for the identification, assessment and management of national heritage resources (operating at a national, provincial and local level). This legislation makes provision for a grading system for the evaluation of heritage resources on three levels which broadly coincide with their national, provincial and local significance.

Under the legislation the South African Heritage Resources Agency (SAHRA), was established, which replaced the National Monuments Council. SAHRA is responsible for the preservation of heritage resources with exceptional qualities of special national significance (Grade I sites). A Provincial Heritage Resources Authority, established in each province, will protect Grade II heritage resources which are significance within the context of a province or region. Buildings and sites of local interest (Grade III sites) is the responsibility of local authorities as part of their planning functions.

There is extensive national legislation covering heritage and archaeological sites. A Heritage Impact Assessment was undertaken for the entire pipeline in June 2011. No red flag heritage sites were identified along the route, however it was identified that permits would be required for the partial destruction of three sites along the route. The updated information, include a layout of the new reservoir location and pipeline deviation was uploaded onto the Sahris Online Applications Website for comment from Amafa. Amafa confirmed that new permits must be obtained for the partial destruction of three heritage sites. The application for new partial destruction permits was submitted on the 12th of February 2019.

8.4 National Water Act (Act 36 of 1998)

The National Water Act of 1998 pertains to the country's water resources. Moreover, this Act regulates issues including wastewater, the pollution of water bodies and the extraction and use of water resources.

The purpose of the act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in ways which take into account amongst other factors:

- Meeting the basic human needs of present and future generations;
- Promoting equitable access to water;
- Redressing the results of past racial and gender discrimination;
- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for growing demand for water use;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety;
- Managing floods and droughts.

And for achieving this purpose, to establish suitable institutions and to ensure that they have appropriate community, racial and gender representation.

In terms of the Northern Aqueduct Augmentation Pipeline Deviation Project, a meeting was held with the Department of Water and Sanitation on the 3rd of August 2018 to discuss the project as a whole and the deviations required in terms of this application. The Department requested that a Wetland Assessment be undertaken of the area in which the deviation is located before further consultation is undertaken. A Wetland Delineation, Functional Assessment and Risk Assessment was undertaken to identify the impacts of the deviation on the water resources. Another meeting was held with the Department on the 15th of February 2019, and they confirmed that a General Authorisation application is required. This process is underway.

The report is attached in **Appendix F.** Proof of correspondence with DWS is attached in **Appendix I.**

8.5 National Environmental Management: Protected Areas Act, 2003 (Act No.57 of 2003 as amended)

The overarching aim of the National Environmental Management: Protected Areas Act (NEMPAA) No. 57 of 2003, within the framework of NEMA, is to provide for:

- provide for the declaration and management of protected areas;
- provide for co-operative governance in the declaration and management of protected areas;
- effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
- provide for a representative network of protected areas on state land, private land and communal land;
- promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
- promote participation of local communities in the management of protected areas, where appropriate; and
- provide for the continued existence of South African National Parks.

The proposed project falls outside any protected areas and outside the areas earmarked as part of the National Protected Areas Expansion Strategy.

9. KEY DEVELOPMENT STRATEGIES AND GUIDELINES

9.1 EThekwini Municipality Spatial Development Framework

Reference is made to the eThekwini Municipality's Spatial Development Framework (SDF) 2017/2018 – 2021/2022 (Final report May 2018). The SDF is an integral component of the Integrated Development Plan (IDP) and a key spatial transformation tool which guides how the implementation of the IDP should occur spatially. The SDF is also aligned with provincial and municipal sector plans and strategies as a way of ensuring that the desired spatial form and outcomes of the Municipality are achieved.

The agenda of the SDF is built around a series of Sustainable Development Goals (SDGs) which aims to "make cities and human settlements inclusive, safe, resilient and sustainable". Include in the SDGs are the following:

- No poverty
- No hunger;
- Good health;
- Clean water and sanitation;
- Good jobs and economic growth;
- Innovation and infrastructure.

The SDF strives to respond to all the goals and targets within its mandate but of particular importance, amongst others, is to ensure access for all to adequate, safe and affordable housing and basic services and upgrade of slums by 2030.

EThekwini Municipality settlement patterns and densities are concentrated within the KwaMashu, Ntuzuma and Inanda area, amongst others. The density patterns have important implications for where people may wish to settle, commuting patterns, public transport and, within the context of this Basic Assessment, basic services and social facilities.

The National Development Plan requires that all municipalities in South Africa prioritise development in rural areas, similar to the area in which the pipeline and reservoir have been located. The provision of basic services is a critical element in the national developmental agenda. Water, electricity, sanitation and social amenities are key and critical services which have been identified by communities that are required to meet their basic needs. Limited funding and exponential growth in the municipality has increased the levels of backlogs.

At the end of November 2016, the water backlog stood at 56 388 households. To cater for the poverty-stricken population, the Municipality as part of its welfare package provides a basket of free basic services, including water, sanitation, electricity and refuse removal for informal and rural settlements. In addition, free basic water and sanitation services (up to (9 Kl/month) are supplied to households valued at less than R 250 000.

Projects such as the implementation of the Northern Aqueduct Augmentation pipeline are critical as a step towards meeting the needs of the communities in terms of supplying basic services and reducing the service backlogs.

In addition to this, the ability of ecosystems to assimilate pollution is being exceeded and the lack of basic services (i.e. water and sanitation) in informal areas has also put strain on natural resources which will also be addressed and hopefully improved by the provision of water.

9.2 Integrated Development Plan, 2017/2018

Reference is made to the eThekwini Municipality's Integrated Development Plan (IDP) 2017/2018 – 2021/2022 (Final report May 2017).

Similarly, the IDP serves as a tool for transforming local governments towards facilitation and management of development. From the outset the IDP outlines the cities commitment to ensuring the delivery of water and sanitation services and to this end the poor rural and township communities remains an area of focus.

Significant strides have been made by the municipality in ensuring adequate water supply however this still remains one of the main challenges and something that needs to be addressed.

The influx of people in rural areas has led to urbanisation in areas that were deemed rural and were serviced as rural settlements. The current reality has changed for a number of areas that are still regarded as rural in eThekwini (by virtue of land ownership) with densities of up to 30 dwelling units per hectare. This phenomenon is increasing pressure on the existing infrastructure and impacting on quality of life.

Some of the key issues and challenges relating to service delivery include:

- Limited funding available to deal with big backlogs
- Illegal water and electrical connections
- Inability of households to pay for basic services due to high level of poverty and unemployment
- Water loss which is significant in the municipality
- Ageing infrastructure

The Northern Aqueduct has been listed in the 2017/2018 IDP as part of the Water Services Development Plan (WSDP) for water provision within the eThekwini Municipality. The WSDP has been developed as one of the plans used to inform the City's IDP. The desired goals of the City's Water and Sanitation Department are to ensure that:

- All citizens have access to an appropriate, acceptable, safe and affordable basic water supply and sanitation service
- All citizens are educated in the healthy use of water and sanitation services and the wise use of water
- Water and sanitation services are provided –
    - equitably (adequate services are provided fairly to all people)
    - affordably (no one is excluded from access to basic services because of their cost)
    - effectively (the job is done well)
    - efficiently (resources are not wasted)
    - Sustainably (services are financially and environmentally sustainable).

As a result of the constraints stated above, huge housing provision backlogs have been experienced by the city. The Northern Aqueduct is an initiative to work towards decreasing that backlog and upgrading the ageing infrastructure.

10. NEED AND DESIRABILITY

In recent years, unprecedented growth in water demand in the western and northern supply areas of the eThekwini Municipality has led to capacity problems with existing bulk water supply infrastructure. The existing Northern Aqueduct system has reached capacity on various sections of the trunk mains as a result of growth in demand over the years. The Ntuzuma region which is supplied from a branch of the aqueduct in the Newlands East area, typically suffers from a shortfall in supply during the summer months. There are regions of Mzinyathi and Senzokuhle which are supplied from the Ntuzuma system which have to be manually isolated on a daily basis so that the Ntuzuma system does not run completely out of water. In

addition, planned developments in the north east will add a substantial new demand at the tail end of the Northern Aqueduct, exacerbating its capacity problems.

According to the EThekwini Municipalities SDP, the city is currently faced with a water backlog which stood at 56 388 households in 2016. The Northern Aqueduct Augmentation pipeline is an initiative that will assist eThekwini in servicing the large water backlog.

In keeping with the city's goals to make potable water more accessible to consumers and address water concerns in the municipality's northern region, the NAA scheme has been devised to address the pending water shortages experienced by consumers in the north.

The proposed Ntuzuma scheme is a sub-phase of the larger Northern Aqueduct scheme that is developed to ensure a sustainable and assured water supply for the increasing water demands. Not implementing the scheme would result in eThekwini Municipality not being able to deliver basic services to the residents within the project area.

11. MOTIVATION FOR THE DEVELOPMENT OF THE NORTHERN AQUEDUCT AUGMENTATION PIPELINE

The NAA project was authorised in August 2012 and Phase 1 and 2 has already been constructed. A Part 1 Amendment was undertaken in 2018 to approve the majority of the shift in pipeline in Phase 3. The deviations, which are the subject of this approval process, are required to connect one portion of the pipeline to the other portion, as minor changes to the route alignment have taken place as well as a change in location of one reservoir. A large amount of planning has gone into the route alignment and reservoir changes to ensure firstly, that there is minimal to no additional land expropriation, as well as the ensure that the impacts to the environment are kept to a minimum.

While Phase 3 was planned within the existing road and road reserve, this option is no longer viable as a result of the future expansion planned by DoT. The design team have had to reposition the pipeline outside of the road reserve while at the same time striving to have the least impact on the communities that live in the area. While it would be preferable for construction to occur within the road reserve, as stated above this is no longer possible.

According to the wetland specialist, the infrastructure will not significantly impede/alter flow characteristics in the long term and, given that they are water pipelines, will not pose any long-term risks in terms of water quality - potable water is not considered a pollutant in the event of pipe rupture. The wetland specialist has further stated that post-development scenario indicates that there will be no loss of wetland habitat during the construction of the NAA deviations. Therefore, the deviation required is not going to have a large impact on the environment and should be approved so that Phase 3 of the NAA can go ahead.

The construction of the Northern Aqueduct Augmentation Pipeline is extremely important as a means to help alleviate the capacity problems (stemming from increased demand) with existing bulk water supply infrastructure in Durban. The large water backlog is the biggest motivation for the development of the pipeline, as a large amount of people will be served by the construction of this scheme of the Northern

Aqueduct Augmentation Pipeline. Should the scheme not be implemented, the municipality will fail to deliver basic services to the residents in the project area, and will not contribute towards achieving one the Sustainable Development Goals which is clean water and sanitation.

12. DETAILS OF ALTERNATIVES CONSIDERED

12.1 Site alternatives

Various options were investigated for the reservoir and pipeline deviations. A layout showing the reservoir location options is included below and attached in **Appendix C**.

Four reservoir options were investigated, including a position in which the reservoir was located outside of the wetland and buffer area. While this option was optimal considering the fact that it would be positioned outside of the buffer, as well as the fact that no additional approvals would have been required, it would have involved the expropriation of three families and was therefore considered an unfeasible option.

There are also a number of other considerations in choosing a site for a reservoir. The proposed 20 Mℓ Ntanda Reservoir is fed under gravity from the Northern Aqueduct pipeline. Based on the available pressure at the Ntuzuma off-take, the reservoir site needs to be selected so that the full supply level of the reservoir is 410 masl or lower. It is also preferable that the full supply level be above 380 masl to limit the pumping head required to the 1 Mℓ break pressure tank. This can be achieved with the reservoir location that the application is seeking approval for, identified in the Site Development Plan attached in **Appendix C**.

The topography of the selected reservoir site also took into account the option where minimum earthworks would be required to create the platform for the reservoir and booster pump station, i.e. sites located on steep slopes are not considered feasible. The selected site was also required to be close to the approved pipeline route and should be easily accessible for maintenance purposes.

The location of existing structures relative to the proposed reservoir position was also an important consideration to mitigate the risk of land expropriation or relocation of houses as stated above. While it is the intention that no additional families will be relocated with the chosen reservoir position, discussion with property owners will need to be undertaken to obtain their consent.

The chosen pipeline deviation across the valley was confirmed once the correct positioning of the reservoir was finalised. The line chosen was through a narrow section of the drainage line and up an already existing footpath to ensure minimal disturbance to the environment.

Figure 4: Reservoir Alternatives

12.2 No-go alternative

In terms of the No-Go Alternative, should the scheme not be implemented, the Northern Aqueduct Augmentation Pipeline would fall short of contributing towards reducing the large water backlog in the eThekwini Municipality.

The proposed Ntuzuma scheme is a sub-phase of the larger Northern Aqueduct scheme that is developed to ensure a sustainable and assured water supply for the increasing water demands. eThekwini Municipality currently experiences frequent water shortages in the areas to be served by the Ntuzuma scheme as the existing infrastructure has reached its capacity. Not implementing the scheme would result in eThekwini Municipality not being able to deliver basic services to the residents within the project area.

The benefit of the no-go alternative is that there will be no disturbance to the drainage line and water resources around the deviation area. However, the specialist has confirmed that the post-development scenario indicates that there will be no loss of wetland habitat during the construction of the NAA deviations, and therefore disturbance is likely to be kept to a minimum.

Another benefit of the no-go alternative is that no additional land expropriation would to take place and the three households identified living in close proximity to the reservoir could continue to live as they have been without the need for relocation. The reservoir location was however chosen by the client with the intention that no additional land expropriation would be required. Earthworks for the reservoir will be in excess of 10m from the affected houses and impacts to these households would be short term, during the construction phase. Discussions with property owners is still required to obtain their consent.

13. DESCRIPTION OF THE PHYSICAL ENVIRONMENT

13.1 Geographical

The Northern Aqueduct Augmentation Pipeline deviation is located in Nongweni in the Inanda area of the eThekwini Municipality, approximately 45km north of the Durban CBD. The main access is off the Curnick Ndlovu Highway/M25, onto Amatikwe Road and Mzunjani Drive before the tar road ends and becomes a dirt road for approximately 3.5km to the site

A layout of the location can be seen in **Appendix B.**

13.2 Climate

The Inanda area normally receives about 759mm of rain per year, with most rainfall occurring mainly during mid-summer. The area receives the lowest rainfall (14mm) in July and the highest (104mm) in January. The average midday temperatures for the area range from 22.2°C in July to 27.4°C in February. The region is coldest during July when the mercury drops to 9.5°C on average during the night.

13.3 Geology and Soils

Terratest (Pty) Ltd undertook a geotechnical assessment of Phase 3 of the NAA. The full assessment is included in **Appendix F**.

The study area is underlain by various lithologies belonging to different chronostratigraphic units with multiple contracts and structural lineaments. The proposed pipeline alignment commences in Ntuxuma, which is underlain by tillite of the Dwyka Group, proceeding across terrain underlain by Sandstone of the Natal Group, unconsolidated sediments of Quaternary age as well as gneisses of the Mapumulo Metamorphic Suite and granites of the Natal Structural Metamorphic Province. With respect to the reservoir position, significant thermal metamorphism was observed in the boreholes in the from foliations and folds as well as gneissic banding in the granites.

According to the 1:250 000 geological map series, 2930 Durban, multiple structural lineaments occur along the pipeline route. This has resulted in severe weathering and breacciation of the materials encountered in the trial pits.

The bedrock geology is predominantly overlain by residual and colluvial soils, the composition of which are mainly sandy due to the parent lithologies. There is also evidence of marginal clay enrichment with increasing depth, due to the processes of eluviation and illuviation and can result in perched water tables.

The geotechnical investigation undertaken along the proposed pipeline route, reservoir and pump station sites concluded that there are no major geotechnical constraints to the construction of the project. The main points emerging from the investigations are summarised as follows:

- Mechanical excavation to trench invert level (assumed to be 2.0m below surface) using an excavator in the 20 to 30 ton category is expected to be possible along the major proportion of the pipeline routes. It is recommended that provision is made for minor and localised quantities of intermediate and boulder excavation.

- No naturally occurring sources of sand that comply with the specification requirements of SANS 1200 LB for bedding were identified along the pipeline route. It is recommended that consideration is given to a relaxed specification that allows the selective usage of materials generated from trench excavation, as well as possibly from existing cuttings and borrow pits in the area. The weathered tillite, sandstone and granite that occurs in abundance across the project area is considered to offer good potential for use as selected fill that extends from 300mm below pipe invert to 300mm above the top of the pipe.

- The need for support and stabilisation of the trench sidewalls is expected to be minimal.

- The underlying soil and weathered rock materials at the reservoir site are of low to moderate potential expansiveness and offer relatively good founding for the proposed reservoir structure, provided pre-treatment of the subgrade is carried out as well as the introduction of an engineered layer.

- Based upon the undertaking of pH and electrical conductivity tests the underlying soils are potentially corrosive and protective coatings must be considered for buried steel and concrete structures.

13.4 Watercourses

A Wetland Delineation and Impact Assessment was undertaken by Groundtruth in September 2018, the results of which are described below. The full report is attached in **Appendix F**.

A site visit was conducted on the 5th of September 2018 to verify the extent of freshwater ecosystems potentially impacted upon by the proposed development, and assess the systems' current levels of ecological integrity.

The proposed development falls within the U20M quaternary catchment. The Mean Annual Precipitation (MAP) is 922.8mm and the Potential Evapotranspiration (PET) is 1644.6mm. This would suggest that the wetlands within the U20M catchment have a Moderately Low sensitivity to hydrological impacts (Macfarlane et al. 2007). The Mgeni River system is largely regulated and developed. The catchment is currently serviced by the following four major dams on the Mgeni River as well as the Mooi-Mgeni transfer scheme; Midmar Dam, Nagle Dam, Albert Falls Dam and Inanda Dam. The water requirements in the Key Area are currently approximately in balance with the available yield. Water quality in the lower Mgeni River and in the Msunduze River is generally poor. This is due to the dense human population in and around Durban and Pietermaritzburg, some of which is not serviced with adequate sanitation.

The freshwater ecosystem delineation study identified multiple freshwater ecosystems that are either crossed by or hydrologically linked to the proposed Northern Aqueduct activities (refer **Figure 5** below). In addition, multiple freshwater ecosystems and drainage lines were identified that are hydrologically isolated from the proposed activities. These systems are hydrologically isolated as they are either located upstream of the proposed activities or within a different micro-catchment. It is anticipated that these systems will not be impacted upon by the proposed activities and therefore, have been excluded from the assessment process. In addition, the freshwater ecosystems that are located further than 50m from the proposed pipeline are considered to be hydrologically isolated. Given the nature and associated impacts of the pipeline, and the distance of these systems from the pipeline, they are unlikely to be directly impacted by the construction and/or operation of the pipeline.

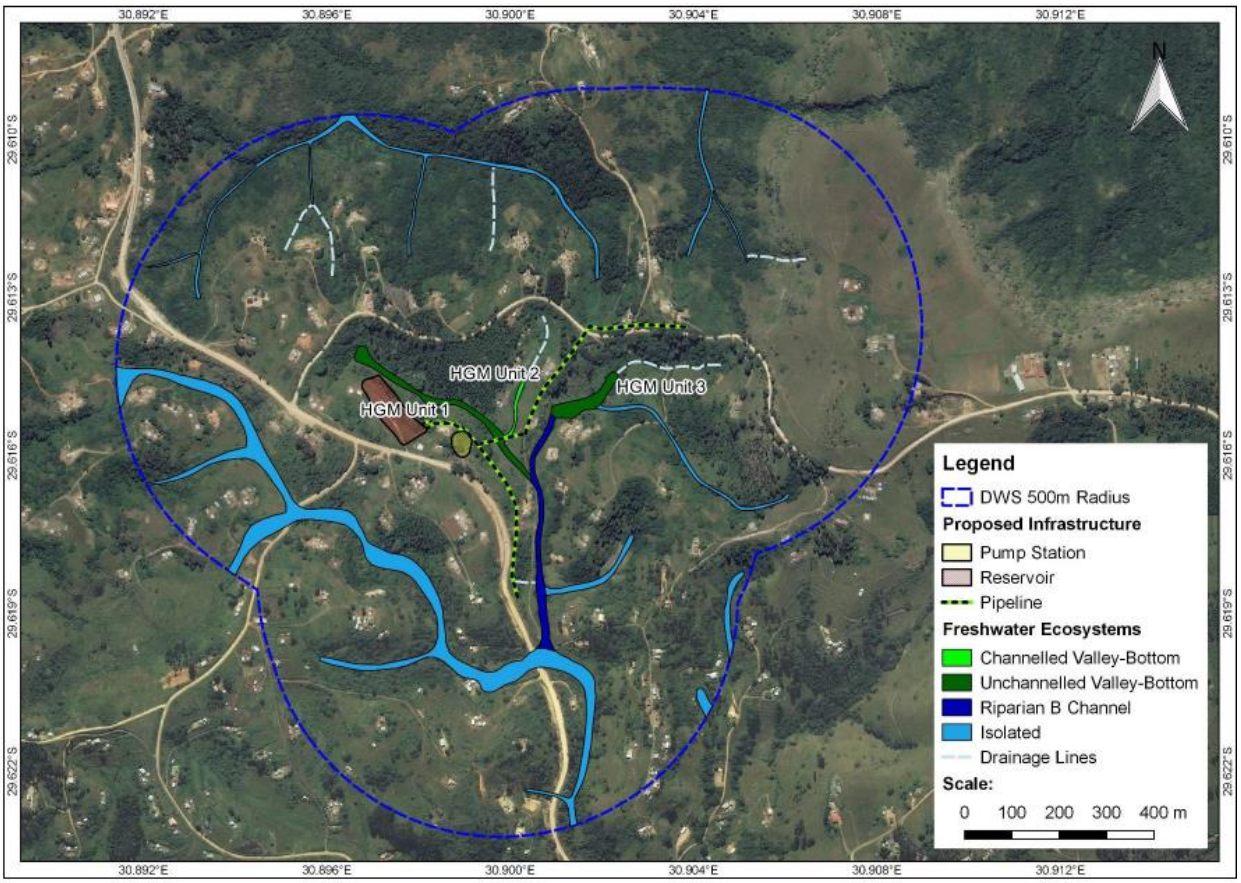

Figure 5: Extent of freshwater habitat

The natural vegetation identified within the wetland areas included inter alia *Cyperus dives* (obligate wetland species), *Cyperus sexangularis* (facultative positive), *Commenlina erecta* (facultative positive) and *Persicaria attenuata* (obligate). Identification of other wetland and terrestrial plant species was not possible due to the fieldwork being undertaken during the non-flowering season. The terrestrial areas were composed predominantly of a mix of grass species and alien invasive tree species (e.g. *Eucalyptus sp*.).

13.4.1 HGM Units Identified

Two wetland systems were identified within the study area that will be directly impacted upon by the proposed pipeline infrastructure (HGM Unit 1 and HGM Unit 2). The proposed reservoir and pump station will not directly impact upon any wetland systems, however, this infrastructure will be located within the catchment area of HGM Unit 1. One wetland was identified within close proximity to the proposed pipeline (HGM Unit 3) and one riparian channel was identified downstream of the pipeline crossing (**Figure 5** above).

HGM Unit 1, which is a tributary of the riparian B channel, is an unchannelled valley-bottom wetland system that flows in an east to south-easterly direction and is approximately 0.65ha in size. The majority of hydrological flows into the system are through surface flows, sub-surface water inputs are most likely limited due to the steep slope of the catchment area and the relatively high inherent runoff potential of the catchment soils. The wetland vegetation is dominated by pasture grass and alien plant species such as *Bambusa sp*. and *Solanum mauritianum*. Natural wetland vegetation, however, is present within the upper and lower most reaches of the system, which includes species such as *Cyperus dives*, *Cyperus sexangularis* and *Persicaria attenuata*. The major impacts to the system include alien invasive plant encroachment within the wetland and its catchment and overgrazing by livestock. Based on the proposed development layout supplied by the client, the proposed pipeline will cross HGM Unit 1 and the pump station and the reservoir will be situated within its catchment area.

HGM Unit 2, which is a tributary of HGM Unit 1, is a channelled valley-bottom wetland that flows in a southerly direction and is approximately 0.1ha in size. A high proportion of hydrological inputs into the wetland originate from surface flows, sub-surface water inputs are likely to be low given the characteristics of the catchment (characteristically similar to HGM Unit 1). The major impacts to the wetland include the encroachment of alien invasive plant species (such as *Lantana camara* and *Chromolaena odorata*), minor channel incision and catchment impacts. The proposed pipeline will cross HGM Unit 2 at the lowermost reaches of the system.

HGM Unit 3, which is a tributary of the riparian B channel, is an unchannelled valley-bottom wetland that flows in a south-westerly direction. A high proportion of hydrological inputs to the wetland originate from surface flows, sub-surface water inputs are likely to be low given the characteristics of the catchment (characteristically similar to HGM Unit 1). The major impacts to the wetland include the encroachment of alien invasive plant species (such as *Eucalyptus sp*.), overgrazing and catchment related impacts. The proposed development will not impact directly upon this system, however, it is located within close proximity to the proposed pipeline alignment.

13.4.2 General Wetland Functioning

A Level 1 Wet-EcoServices assessment was performed to provide a general description of the functioning of the wetland systems identified within the study area. From a biodiversity point of view, the wetlands within the study area are considered to be of low value as they are generally dominated by disturbance tolerant and alien invasive plant species.

13.4.3 Wetland Ecosystem Functioning

The general features of the HGM units hydrologically linked to the proposed Northern Aqueduct development were assessed in terms of the ecosystem functioning at a landscape level for the current and post-development scenarios using a Level 2 Wet-EcoServices assessment.

Generally, the values recorded for the regulating and supporting services for the current scenario were Intermediate to Moderately High for the HGM units. The high effectiveness of HGM Unit 1 at supplying water quality enhancement services is largely due to the diffuse patterns of low flows through the system, the hydrological zonation of the wetland (predominantly seasonal and permanent) and the extent of vegetation cover. The effectiveness of HGM units 2 and 3 at supplying water quality enhancement services was considered to be Intermediate to Moderately High.
Stream flow regulation and flood attenuation services are being supplied at an Intermediate level. Biodiversity maintenance and integrity was also considered to be Intermediate. The systems within the study area contain portions of intact wetland vegetation, however, the vegetation within these systems has largely been altered by historical and current land use practices.

Generally, the direct benefit services are currently being supplied at a Moderately Low level. Although the systems are located within a rural area and are easily accessible, the use of the wetlands by the local community appears to be limited to grazing by livestock.

The proposed development will not impact upon the service provision of any of the HGM units within the study area. This is largely due to the proposed location of the reservoir and pump station, which is not directly within any wetland habitat. The proposed pipeline will cross both HGM Unit 1 and 2. However, due to the limited extent and magnitude of the impact, it is not anticipated to impact the ecosystem service provision of the effected wetlands.

13.4.4 Ecological Importance and Sensitivity

The wetland systems associated with the proposed development would be a D category. A D category indicates that the wetlands have a low/marginal ecological importance and sensitivity. For the post-development scenario, due to the location and nature of the infrastructure, the proposed development is not expected to impact upon the EIS of any of the HGM units within the study area.

13.4.5 Ecological Integrity/Present Ecological State (PES)

The ecological integrity or Present Ecological State (PES) of the HGM units associated with the proposed Northern Aqueduct development were assessed for the hydrology, geomorphology and vegetation components for the current and post-development scenarios.

Based on the PES for the HGM units recorded for the current scenario, the approximately 1.1ha of wetland habitat is considered to be the equivalent of 0.7ha of intact wetland habitat. The graphic representation of functional wetland area versus the total extent of the wetland habitat onsite clearly illustrates that the wetland habitat is functioning at approximately 64%. The post-development scenario, indicates that there will be no loss of wetland habitat.

13.4.6 Potential Impacts of Development

Generally, the construction of a pipeline and its associated infrastructure are likely to have adverse impacts on the freshwater ecosystems and indirectly on the water resource, and consequently these need to be managed during construction.

The impacts associated with a pipeline mostly relate to the physical disturbance footprint of the construction activities, such as, vehicle movements, earth moving and storage etc; as well as the potential of the pipelines to create impoundments and unfavourable sub-surface drainage within the wetlands. Upon completion of the installation of the infrastructure, these impacts are either addressed by rehabilitation/mitigation measures or no longer occur with the cessation of construction. Pipelines, like all linear features, tend to have spatially limited impacts unless they interrupt driving processes that shape freshwater ecosystems. Regardless, the management and maintenance of pipeline crossings should be integrated into an ongoing management and maintenance plan.

Some of the potential impacts associated with the construction and operational phases of the pipeline, reservoir and pump station may include the following:

- Habitat transformation
- Increased stormwater runoff
- Erosion

The management and maintenance of pipeline crossings will be integrated into the Environmental Management Plan for use during the construction phase.

13.4.7 Conclusion

The wetlands assessed within the study area are moderately modified in terms of the systems' integrity. The main factors impacting upon the systems' integrity include overgrazing by livestock, the encroachment of alien invasive plant species, and modifications to the systems' catchments. The riparian system's habitat was found to be fair/good, which is as a result of similar impacts affecting the wetland ecosystems.

Impacts associated with proposed pipeline are generally fairly negligible and should be addressed/managed by the adoption of mitigation measures.

The proposed pump station and reservoir are located within close proximity (but not within) HGM Unit 1. In order to avoid unnecessary loss of wetland habitat, it is important that the prescribed construction phase mitigation measures, as included in the EMP and appropriate leak detection systems are adopted. This is especially important given the close proximity of the proposed pump station and reservoir to HGM Unit 1.

13.5 Vegetation

Under natural conditions, the surrounding landscape and study area would have been characterised by particular vegetation types. The historical dominant vegetation type present would have been the KwaZulu-

Natal Coastal Belt (CB3), which falls under the Indian Ocean Coastal Belt (CB) Group 2 bioregion (Nel et al. 2011; Mucina and Rutherford 2006).

The vegetation type has been classified as 'endangered', with less than 0.6% receiving formal protection. Of the remaining 50% only a small percentage is statutorily protected in reserves including Ngoye, Mbumbazi and Vernon Crookes Nature Reserves. This vegetation type extends from Mtunzini along the north coast of KwaZulu-Natal to Port Edward in the south, and commonly occurs at altitudes of 20-450m above sea level. The greatest threat to this vegetation type has been agriculture, urbanization and the construction of roads (Mucina and Rutherford 2006).

A small amount of Critical Biodiversity Area (CBA): Irreplaceable was identified on site; however the pipeline for the most part avoids this area. The line where the DN350 pipeline runs up the valley to re-connect to the already approved pipeline is an existing walking path and therefore already highly disturbed. No DMOSS was identified in the vicinity of the deviation area.

A vegetation assessment was undertaken in March 2019 to identify any sensitivities in terms of the vegetation on site. The report is attached in **Appendix F**. As stated above, the site is partially CBA Irreplaceable and according to Mucina and Rutherford 2006 is classified as KwaZulu-Natal Coastal Belt (CB3) vegetation type which is considered Endangered. Upon undertaking the groundtruthing exercise it was found that the site is transformed from natural and impacted by overgrazing and alien invasive plant infestation.

A total of 108 plant species were recorded during the field survey, of which 46 were alien. Six (6) plant species which are protected by Provincial Legislation were noted within the development site. The plant species that fall under the protection of the KwaZulu-Natal Nature Conservation Management Act are:
Asparagus laricinus, Asparagus setaceus, Dietes grandiflora, Dracaena aletriformis, Hypoxis hemerocallidea, Ledebouria sp.

Although the vegetation type is classified as endangered, the ground-truthing exercise identified the area as transformed from natural and exhibits a Medium-low conservation value.

If mitigation measures for the pipeline routing are correctly implemented and the rehabilitation of the pipeline and reservoirs is successful, minimal disturbance of environment will be seen. The provincially protected species will need to be removed or relocated and permits for their removal will need to be obtained from Ezemvelo KZN Wildlife and DAFF.

The ecologist has no objection to the amendment of the pipeline provide all mitigation measures are in implemented.

A layout of the vegetation and CBA is attached in **Appendix B** as well as included in **Figure 6** below.

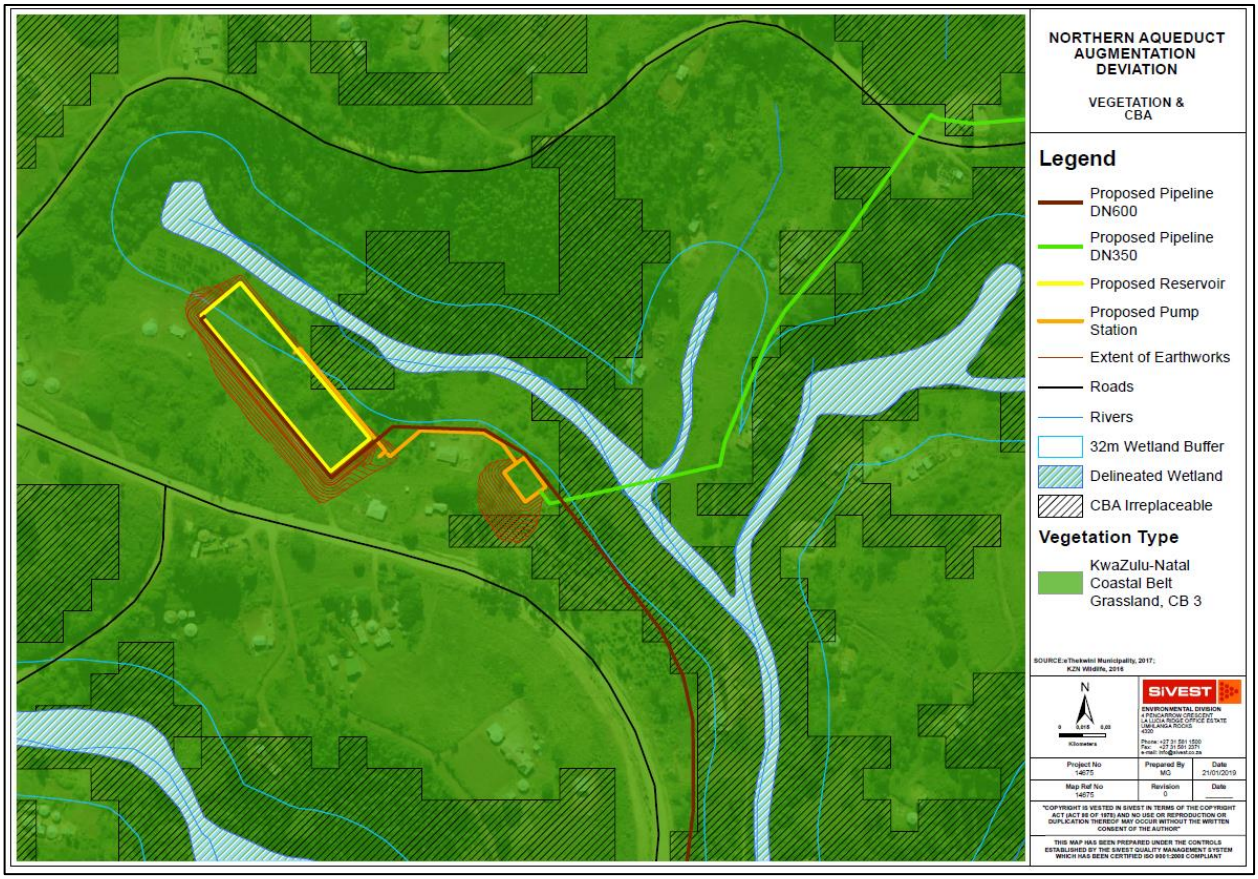

Figure 6: Vegetation and CBA

14. DESCRIPTION OF THE SOCIO- ECONOMIC ENVIRONMENT

14.1 General Socio-Economic Characteristics of the Area

Reference is made to the eThekwini Municipality IDP 2017-2018, the eThekwini Municipality's Spatial Development Framework (SDF) 2017/2018 – 2021/2022, as well as the Socio Economic Study undertaken by Urban-Econ in 2010 (attached in **Appendix F**).

ETHekwini Municipality is located on the east coast of South Africa in the Province of KwaZulu-Natal (KZN). The municipality spans an area of approximately 2555km^2 and is home to approximately 3.6 million people in 2016. It consists of a diverse society which faces social, economic, environmental, and governance challenges.

In 2001, the population of eThekwini was 3.09 million and has grown at an average annual percentage of 1.13% per annum to reach 3.44 million in 2011. The Municipality is forecast to grow by 175 000 between 2016 and 2020 when the population total will be approximately 3.85 million.

According to the StatsSA Forecast 2016, the eThekwini population is young with 63% of the population below the age of 35 years. Individuals within the 0-14 years old group comprises 29% and the 15-34 age group 33% of the population. The 35-59 age group comprises 28% and those over 60 represent 9 % of the population. The economically active age group from 15-59 years include 62% of the population.

Like all developing world cities, the eThekwini Municipality is subject to high rates of in-migration from rural areas and small towns in KZN. This has resulted in a rate of urbanisation and population increase that is difficult to project and a large number of new residents require housing and services. African cities are generally dynamic and have fast growing populations, with eThekwini' Municipality being no different, with the majority of this growth happening on the urban periphery where it is easier to access land. With such rapid growth, city development will need to be significantly accelerated to adequately address this challenge.

According to the Socio-economic study undertaken by Urban Econ, the positive impacts of the aqueduct extension will largely be centred on the construction process and the employment and income multiplier effects that will result from it. These can be calculated by examining the cost of the pipe and average man hours required to lay each section of the pipe. The aqueduct extension will not create any permanent employment but will create a temporary injection of employment and income into areas through which the pipe is laid.

Ogunjini is characterized by low density residential settlements with moderate income and expenditure totals. The residents of Ogunjini are also characterized by a high involvement in the tertiary sector in comparison to the secondary and primary sectors, something which will have to be taken into effect when calculating the cost of delays due to the aqueduct construction phase through the area. Once the NAA is complete through Ogunjini the positive impacts of having access to higher water availability in the area will have a positive impact the potential business growth of the area.

It is important to note that the majority of impacts are temporary in nature – aligned predominantly to the construction of the NAA. However, the over-arching benefit of the total project – the significant increase in local supply of potable water, will have a longer term positive impact on the socio-economic spheres. The impacts are discussed below.

- Desirability

The desirability of the of the NAA project stems from the fact that it successfully addresses many of the constraints present and anticipated in the future for water shortages in the north of eThekwini municipality. The NAA project will also increase the access to potable water resources as well as increasing water for industries in the area.

- Changes in demographics

Demographic impacts include the number of new permanent residents or migrant residents associated with the development, the density and distribution of people and any changes in the composition of the population such as age, gender, wealth, income, occupational characteristics, educational level and health status.

Development invites growth in new jobs in a community and draws new workers and their families into the community, either as permanent or temporary residents. When this occurs, the incoming population affects the social environment in various ways including increased demand for housing and social services (e.g. health care, day care, education, recreational facilities).

The completion of the NAA project is anticipated to have an immediate impact on the community's ability to accommodate new residents and to adapt to changes in the biophysical environment, such as water shortages. Assessing the magnitude and rate of population change has important implications for community infrastructure and service requirements and can play a major role in determining social impacts associated with the proposed development – however, there is no provision made for any other kind of infrastructure bulks in the area, thus the impact is anticipated to be constrained.

- Changes in income and employment

The aqueduct is unlikely to directly influence changes in employment and income opportunities in the townships and surrounding communities. Such changes may be more or less temporary (e.g., construction projects, or seasonal employment). Changes in income, however temporary will also influence the social environment in a number of ways such as raising the average standard of living for residents in the townships.

- Household income

Household income in the study areas appears typical of South African townships. The residents who did receive monthly or weekly incomes were primarily employed in the surrounding industries in Phoenix, Canelands, Riverhorse and surrounds.

A number of households who receive no formal income in the form of wages and salaries rely on various grants and remittances. The most prevalent grant received by households are the Pension and Child Care grants. The majority of households, along the Ntuzuma, Inanda, Mawothi, and Kwamashu areas, receive a household income ranging from R5000.00-R8000 per month. Given the large household sizes, this is insufficient to meet the monthly food, schooling and medical needs of members. Given an average household size ranging from 4-7 members, this is translated into a per-capita income in the range of R1300-R1600 per household member.

- Employment

The unemployment rate stands at 35%, with only 27% of the township population employed. The majority of the employed population are employed in low skilled occupations. The proposed development will directly impact only temporary employment. This will also directly impact on household incomes.

- Aesthetics

The aesthetic quality of the township will be affected by the presence of the construction, although this will be short term, as the pipeline will be underground. The aesthetic quality of the township will not be negatively affected by the presence of the pipeline.

14.2 Cultural/Historical Environment

A Heritage Impact Assessment was undertaken for the entire pipeline in June 2011. No red flag heritage sites were identified along the route, however it was identified that permits would be required for the partial destruction of three sites along the route.

The updated information, including a layout of the new reservoir location and pipeline deviation was uploaded onto the Sahris Online Applications Website for comment from Amafa. Amafa confirmed that they have no objection to the proposed deviation but requires new permit application relating to the previously identified resources as they have expired (comment attached in **Appendix I**). New permit applications have been submitted to Amafa. The application for new partial destruction permits was submitted on the 12th of February 2019.

15. PUBLIC PARTICIPATION PROCESS

The Public Participation Process has been undertaken in line with Chapter 6 of the EIA Regulations 2014 (as amended 2017).

The following process was undertaken as part of the Public Participation Process:

15.1 Notification of Interested and Affected Parties (I&AP's)

I&AP's and key stakeholders were notified via email of the availability of the report. Key stakeholders were sent hard copies of the report.

15.2 Site Notices

Site notices were placed around the vicinity of the site on 16th of April 2019. Proof is available in **Appendix E**.

15.3 Advertisements

Adverts will be placed in the ezaseGagasini Metro and the Isolezwe.

15.4 Summary of the issues raised by Interested and Affected Parties to date

To be included following the PPP process.

15.5 Draft Basic Assessment Report

Interested and affected persons (I&AP's) will be afforded a thirty (30) day comment period from the date of notification and receipt of the DBAR to provide comment on the DBAR. A register will be opened and will be attached to the final report. This will include the names, contact details and addresses of all people who submitted written comments, all people who requested their names be placed on the register as well as all organs of state which have jurisdiction in respect of the activity. A comments and response report will be drafted and attached to the final report.

16. IMPACTS AND RISKS IDENTIFIED FOR THE PREFERRED ALTERNATIVE

The SiVEST Impact Assessment method, dated 28 July 2017 (**attached as Appendix G**) has been utilised to assess the following potential impacts identified in the assessment phase and presented in the following sections.

The method used in this impact assessment determines significance (can be both positive and negative) of an impact by multiplying the value of the environmental system or component affected by the magnitude of the impact on that system or component (System or Component Value x Impact Magnitude).

In this method, all significant impacts on the natural or biophysical environment are assessed in terms of the overall impacts on the health of ecosystems, habitats, communities, populations and species. Thus, for example, the impact of an increase in stormwater runoff generated by a development can only be assessed in terms of the impact on the health of the affected environmental systems.

Similarly, all significant impacts on the social and socio-economic environment are assessed in terms of the overall impacts to the quality of life, health and safety of the affected population, communities and/or individuals, with the exception of impacts on resources that are assessed on their own.

The following impacts have been identified:

16.1 Impacts on Biophysical Systems / Components during the construction phase

16.1.1 Wetland Impacts

Vegetation/Biodiversity Loss

The construction of the pipeline will result in the loss of vegetation however the loss will be minimal. The pipeline will cross the drainage line at a very narrow point. According to the wetland specialist, the drainage lines and wetland area is heavily invaded by alien invasive species. The construction of the reservoir and pipeline will result in the clearance of a small amount of vegetation.

Table 9: Impact of loss of vegetation/biodiversity during construction

Environmental parameter	**Clearing of vegetation/loss of habitat**	
Extent	Site	
Probability	Definite	
Reversibility	Partly Reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Long term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	**Medium negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	4
Reversibility	2	2
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	**-30 medium negative impact**	**-10 low negative impact**
Mitigation measures	Excavation • The physical disturbance footprint (including moving and parking of machinery) must not encroach into any of the identified wetland habitat. • The physical disturbance footprint of construction, including moving and parking of vehicles and machinery must be limited to the smallest area possible • The alignment of the pipelines, together with the adjacent working area, must be clearly demarcated prior to the commencement of the excavations. The width of the working area within the freshwater ecosystems must be kept to a minimum (12m) to ensure that impacts on these systems are minimised. All activities must be restricted to within the demarcated working area. • The offset for the 12m wide working area must be as follows: ○ 2m for topsoil stockpile; ○ 2m for trench; ○ 2m for the sub- soil stockpile; and ○ 6m for the movement of a tracked excavator on only ONE side of the corridor	

Environmental parameter	Clearing of vegetation/loss of habitat
	Trenching • The vegetation must be carefully removed by hand in sods and suitably stored for replanting upon the completion of the backfilling process. • The size of the excavation of the crossing must be kept to a minimum in order to minimise the extent of the disturbance to the freshwater ecosystems i.e. the minimum allowable width and depth must be implemented. Re-vegetation • It is critical that vegetation is established immediately after the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process must be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture must be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful. • The grass must be watered on a regular basis until the vegetation has established and adequate cover is achieved (should the wetland become drier during the dry season). • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture.

Siltation/Erosion

Construction activities create bare areas/expose soil to environmental factors including rainfall and wind which can result in the removal of topsoil and subsequently soil erosion.

Table 10: Impact of erosion during construction

Environmental parameter	**Creation of bare areas/siltation/erosion**	
Extent	Local area/district	
Probability	Probable	
Reversibility	Barely reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Medium term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	**Medium negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	1
Reversibility	3	2
Irreplaceable loss	2	2
Duration	2	2
Cumulative effect	3	3
Intensity/magnitude	2	1
Significance rating	**-30 medium negative impact**	**-12 low negative impact**
Mitigation measures	Erosion control methods must be implemented to ensure that erosion of the disturbed areas is kept to a minimum. The following recommendations must be implemented to prevent erosion and the generation of sediment: • It is critical that vegetation is established immediately after the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process must be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture must be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful. • The grass must be watered on a regular basis until the vegetation has established and adequate cover is achieved (should the wetland become drier during the dry season). • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing.	

Environmental parameter	Creation of bare areas/siltation/erosion
	• The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. • The horizontal spacing between the diversion structures/berms will be determined by the gradient of the approach slopes. The number of berms to be constructed must be specified by the Environmental Control Officer (ECO) in consultation with an environmental engineer during construction; however, it is anticipated that approximately 3 to 4 berms per approach should suffice. • The diversion berms must divert the water off the trench towards the downslope side of the wetland. Care must be taken to discharge water to areas where erosion will be minimised e.g. vegetated areas or existing formal drains. • Bio-degradable erosion control blankets must be considered to stabilise the disturbed areas on the steeper approaches to the wetlands where the risk of erosion of the soils is higher. The erosion control blankets must be implemented according to the supplier's specification. <u>Trenching</u> • The topsoil must be removed and stockpiled separately from the underlying sub-soil on either side of the trench. • The excavation must be carried out immediately prior to the laying of the pipeline foundations in order to minimise the time during which the trench remains open. • The excavated material must be protected from erosion if it is anticipated that it will remain exposed for any length of time. Stockpiles of this material must be positioned on either side of the trenches, keeping the top soil and the sub-soil separate.

<u>Development of hardened surfaces</u>

Table 11: Impact of hardened surfaces on biophysical components during construction

Environmental parameter	**Flow changes and/or erosion**	
Extent	Site	
Probability	Possible	
Reversibility	Completely Reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Long term	
Cumulative effect	Low cumulative impact	
Intensity/magnitude	Low	
Significance Rating	**Low negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	1	1
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	2	2
Intensity/magnitude	1	1
Significance rating	**-11 low negative impact**	**-10 low negative impact**
Mitigation measures	Erosion control methods must be implemented to ensure that erosion of the disturbed areas is kept to a minimum. The following recommendations must be implemented to prevent erosion and the generation of sediment: • It is critical that vegetation is established immediately after the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process must be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture should be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful. • The grass must be watered on a regular basis until the vegetation has established and adequate cover is achieved (should the wetland become drier during the dry season). • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures should consist of either a series of low earthen berms (approximately 300mm in height constructed	

Environmental parameter	Flow changes and/or erosion
	with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. • The horizontal spacing between the diversion structures/berms will be determined by the gradient of the approach slopes. The number of berms to be constructed should be specified by the Environmental Control Officer (ECO) in consultation with an environmental engineer during construction; however, it is anticipated that approximately 3 to 4 berms per approach should suffice. • The diversion berms must divert the water off the trench towards the downslope side of the wetland. Care must be taken to discharge water to areas where erosion will be minimised e.g. vegetated areas or existing formal drains. • Bio-degradable erosion control blankets must be considered to stabilise the disturbed areas on the steeper approaches to the wetlands where the risk of erosion of the soils is higher. The erosion control blankets must be implemented according to the supplier's specification. <u>Trenching</u> • The topsoil must be removed and stockpiled separately from the underlying sub-soil on either side of the trench. • The excavation must be carried out immediately prior to the laying of the pipeline foundations in order to minimise the time during which the trench remains open. • The excavated material must be protected from erosion if it is anticipated that it will remain exposed for any length of time. Stockpiles of this material must be positioned on either side of the trenches, keeping the top soil and the sub-soil separate.

<u>Installation of pipeline: impoundment of flows</u>

Table 12: Impacts of installation of pipeline - impoundment of flows

Environmental parameter	Impoundment of flows
Extent	Site
Probability	Definite
Reversibility	Partly Reversible
Irreplaceable loss of resources	Marginal loss of resource
Duration	Long term

Environmental parameter	**Impoundment of flows**	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	**Medium negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	1
Reversibility	2	1
Irreplaceable loss	2	2
Duration	3	1
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	**-30 medium negative impact**	**-8 low negative impact**
Mitigation measures	Where the proposed infrastructure crosses the wetland habitat, the following needs to be considered: • Where the infrastructure is unable to be aligned with existing services, the crossing must be planned at a narrow section and be perpendicular to the flow direction, minimising the amount of disturbance to the freshwater ecosystem and the risks of headward erosion. • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. <u>Backfilling</u> • The backfilling is to be carried out immediately after the necessary trench construction has been finalised. • The backfill material must be returned in the same order that it was removed i.e. the sub-soil replaced first, followed by the topsoil material closer to the surface. • The material must be well moistened and compacted in 100mm layers to ensure that a similar bulk density to surrounding areas is achieved.	

Environmental parameter	Impoundment of flows
	• The backfill material must be compacted to the same height as the natural ground profile i.e. the trenching activities must in no way alter the natural surface flows.

Installation of pipeline: alteration of subsurface flows

Table 13: Impacts of installation of pipeline – Alteration of subsurface flows

Environmental parameter	Alteration of subsurface flows	
Extent	Site	
Probability	Definite	
Reversibility	Partly Reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Long term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	**Medium negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	1
Reversibility	2	1
Irreplaceable loss	2	2
Duration	3	1
Cumulative effect	3	2
Intensity/magnitude	2	1
Significance rating	**-30 medium negative impact**	**-8 low negative impact**
Mitigation measures	Where the proposed infrastructure crosses the wetland habitat, the following needs to be considered: • Where the infrastructure is unable to be aligned with existing services, the crossing must be planned at a narrow section and be perpendicular to the flow direction, minimising the amount of disturbance to the freshwater ecosystem and the risks of headward erosion. • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing.	

Environmental parameter	Alteration of subsurface flows
	• The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. <u>Excavation</u> • The alignment of the pipelines, together with the adjacent working area, must be clearly demarcated prior to the commencement of the excavations. The width of the working area within the freshwater ecosystems must be kept to a minimum (12m) to ensure that impacts on these systems are minimised. All activities must be restricted to within the demarcated working area. • The offset for the 12m wide working area must be as follows: ○ 2m for topsoil stockpile; ○ 2m for trench; ○ 2m for the sub- soil stockpile; and ○ 6m for the movement of a tracked excavator on only ONE side of the corridor <u>Trenching</u> • The vegetation must be carefully removed by hand in sods and suitably stored for replanting upon the completion of the backfilling process. • The size of the excavation of the crossing must be kept to a minimum in order to minimise the extent of the disturbance to the freshwater ecosystems i.e. the minimum allowable width and depth must be implemented. <u>Backfilling</u> • The backfilling is to be carried out immediately after the necessary trench construction has been finalised. • The backfill material must be returned in the same order that it was removed i.e. the sub-soil replaced first, followed by the topsoil material closer to the surface. • The material must be well moistened and compacted in 100mm layers to ensure that a similar bulk density to surrounding areas is achieved.

Environmental parameter	Alteration of subsurface flows
	• The backfill material must be compacted to the same height as the natural ground profile i.e. the trenching activities must in no way alter the natural surface flows.

16.1.2 Biodiversity loss

Loss of habitat for flora

The clearing of land reduces available habitat for floral species. Fauna is reliant on flora, as vegetation provides food and refuge for faunal species. This results in a local scale loss in ecosystem functionality and biodiversity and potentially reduces available habitat for red data species. Mitigation measures can reduce inevitable environmental damage to a state where long-term losses are negated.

The construction of the reservoir and pipeline will also result in the clearance of a small amount of vegetation.

Table 14: Loss of habitat

Environmental parameter	**Biodiversity – Loss of flora (common and protected or red data species)**	
Extent	Site	
Probability	Definite	
Reversibility	Partly Reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Long term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	**Medium negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	4	1
Reversibility	2	1
Irreplaceable loss	2	1
Duration	3	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	**-30 medium negative impact**	**-6 low negative impact**
Mitigation measures	• Footprint of the activity needs to be strictly adhered to. • A site specific Environmental Management Programme needs to be developed for the construction and operation phases.	

Environmental parameter	Biodiversity – Loss of flora (common and protected or red data species)
	• An Environmental Control Officer (ECO) needs to be appointed for the duration of construction. • A search and rescue operation needs to be conducted by a suitably qualified ecologist to collect/capture species and species of special concern. • Permits for plants and animal collection/removal need to be obtained prior to search and rescue operations. • Strictly no removing of any floral species without the valid permits in place. • Clearance in the construction phase is to be remove in a phased approach, as and when it becomes necessary. • Sensitive areas need to be demarcated clearly before construction commences. • Where possible, construction should occur in the dry season to prevent soil loss through stormwater. • Where possible, manual clearance of the line and vegetation should be done so as to prevent the movement of machinery. • The contractor should implement an alien invasive control programme, particularly in areas where soil disturbance occurs. • Soil stockpiles need to be grassed with an indigenous mix or covered with shadecloth to prevent soil loss through wind and water erosion. • Strictly no trapping or hunting is allowed. • Rehabilitation should take place as soon as construction of the section of line is complete. • Strictly no littering. The contractor should highlight this at daily toolbox talks and site clean-ups should occur on a daily occasion. • A mix of indigenous grass species, should be used for rehabilitation.

Habitat Fragmentation

The loss of habitat and lack of habitat continuity may lead to habitat fragmentation. This will result in an edge effect. Ecological corridors, through Ecological Support Areas aim to reduce edge effects. The edge effect can be mitigated with linear activities and if rehabilitated correctly, the habitat can return to its former state in minimal time.

Table 15: Habitat Fragmentation

Environmental parameter	**Biodiversity – Habitat Fragmentation**	
Extent	Local/District	
Probability	Probable	
Reversibility	Partly Reversible	
Irreplaceable loss of resources	Marginal loss of resource	
Duration	Medium term	
Cumulative effect	Medium cumulative impact	
Intensity/magnitude	Medium	
Significance Rating	**Medium negative impact – The anticipated impact will have negligible negative effects and will require little to no mitigation**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	1
Reversibility	2	1
Irreplaceable loss	2	2
Duration	2	1
Cumulative effect	3	1
Intensity/magnitude	2	1
Significance rating	**-28 medium negative impact**	**-8 low negative impact**
Mitigation measures	• Ecological corridors need to be monitored and maintained for establishment of alien invasive plants and erosion. • Six monthly checks of the area should take place for the emergence of species.	

16.2 Impacts to Socio-Economic Components during Construction Phase

16.2.1 Air / Dust pollution

Dust could become a problem during construction, especially on windy days. This is as a result of the developments proximity to residential areas.

Air pollution may occur in the vicinity of the site and the immediate surrounds during the construction phase as a result of:

- Exhaust fumes from heavy vehicles and machinery, in particular poorly serviced vehicles
- Dust from exposed surfaces and soil stockpiles picked up by wind
- Dust on haulage and access roads emitted into the air by construction vehicles
- Odours downstream of inappropriate and mismanaged chemical toilets

Table 16: Air/dust pollution impacts during construction

Environmental parameter	**Dust pollution (for neighboring residents)**	
Extent	Site	
Probability	Probable	
Reversibility	Completely reversible	
Irreplaceable loss of resources	No loss of resource	
Duration	Short term	
Cumulative effect	Negligible cumulative impact	
Intensity/magnitude	Low	
Significance Rating	**Low negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	3	2
Reversibility	1	1
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	1	1
Intensity/magnitude	2	2
Significance rating	**-16 low negative impact**	**-14 low negative impact**
Mitigation measures	• All exposed stockpiles must be covered with hessian sheeting when not in use or dampened by a watercart at regular interval if in use. • The site must be dampened at regular intervals and more frequently during windy conditions. • Exposed areas where no construction will take place must be vegetated as soon as possible. • Dust generating construction activities must be avoided during strong winds. • Management (including storage, transport, handling and disposal) of hazardous substances that have the potential to become airborne during construction must be carefully managed. • Un-surfaced construction roads and bare surfaces within the construction site must be regularly wetted during dry conditions. A suitable dust palliative must be applied if wetting is ineffective. • Soil loads in transit must be kept covered or wetted.	

Environmental parameter	Dust pollution (for neighboring residents)
	• Servicing of vehicles must occur off site to limit gaseous emissions. • Chemical toilets must be placed on site and must be maintained on a daily basis. • Burning of waste is forbidden. • The maximum speed limit for construction vehicles travelling on un-surfaced construction roads within the site is 25km/hour. • A dust complaints register must be kept within the camp site offices for the entire construction phase. • These measures are contained within the EMP and must be monitored to ensure compliance.

16.2.2 Noise

The generation of noise (from earth moving machinery, piling works etc.) during the construction phase may result in the disturbance to neighbouring residents. Noise generated by delivery vehicles, earth moving machinery, piling works and the workforce have the potential to impact negatively on people living and/or working along the property boundaries and in relatively close proximity to the proposed development. The negative impacts could result in an increase in stress and frustration and associated health implications.

Disturbance may also be caused by construction starting too early or finishing too late. However, this impact is likely to be sporadic and relatively short.

Table 17: Noise pollution impacts during construction

Environmental parameter	**Noise**	
Extent	Site	
Probability	Possible	
Reversibility	Partly Reversible	
Irreplaceable loss of resources	No loss of resources	
Duration	Short term	
Cumulative effect	Negligible cumulative impact	
Intensity/magnitude	Low	
Significance Rating	**Low negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	1
Reversibility	2	2

Environmental parameter	Noise	
Irreplaceable loss	1	1
Duration	1	1
Cumulative effect	1	1
Intensity/magnitude	1	1
Significance rating	**-8 low negative impact**	**-7 low negative impact**
Mitigation measures	• Construction activities must only take place within agreed working hours. • A complaints register must be kept at all times. • Construction staff must be provided with training regarding noise prevention and antisocial behaviour/conduct.	

16.2.3 Job creation

A number of jobs will be created during the construction phase of the project.

For those unemployed in the area, should local labour be utilised, the creation of short-term construction jobs would improve their economic well-being for the period of construction and may lead to further employment opportunities through skills enhancement and experience. Economic well-being is generally regarded as an important contributor of individual quality of life, especially for those unemployed and struggling to makes ends meet.

The positive impacts of the aqueduct extension will largely be centred on the construction process and the employment and income multiplier effects that will result from it. These can be calculated by examining the cost of the pipe and average man hours required to lay each section of the pipe. The aqueduct extension will not create any permanent employment but will create a temporary injection of employment and income into areas through which the pipe is laid.

Table 18: Job creation during construction

Parameter	Job creation during the construction phase	
Extent	Medium	
Probability	Possible	
Social value	High	
Importance to Quality of Life	Very high	
Duration	Short term	
Cumulative effect	High cumulative impact	
Intensity/Magnitude	High	
Significance Rating	**Medium Positive Impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	n/a

Parameter	Job creation during the construction phase	
Probability	2	n/a
Social value	3	n/a
Importance to Quality of Life	4	n/a
Duration	1	n/a
Cumulative effect	4	n/a
Intensity/Magnitude	3	n/a
Significance rating	**48 medium positive impact**	n/a
Mitigation measures	The construction process must use a local labour force as much as possible.	

16.2.4 Land Expropriation/Relocation of households

There is the potential for three households to be re-located during the construction of the reservoir. The earthworks from the reservoir extend approximately 10m away from existing structures and do not directly impact their properties. Discussions with property owners still have to be undertaken to obtain their consent.

Table 19: Impacts of land expropriation on households during construction

Parameter	Land expropriation/relocation of households	
Extent	Medium	
Probability	Unlikely	
Social value	High	
Importance to Quality of Life	Very high	
Duration	Permanent	
Cumulative effect	High cumulative impact	
Intensity/Magnitude	High	
Significance Rating	**High Negative Impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	n/a
Probability	1	n/a
Social value	3	n/a
Importance to Quality of Life	4	n/a
Duration	4	n/a
Cumulative effect	4	n/a
Intensity/Magnitude	3	n/a
Significance rating	**-54 high negative impact**	n/a
Mitigation measures	The location of the reservoir was chosen to minimize the number of household that would have to be removed. The current reservoir location and earthworks is approximately 10m away from any households and the need to relocation is therefore unlikely.	

Parameter	Land expropriation/relocation of households
	However, discussions with landowners will still need to be undertaken to obtain their consent. While the relocation of households is a high negative impact, alternative housing will be made available for people should this become a reality.

16.3 Impacts to Biophysical Systems / Components during the operational phase

16.3.1 Risk of rupture of the pipeline to the environment

A rupture in the pipeline has the potential to cause localised damage to the area surrounding the rupture. Steel pipelines seldom rupture in a dramatic fashion, and water loss is usually a gradual event as opposed to a single large event. There are a number of factors that can contribute to pipe failure. These include inherent flaws in the pipe, operational faults, and third party damage. There will be a number of management policies in place to ensure that the pipe integrity is maintained. Pipelines are now designed with a factor of safety enabling pipes to withstand pressure much higher than that which it is subjected to.

The steel pipelines which are to be used in projects of this nature are cathodically protected to prevent pipelines from eroding thereby decreasing the risk of rupture. The pipe will be coated and lined to prevent corrosion. Pipe material, design, construction and maintenance will be in accordance with all applicable South African standards, guidelines and legislation, as well as certain international specifications.

Potable water is not considered a pollutant in the event of pipe rupture. Pipe rupture is unlikely to cause any environmental pollution, but may cause significant environmental and infrastructural damage (unrelated to ground water).

Table 20: Impact of rupture of pipeline on environment during operation

Environmental parameter	Risk of rupture to the environment	
Extent	Site	
Probability	Possible	
Reversibility	Partly reversible	
Irreplaceable loss of resources	Marginal loss of resources	
Duration	Short term	
Cumulative effect	High cumulative impact	
Intensity/magnitude	High	
Significance Rating	**Medium negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	1	1
Probability	2	2

Environmental parameter	Risk of rupture to the environment	
Reversibility	2	2
Irreplaceable loss	2	2
Duration	1	1
Cumulative effect	4	4
Intensity/magnitude	3	2
Significance rating	**-36 medium negative impact**	**-24 low negative impact**
Mitigation measures	• Requires effective project management • Requires stringent testing prior to operation • Requires regular maintenance and management • Set notification, warning and contingency plans and emergency procedures	

16.4 Impacts to Socio-Economic Components during operation phase

16.4.1 Provision of Basic Services

Once the NAA is complete through Ogunjini the positive impacts of having access to higher water availability in the area will have a positive impact the potential business growth of the area. As access to basic municipal services is an important contributor to overall quality of life, it is likely that households will experience a substantial improvement in their living conditions and quality of life.

Table 21: Impact of provision of basic services during operation

Parameter	Provision of basic services	
Extent	Very High	
Probability	Definite	
Social value	Very High	
Importance to Quality of Life	Very High	
Duration	Permanent	
Cumulative effect	High cumulative impact	
Intensity/Magnitude	Very High	
Significance Rating	**Very high positive impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	n/a
Probability	4	n/a
Social value	4	n/a
Importance to Quality of Life	4	n/a
Duration	4	n/a
Cumulative effect	4	n/a
Intensity/Magnitude	4	n/a

Parameter	Provision of basic services	
Significance rating	**96 Very high positive impact**	n/a
Mitigation measures	n/a	

16.5 No-go alternative

16.5.1 Loss of opportunities for provision of basic services

The benefits of the proposed NAA will be largely social and economic in nature, and are considered to be very important positive impacts given South Africa's need to improve the basic services to peripheral communities. If Phase 3 of the NAA does not go ahead, the provision of bulk water infrastructure necessary in the long term to eventually ensure adequate potable water supply to the communities within the north eastern portion of Durban will not be realised.

Table 22: Impact of loss of opportunities for provision of basic services

Parameter	Loss of opportunities for the provision of basic services	
Extent	Very High	
Probability	Definite	
Social value	Very High	
Importance to Quality of Life	Very High	
Duration	Permanent	
Cumulative effect	High cumulative impact	
Intensity/Magnitude	Very High	
Significance Rating	**Very high negative impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	4	n/a
Probability	4	n/a
Social value	4	n/a
Importance to Quality of Life	4	n/a
Duration	4	n/a
Cumulative effect	4	n/a
Intensity/Magnitude	4	n/a
Significance rating	**-96 Very high negative impact**	n/a
Mitigation measures	n/a	

16.5.2 No requirement for land expropriation/relocation of households

While the need for land expropriation for the construction of the reservoir is unlikely and not yet confirmed, should the pipeline not go ahead, no households will have to be relocated and can continue to live as they have been.

Table 23: Impact of land exportation not taking place

Parameter	**Land expropriation/relocation of households**	
Extent	Medium	
Probability	Definite	
Social value	High	
Importance to Quality of Life	Very high	
Duration	Permanent	
Cumulative effect	High cumulative impact	
Intensity/Magnitude	High	
Significance Rating	**High Positive Impact**	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	n/a
Probability	4	n/a
Social value	3	n/a
Importance to Quality of Life	4	n/a
Duration	4	n/a
Cumulative effect	4	n/a
Intensity/Magnitude	3	n/a
Significance rating	**-63 high positive impact**	n/a
Mitigation measures	n/a	

17. POSITIVE AND NEGATIVE IMPACTS OF THE MARIANRIDGE HOUSING DEVELOPMENT

A summary of the impacts pre-mitigation and post-mitigation are provided below:

Table 24: Summary of impacts pre and post-mitigation

Impact	**Pre-mitigation**	**Post-mitigation**
Impacts on Biophysical Systems / Components during the construction phase		
Vegetation/Biodiversity Loss	Medium negative impact	Low negative impact
Soil Erosion	Medium negative impact	Low negative impact

Impact	Pre-mitigation	Post-mitigation
Development of hardened surfaces: Flow changes and/or erosion	Low negative impact	Low negative impact
Installation of pipeline: Impoundment of flows	Medium negative impact	Low negative impact
Installation of pipeline: Alteration of subsurface flows	Medium negative impact	Low negative impact
Biodiversity: Loss of flora	Medium negative impact	Low negative impact
Biodiversity: Habitat fragmentation	Medium negative impact	Low negative impact
Impacts to Socio-Economic Component during the construction phase		
Air / dust pollution	Low negative impact	Low negative impact
Noise	Low negative impact	Low negative impact
Job creation	Medium positive impact	No mitigation required
Land expropriation/relocation of households (if applicable)	High negative impact	No mitigation possible
Impacts to Biophysical Systems/components during the operational phase		
Rupture of pipeline	Medium negative impact	Low negative impact
Impacts to Socio-Economic component during the operational phase		
Provision of basic services	Very high positive impact	No mitigation required
No-go Alternative		
Loss of opportunities for provision of basic services	Very high negative impact	No mitigation possible
No requirements for land expropriation	High positive impact	No mitigation required

17.1 Mitigation measures

Refer to section 15 above. Specialist studies have informed the environmental issues and risks identified by the development. The assessment of each issue is included in Section 15 above and mitigation measures are provided for each impact identified.

18. SUMMARY OF SPECIALIST REPORTS

Table 25: Summary of specialist reports

Environ. Parameter	Summary of major findings	Impact management measures
Geology	The study area is underlain by various lithologies belonging to different chronostratigraphic units with multiple contracts and structural lineaments. The proposed pipeline alignment commences in Ntuxuma, which is underlain by tillite of the Dwyka Group, proceeding across terrain underlain by Sandstone of the Natal Group, unconsolidated sediments of Quaternary age as well as gneisses of the Mapumulo Metamorphic Suite and granites of the Natal Structural Metamorphic Province. With respect to the reservoir position, significant thermal metamorphism was observed in the boreholes in the from foliations and folds as well as gneissic banding in the granites. According to the 1:250 000 geological map series, 2930 Durban, multiple structural lineaments occur along the pipeline route. This has resulted in severe weathering and breacciation of the materials encountered in the trial pits. The bedrock geology is predominantly overlain by residual and colluvial soils, the composition of which are mainly sandy due to the parent lithologies. There is also evidence of marginal clay enrichment with increasing depth, due to the processes of eluviation and illuviation and can result in perched water tables.	The geotechnical investigation undertaken along the proposed pipeline route, reservoir and pump station sites concluded that there are no major geotechnical constraints to the construction of the project. The main points emerging from the investigations are summarised as follows: • Mechanical excavation to trench invert level (assumed to be 2.0m below surface) using an excavator in the 20 to 30 ton category is expected to be possible along the major proportion of the pipeline routes. It is recommended that provision is made for minor and localised quantities of intermediate and boulder excavation. • No naturally occurring sources of sand that comply with the specification requirements of SANS 1200 LB for bedding were identified along the pipeline route. It is recommended that consideration is given to a relaxed specification that allows the selective usage of materials generated from trench excavation, as well as possibly from existing cuttings and borrow pits in the area. The weathered tillite, sandstone and granite that occurs in abundance across the project area is considered to offer good potential for use as selected fill that extends from 300mm below pipe invert to 300mm above the top of the pipe. • The need for support and stabilisation of the trench sidewalls is expected to be minimal. • The underlying soil and weathered rock materials at the reservoir site are of low to moderate potential expansiveness and offer relatively

Environ. Parameter	Summary of major findings	Impact management measures
		good founding for the proposed reservoir structure, provided pre-treatment of the subgrade is carried out as well as the introduction of an engineered layer. • Based upon the undertaking of pH and electrical conductivity tests the underlying soils are potentially corrosive and protective coatings must be considered for buried steel and concrete structures.

Wetland	The freshwater ecosystem delineation study identified multiple freshwater ecosystems that are either crossed by or hydrologically linked to the proposed Northern Aqueduct activities.
	
	Two wetland systems were identified within the study area that will be directly impacted upon by the proposed pipeline infrastructure (HGM Unit 1 and HGM Unit 2). The proposed reservoir and pump station will not directly impact upon any wetland systems, however, this infrastructure will be located within the catchment area of HGM Unit 1.
	
	HGM Unit 1, which is a tributary of the riparian B channel, is an unchannelled valley-bottom wetland system that flows in an east to south-easterly direction and is approximately 0.65ha in size. The major impacts to the system include alien invasive plant encroachment within the wetland and its catchment and overgrazing by livestock.
	
	HGM Unit 2, which is a tributary of HGM Unit 1, is a channelled valley-bottom wetland that flows in a southerly direction and is approximately 0.1ha in size. The major impacts to the wetland include the encroachment of alien invasive plant species, minor channel incision and catchment impacts.
	
	General Wetland Functioning
		<u>Excavation</u>
		• The physical disturbance footprint (including moving and parking of machinery) must not encroach into any of the identified wetland habitat.
		• The physical disturbance footprint of construction, including moving and parking of vehicles and machinery must be limited to the smallest area possible
		• The alignment of the pipelines, together with the adjacent working area, must be clearly demarcated prior to the commencement of the excavations. The width of the working area within the freshwater ecosystems must be kept to a minimum (12m) to ensure that impacts on these systems are minimised. All activities must be restricted to within the demarcated working area.
		• The offset for the 12m wide working area must be as follows:
		  ○ 2m for topsoil stockpile;
		  ○ 2m for trench;
		  ○ 2m for the sub- soil stockpile; and
		  ○ 6m for the movement of a tracked excavator on only ONE side of the corridor
		
		<u>Trenching</u>

Environ. Parameter	Summary of major findings	Impact management measures
	A Level 1 Wet-EcoServices assessment was performed to provide a general description of the functioning of the wetland systems identified within the study area. From a biodiversity point of view, the wetlands within the study area are considered to be of low value as they are generally dominated by disturbance tolerant and alien invasive plant species. **Wetland Ecosystem Functioning** Generally, the direct benefit services are currently being supplied at a Moderately Low level. Although the systems are located within a rural area and are easily accessible, the use of the wetlands by the local community appears to be limited to grazing by livestock. The proposed development will not impact upon the service provision of any of the HGM units within the study area. This is largely due to the proposed location of the reservoir and pump station, which is not directly within any wetland habitat. The proposed pipeline will cross both HGM Unit 1 and 2. However, due to the limited extent and magnitude of the impact, it is not anticipated to impact the ecosystem service provision of the effected wetlands. **Ecological Importance and Sensitivity** The wetland systems associated with the proposed development would be a D category. A D category indicates that the wetlands have a low/marginal ecological importance and sensitivity. For the post-development scenario, due to the location and nature of the infrastructure, the proposed development is not expected to impact upon the EIS of any of the HGM units within the study area. **Ecological Integrity/Present Ecological State (PES)**	• The vegetation must be carefully removed by hand in sods and suitably stored for replanting upon the completion of the backfilling process. • The size of the excavation of the crossing must be kept to a minimum in order to minimise the extent of the disturbance to the freshwater ecosystems i.e. the minimum allowable width and depth must be implemented. <u>Re-vegetation</u> • It is critical that vegetation is established immediately after the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process must be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture must be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful. • The grass must be watered on a regular basis until the vegetation has established and adequate cover is achieved (should the wetland become drier during the dry season). • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. • The diversion berms must divert the water off the trench towards the downslope side of the wetland. Care must be taken to discharge

Environ. Parameter	Summary of major findings	Impact management measures
	The post-development scenario, indicates that there will be no loss of wetland habitat. **Potential Impacts of Development** Pipelines, like all linear features, tend to have spatially limited impacts unless they interrupt driving processes that shape freshwater ecosystems. **Conclusion** The wetlands assessed within the study area are moderately modified in terms of the systems' integrity. The main factors impacting upon the systems' integrity include overgrazing by livestock, the encroachment of alien invasive plant species, and modifications to the systems' catchments. The riparian system's habitat was found to be fair/good, which is as a result of similar impacts affecting the wetland ecosystems. Impacts associated with proposed pipeline are generally fairly negligible and should be addressed/managed by the adoption of mitigation measures. The proposed pump station and reservoir are located within close proximity (but not within) HGM Unit 1. In order to avoid unnecessary loss of wetland habitat, it is important that the prescribed construction phase mitigation measures, as included in the EMP and appropriate leak detection systems are adopted. This is especially important given the close proximity of the proposed pump station and reservoir to HGM Unit 1.	water to areas where erosion will be minimised e.g. vegetated areas or existing formal drains. • Bio-degradable erosion control blankets must be considered to stabilise the disturbed areas on the steeper approaches to the wetlands where the risk of erosion of the soils is higher. The erosion control blankets must be implemented according to the supplier's specification. Where the proposed infrastructure crosses the wetland habitat, the following needs to be considered: • Where the infrastructure is unable to be aligned with existing services, the crossing must be planned at a narrow section and be perpendicular to the flow direction, minimising the amount of disturbance to the freshwater ecosystem and the risks of headward erosion. • Diversion structures must be constructed across the surface of the trenches to reduce runoff opportunities along the length of the trench, especially on steep slopes approaching the wetland crossing. • The diversion structures must consist of either a series of low earthen berms (approximately 300mm in height constructed with suitable material) or biodegradable sacks filled with a combination of soil, topsoil and an approved seed mixture. <u>Backfilling</u> • The backfilling is to be carried out immediately after the necessary trench construction has been finalised. • The backfill material must be returned in the same order that it was removed i.e. the sub-soil replaced first, followed by the topsoil material closer to the surface.

Environ. Parameter	Summary of major findings	Impact management measures
		• The material must be well moistened and compacted in 100mm layers to ensure that a similar bulk density to surrounding areas is achieved. • The backfill material must be compacted to the same height as the natural ground profile i.e. the trenching activities must in no way alter the natural surface flows.
Vegetation Assessment	The site is partially CBA Irreplaceable and according to Mucina and Rutherford 2006 is classified as KwaZulu-Natal Coastal Belt (CB3) vegetation type which is considered Endangered. Upon undertaking the groundtruthing exercise it was found that the site is transformed from natural and impacted by overgrazing and alien invasive plant infestation. A total of 108 plant species were recorded during the field survey, of which 46 were alien. Six (6) plant species which are protected by Provincial Legislation were noted within the development site. The plant species that fall under the protection of the KwaZulu-Natal Nature Conservation Management Act are: *Asparagus laricinus, Asparagus setaceus, Dietes grandiflora, Dracaena aletriformis, Hypoxis hemerocallidea, Ledebouria sp.* Although the vegetation type is classified as endangered, the ground-truthing exercise identified the area as transformed from natural and exhibits a Medium-low conservation value. If mitigation measures for the pipeline routing are correctly implemented and the rehabilitation of the pipeline and reservoirs is successful, minimal disturbance of environment will be seen. The provincially protected species will need to be removed or relocated and permits for their removal will need to be obtained from Ezemvelo KZN Wildlife and DAFF.	• Footprint of the activity needs to be strictly adhered to. • A site specific Environmental Management Programme needs to be developed for the construction and operation phases. • An Environmental Control Officer (ECO) needs to be appointed for the duration of construction. • A search and rescue operation needs to be conducted by a suitably qualified ecologist to collect/capture species and species of special concern. • Permits for plants and animal collection/removal need to be obtained prior to search and rescue operations. • Strictly no removing of any floral species without the valid permits in place. • Clearance in the construction phase is to be removed in a phased approach, as and when it becomes necessary. • Sensitive areas need to be demarcated clearly before construction commences. • Where possible, construction should occur in the dry season to prevent soil loss through stormwater. • Where possible, manual clearance of the line and vegetation should be done so as to prevent the movement of machinery. • The contractor should implement an alien invasive control programme, particularly in areas where soil disturbance occurs.

Environ. Parameter	Summary of major findings	Impact management measures
	The ecologist has no objection to the amendment of the pipeline provide all mitigation measures are in implemented.	• Soil stockpiles need to be grassed with an indigenous mix or covered with shadecloth to prevent soil loss through wind and water erosion. • Strictly no trapping or hunting is allowed. • Rehabilitation should take place as soon as construction of the section of line is complete. • Strictly no littering. The contractor should highlight this at daily toolbox talks and site clean-ups should occur on a daily occasion. • A mix of indigenous grass species, should be used for rehabilitation. • Ecological corridors need to be monitored and maintained for establishment of alien invasive plants and erosion. • Six monthly checks of the area should take place for the emergence of species.
Socio-Economic Assessment	According to the Socio-economic study undertaken by Urban Econ, the positive impacts of the aqueduct extension will largely be centred on the construction process and the employment and income multiplier effects that will result from it. These can be calculated by examining the cost of the pipe and average man hours required to lay each section of the pipe. The aqueduct extension will not create any permanent employment but will create a temporary injection of employment and income into areas through which the pipe is laid. Once the NAA is complete through Ogunjini the positive impacts of having access to higher water availability in the area will have a positive impact the potential business growth of the area. It is important to note that the majority of impacts are temporary in nature – aligned predominantly to the construction of the NAA. However, the over-arching benefit of the total project – the significant increase in local supply of potable water, will have a longer term positive impact on the socio-economic spheres. The impacts are discussed below.	

	Desirability The desirability of the NAA project stems from the fact that it successfully addresses many of the constraints present and anticipated in the future for water shortages in the north of eThekwini municipality. The NAA project will also increase the access to potable water resources as well as increasing water for industries in the area. **Changes in demographics** Development invites growth in new jobs in a community and draws new workers and their families into the community, either as permanent or temporary residents. When this occurs, the incoming population affects the social environment in various ways including increased demand for housing and social services (e.g. health care, day care, education, recreational facilities). The completion of the NAA project is anticipated to have an immediate impact on the community's ability to accommodate new residents and to adapt to changes in the biophysical environment, such as water shortages. Assessing the magnitude and rate of population change has important implications for community infrastructure and service requirements and can play a major role in determining social impacts associated with the proposed development – however, there is no provision made for any other kind of infrastructure bulks in the area, thus the impact is anticipated to be constrained. **Changes in income and employment** The aqueduct is unlikely to directly influence changes in employment and income opportunities in the townships and surrounding communities. Such changes may be more or less temporary (e.g., construction projects, or seasonal employment). Changes in income, however temporary will also influence the social environment in a number of ways	

Environ. Parameter	Summary of major findings	Impact management measures
	such as raising the average standard of living for residents in the townships. **Household income** Household income in the study areas appears typical of South African townships. The residents who did receive monthly or weekly incomes were primarily employed in the surrounding industries in Phoenix, Canelands, Riverhorse and surrounds. A number of households who receive no formal income in the form of wages and salaries rely on various grants and remittances. The most prevalent grant received by households are the Pension and Child Care grants. The majority of households, along the Ntuzuma, Inanda, Mawothi, and Kwamashu areas, receive a household income ranging from R5000.00-R8000 per month. Given the large household sizes, this is insufficient to meet the monthly food, schooling and medical needs of members. Given an average household size ranging from 4-7 members, this is translated into a per-capita income in the range of R1300-R1600 per household member. **Employment** The unemployment rate stands at 35%, with only 27% of the township population employed. The majority of the employed population are employed in low skilled occupations. The proposed development will directly impact only temporary employment. This will also directly impact on household incomes. **Aesthetics** The aesthetic quality of the township will be affected by the presence of the construction, although this will be short term, as the pipeline will be	

Environ. Parameter	Summary of major findings	Impact management measures
	underground. The aesthetic quality of the township will not be negatively affected by the presence of the pipeline.	
Heritage Assessment	A Heritage Impact Assessment was undertaken for the entire pipeline in June 2011. No red flag heritage sites were identified along the route, however it was identified that permits would be required for the partial destruction of three sites along the route. The updated information, including a layout of the new reservoir location and pipeline deviation was uploaded onto the Sahris Online Applications Website for comment from Amafa. Amafa confirmed that they have no objection to the proposed deviation but requires new permit application relating to the identified resources as they have expired. New permit applications have been submitted to Amafa.	• Amafa must be contacted if any heritage objects are identified during earthmoving activities and all development must cease until further notice. • No structures older than sixty years or parts thereof are allowed to be demolished altered or extended without a permit from Amafa. • Under no circumstances may any heritage material be destroyed or removed from site unless under direction of Amafa and a heritage specialist. • Should any remains be found on site that is potentially human remains, the South African Police Service (SAPS) should also be contacted. No SAPS official may disturb or exhume such remains, whether of recent origin or not, without the necessary permission from Amafa. • No activities are allowed within 50m of a site, which contains rock art. • Sources of all natural materials (including topsoil, sands, natural gravels, crushed stone, asphalt, etc.) must be obtained in a sustainable manner and in compliance with the heritage legislation.

19. ENVIRONMENTAL IMPACT STATEMENT

The existing Northern Aqueduct system has reached capacity on various sections of the trunk mains as a result of growth in demand over the years. The eThekwini Municipality Water and Sanitation Department (EWS) have recognised the need to meet the predicted water demands of consumers within the north eastern portion of the eThekwini Metropolitan boundary. In order to achieve these demands, the Northern Aqueduct Augmentation project was initiated by the EWS Department. This project was authorised in three Phases by the Department of Agriculture and Environmental Affairs (DAEA) in August 2012. Phase 1 and 2 have already been constructed. Phase 3 has been approved for construction, with the exception of a minor deviation in the pipeline routing and change in location of a reservoir.

The changes requiring approval in this Basic Assessment include a minor deviation with a new watercourse crossing and the change in location of a reservoir and associated infrastructure. The changes are described as follows:

- Change in location of the 20ML Ntanda Reservoir which will be a reinforced concrete reservoir with a full supply level of 410 metres above sea level (masl) or lower;
- A booster pump station will be constructed to pump water to a proposed 1ML break pressure tank/reservoir;
- A DN 350 steel pipeline which will link to the booster pump station and run across the valley to connect back into the already approved pipeline to the 1ML break pressure tank/reservoir.

The DN steel 600 pipeline (already approved) will terminate at the inlet valve chamber located immediately upstream of the Ntanda Reservoir, which is a 20ML reinforced concrete reservoir. The booster pump station will be constructed to pump water to a reservoir/break pressure tank (already approved) situated 3km away. The distance of the deviation from the pump station to connect into the already approve line is approximately 400m long. The site development plan is included in **Figure 7** below.

Figure 7: Site Development Plan

According to the EThekwini Municipalities SDP, at the end of November 2016, the water backlog stood at 56 388 households. The National Development Plan requires that all municipalities in South Africa prioritise development in rural areas, similar to the area in which the pipeline and reservoir have been located. The provision of basic services is a critical element in the national developmental agenda. Water, electricity, sanitation and social amenities are key and critical services which have been identified by communities that are required to meet their basic needs. Limited funding and exponential growth in the municipality has increased the levels of backlogs.

Projects such as the Northern Aqueduct Augmentation pipeline are critical as a step towards meeting the needs of the communities in terms of supplying basic services and reducing the service backlogs. The desirability of the NAA project stems from the fact that it successfully addresses many of the constraints present and anticipated in the future for water shortages in the north of eThekwini municipality. The initial positive impacts of the aqueduct extension will largely be centred on the construction process and the employment and income multiplier effects that will result from it. The aqueduct extension will not create any permanent employment but will create a temporary injection of employment and income into areas through which the pipe is laid.

Once the NAA is complete through Ogunjini the positive impacts of having access to higher water availability in the area will have a positive impact on the potential business growth of the area. While the majority of impacts are temporary in nature, the over-arching benefit of the total project – the significant increase in local supply of potable water, will have a longer term positive impact on the socio-economic spheres.

A Wetland Assessment was undertaken (refer **Appendix F**) to identify the extent of wetland in the area surrounding the deviation as well as the impact of the development on the wetland systems. Two wetland systems were identified within the study area that will be directly impacted upon by the proposed pipeline infrastructure. The proposed reservoir and pump station will not have any direct impact upon any wetland systems, however, the infrastructure will be located within the catchment area of a wetland unit. Both wetland units have been impacted upon by alien invasive plant encroachment, overgrazing and minor channel incision in the catchment.

It was identified that, from a biodiversity point of view, the wetlands within the study area are considered to be of low value as they are generally dominated by disturbance tolerant and alien invasive plant species. The proposed development will not impact upon the service provision of any of the HGM units within the study area. This is largely due to the proposed location of the reservoir and pump station, which is not directly within any wetland habitat. The proposed pipeline will cross both HGM Unit 1 and 2. However, due to the limited extent and magnitude of the impact, it is not anticipated to impact the ecosystem service provision of the effected wetlands.

The wetland systems associated with the proposed development would be a D category. A D category indicates that the wetlands have a low/marginal ecological importance and sensitivity. The post-development scenario, indicates that there will be no loss of wetland habitat. Pipelines, like all linear features, tend to have spatially limited impacts unless they interrupt driving processes that shape freshwater ecosystems.

The specialist recommended that, in order to avoid unnecessary loss of wetland habitat, it is important that the prescribed construction phase mitigation measures, as included in the EMP and appropriate leak detection systems are adopted. This is especially important given the close proximity of the proposed pump station and reservoir to HGM Unit 1.

A Vegetation Assessment was undertaken (refer **Appendix F**) to identified any species of biodiversity significance. A total of 108 plant species were recorded during the field survey, of which 46 were alien. Six (6) plant species protected by Provincial Legislation were noted within the development site. Although the general vegetation type is classified as endangered, the ground-truthing exercise identified the area as transformed from natural and exhibits a Medium-low conservation value. If mitigation measures for the pipeline routing are correctly implemented and the rehabilitation of the pipeline and reservoirs is successful, minimal disturbance of environment will be seen. The provincially protected species will need to be removed or relocated and permits for their removal will need to be obtained from Ezemvelo KZN Wildlife and DAFF.

A Heritage Impact Assessment was undertaken for the entire pipeline in June 2011. No red flag heritage sites were identified along the route, however it was identified that permits would be required for the partial

destruction of three sites along the route. The updated information, including a layout of the new reservoir location and pipeline deviation was uploaded onto the Sahris Online Applications Website for comment from Amafa. Amafa confirmed that they have no objection to the proposed deviation but requires new permit applications relating to the identified resources as they have expired. New permit applications have been submitted to Amafa for approval.

Under natural conditions, the surrounding landscape and study area would have been characterised by particular vegetation types. The historical dominant vegetation type present would have been the KwaZulu-Natal Coastal Belt (CB3), which falls under the Indian Ocean Coastal Belt (CB) Group 2 bioregion (Nel et al. 2011; Mucina and Rutherford 2006).

A small amount of Critical Biodiversity Area (CBA): Irreplaceable was identified on site; however the pipeline for the most part avoids this area. The line where the DN350 pipeline runs up the valley to re-connect to the already approved pipeline is an existing walking path and therefore already highly disturbed. No DMOSS was identified in the vicinity of the deviation area. In terms of the vegetation identified in and around the wetland units, the wetland specialist has noted for all wetland units that the major impacts to the systems include alien invasive plant encroachment.

A layout of overall site sensitivities is included in **Figure 8** below.

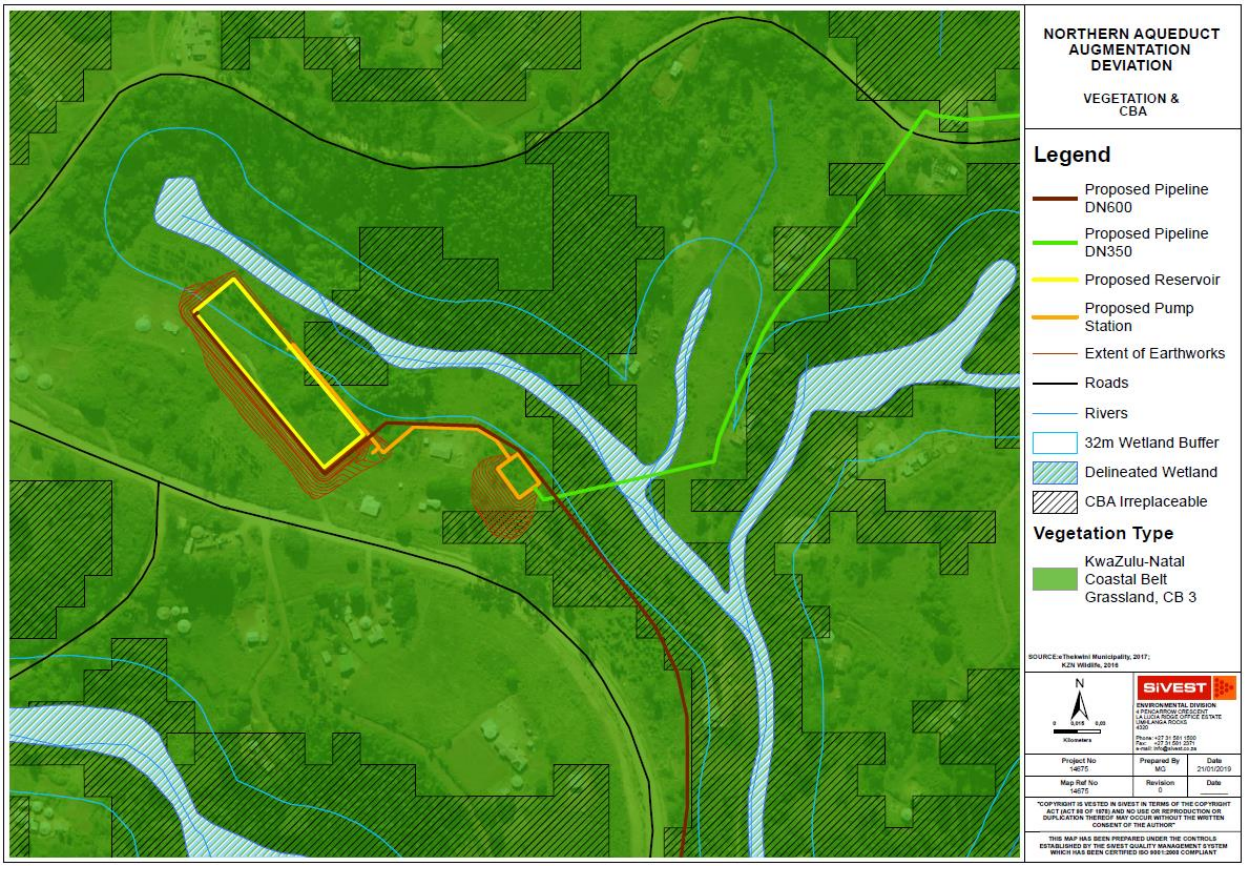

Figure 8: Site Sensitivities

In terms of impacts to biophysical systems during construction (i.e. impacts to vegetation and wetlands), the impacts were mostly medium negative impacts. However, with adherence to the mitigation measures, which have been include in the EMPr, all biophysical impacts during the construction phase can be mitigated to low negative impacts. In terms of socio-economic impacts during construction, one impact, the potential for land expropriation, was rated as a high negative impact with no possibility of mitigation. However, the location of the reservoir was chosen to avoid the need for land expropriation and it is the intention of the applicant to avoid this process if possible. Consultation with the households living adjacent to the reservoir needs to be undertaken. The creation of temporary jobs was rated as a medium positive impact during construction. During the operational phase, the provision of basic services was rated as a very high positive impact.

In terms of the No-Go Alternative, the loss of opportunities for the provision of basic services was rated as a very high negative impact. The proposed Ntuzuma scheme is a sub-phase of the larger Northern Aqueduct scheme that is developed to ensure a sustainable and assured water supply for the increasing water demands. eThekwini Municipality currently experiences frequent water shortages in the areas to be served by the Ntuzuma scheme as the existing infrastructure has reached its capacity. Not implementing the scheme would result in eThekwini Municipality not being able to deliver basic services to the residents within the project area.

The following provides a summary of the positive and negative impacts associated with the proposed project:

Table 26: Summary of impacts pre and post mitigation

Impact	Pre-mitigation	Post-mitigation
Impacts on Biophysical Systems / Components during the construction phase		
Vegetation/Biodiversity Loss	Medium negative impact	Low negative impact
Soil Erosion	Medium negative impact	Low negative impact
Development of hardened surfaces: Flow changes and/or erosion	Low negative impact	Low negative impact
Installation of pipeline: Impoundment of flows	Medium negative impact	Low negative impact
Installation of pipeline: Alteration of subsurface flows	Medium negative impact	Low negative impact
Biodiversity: Loss of flora	Medium negative impact	Low negative impact
Biodiversity: Habitat fragmentation	Medium negative impact	Low negative impact
Impacts to Socio-Economic Component during the construction phase		
Air / dust pollution	Low negative impact	Low negative impact
Noise	Low negative impact	Low negative impact
Job creation	Medium positive impact	No mitigation required
Land expropriation/relocation of households (if applicable)	High negative impact	No mitigation possible
Impacts to Biophysical Systems/components during the operational phase		

Impact	Pre-mitigation	Post-mitigation
Rupture of pipeline	Medium negative impact	Low negative impact
Impacts to Socio-Economic component during the operational phase		
Provision of basic services	Very high positive impact	No mitigation required
No-go Alternative		
Loss of opportunities for provision of basic services	Very high negative impact	No mitigation possible
No requirements for land expropriation	High positive impact	No mitigation required

20. ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR) AND CONDITIONS TO BE INCLUDED IN ENVIRONMENTAL AUTHORISATION (EA)

Mitigation measures from the specialist studies have been included in the EMPr that is attached in **Appendix H.**

Taking into account the potential negative and significant positive impacts that the proposed development could have on the social and biophysical environment, it is the opinion of the EAP that the proposed development should be authorised subject to the following conditions of authorisation:

- All of the mitigation measures identified in this BA Report must be made conditions of the authorisation.
- It is important that all of the listed mitigation measures are costed for in the construction phase financial planning and budget so that the contractor and/or developer cannot give financial budget constraints as reasons for non-compliance.
- The construction EMP must be approved by the EDTEA prior to construction commencing.
- An independent Environmental Control Officer (ECO) must be appointed by the applicant to monitor the implementation of the construction EMP. The ECO should undertake monthly site inspections and compile a monthly environmental audit report.

The following recommendations of the specialist studies/authority should be included in the EA:

Wetland

Excavation

- The physical disturbance footprint (including moving and parking of machinery) must not encroach into any of the identified wetland habitat.
- The alignment of the pipelines, together with the adjacent working area, should be clearly demarcated prior to the commencement of the excavations. The width of the working area within the freshwater ecosystems should be kept to a minimum (12m) to ensure that impacts on these systems are minimised. All activities must be restricted to within the demarcated working area.
- The offset for the 12m wide working area should be as follows:
    - 2m for topsoil stockpile;
    - 2m for trench;
    - 2m for the sub- soil stockpile; and
    - 6m for the movement of a tracked excavator on only ONE side of the corridor

Trenching

- The size of the excavation of the crossing should be kept to a minimum in order to minimise the extent of the disturbance to the freshwater ecosystems i.e. the minimum allowable width and depth should be implemented.

Revegetation

- Vegetation must be established immediately after the backfilling of the trenches is complete. The sods of vegetation that were removed during the excavation process should be replanted on completion of the backfilling process. An approved local indigenous grass seed mixture should be applied in conjunction with the sods if it is deemed that establishment of the vegetation from the sods is unlikely to be successful.

Backfilling

- The backfilling is to be carried out immediately after the necessary trench construction has been finalised.
- The backfill material should be compacted to the same height as the natural ground profile i.e. the trenching activities must in no way alter the natural surface flows.

Vegetation

- Permits for the removal and relocation of plants and animals must be in place before any construction can commence;
- Translocation plan should inform the relocation of protected plants;
- A search and rescue operation, undertaken by a suitably qualified person, must be undertaken before construction commences;
- An Alien Invasive Control Programme must be implemented.
- Erosion control measures must be implemented;
- Construction must occur in a phased approach;
- Rehabilitation must occur once construction is complete in the relevant area;

Heritage

- Amafa should be contacted if any heritage objects are identified during earthmoving activities and all development should cease until further notice.
- No structures older than sixty years or parts thereof are allowed to be demolished altered or extended without a permit from Amafa.
- Under no circumstances may any heritage material be destroyed or removed from site unless under direction of Amafa and a heritage specialist.
- Should any remains be found on site that is potentially human remains, the South African Police Service (SAPS) should also be contacted. No SAPS official may disturb or exhume such remains, whether of recent origin or not, without the necessary permission from Amafa.
- No activities are allowed within 50m of a site, which contains rock art.
- Sources of all natural materials (including topsoil, sands, natural gravels, crushed stone, asphalt, etc.) must be obtained in a sustainable manner and in compliance with the heritage legislation.

21. UNCERTAINTIES, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The assessment has been based by SiVEST on information sourced and provided by the Applicant, site visits conducted, specialist findings and the application of the SiVEST assessment criteria. The EAP is of the opinion that the assessment method applied is acceptable. SiVEST assumes that:

- All the information provided by the Applicant is accurate and unbiased.
- The available data, including Topocadastral maps, Orthophotographs, geological maps and Google Earth images, are reasonably accurate.
- All information contained in the specialist studies provided is accurate and unbiased.
- It is not always possible to involve all Interested and/or Affected Parties (I&APs) individually, however, every effort has/is been made to involve as many interested parties as possible. It is also assumed that individuals representing various associations or parties convey the necessary information to these associations / parties.
- It is not possible to determine the actual degree of the impact that the development will have on the immediate environment without some level of uncertainties. Actual impacts can only be determined following construction and/or operation commences.

22. AUTHORISATION OF THE NORTHERN AQUEDUCT AUGMENTATION PIPELINE DEVIATION AND RESERVOIR

We request that the Department authorizes the development. The impacts to the biophysical environment can be mitigated to acceptable levels provided the EMPr developed for the site is strictly adhered to. In terms of the wetland assessment, the post-development scenario, indicates that there will be no loss of wetland habitat. In general, pipelines, like all linear features, tend to have spatially limited impacts unless they interrupt driving processes that shape freshwater ecosystems. The NAA deviation is a minor adjustment in the pipeline which will connect to the remainder of the already approved Phase 3 pipeline. The socio-economic benefits of this project are far reaching and its approval will contribute towards addressing the massive water backlogs experienced by the municipality.

Conditions to be included in the Environmental Authorisation are listed in Section 19 above.

The environmental authorization should be valid for a period of 5 years. It is anticipated that the construction period will commence during November 2020.

SiVEST Environmental Division
4 Pencarrow Crescent,
La Lucia Ridge Office Estate,
Umhlanga Rocks, 4320
PO Box 1899, Umhlanga Rocks, 4320
KwaZulu-Natal, South Africa

Tel +27 35 789 2066
Email info@sivest.co.za
www.sivest.co.za

Contact Person: Michelle Guy
Email: michelleg@sivest.co.za