Environmental Impact Assessment (EIA) for the Proposed Construction, Operation and Decommissioning of a Sea Water Reverse Osmosis Plant and Associated Infrastructure Proposed at Lovu on the KwaZulu-Natal South Coast

DEA Reference No: 14/12/16/3/3/2/636
CSIR Report No: CSIR/CAS/EMS/ER/2014/0014/B

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

UMGENI WATER • AMANZI

CSIR
our future through science

APRIL 2016

REPORT DETAILS

Title:	**Environmental Impact Assessment (EIA) for the Proposed Construction, Operation and Decommissioning of a Seawater Reverse Osmosis Plant and Associated Infrastructure at Lovu, KwaZulu-Natal South Coast: Final EIA Report**
Purpose of this report:	This Final EIA Report forms part of a series of reports and information sources that are being provided during the EIA Process for the for the Proposed Construction, Operation and Decommissioning of a Seawater Reverse Osmosis Plant and Associated Infrastructure at Lovu, KwaZulu-Natal South Coast. In accordance with the EIA Regulations, the purpose of this Final EIA report is to: • Present the proposed project, including project alternatives and the need for the project; • Describe the affected environment, including the planning context, at a sufficient level of detail to facilitate informed decision making; • Provide an overview of the EIA Process being followed, including public consultation; • Assess the predicted positive and negative impacts of the project on the environment; • Provide recommendations to avoid or mitigate negative impacts and to enhance the positive benefits of the project; • Provide a Environmental Management Programme (EMPr) for the design, construction and operational phases of the project. The Final EIA Report and EMPr are being made available to all stakeholders for a 21-day review period following which it will be submitted to the National Department of Environmental Affairs (DEA) for decision-making. All stakeholders are invited to comment on the Final EIA Report, with comments to reach the National Department of Environmental Affairs by **18 May 2016**. Please provide a copy of such comments to the Environmental Assessment Practitioner (contact details below) **Ms Matlhodi Mogorosi** **National Department of Environmental Affairs** Private Bag X 447, Pretoria, 0001; or Fedsure Building, 315 Pretorius Street, Pretoria Fax: 012 – 322 2682 Email: mmogorosi@environment.gov.za
Prepared for:	Umgeni Water Amanzi (Umgeni Water) Contact: Phumi Ndlovu Tel: +27-31-268 7172/Cell: +27-83-581 1904 Email: Phumi.Ndlovu@umgeni.co.za
Prepared by:	CSIR, P O Box 320, Stellenbosch, 7599, South Africa Tel: +27-21-888 2400 Fax: +27-21-888 2693
Lead Authors:	Annick Walsdorff, Rohaida Abed and Paul Lochner
CSIR Report Number:	CSIR/CAS/EMS/ER/2014/0014/B
DEA Reference Number:	14/12/16/3/3/2/636
Date:	April 2016
To be cited as:	CSIR (2016): Final EIA report for the Proposed Construction, Operation and Decommissioning of a Seawater Reverse Osmosis Plant and Associated Infrastructure at Lovu, KwaZulu-Natal South Coast.

CONTENTS

PART A: FINAL EIA REPORT

APPENDICES

PART B: EMPR

STATEMENT OF INDEPENDENCE

CSIR has been commissioned by Umgeni Water to conduct an EIA in terms of the 2010 EIA Regulations R543, R544, R545 and R546 under the National Environmental Management Act, 1998 (Act 107 of 1998, with amendments). CSIR complies with the general requirements set out below in the Regulations:

General requirements for EAPs or a person compiling a specialist report or undertaking a specialised process

An EAP appointed in terms of regulation 16(1) must -

a) be independent;
b) have expertise in conducting environmental impact assessments, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity;
c) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
d) comply with the Act, these Regulations and all other applicable legislation;
e) take into account, to the extent possible, the matters referred to in regulation 8 when preparing the application and any report relating to the application; and
f) disclose to the applicant and the competent authority all material information in the possession of the EAP that reasonably has or may have the potential of influencing-
    - any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or
    - the objectivity of any report, plan or document to be prepared by the EAP in terms of these Regulations for submission to the competent authority.

Paul Lochner
CSIR Project Leader
EAP-SA

Annick Walsdorff
CSIR Project Manager

April 2016

SUMMARY

PROJECT AND APPLICANT OVERVIEW

Umgeni Water Amanzi (Umgeni Water) (i.e. the Project Applicant) is proposing to construct and operate a sea water desalination plant in the Lovu area (on the south coast of Durban, within the eThekwini Municipality) using sea water reverse osmosis (SWRO) technology. Umgeni Water has appointed the Council for Scientific and Industrial Research (CSIR) to undertake the requisite Environmental Impact Assessment (EIA) and determine the biophysical, social and economic impacts associated with undertaking the proposed activity. The proposed project requires an EIA in terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) and its amended EIA Regulations (i.e. Government Notice (GN) R543, R544, R545 and R546); as promulgated on 18 June 2010.

Umgeni Water is a state-owned entity and is the largest supplier of bulk potable water in KwaZulu-Natal. The organisation was established in 1974, and has grown over the years to become an entity of strategic importance in KwaZulu-Natal. Umgeni Water has six municipal customers, namely eThekwini Metropolitan Municipality, Ilembe District Municipality, Sisonke District Municipality, Umgungundlovu District Municipality, Ugu District Municipality and Msunduzi Local Municipality. The organisation currently supplies 426 million m^3 of potable water to its six municipal customers. The proposed project will service the requirements of the eThekwini Municipality.

NEED FOR THE PROPOSED PROJECT

The proposed Umgeni Water desalination plant will aim to ensure the promotion of sustainable economic development by serving the interests of a growing population as well as other commercial interests in the region. It is recognised that the future of the South Coast region of KZN is greatly dependent on an alternative water source to augment water supply of which desalination is one option.

The main objectives of the proposed desalination plant are to:

- develop a long term, sustainable alternative water source for the east coast region that is rainfall/climate-independent and ensures long-term security of supply; and
- establish a world-class and cost-effective desalination plant, whilst minimising the harmful environmental impacts of the desalination plant through comprehensive scientific investigation and consistent stakeholder engagement.

Rainfall in South Africa is highly variable in spatial distribution and unpredictable, both within and between years. Much of the country is arid or semi-arid and the whole country is subject to droughts

and floods. Bulk water supplies are largely provided via a system of large storage dams and inter-basin water transfer schemes. Thus, a reduction in the amount or reliability of rainfall, or an increase in evaporation may exacerbate the already seriously limited surface and ground water resources in South Africa. According to the South African National Water Resource Strategy, South Africa will face serious water challenges in the near future if the economic growth envisaged for the country is to be sustained.

In the Water for Growth and Development Framework (2011), the Department of Water Affairs suggests that, in addition to the traditional water supply schemes, two major ways that water supplies can be augmented are the treatment of effluent and the desalination of seawater for productive use. For the latter, major advances in the field of membrane technology during the past two decades have meant that Reverse Osmosis (RO) as a means of sea water desalination has become a competitive alternative water source. In this regard, a key principle behind assuring local water supplies is to limit the expense of transporting water by keeping supplies as close to the end-user as possible. This would therefore suggest that traditional large-scale, inter-basin transfer schemes and similar strategies will be supplemented in coastal areas by 'point-of-source' water augmentation strategies such as desalination. As conventional water resources near their full yield potential and with climate change likely to increase the risks associated with water supply, attention is sharply focusing on seawater desalination as the 'ultimate solution' to the looming water crisis in many South African coastal towns and cities.

The Spring Grove Dam was constructed as part of an inter-basin transfer scheme between the Mooi River and the Mgeni Catchment to augment the water resources in the Mgeni system. However, with the current growth in water demand, even this scheme will soon not be enough to provide the required assurance of supply to Durban, Pietermaritzburg and surrounding areas. The Department of Water and Sanitation's Reconciliation Strategy Study for the Kwazulu-Natal Metropolitan Coastal Areas indicates that even with further augmentation of the Mgeni System (including the implementation of Spring Grove Dam and the planned Mooi-Mgeni Transfer Scheme Phase 2) by an additional 137 Ml/day (50 million m^3/a), the supply of water in future will still not exceed the required 99% assurance of supply. Phase 1 of the proposed uMkhomazi Water Project is planned to secure an additional 600 Ml/d (220 million m^3/a). This involves the potential development of Smithfield Dam located along the central reaches of the uMkhomazi River, with a storage capacity of 250 million m^3 (250 000 Ml).

The proposed Smithfield Dam and associated infrastructure would not be able to augment the supply to the South Coast. The capital cost of the proposed dam, delivery tunnel and other infrastructure would be about R17 billion and the scheme would take many years to construct. Therefore Umgeni Water identified a sea water desalination plant in the Lovu area using RO technology as a possible short-medium term alternative that could be implemented fairly quickly to meet the growing water demand and ensure the sustainable economic development of the region. Parts of the Umgeni Water operational area are currently in a state of drought. The affected areas are the north of the eThekwini Municipality, parts of the iLembe District and the Middle South Coast. In the south, levels of two of the three dams that serve the Middle South Coast (i.e. the Nungwane and Umzinto) are currently below 50% and the overall system storage of the South Coast System is below 50%. A 25% restriction

has been gazetted and Umgeni Water has implemented a temporary emergency scheme to pump water from the Mpambanyoni River to E J Smith Dam to augment supply. Even without the current drought, the water resources of the South Coast will not be able to meet the increased demand in five years' time. It is therefore imperative that Umgeni Water augment the supply of water to the South Coast over the next five years to ensure that their customers within this region can receive a sustainable supply of water.

This indicates the serious need for water within the region, and therefore Umgeni Water is considering the proposed desalination plant as a possible short-medium term alternative to assist with the water shortages.

PROJECT DESCRIPTION

The proposed desalination plant will produce approximately 150 Ml/day of freshwater when at final capacity, and will have an average inflow rate of 389 Ml/day. Approximately 183 Ml/day of brine (concentrated sea water) will be discharged into the sea. The plant will have a payback period of 20-25 years with the potential of a lifespan extension. It may be constructed in two phases over a period of five years and will occupy an area of approximately ±70 000 m^2 (excluding servitudes for pipelines). The desalination plant will consist of the following 'Linear' and 'On-site' elements:

Linear Infrastructure:

- Sea water (source water) intake with screens, sea-bed pipeline buried under the coast to the sea water pump station located a short distance inland;
- Brine outfall constructed from the sea water pump station under the coast to a sea-bed pipeline and diffuser;
- Terrestrial pipelines comprising a sea water pipeline between the sea water pump station and the desalination plant;
- A brine pipeline from the desalination plant back to the sea water pump station;
- A short potable water pipeline to the existing South Coast System pipeline; and
- Electrical power line and transformer yard infrastructure.

On-site Infrastructure:

- A sea water pump station located within the littoral zone;
- Pre-treatment facilities including flocculation, Dissolved Air Flotation if required (DAF) and pre-treatment membrane filtration (Ultrafiltration);
- SWRO system (with energy recovery equipment) including cartridge filtration and RO membranes;
- Pre-treatment and RO buildings and other smaller water treatment related infrastructure;
- The extension and/or upgrading of existing access roads;
- The development of internal access roads;
- All chemical infrastructure for conditioning of the pre and post-filtered water;
- Two freshwater holding reservoirs each of 37.5 Ml capacity;
- Domestic sewerage treatment facility;

- Stormwater handling facility;
- Primary electricity building to be connected to 132/11kV substation;
- Desalination plant waste streams handling and treatment facilities;
- Solid wastes (i.e. screenings) handling and storage facilities; and
- A total operational site including all on-site infrastructure enclosed by an approximately 3 m high security fence.

A brief description of the key infrastructural components associated with the proposed Lovu desalination facility is provided in Table 1 below.

Table 1: Summary of the Proposed Key Components of the Lovu Desalination Plant

Component of the Lovu Desalination Plant	Brief Description
Sea Water/ Marine Intake and Pipeline	▪ Sea water will be abstracted from the marine environment via an intake structure located about 1000 m from shore at a water depth of about 20 m. ▪ Water will be drawn in through coarse screens on the intake structure, at a height of between 4 m and 6 m above the seabed, in order to avoid the intake of marine sediment and floating matter. ▪ A low inflow velocity of less than 0.15 m/s will reduce the intake of small fish and other marine organisms. ▪ Pipelines will transport the intake water under gravity flow to the sea water pump station on shore. ▪ The marine pipeline will be buried below the seabed through the surf zone and beach area to the pump station, in order to prevent undermining of the pipelines by scour.
Sea Water Pump Station	▪ A sea water pump station is proposed within a disturbed dune site situated within close proximity to the beach. ▪ The sea water intake pump station will be sited approximately 200 m inland from the shore. ▪ It is anticipated that the excavation for the invert of the pump station sump is likely to be at approximately 9 m below Mean Sea Level (MSL). This is based on the requirement that the sump at the pump station be deep enough to allow for gravitational inflow of the sea water into the sump.
Sea Water Intake Pipeline (Terrestrial Pipeline)	▪ The sea water pump station will convey the source sea water to the proposed desalination plant site via a terrestrial pipeline following a route along either the northern or southern banks of the Lovu River estuary. ▪ Four alternative pipeline routes and combined pipeline and tunnel alternatives have been considered. ▪ Booster pumps for seawater as required along the proposed terrestrial pipelines routes.
SRWO Desalination Plant	▪ The proposed desalination site will require an area of land approximately 70 000 m^2 in extent (7 ha). ▪ Two site alternatives for the proposed desalination plant have been considered in this EIA Process. ▪ These sites are situated within approximately 3 km of the coast.
Brine Discharge Pipeline (Terrestrial Pipeline)	▪ The brine discharge pipeline will extend from the proposed desalination plant to the sea water pump station and will follow the same route as the seawater pipeline as described above. ▪ Booster pumps for brine at the desalination plant.

Component of the Lovu Desalination Plant	Brief Description
Brine Discharge Pipeline (Marine Pipeline) and Diffuser System	▪ From the pump station, a pipeline would extend approximately 650 m offshore (i.e. beyond the surf zone) to a diffuser sited at a water depth of approximately 10 to 12 m. ▪ Brine will be discharged via a number of outlet ports located in series along the length of a diffuser. ▪ These will discharge the dense brine upwards into the water column to provide good mixing with the ambient seawater.
Potable Water Pipelines	▪ The proposed Lovu Desalination Plant is situated adjacent to an existing bulk potable water pipeline, into which it will connect. ▪ The proximity of the proposed desalination plant to this existing bulk water infrastructure will require that the length of new potable water pipelines will be minimal.
Power Supply Infrastructure	▪ The proposed desalination plant is anticipated to have a total energy demand of approximately 32 MW (i.e. approximately 4 kWh/m³ of potable water produced, while additional power will be required to pump water to the plant from the sea and to deliver potable water into the existing bulk supply infrastructure). ▪ It is expected that the total electrical connection to the proposed plant would be approximately 40 MW. ▪ A transmission line (132 kV) would be required to transfer electricity to the desalination site and the pump station, and a substation would be required to reduce the voltage to 11 kV.
Other Auxiliary Infrastructures	▪ Extension and/or upgrading of existing access roads; ▪ Development of internal access roads; ▪ Chemical infrastructure for conditioning of the pre and post-filtered water; ▪ Two freshwater holding reservoirs of 37.5 Ml; ▪ Onsite sewerage treatment facility; ▪ Stormwater handling facility; ▪ Concrete retention tank; and ▪ A 3 m high security fence.

An initial site selection Environmental Screening Study (ESS) was undertaken by Umgeni Water in 2010/2011 for site identification and assessment of the desalination plant and the associated infrastructure on the KZN coastline. This study investigated six potential sites on the KZN South Coast for the possible implementation of a desalination facility, namely: the Bluff; the old Durban International Airport site; Mbokodweni; Lovu; Msimbazi; and Crocworld (in Scottburgh). On the basis of various environmental and social screening criteria, the outcomes of the site selection study indicated that the Lovu site on the KZN South Coast was the most favourable and was assessed further as part of a Phase 1 Due Diligence Report. This report provided an overview of the proposed desalination project and associated infrastructure; and included an overview of potential social and environmental impacts. Following on from the Phase 1 Due Diligence Study, a Phase 2 Feasibility Study (and preliminary design) was undertaken by the appointed consulting engineers and completed in June 2015, which has been used to inform this EIA Process.

CONSIDERATION OF ALTERNATIVES

The alternatives assessed in the Final EIA report are the most feasible and likely development options in terms of environmental, social and technical criteria. All reasonable measures to forecast the expected environmental outcomes of the proposed desalination project have been undertaken as far as possible and within the full ambit of the 2010 NEMA EIA Regulations. The alternatives noted in the Final Scoping Report were at an early stage in the EIA Process. As such, certain modifications and changes to the proposed alternatives have become necessary as a result of the findings of the detailed Phase 2 Feasibility Study.

Apart from the no-go alternative, other types of alternatives were considered in the pre-feasibility planning for this project and as part of this EIA Process. The analysis of the various alternatives is presented in Chapter 2 and Chapters 6 to 13 of this Final EIA report, with a summary provided below:

- **No-go Alternative:**
    - The no-go alternative assumes that the proposed project does not go ahead. This alternative provides the baseline against which other alternatives are compared and will be considered throughout the report. The main implications of the no-go alternative are that alternative and possibly more expensive water supply schemes will be developed; and that water will become more expensive and possibly more scarce in the region and water reduction strategies will need to be enforced. Further, as conventional water resources near their full potential, the region will face serious challenges in terms of sustaining the economic growth envisaged for the region.

- **Location Alternatives**
    - As highlighted above and in Chapter 2 of the Final EIA report, an ESS was used to assess 6 potential site locations between Durban and Scottburgh in terms of ecological and social sensitivity to the receiving marine and terrestrial environments, as well as project technical requirements. Based on the findings of the multi-criteria analysis, Lovu was selected as the preferred site location for the proposed desalination plant. Two site alternatives for the proposed desalination plant have been investigated in the EIA Phase. Both the preferred and alternative sites are located on the southern bank of the Lovu River.

- **Layout Alternatives: Sea Water Pipelines**
    - As highlighted above and in Chapter 2 of the Final EIA report, the proposed sea water pipelines extending between the proposed sea water pump station and the desalination plant consists of four different routing alternatives that have been assessed as part of the EIA Process. These alternative routings include the Preferred Pipeline Routing, Pipeline Route Alternative 1, Pipeline Route Alternative 2 and Pipeline Route Alternative 3.

- **Layout Alternatives: SWRO Site Location**
    - As highlighted above and in Chapter 2 of the Final EIA report, two site alternatives for the proposed desalination plant have been considered in this EIA Process. The preferred site is located approximately 3 km away from the ocean shore and is situated approximately 10 m above sea level on the southern bank of the Lovu River. The alternative site for the proposed desalination plant is located west of the preferred site. Both sites are currently used to grow sugar cane.

- **Technical and Design Alternatives**
    - The technology proposed for the construction and operation of the desalination plant will be guided by industry standards and global best practice. The applicable technology alternatives for this project relate to the infrastructure being installed and constructed. As noted above, a detailed feasibility study was undertaken by the applicant. The study assessed the various technology and design options for the proposed project and recommended (technically, economically and environmentally) feasible options to be considered during the detailed design phase.

NEED FOR AN EIA

As noted above, in terms of the EIA Regulations promulgated under Chapter 5 of the NEMA published in GN R543, 544, 545 and 546 on 18 June 2010 and enforced on 2 August 2010 (as amended), a full Scoping and EIA Process is required for the proposed project. The need for the full Scoping and EIA is triggered by, amongst others, the inclusion of the Activity 14 listed in GN R545 (Listing Notice 2):

- *"The construction of an island, anchored platform or any other permanent structure on or along the sea bed excluding construction of facilities, infrastructure or structures for aquaculture purposes".*

APPROACH TO THE EIA

An Application for Environmental Authorisation was lodged with the National Department of Environmental Affairs (DEA) (i.e. the Competent Authority) in December 2013, in terms of the 2010 NEMA EIA Regulations (prior to the promulgation of the 2014 EIA Regulations). The Application for Environmental Authorisation was accepted by the National DEA on 10 March 2015 and the DEA EIA Reference Number: 14/12/16/3/3/2/636 was allocated to the application. Correspondence from the National DEA is included in Appendix C of the Final EIA report.

As noted above, since the release of the Final Scoping Report, further feasibility studies have been undertaken by the Project Applicant, which have provided additional project details. Linked to this, certain listed activities are no longer applicable to the proposed project, and as such an Amended Application for Environmental Authorisation is currently being submitted to the National DEA (and is included in Appendix B of the Final EIA report).

Subsequent to the acceptance of the original Application for Environmental Authorisation in March 2014, the project accordingly proceeded into the Scoping Phase. In line with this, the Final Scoping Report and Plan of Study for EIA were submitted to the National DEA on 23 February 2015 for decision-making and concurrent Interested and Affected Party (I&AP) review for a period of 21-days. The National DEA accepted the Final Scoping Report on 30 April 2015, and a copy of the acceptance letter, allowing the project to proceed to the EIA Phase, is included in Appendix C of the Final EIA report.

The results of the specialist studies and other relevant project information are summarized and integrated into the Final EIA report. This Final EIA report also includes an Environmental Management Programme (EMPr) (as Part B of the report), which has been prepared in compliance with the relevant regulations and which is based on the recommendations made by specialists for design, construction, operation, and decommissioning of the project. The EMPr is also based on the Umgeni Water Particular Specification for Environmental Management of Construction Projects (Version 001, dated February 2010), which has been compiled by Umgeni Water for implementation across all their construction and infrastructure projects in order to avoid and/or manage potential negative impacts.

The Final EIA report and EMPr are now being released to stakeholders for a 40-day review period. All comments received will be included in the Final EIA Report, which will be submitted to National DEA for decision-making.

This Final EIA report is available at the Kingsburgh Public Library and on the following project website: http:// www.csir.co.za/eia/LovuDesalination/

Written notifications, hard copies and/or CDs containing the document were sent to key stakeholders, including authorities. All I&APs on the project database have been notified of the release of the Final EIA report and EMPr.

REQUIREMENT FOR A COASTAL WATER DISCHARGE PERMIT AND WATER USE LICENCE

The operation of the proposed desalination plant requires a Coastal Waters Discharge Permit in terms of the National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008) in order to enable the disposal and discharge of effluent to sea. The Coastal Waters Discharge Permit was submitted to the DEA Branch: Oceans and Coasts (Directorate: Coastal Pollution Management) in September 2015. A copy of the permit application can be made available to stakeholders and I&APs upon request. A reference number for the Coastal Waters Discharge Permit application is pending from the National DEA: Branch Oceans and Coasts. Additional information regarding the need for the Coastal Waters Discharge Permit is included in Chapter 4 of the Final EIA report.

In addition, a Water Use Licence (WUL) will be required in terms of Section 21 of the National Water Act (Act 36 of 1998) as a result of the proximity to or the crossing of nearby watercourses or identified wetlands by the proposed terrestrial pipelines. Additional information regarding the need for a WUL is provided in the Final EIA report. The WUL Application is planned to be submitted to the decision-making authority, the KZN Department of Water and Sanitation, during the release of the

Final EIA Report (i.e. subsequent to the submission of the release of the Final EIA report to account for feedback from the KZN Department of Water and Sanitation). The KZN Department of Water and Sanitation was consulted during the EIA Process (Pre-application meeting dated 17 December 2015) to confirm the need for a WUL, confirm the requirements thereof, and to seek comment on the proposed project. At this stage, activities that would definitely trigger either a General Authorisation Registration or WUL requirements would include:

- Construction of the proposed desalination plant within 500m of a wetland (i.e. the Lovu Estuary is associated with floodplain wetlands);
- Excavation of pipelines through or within 500m of a wetland (i.e. this would apply to all alternatives);
- Construction of transmission lines across wetlands or rivers;
- Passage of pipelines across wetlands or rivers (i.e. the pipeline alternatives (preferred route and Alternatives 1 and 3) would both cross a watercourse (referred to as "Watercourse 1" in the Freshwater/Aquatic Ecology Assessment (Chapter 8 of the Final EIA report);
- The construction of a bridge across the estuary; and
- The proposed potable freshwater holding reservoirs each of 37.5 Ml capacity (2 x 37.5Ml), as their storage capacity exceeds 10 000 m^3.

IMPACT ASSESSMENT

Provided the stipulated management actions are implemented effectively, no negative impacts of high significance are predicted to occur as a result of this project, with the exception of residual **negative** impacts associated with disturbance of the *general surface environment at the proposed Alternative site* and *visual impacts* associated with construction activities with which remain of **high** significance. The **positive** impacts generated by the project are associated with the economic benefits from employment opportunities, knowledge gained from conservation of potential fossil finds and the fact that the proposed facility is largely compatible with relevant water supply planning and with relevant economic development and associated spatial planning for the area. Refer to Table 2 below for summary of impacts.

Considering that all the negative impact would be appropriately managed and the positive impacts enhanced through mitigation measures and management actions included in the EMPr (Part B of this Final EIA report), the potential negative residual impacts associated with the proposed project are not anticipated to be significant.

Table 2: Comparative assessment of overall impacts following mitigation measures

	Preferred site	Alternative site	Pipeline		Powerline
			Preferred /Alternative 1 & 3 routes	Alternative 2 route	
Construction Phase					
Marine Ecology Assessment	-	-	Low Negative (**Low Positive**)	Low Negative (**Low Positive**)	-
Freshwater Ecology Assessment	Low	Low-Medium	Very Low Negative	-	Very Low
Estuarine Ecology Assessment	Very Low - Low	Very Low - Low	Very Low – Low	Very Low - Medium	Very Low - Low
Terrestrial Ecology Assessment	Low-Medium	Low – High	Low	Low	Low-Medium
Noise Impact Assessment	Low	Low	Low	Low	Low
Visual Impact Assessment	High	High	Low	Low	Low-Medium
Socio-economic Assessment	Low-Medium (**Medium Positive**)	Low (**Medium Positive**)	Low-Medium	Low-Medium	Low-Medium
Heritage Assessment: Letter for Exemption	Low	Low	Low	Low	Low
Operation Phase					
Marine Ecology Assessment	Low	Low	-	-	-
Freshwater Ecology Assessment	Low	Low	Very Low	-	-
Estuarine Ecology Assessment	Very Low - Low	Very Low - Low	-	-	-
Terrestrial Ecology Assessment	Low	Low	Low-Medium	Low-Medium	Low-Medium
Noise Impact Assessment	Very Low	Very Low	Very Low	Very Low	-
Visual Impact Assessment	Low-Medium	Low-Medium	-	-	Low
Socio-economic Assessment	Low-Medium (**Medium Positive**)	Low-Medium (**Medium Positive**)	-	-	Low-Medium
Heritage Assessment: Letter for Exemption	-	-	-	-	-

Based on the findings of the specialist's studies, the construction and operation of the proposed desalination facility at the *Preferred* site or at the *Alternative site* will largely result in environmental impacts of comparable significance, providing the recommended mitigation measures are effectively implemented. Disturbance of general surface environment and alteration of edaphics at depth associated with the construction of the Alternative site may however result in significant variation in soil nutrient levels, permeability and related factors (e.g. change in hydrology). Both sites have their socio-economic advantages and disadvantages which are conceptually difficult to reconcile particularly without more detailed investigations and assessment. If the Preferred Site is chosen an amicable solution will need to be found to the provision of replacement sports fields for the Mother of Peace Children's Home. These fields would need to be of a similar size and quality containing the same facilities as at present and should be established before the existing sports fields are built on. They will need to also be adjacent to the existing Mother of Peace buildings which implies that land would be needed from Illovo Sugar.

For the pipeline alternatives, the overall environmental impact significance rating is slightly lower for the three pipeline routes located on the northern bank of the Lovu estuary, provided that the Preferred pipeline route (and Alternative 3 route) is moved slightly south, to align it with the existing disturbed areas of the cane field. The Applicant's *Preferred Pipeline* would be most favourable from a cost perspective (with the Alternative 1 and 3 pipeline routes being more costly). It would, however, require the applicant to engage further with the owners of the Winkelspruit Caravan Park site with a view to finding an agreement to avoid impacts. Should this engagement not be successful, the Alternative 3 route, although a more expensive tunnelling alternative, would be recommended for the most difficult section of the onshore pipeline route (which is fairly confined and passes under the railway, the M3 and the N2).

Although decommissioning must be considered as a possibility, the probability of the plant being decommissioned is near zero. The intention would be to manage the plant indefinitely and to upgrade components of the plant as and when required. Once commissioned the plant would form an integral part of the supply system for the South Coast and as such will be needed for future supply to the area. Seawater desalination technologies will improve with time and it is possible that components of the scheme may be replaced (mostly internal process components) as these technologies improve. However, it is extremely unlikely that the plant will be decommissioned in totality.

Cumulative Effects

Cumulative impact are defined as the impact on the environment, which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (CEQ, 1997). Bear in mind also that the distinction between cumulative and other impacts is often difficult to make. The assessment of cumulative impacts is also generally more difficult primarily as they often require more onerous assumptions regarding the likely actions of others.

It is expected that the project would facilitate further development in the wider area through the potential to influence investors (including locals) due to the availability of water supply which is a pre-requisite for such development. This would result in cumulative **positive** impacts of **medium** to **high** significance on overall investment levels. In a sense the project has the potential to lead to the

'crowding in' of further investment. Note that this is not a differentiating factor with regard to project alternatives – i.e. all alternatives considered would result in similar cumulative impacts in this regard. Note also that in the medium to longer term this is likely to include more development in the general vicinity of the Mother of Peace Children's Home as per the Illovo South Local Area Plan (LAP).

Concerns have however been raised that the proposed development would open the way for more industrial development in the immediate vicinity of the site. It is not possible to predict outcomes in this regard as future land use will depend on developer interest and what the Municipality approves. Residential development is, however, currently indicated in municipal planning for the area surrounding the site. The bulk of the affected mesic environment presently lies under cultivated lands. As such, cumulative impacts will relate to the loss of unencumbered farmlands to urban / service infrastructure.

From a coastal and marine environmental perspective, given the current past and future proposed development along the coastline of the project area, cumulative impacts associated with disturbances to marine or coastal systems or features as well as cumulative impacts on fishing and water based recreation can be expected. This should be kept in mind during any monitoring studies undertaken as part of this (or any other similar) project.

In terms of aquatic ecology, the extensive fragmentation and cultivation of natural freshwater wetlands on the floodplain within broad transformed landscapes, augmented by the permanent loss of opportunities to rehabilitate these to estuarine corridors, in particular within cane field environments in the Lovu estuary is a key concern. It is therefore recommended to rehabilitate the cane field wetlands in the north eastern corner of the floodplain, as well as the artificially excavated trench just upstream of the N2, to create a broad swathe of naturally vegetated wetland, as far as the estuarine channel, and the rehabilitation of a broad swathe of wetland, within the existing wetland in this area, that has been subject to long-term cultivation.

The cumulative impact on the landscape and on sensitive receptors due to the desalination plant and other future developments as suggested in the Local Area Plan for Illovo South (the area in which the desalination plant will be located) will be low with effective mitigation since the future landscape character will be mixed urban with residential, industrial and commercial elements.

Aside from issues discussed above, cumulative impacts on tourism and property values are expected to be driven primarily by cumulative visual, noise and ecological impacts.

The combined effects of the above findings indicate **low** to **medium** risks of negative cumulative impacts.

OVERALL EVALUATION OF IMPACTS BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

In accordance with the Guideline on Need and Desirability published in the Government Gazette of 20 October 2014 (GN No 38108), this EIA considered the nature, scale and location of the development as well as the wise use of land (i.e. is this the right time and place for the development of this proposed project).
Section 24 of the Constitutional Act states that "everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that:

- Prevents pollution and ecological degradation;
- Promotes conservation; and
- Secures ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

This EIA was undertaken to ensure that these principles are met through the inclusion of appropriate management and mitigation measures and monitoring requirements. These measures will be undertaken to promote conservation by avoiding the sensitive environmental features present on site and through appropriate monitoring and management plans to, inter alia, monitor the impacts on marine ecology associated with the discharge of brine and protection of freshwater features present within this area (as noted in the EMPr, Part B of this Final EIA report).

The outcomes of this project therefore succeeds in meeting the environmental management objectives of protecting the ecologically sensitive areas and support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in the areas nearest to the project site. The EIA has investigated and assessed the significance of the predicted positive and negative impacts associated with the proposed Desalination Facility. No negative impacts have been identified within the ambient of this EIA that, in the opinion of the Environmental Assessment Practitioner, should be considered "fatal flaws" from an environmental perspective, and thereby necessitate substantial re-design or termination of the project.

The evidence that has been provided to the EAP consisting of feasibility studies that have motivated for the development of the desalination alternative above all other water augmentation strategies and the subsequent environmental evidence presented by the specialist studies within this EIA have led to the following recommendation:

- After due consideration of the proposed development, associated impacts identified and assessed by specialists during the EIA Process (including inputs from the local community), the EAP recommends that the proposed 150 Ml/day SWRO facility receives the appropriate Environmental Authorisation from the DEA (in terms of the NEMA EIA Regulations) on the conditions that key management and monitoring actions are implemented in order to mitigate the main potential impacts of the proposed project. This recommendation applies to the

Preferred location for the desalination plant and the Preferred seawater intake and brine discharge pipeline route or the Alternative 3 pipeline route. However, as noted above, if the Preferred Site is chosen an amicable solution will need to be found to replace the sports fields for the Mother of Peace Children's Home. It should be noted that if this agreement does not conclude, the Alternative site has also been assessed in this EIA as a suitable site for the proposed development, providing that the recommended key management actions are effectively implemented. It is therefore recommended that both locations (Preferred and Alternative Sites) be considered for the Environmental authorisation in order to make room for negotiations with Illovo and Mother of Peace during the detailed engineering design phase of the project.

In order to ensure the effective implementation of the mitigation and management actions, an EMPr has been prepared for the construction, operation and decommissioning phases of the proposed project (Part B of the Final EIA report). The mitigation measures necessary to ensure that the project is planned, constructed, operated and decommissioned in an environmentally responsible manner are listed in this EMPr. The EMPr is a dynamic document that should be updated regularly and provides clear and implementable measures for the establishment and operation of the proposed desalination project.

GLOSSARY

BA	Basic Assessment
BAT	Best Available Technology
BEP	Best Environmental Practice
BID	Background Information Document
CBA	Critical Biodiversity area
CBD	Critical Biodiversity Area
CIP	Clean-in-place
CSIR	Council for Scientific and Industrial Research
CWDP	Coastal Waters Discharge Permit
DAF	Dissolved Air Flotation
DEA	National Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DSR	Draft Scoping Report
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
ESS	Environmental Screening Study
FSR	Final Scoping Report
Gl	Gigalitre (1 000 000 000 litres or Mm^3)
GRP	Glass-fibre Reinforced Polyester
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
ICMA	Integrated Coastal Management Act
IDP	Integrated Development Plan
IDP	Integrated Development Process
IDZ	Industrial Development Zone
kWh	Kilowatt Hours
kWh/m3	Kilowatt hours per cubic meter
KZN	KwaZulu-Natal
LAP	*Local Area Plan*

Ml	Megalitre (1 000 000 litres)
MSL	Mean Sea Level
MW	Mega Watts
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environment Management: Air Quality Act (Act 39 of 2004)
NEMBA	National Environment Management: Biodiversity Act (Act 10 of 2004)
NEMICMA	National Environment Management: Integrated Coastal Management Act (Act 24 of 2008)
NEMICMAA	National Environmental Management: Integrated Coastal Management Amendment Act (Act 36 of 2014)
NEMWA	National Environment Management: Waste Act (Act 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act (Act 25 of 1999)
PPP	Public Participation Process
PSEIA	Plan of Study for EIA
RO	Reverse Osmosis
ROD	Record of Decision
SABS	South Africa Bureau of Standards
SADC	South African Development Community
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SMBS	Sodium Metabisulphite
SUD	Sustainable Urban Design
SWRO	Seawater Reverse Osmosis
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
ToR	Terms of Reference
TSS	Total Suspended Solids
UF	Ultrafiltration
UW	Umgeni Water
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environmental Programme
WHO	World Health Organisation
WUL	Water Use Licence
WULA	Water Use Licence Application