



APPENDIX 2: Heritage Impact Assessment (Maritime, Archaeology, Cultural Heritage and Palaeontology)

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

**SCOPING & ENVIRONMENTAL IMPACT ASSESSMENT (S&EIA) FOR THE
PROPOSED 2 MEGALITRES PER DAY (MLD) SOLAR POWERED SEAWATER
DESALINATION PLANT IN THE PORT OF EAST LONDON, BUFFALO CITY
METROPOLITAN MUNICIPALITY, EASTERN CAPE PROVINCE, BY TRANSNET
NATIONAL PORTS AUTHORITY**

DFFE EA Application Reference Number: 14/12/16/3/3/2/2845

September 2026



ANCHOR
environmental

PART OF



**HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED TWO MEGALITRE
PER DAY SOLAR POWERED SEAWATER DESALINATION PLANT IN THE
PORT OF EAST LONDON, BUFFALO CITY METROPOLITAN MUNICIPALITY,
EASTERN CAPE PROVINCE**

Assessment conducted under Section 38 (8) of the National Heritage Resources Act (No. 25
of 1999) as part of an Environmental Impact Assessment

Prepared for

Anchor Environmental Consultants (Pty) Ltd

On behalf of

Transnet SOC Limited

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The proposed project will be located on the southern bank of the Buffalo River within the Port of East London. Saline water will be abstracted from the Buffalo River Estuary via a submerged 315 mm diameter intake pipe. The water will undergo desalination at the plant, producing two megalitres of fresh water per day which will be used by Transnet National Ports Authority to support port operations and help reduce reliance on municipal water.

The concentrated brine generated as a by-product of the desalination process will be temporarily stored at the RO site in a holding tank, before being transported via a pipeline and discharged by gravity into the marine environment through a dedicated marine outfall pipeline to be constructed south-east of the grain silo.

Heritage Impact Assessment

This heritage impact assessment provides an assessment of the palaeontological, terrestrial archaeological, submerged prehistoric archaeological and maritime cultural heritage potential of the proposed desalination plant and its associated infrastructure, within a study area which encompasses both the terrestrial and marine elements of the project.

The results of the studies listed above are integrated in this HIA report, along with an assessment of the sensitivity and significance of any heritage resources, an evaluation of the potential impacts on them arising from the construction, operation and decommissioning of the desalination plant, and recommendations for measures to mitigate any negative impacts of these activities on them.

Findings

Palaeontology

The southern half of proposed Port of East London desalination plant project site is located mainly on the Nanaga Formation aeolianites which are given a very high sensitivity rating on SAHRA's palaeo-sensitivity map. In practice, however, according to the palaeontological impact assessment conducted for this project, the fossil occurrences within this formation are very rare and frequently very weathered due to extensive post-depositional diagenesis, and Bamford (2024) recommends that a low palaeosensitivity rating for this formation is more appropriate, with mitigation not required unless rich fossil accumulations are exposed during excavations.

The northern half of the project site is underlain by the Permian Middelton Formation that is also indicated as very highly sensitive on SAHRIS, but according to Bamford (2024), this sensitivity rating is more applicable to the central Karoo Basin where the formation has not been impacted by sea-level rise. Bamford (2024) further indicates that there are no records of Permian vertebrates or plants from this area.

Terrestrial Archaeology

No Early Stone Age archaeological material has been reported from the East London area, and the known archaeology is dominated by a “litter” of Middle Stone Age lithic material that is present almost everywhere. Further evidence of early modern human presence in the East London area during the Middle Stone Age was found in 1964 when the footprints of a young human child and the tracks of a bird and two mammal species, estimated to be approximately 124 000 years old, were discovered preserved in sandstone at Nahoon Point, north of the Buffalo River.

The scatters of Middle Stone Age artefacts reported around East London are, in the main, in secondary context (i.e. not where they were originally deposited) and cannot generally be said to form discrete archaeological sites. This material is generally considered to be of low archaeological significance and sensitivity.

By contrast, Later Stone Age archaeological material, also widely recorded in the area, most often as coastal shell middens, generally occurs as definable sites, sometimes in sealed contexts and accompanied by bone and other archaeological material. These sites are generally of moderate and sometimes high, local archaeological significance.

Submerged Prehistory

The seabed of the East London nearshore environment is typically devoid of notable sediment accumulations with exposed rock outcrops dominating. This suggests that the survival of *in situ* submerged archaeological deposit is unlikely in this area, except possibly in isolated contexts within incised valleys on the continental shelf which were cut during sea level low stands when river courses extended onto the shelf and which are described by a number of studies for the East Coast.

The marine outfall for the Port of East London desalination plant will be installed in the current surf zone east of a recently upgraded artificial rock revetment and boulder beach. The aggressively erosive surf environment indicated by the need for the revetment and boulder beach suggests that survival of submerged prehistoric archaeological material – either in or ex situ – is extremely unlikely. The installation of the proposed marine outfall pipes on the surface of the constructed rocky beach also suggests that even were archaeological material present, impacts on it are unlikely.

Similarly, within the Buffalo River, the intake pipeline will also be laid on the surface of the riverbed, which itself has been subject to nearly 150 years of dredging and human interference. The survival of submerged prehistoric archaeological material here is also unlikely.

Maritime Archaeology

As with many ports at river mouths there was, historically, always an element of risk involved in entering and leaving the Port of East London. Records consulted for this study indicate the

potential for approximately 90 wrecks within a 1 km radius of the intake and outfall pipelines associated with the proposed desalination plant.

The historical widening of the Buffalo River by cutting back the West Bank means that it is extremely unlikely there were or are any wrecks, or related artefacts, present on what is a new riverbed in the vicinity of the water intake pipe.

In the area of the marine outfall, historical records describe several maritime casualties south of what used to be Castle Point at the mouth of the river. The historical descriptions of these events are, however, vague and positions given unreliable. The presence of any wrecks within the impact footprint of the marine outfall is, thus, highly speculative.

If wrecks are present in the marine outfall area, any remains close onshore are likely to have been buried under the rocky beach and revetment and will not be impacted by the proposed surface deployment of the outfall pipelines. Beyond the rocky beach the local surf zone regime, which does not favour the accumulation of seabed sediment, suggests that any wreck material in the area would lie on the exposed rocky seabed and would be subject to impacts from the outfall pipelines should their positions intersect.

Recommendations

This assessment of the heritage resources of the Port of East London desalination plant indicates that there is some limited potential for palaeontological material and maritime archaeological sites or material within the project footprint. Terrestrial and submerged prehistoric archaeological sites and materials are not expected.

Because of the non-renewable nature of heritage resources, avoidance during development is the preferred mitigation option. While this is usually possible in the case of shipwreck sites, it is unlikely to be possible to achieve in respect of palaeontological material within the footprint of project impacts because the location and extent of this material cannot be predicted.

The following mitigation measures for enhancing positive impacts and avoiding or mitigating negative impacts and risks to heritage resources are, therefore, recommended for inclusion in an Environmental Management Programme (EMPr) and for implementation during the life of the project, but particularly during the construction phase.

Palaeontology

Although it is unlikely that significant fossils or prehistoric archaeological sites and material will be disturbed by the construction of the Port of East London desalination plant, there is a small chance that fossils may occur in the Nanaga Formation aeolianites and the Middleton Formation bedrock. It is recommended, therefore, that a palaeontological Chance Find Protocol is implemented under the EMPr, which will ensure the identification, recovery, curation and reporting to SAHRA of any fossil finds.

If fossils are found by the environmental officer, or other responsible person once excavations for foundations have commenced then they should be rescued and SAHRA and ECPHRA

notified to determine whether a palaeontologist should be called to assess and collect a representative sample.

Any recovered fossils or artefacts are the property of the State will need to be deposited in a suitable curatorial institution. Information on the sources or contexts of the collected items must accompany them, as far as can be determined.

Maritime Archaeology

Shipwrecks and shipwreck remains, even in an active marine environment, are generally large and visible on the seabed. If wreck material is present on the seabed in the marine outfall area, therefore, this is likely to become evident in any pre-installation survey or ground investigation and measures can be taken in advance of installation activities to avoid the site or material, thereby mitigating potential impacts to it.

It is recommended, therefore, that wreck or related artefacts identified during any pre-construction ground-truthing of the marine outfall site, are reported to a suitably qualified maritime archaeologist and SAHRA notified.

It is recommended that any wreck is subject to the implementation of a suitably defined construction exclusion zone, which will ensure that it is not impacted by the installation of the marine outfall. The project maritime archaeologist's advice must be sought on the appropriate size and extent of any such exclusion zone. Any such exclusion zones must be marked on all project mapping as no-go areas for construction contractors.

If seabed debris or a previously unknown wreck are encountered during the installation of the marine outfall, the project maritime archaeologist and SAHRA must be notified immediately and work must cease in the immediate vicinity until the maritime archaeologist and SAHRA have assessed the significance of the site and a decision has been taken as to how to deal with it.

Terrestrial Archaeology

Lastly, should any terrestrial pre-colonial or historical archaeological sites or material be encountered during the construction of the desalination plant, work must immediately cease in that area. The area must be cordoned off and the material made safe but left in situ. A suitably qualified archaeologist must be called to site to assess the significance of the find and SAHRA and the ECPHRA must be notified of the find.

In the event of human remains being uncovered during work, all activities in the vicinity must cease and the site made secure until a suitably qualified archaeologist and SAHRA and the ECPHRA have been notified, the significance of the material has been assessed, and a decision has been taken as to how to deal with it.

CONCLUSION

It is our reasoned opinion that the proposed construction of the Port of East London desalination plant and its associated maritime infrastructure could impact on palaeontological and maritime archaeological heritage resources. Impacts on terrestrial and submerged prehistoric archaeological resources are not anticipated.

Provided the recommendations to mitigate and offset any potential impacts are implemented under the EMP, it is our assessment that the proposed Port of East London desalination plant can be considered to be archaeologically and paleontologically acceptable and can be authorised.

Author/s and Date

Maritime Heritage Impact Assessment: John Gribble, TerraMare Archaeology (Pty) Ltd, 2026.

Palaeontological Impact Assessment: Marion Bamford, 2026.

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(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix 1
(c) an indication of the scope of, and the purpose for which, the report was prepared;	Section 2
(cA) an indication of the quality and age of base data used for the specialist report;	Section 5
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(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 5.3
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 5
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Section 7 Section 8
(g) an identification of any areas to be avoided, including buffers;	Section 8 Section 13
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 7, 8, 15-18

(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5.5
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	Section 7 Section 8
(k) any mitigation measures for inclusion in the EMPr;	Section 13
(l) any conditions for inclusion in the environmental authorisation;	N/A
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	N/A
(n) a reasoned opinion— i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	Section 16
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
(p) any other information requested by the competent authority	N/A
Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

THE AUTHOR

John Gribble has an MA (UCT, 1989), in archaeology and has been working in cultural resource management since the early 1990s. He has worked in both the regulatory and commercial heritage management fields: the former during 13 years at the National Monuments Council / South African Heritage Resources Agency (SAHRA), and the latter as both a terrestrial and maritime archaeological consultant in South Africa and the United Kingdom.

He holds archaeological accreditation with the Association of Southern African Professional Archaeologists CRM section (Member #43) as follows:

- Principal Investigator: Maritime Archaeology and Colonial Archaeology; and
- Field Director: Stone Age Archaeology.

A signed and certified specialist statement of independence is attached to this report as Appendix 1 and the author's CV is attached as Appendix 2.

GLOSSARY

Archaeology: Remains resulting from human activity which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Cenozoic: The current geological era, spanning from 66 million years ago to the present day.

Coquinite: A sedimentary rock composed of the transported, abraded, and mechanically sorted fragments of mollusks, trilobites, brachiopods, or other invertebrates.

Early Stone Age: The archaeology of the Stone Age between 700 000 and 2 500 000 years ago.

Heritage: That which is inherited and forms part of the National Estate as defined by the National Heritage Resources Act 25 of 1999.

Holocene: The most recent geological time period which commenced 10 000 years ago.

Hominin: A member of the tribe Hominini which comprises those species regarded as human, directly ancestral to humans, or very closely related to humans.

Late Stone Age: The archaeology of the last 20 000 years associated with fully modern people.

Marine Isotope Stages: Alternating warm and cool periods in the Earth's paleoclimate, deduced from oxygen isotope data reflecting changes in temperature derived from data from deep sea core samples.

Middle Stone Age: The archaeology of the Stone Age between 20 000-300 000 years ago associated with early modern humans.

Miocene: an epoch within the Neogene Period, spanning from roughly 23.03 to 5.333 million years ago. It was a time of significant global warming, continental movement, and the evolution of diverse flora and fauna.

Pleistocene: A geological time period (of 3 million – 10 000 years ago).

Pliocene: A geologic epoch that spanned from 5.33 to 2.58 million years ago.

Quaternary: The current and most recent of the three periods of the Cenozoic Era spanning the period from ± 2.5 million years ago to the present.

SAHRA: South African Heritage Resources Agency – the compliance authority which protects national heritage.

Subaerial: Existing, occurring, or formed in the open air or on the earth's surface, not under water or underground.

ABBREVIATIONS

DFFE	Department of Forestry, Fisheries and the Environment
EA	Environmental Authorisation
ECPHRA	Eastern Cape Provincial Heritage Resources Authority
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme
ESA	Early Stone Age
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
kWp	Kilowatt Peak
LAT	Lowest Astronomical Tide
LSA	Late Stone Age
MHWM	Mean High Water Mark
MIS	Marine Isotope Stage
ML	Megalitre (ML)
ML/d	Megalitre per day
MSA	Middle Stone Age
MSL	Mean Sea Level
MSP	Marine Sector Plan
MUCH	Maritime and Underwater Cultural Heritage
NEMA	National Environmental Management Act (No. 107 of 1998)
NHRA	National Heritage Resources Act (No. 25 of 1999)
PIA	Palaeontological Impact Assessment
PV	Photovoltaic
RO	Reverse Osmosis
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
TNPA	Transnet National Ports Authority (TNPA)
UNCLOS	United Nations Convention on the Law of the Sea

1 INTRODUCTION

TerraMare Archaeology (Pty) Ltd has been commissioned by Anchor Environmental Consultants (Pty) Ltd, on behalf of Transnet SOC Limited, through their division Transnet National Ports Authority (TNPA), to undertake a heritage impact assessment (HIA) to support an application to develop a two megalitre per day (ML/d) solar-powered reverse osmosis (RO) desalination plant within the Port of East London in the Buffalo City Metropolitan Municipality, Eastern Cape Province (Figure 1).

The proposed project will be located on the southern bank of the Buffalo River within the Port of East London. Saline water will be abstracted from the Buffalo River via a submerged, direct intake and pipeline (Figure 2). The water will be pumped to the RO plant where it will undergo desalination, producing two (2) megalitres (ML) of fresh water per day which will be used by TNPA to support port operations and help reduce reliance on municipal water. The brine by-product of the desalination process will be discharged via a pipeline to a marine outfall.

2 TERMS OF REFERENCE

As part of the EIA process, Anchor Environmental Consultants (Pty) Ltd, on behalf of Transnet SOC Limited, has appointed specialists to assess the potential risks to, inter alia, the marine and estuarine environments, terrestrial and coastal ecology, socio-economic resources and heritage resources, arising out of the proposed Port of East London desalination plant.

TerraMare Archaeology has been commissioned to produce a HIA to identify heritage resources which may be impacted by the construction, operation and decommissioning of the desalination plant, to assess their significance and provide recommendations for mitigation, as required by the National Environmental Management Act (No 107 of 1998) (NEMA), as amended.

This document therefore includes the following:

- A desk-based assessment by a palaeontologist of the potential for palaeontological features and material within the terrestrial project footprint. Brief consideration is given to the potential for the presence of fossil material in the marine portion of the project.
- An assessment of the potential for terrestrial archaeological sites and material within the project footprint, supported by an archaeological site visit.
- A consideration of the potential for the presence of submerged pre-colonial archaeological sites or materials in or on the seabed in the area to be affected by the water intakes and outfalls.
- A desk-based literature review to assess the potential for maritime archaeological sites in the area to be affected by the water intakes and outfalls.

The results of the studies listed above are integrated in this HIA report, along with an assessment of the sensitivity and significance of any heritage resources, an evaluation of the potential impacts on them arising from the construction, operation and decommissioning of

the desalination plant, and recommendations for measures to mitigate any negative impacts of these activities on them.

The HIA will meet the requirements of the South African Heritage Resources Agency's (SAHRA) minimum standards for HIAs and Appendix 6 of the EIA Regulations (2014 as amended) and must be submitted for comment to SAHRA and the Eastern Cape Provincial Heritage Resources Authority (ECPHRA), the relevant statutory heritage commenting bodies under the NEMA, as part of the EIA process.

3 PROJECT DESCRIPTION

The proposed development layout in relation to the Port of East London, is shown in Figure 2. This layout includes the proposed locations for the RO plant (including the reservoir) and solar facility, the proposed water intake and outfall pipelines and points, the municipal grid connections and site camps which will be used during the construction of the facility. These various project components are described in detail below.

3.1 Water Intake Infrastructure

Approximately 5,500 cubic metres (5.5ML) of saline water will be abstracted daily from the Buffalo River Estuary via a submerged 315 mm diameter intake pipe (Figure 2).

The intake point will be located between 13 and 18 m from the edge of the existing wharf. This distance is based on the requirement that the intake be positioned 0.5 m below the lowest astronomical tide (LAT) water level, which is approximately 2 m below mean sea level (MSL), allowing for some tolerances. Survey data indicate that the -2 m MSL contour lies 13–18 m from the wharf edge at this site.

The horizontal intake will be installed to avoid drawing water from the upper or lower one metre of the water column.

The current preferred intake design will use a floating pipeline/pontoon system which will be attached to the pump house and extend approximately 19 m into the estuary from the existing concrete wharf (Figure 3). The pontoon footprint will be ~91 m² and the area in which the pontoon will be located is ~576 m².

A key advantage of this floating design is the ease of access for maintenance. Strainers at the mouth of the pipe require frequent cleaning, which is significantly easier on a pontoon-based system.

The quay adjacent to the pontoon will be converted to accommodate the supporting infrastructure for the intake infrastructure. This will comprise a pumphouse building with a concrete foundation and a footprint of approximately 42 m², parking and landscaping for ease of access. The total footprint of the intake site is approximately 340 m² (Figure 2).

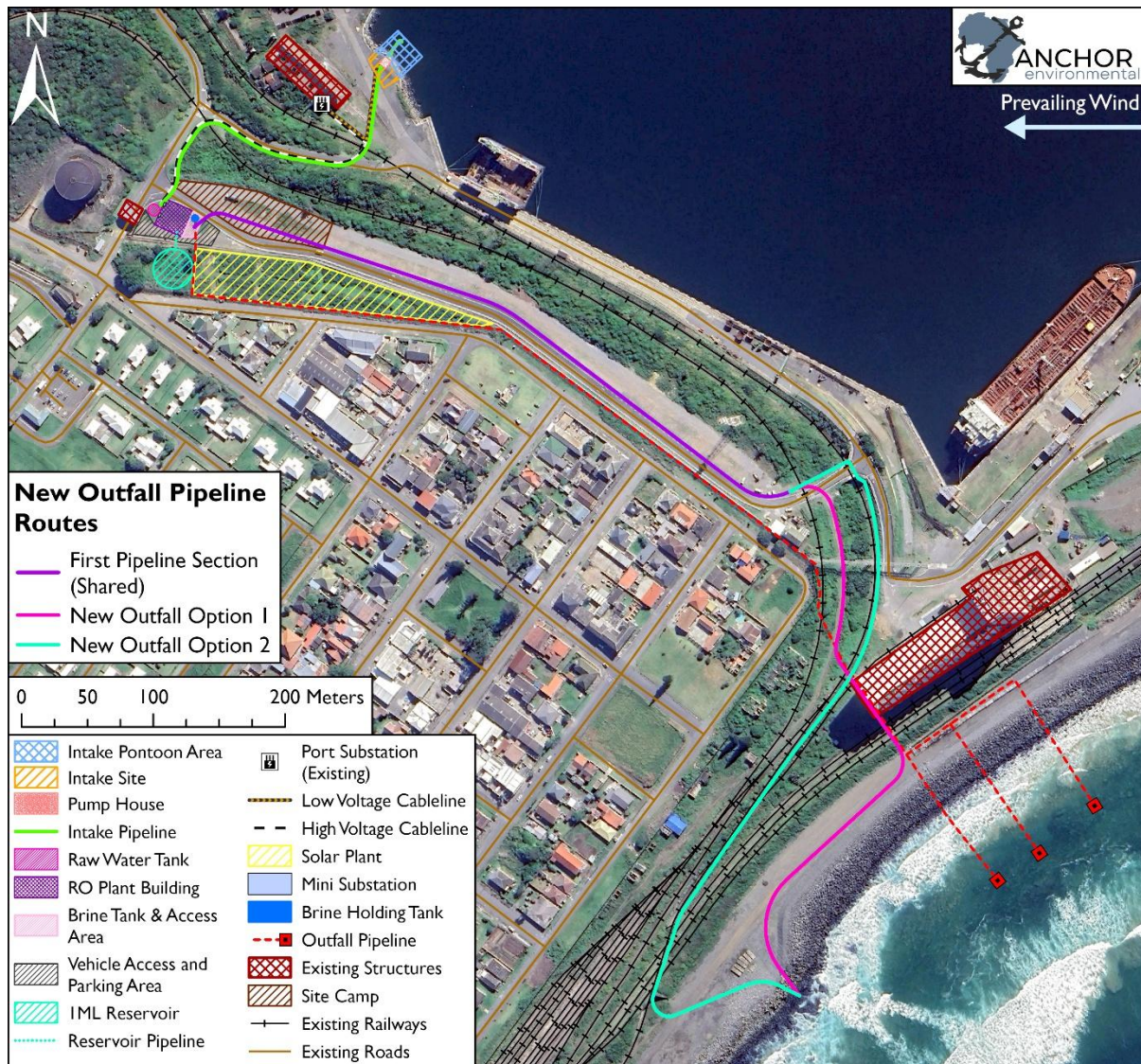


Figure 2: Location and layout of the proposed Port of East London desalination plant on the west bank of the Buffalo River, within the Port of East London (Source: Anchor Environmental Consultants (Pty) Ltd).

Water will be pumped upslope from the intake to the RO plant in a pipe whose alignment will follow that of existing roads (see Figure 3). The pipeline will be approximately 290 m in length (of which ~13–18 m will be between the intake and existing quay wall). Provision has been made in the design for a pipeline corridor with a width of 4 m, which gives an estimated maximum land-based construction footprint for the intake pipeline of ~1,111 m².

Wherever possible, the pipe will be buried along its alignment, within or adjacent to the existing roadbed in a trench ~0.6 m wide. It is anticipated that in a few areas the pipeline may remain exposed where burial is impractical, such as at certain servitude crossings. Final details will be confirmed during detailed design.

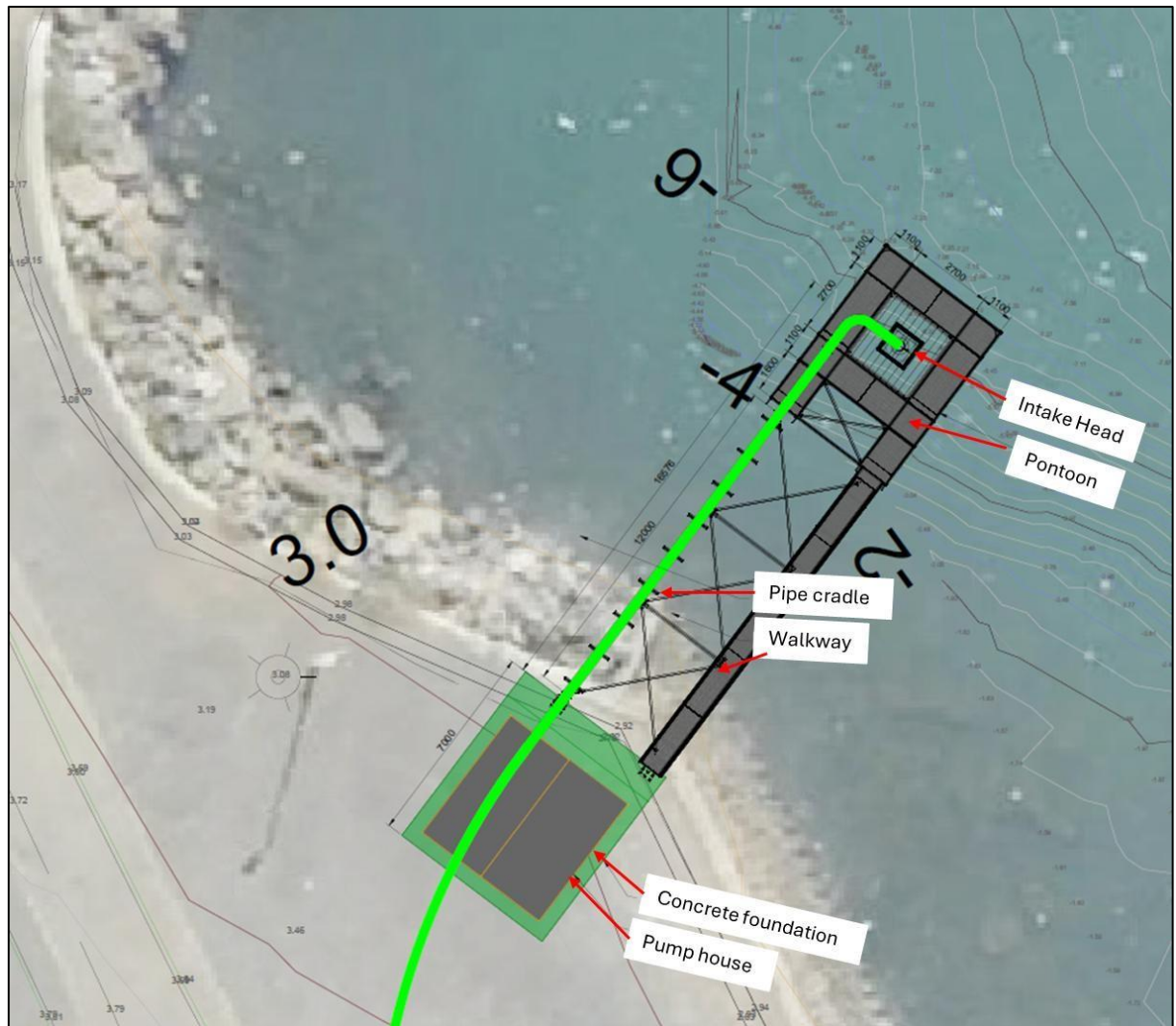


Figure 3: Draft pontoon system, pump house on concrete foundation and intake pipeline (bright green).

3.2 Desalination Plant: Site and Structures

Desalination will take place at the RO plant where the abstracted seawater will be converted into an initial 500 m³ of freshwater per day. This output will gradually be scaled up to 2,000 m³ of freshwater per day at full operational capacity. The fresh water will be stored in an on-site tank before distribution to TNPA and a nearby factory, via the existing TNPA hydraulic network.

The RO plant and PV facility will both be located on a triangular piece of brownfield land near the landward fence of the port, approximately 7,800 m² in extent (Figure 2). The site will require extensive ground improvements or deep foundations, depending on load-bearing requirements, and will, therefore, be fully transformed to support the necessary infrastructure.

Structures and infrastructure comprising the RO plant will include:

- RO Desalination plant building and surrounding foundations and a 1.5 m stone walkway (total footprint of 528m²; dimensions: 24 x 22 m). The building will house the following structures/ component (list not extensive):
 - General storage room;
 - Restrooms;
 - Control/operations room with switchboard and computers
 - Feed pumps and pre-treatment filters;
 - A chemical storage room/container (85 m³ capacity) for CIP and pre-treatment chemicals;
 - Battery storage container of 32.6 m³ (batteries only potentially required in future to store excess electricity, if generated by the solar plant).
 - Reverse osmosis pumps and energy recovery devices; and
 - Two trains of RO membranes.
- A 60 m³ brine holding or “treatment” tank with a 5 m diameter and a ~19.6 m² footprint.
- An 80 m³ ultrafiltration tank (6 m in diameter and with a ~28.3 m² footprint) which will act as a buffer tank between the ultrafiltration pre-treatment and the main reverse osmosis treatment.
- A vehicle access and parking area with a ~756 m² footprint.
- A 200 m³ raw water holding tank with a diameter of 9 m diameter and ~63.6 m² footprint.
- A mini substation / transformer to be situated next to RO plant building, close to the motor control centre housed inside. This substation will be connected to a proposed 11 kV cable which connects to the existing substation near the intake (Figure 2). Note that only one transformer will be used.
-

3.3 Reservoir Site

The freshwater (permeate) produced by the RO plant will be stored in a reservoir on a site adjacent to and south of the desalination facility (see Figure 2).

The area has a footprint of 1,883 m² and will comprise a ~707 m² reservoir, surrounded by a Reservoir Access Area of 1,176 m². The reservoir will have a 1 ML capacity, and a diameter of 30 m.

Booster pumps will also be constructed on the site, to support gravity-fed supply into the port’s water network. A permeate pipeline will convey desalinated freshwater from the RO plant to the reservoir.

3.4 Solar Plant

The desalination plant will be powered by a hybrid energy system comprising both solar power and municipal grid electricity. The bulk of the power will be provided by the solar installation and only if solar generation is insufficient will municipal grid electricity (at up to 400 V) be use,

via the existing substation near the water intake on the quayside. If excess electricity is generated by the solar plant, it will be stored in batteries housed at the RO plant site.

The solar component will be a photovoltaic (PV) system with an estimated output of 525 kWp (kilowatt peak), generating direct current (DC) at up to 1 000 V (1 kV), which will be supplied directly to the RO plant. . The final system size will be confirmed during process design optimisation.

The area designated for the solar installation is located east of and adjacent to the reservoir site and has a footprint of approximately ~5,505 m² (Figure 2).

PV systems consist of flat panels made up of many small solar cells that generate electricity when exposed to sunlight. They are oriented such that they receive the largest possible amount of sunlight. Each solar panel on its own produces only a small amount of power, but when combined into larger groups called solar arrays, they can generate enough electricity to meet high demands such as running a desalination plant. While there are different types of solar panels, monocrystalline panels will be used. These panels are made from a single piece of silicon, which makes them more efficient, durable, and longer-lasting than other types (polycrystalline or thin-film panels). They also produce more electricity per square metre, meaning fewer panels are needed.

The PV array system proposed for this project will:

- Use monocrystalline panels, known for their high-power efficiency (converting a large amount of the sun's energy into electricity) and minimal light reflection (generally between 0.2–0.4%, and less than 1.5%).
- Be coated with anti-reflective or light-scattering coatings to minimise reflection and visual impact.
- Most likely be installed in an east–west configuration (depending on coastal wind loads), or alternatively in a north-facing configuration.
- Be tilted at an angle of approximately 30 degrees and have an estimated height of around 2 m from ground level to the highest point of the panels (to be confirmed and dependant on the above configuration).

This power generated by the solar facility will be transported through the proposed 11 kV underground cable line connecting the substation to the RO plant. Certain low-voltage components at the RO plant (e.g. lights) will rely exclusively on municipal grid electricity supplied through this 11 kV cable, rather than on solar power.

3.5 Marine Outfall and Pipelines

The concentrated brine generated as a by-product of the desalination process will be temporarily stored at the RO site in a holding tank, before being transported via a pipeline and discharged by gravity into the marine environment through a dedicated marine outfall.

The discharge volumes will increase as freshwater production increases:

- In the initial phase ($\pm 500 \text{ m}^3/\text{day}$ freshwater production), brine discharge will be approximately $815 \text{ m}^3/\text{day}$.
- At full capacity ($2\,000 \text{ m}^3/\text{day}$ freshwater production), brine discharge will increase to approximately $3\,260 \text{ m}^3/\text{day}$.

The proposed Marine Outfall Pipeline will extend from the RO Plant, running adjacent to the internal road in a south-easterly direction towards the existing grain silos. From there, it will continue in a southerly direction along the railway line until reaching the railway underpass, where it will bend and proceed in an easterly direction, crossing the service road towards the breakwater and ocean. The pipeline will traverse the breakwater, which comprises rock and dolosse, and will terminate at the seaward edge of the breakwater (i.e. the outer edge of the dolosse), discharging into the ocean (see Figure 2 above).

From the RO Plant to the breakwater, the pipeline will cross several roads and railway lines. It will be buried wherever feasible, with short sections remaining exposed where burial is not practical.

The last section of the pipeline will be secured by a concrete encasing within the existing rock revetment (see Figure 4 below).

A portion of the pipeline, located just after the railway underpass and prior to the breakwater (i.e. where it crosses the service road), will be encased within a precast portal culvert to allow for continued access by port staff and security. The pipeline route largely follows existing roads and railway lines within already disturbed and modified areas (see Figure 2 above).

Outfall design and disposal method:

- The outfall pipeline from the RO plant to the discharge point will be approximately 1093 m long. While the pipeline trench will be fairly narrow ($\sim 0.6 \text{ m}$), a pipeline corridor of 8 m has been considered to account for vegetation clearing and vehicle access. Consequently, the total outfall pipeline will have a footprint of approximately $10\,240 \text{ m}^2$.
- The section of the final portion of the pipeline ($\sim 101 \text{ m}$ in length) will be encased in a culvert structure, before passing through the existing revetment infrastructure. An 8 m buffer has been allocated surrounding these structures, to facilitate vehicle access/necessary disturbances, this resulting in a footprint of $2\,359 \text{ m}^2$.
- The pipeline will have a diameter of 200 mm, reducing to 150 mm at the outlet to comply with the dispersion modelling requirements. The reduced outlet diameter increases the exit velocity to ensure sufficient dispersion energy.
- Maximum peak throughput will be approximately 38 l/s.
- Brine will be discharged through a single-point outlet rather than multi-nozzle diffusers.

The pipeline is not expected to extend far beyond the artificial beach onto the adjacent sandy seabed. The exact distance the pipeline extends past the rocks will be determined by the results of the brine dispersion modelling.

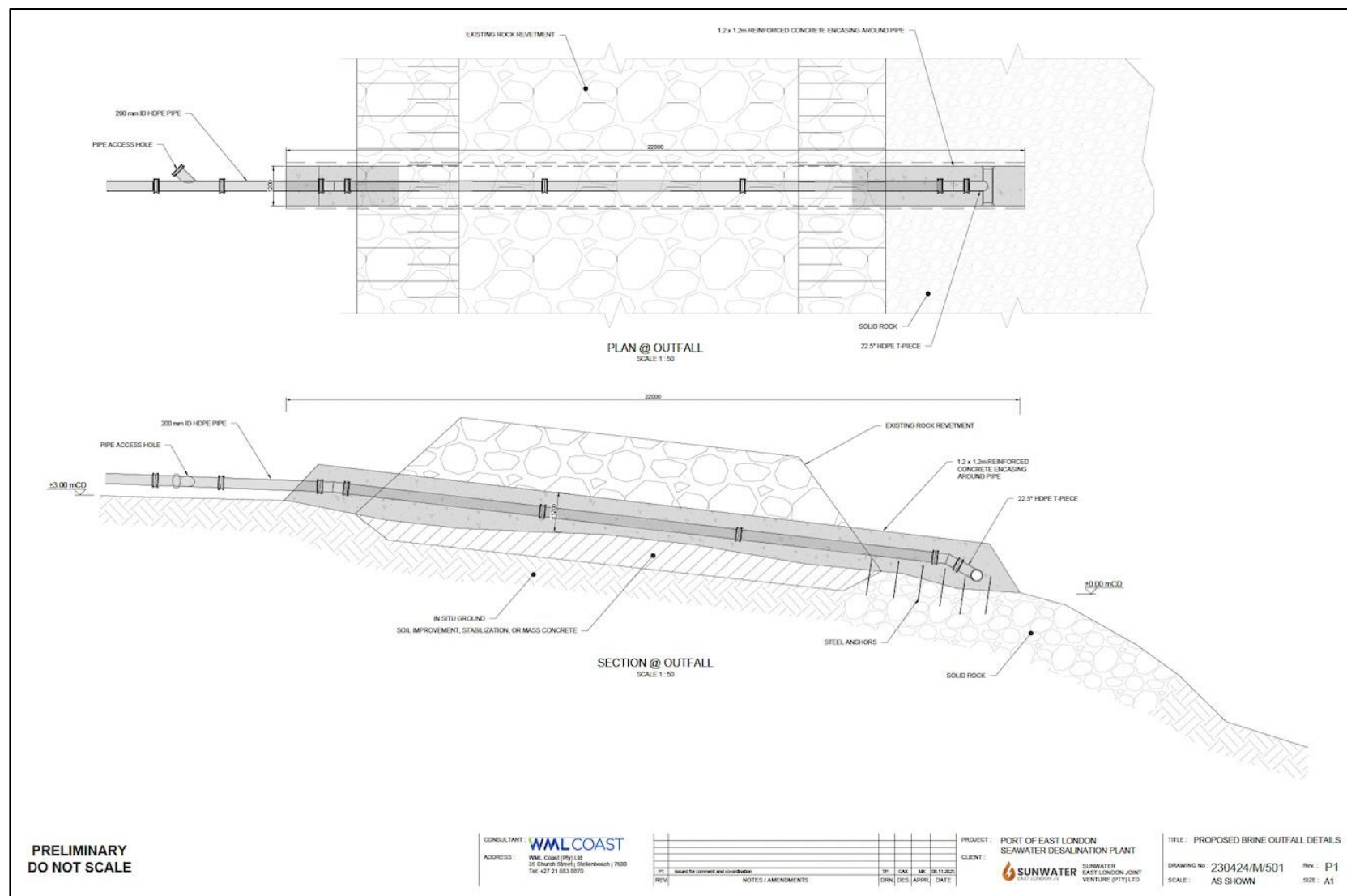


Figure 4: Proposed brine outfall detail (Source: Anchor Environmental).

3.6 Municipal Grid Connection

A new low-voltage cable (102 m in length) will be installed from an existing substation to the intake pump house to provide grid power at 230–400 V. The cable will be routed on a cable rack that follows the alignment of the intake pipeline (see Figure 2). It will have a total footprint of 408 m², although most of this footprint will overlap with the Medium Voltage Cable Line and / or intake pipeline). Note: this area is based on a corridor width of 4 m.

In addition, a new 11 kV Medium Voltage underground cable (253 m in length) will be installed from the existing substation to the RO plant. This cable is required because certain low-voltage components at the RO plant will rely solely on municipal grid electricity supplied through the 11 kV line, rather than on solar power.

As indicated above, only if solar generation is insufficient, will additional electricity also be drawn from the municipal grid (at up to 400 V) via the existing substation and transmitted along the proposed 11 kV underground cable to the RO plant.

It will have a total footprint of approximately 1011 m², although most of this footprint will overlap with the Low Voltage Cable Line and / or intake pipeline). Note: this area is also based on a corridor width of 4 m.

From the existing port substation to the intake pipeline, the 11 kV cable will be installed underground within the same footprint as the previously proposed overhead line (an on the same footprint as the Low Voltage Cable Line). From the intake pipeline connection point, it will continue along the same route and share a trench with the intake pipeline to the RO plant, where it will connect to the mini substation/ transformer, located adjacent to the RO plant building near the Motor Control Centre.

3.7 Site Camps

Two site camps will be established. The first will be located across the road from the desalination plant, within an existing disturbed parking/gravel area that was previously used as a site camp for an earlier development. The footprint of this camp will be approximately 2 859 m² (see Figure 2).

The second site camp will be established near the marine outfall, adjacent to the port breakwater, and have a footprint of 2 406 m² (see Figure 2).

4 RELEVANT LEGISLATION

4.1 National Heritage Resources Act (No 29 of 1999)

The National Heritage Resources Act (NHRA) came into force in April 2000 with the establishment of SAHRA, replacing the National Monuments Act (No. 28 of 1969 as amended)

and the National Monuments Council as the national agency responsible for the management of South Africa's cultural heritage resources.

The NHRA reflects the tripartite (national/provincial/local) nature of public administration under the South African Constitution and makes provision for the devolution of cultural heritage management to the appropriate, competent level of government.

Because national government is responsible for the management of the seabed below the mean high water mark (MHWM), however, the management of maritime and underwater cultural heritage resources under the NHRA does not devolve to provincial or local heritage resources authorities but remains the responsibility of the national agency, SAHRA.

The NHRA gives legal definition to the range and extent of what are considered to be South Africa's heritage resources. According to Section 2(xvi) of the Act a heritage resource is "any place or object of cultural significance". This means that the object or place has aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance.

In terms of the definitions provided in Section 2 of the NHRA, maritime and underwater cultural heritage can include the following sites and/or material relevant to this assessment:

- Material remains of human activity which are in a state of disuse and are in or on land [which includes land under water] and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures (Section 2(ii));
- Wrecks, being any vessel or aircraft, or any part thereof, which was wrecked in South Africa, whether on land, in the internal waters, the territorial waters or in the maritime culture zone of the Republic, as defined respectively in sections 3, 4 and 6 of the Maritime Zones Act, 1994 (Act No. 15 of 1994), and any cargo, debris or artefacts found or associated therewith, which is older than 60 years or which SAHRA considers to be worthy of conservation (Section 2(ii)); and
- Any movable property of cultural significance which may be protected in terms of any provisions of the NHRA, including any archaeological artefact or palaeontological specimen (Section 2(xxix)).

Of the heritage resource types protected by the NHRA, the development of the Port of East London desalination plant has the potential to impact the following:

- Palaeontological features and material, which are defined by the NHRA as the fossilised remains or fossil trace of animals or plants which lived in the geological past.
- Submerged pre-colonial archaeological sites and materials.
- Terrestrial pre-colonial and historical archaeological sites and artefacts.
- Maritime and underwater cultural heritage sites and material, which are principally historical shipwrecks.

As per the definitions provided above, these cultural heritage resources are protected by the NHRA and a permit from SAHRA is required to destroy, damage, excavate, alter, deface or otherwise disturb any such site or material.

It is also important to be aware that in terms of Section 35(2) of the NHRA, all archaeological objects and palaeontological material is the property of the State and must, where recovered from a site, be lodged with an appropriate museum or other suitable public institution.

4.2 Maritime Zones Act (No 15 of 1994)

South Africa's Maritime Zones Act of 1994 is the national legislative embodiment of the international maritime zones set out in the United Nations Convention on the Law of the Sea (UNCLOS).

The Act defines the extent of the South Africa's territorial waters, contiguous zone, exclusive economic zone (EEZ) and continental shelf, which together comprises of some 4.34 million square kilometres of seabed and sets out South Africa's rights and responsibilities in respect of these various maritime zones.

Under the terms of Sections 4(2) and 6(2) of the Maritime Zones Act respectively, "any law in force in the Republic, including the common law, shall also apply in its territorial waters" and "subject to any other law the Republic shall have, in respect of objects of an archaeological or historical nature found in the maritime cultural zone, the same rights and powers as it has in respect of its territorial waters". The NHRA applies, therefore, within South Africa's territorial waters (12 nautical miles seaward of the baseline) and to the outer limit of the maritime cultural or contiguous zone (24 nautical miles seaward of the baseline).

The proposed outfall pipelines for the Port of East London desalination plant all lie within South African territorial waters and the NHRA therefore applies to any offshore activities related to their construction that have the potential to disturb or damage cultural heritage resources located in or on the seabed within the project areas.

This means the involvement of SAHRA, as a) a commenting body in respect of the NEMA environmental impact assessment process (see below) and b) as permitting authority where impacts to sites or material cannot be avoided and damage or destruction will occur.

4.3 National Environmental Management Act (Act No 107 of 1998)

The National Environmental Management Act (No 107 of 1998) (NEMA) provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals that are likely to have a negative effect on the environment.

Regulations governing the environmental authorisation process have been promulgated in terms of NEMA and include the EIA Regulations (GNR R326/2017) and Listing Notices (LN) 1-3 (R327, R325 and R324) that list activities requiring an EA.

The Port of East London desalination plant triggers NEMA listed activities and requires an application for EA that follows the EIA process.

The EIA process aims to identify and assess all potential environmental impacts (negative and positive) and the EIA report should recommend how potential negative impacts can be effectively mitigated and how benefits can be enhanced.

4.4 Protocols Applicable to the Study

At the time of writing there are no published Environmental Theme Protocols applicable to cultural heritage resources in the *Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes* published by the Minister of Environment, Forestry and Fisheries on 20 March 2020.

According to these procedures, where a specialist assessment is required and no specific environmental theme protocol has been prescribed, the required level of assessment must be based on the findings of the site sensitivity verification and must comply with Appendix 6 of the EIA Regulations.

This HIA has considered the results of a DFFE Screening Tool Report for the Port of East London desalination plant generated on 22 August 2024 which indicates a very high archaeological and cultural heritage sensitivity and a very high palaeontological sensitivity for the area assessed.

4.5 Draft Maritime and Underwater Cultural Heritage Sector Plan

Under the Marine Spatial Planning Act (Act No. 16 of 2018), a series of draft Marine Sector Plans (MSP) were published for public comment in March 2023. These MSPs support the development of Marine Area Plans as part of the Marine Spatial Planning process and specify the overall development objectives and priorities of various marine sectors for the coming two decades.

The draft Maritime and Underwater Cultural Heritage (MUCH) Sector Plan identified several sector development objectives to guide the future development of the sector as part of and through marine spatial planning. These include the need to:

- Protect maritime heritage resources in compliance with the relevant legislation and international standards, including through improved cooperative governance.
- Improve and enable appropriate and sustainable public access to maritime heritage resources.
- Enable and advance maritime heritage research and the dissemination of this information.
- Utilise and strengthen synergies with other sectors and stakeholders, particularly with biodiversity conservation and tourism development.

Based on these objectives, the draft MSP proposes a number of sector development guidelines of which the following are relevant to this HIA:

- SDG1: Marine planners and decision-makers must consider and adhere to the requirements of Section 38 of the NHRA when contemplating developments in the marine space. The aim must be to minimise the potential impacts on maritime heritage assets, taking as a starting point that priority must be given to the *in situ* preservation of maritime heritage resources.
- SDG2: Marine planners and decision-makers should consider the potential impacts of seabed development on, the potential value of and the need to protect heritage resources which are not yet designated or protected by the NHRA.

Marine planners and decision-makers must also be aware of the potential for new discoveries of historical or archaeological interest during seabed development, and that this may require the introduction of new restrictions on the proposed development and will require reporting to SAHRA without delay.

- SDG3: Proposals for activities that may affect maritime heritage resources must provide up to date assessments of the presence and significance of these resources within the area to be affected, and of the potential for new discoveries to arise, in accordance with statutory regulations. Proposals must demonstrate how any adverse impacts will be avoided, or, if this is not possible, minimised and mitigated.

The draft MUCH MSP does not propose any dedicated maritime heritage zones but refers instead to the imposition of a standard 200 m exclusion or buffer zone around identified wreck sites within any proposed development area as a basis for inclusion of maritime heritage interests in the Marine Area Plans. The draft MSP notes that these exclusion zones should be defined on a case-by-case basis and may be increased for large wrecks, wrecks with imprecise coordinates, and highly significant wrecks.

This HIA has considered and meets the requirements of the relevant sector development guidelines in the draft MUCH MSP. No exclusion zones as envisaged by the draft MSP are required as there are no identified wrecks or other maritime heritage resources within the Port of East London desalination plant project footprint.

5 METHODOLOGY

This desktop HIA provides an assessment of the palaeontological, terrestrial archaeological, submerged pre-colonial archaeological, and maritime and underwater cultural heritage potential of the proposed Port of East London desalination plant, within the study area defined in Section 5.1 below.

A desktop palaeontological impact assessment (PIA) was commissioned from Dr Marion Bamford and assessed the potential for the presence of palaeontological resources within the project area (see Section 6.1). The findings and recommendations of the PIA are included in this HIA.

An assessment of the potential impacts of the project on heritage resources in the project area is provided, and this is supported by recommendations for measures to mitigate possible impacts to these resources arising from the Port of East London desalination plant.

5.1 Sources of Information

This HIA draws information from the range of primary and secondary sources to identify as accurately as possible the terrestrial and maritime heritage resources within the Port of East London desalination plant project area and to provide an assessment of the heritage sensitivity of both the terrestrial and marine elements of the project.

The sources of information used include a variety of modern and historical maps and charts, published and unpublished archaeological and palaeontological papers and reports from the project area and vicinity, and a database of underwater heritage resources maintained by TerraMare Archaeology.

Sources of information used are shown in Table 1 below.

Table 1: Information sources used in this assessment

Data/Information	Source	Date	Type	Description
Maps	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical and current 1:50 000 topographic maps of the study area and immediate surrounds
Geological chart	Council for Geoscience	Various	Spatial	Current 1:250 000 geological survey chart for the area
Aerial photographs	Chief Directorate: National Geo-Spatial Information	Various	Spatial	Historical aerial photography of the study area and immediate surrounds
Aerial photographs	Google Earth	Various	Spatial	Recent and historical aerial photography of the study area and immediate surrounds
Background data	South African Heritage Resources Information System (SAHRIS)	Various	Reports	Previous impact assessments for any developments in the vicinity of the study area
Palaeontological sensitivity	South African Heritage Resources Information System (SAHRIS)	Current	Spatial	Map showing palaeontological sensitivity and required actions based on the sensitivity.
Background data	Books, journals, websites	Various	Books, journals, websites	Historical and current literature describing the study area and any relevant aspects of cultural heritage.
Shipwrecks	TerraMare Archaeology shipwreck database	Current	Spatial	Spatialised historical shipwreck data on GPS.

5.2 Study Area

The study area for the proposed Port of East London desalination plant HIA is shown on Figure 5 and includes nearby residential housing south of the RO and PV plants and marine outfall pipeline. The marine outfall is buffered by at least 120 m.



Figure 5: Study area (red polygon) utilised in this HIA (Source: Google Earth).

5.3 Archaeological Walkover Survey

An archaeological site visit and walkover survey of the terrestrial portion of the project layout current at the time was conducted on behalf of TerraMare Archaeology by archaeologist Jonathan Kaplan on 11 June 2025.

The archaeologist carried a hand-held GPS receiver, which logged the travelled survey tracks which are indicated on Figure 6.

Survey coverage was good and ground visibility generally good. Photos taken during the walkover survey are shown in Plate 1 - Plate 3 below.

The survey was carried out at the surface only and any buried archaeological sites or material will not have been recorded.



Figure 6: June 2025 walkover survey tracks (pale blue lines) overlaid on the project footprint (Source: Google Earth).



Plate 1: Views west (left) and east (right) across the PV facility site (Photos: J Kaplan).



Plate 2: Views east along the proposed marine outfall pipeline route (Photos: J Kaplan).

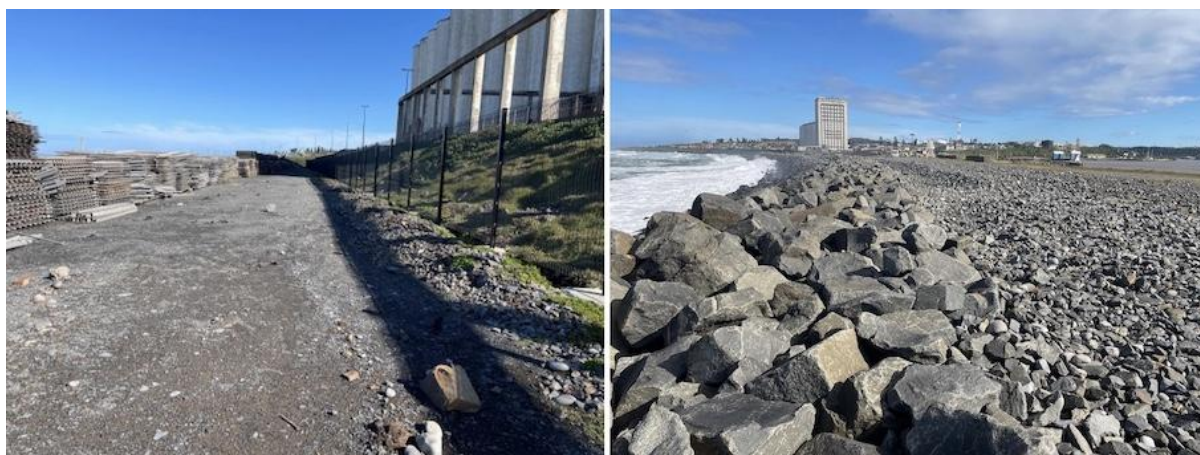


Plate 3: Views south showing the nature of the constructed rocky at the end of the marine outfall (Photos: J Kaplan).

5.4 Grading and Site Sensitivity

Archaeological survey protocol requires the grading in the field of any finds of heritage resources, using the table in Baumann and Winter (2005).

Sites of local heritage significance form the Grade 3 tier of the system, with those of high local significance designated as Grade 3A. Those of medium or low local significance are designated Grades 3B and 3C respectively. It is generally assumed that Grade 3A heritage resources should be preserved in their entirety, while Grade 3B and 3C sites can be mitigated or part preserved, as appropriate.

Resources which do not meet the Grade 3 criteria are referred to as Not Conservation-Worthy, although these authors prefer the term “Ungradable” and this is used in this report. Generally, ungradable resources require no further action or mitigation in respect of development proposed on a site.

5.5 Limitations and Assumptions

5.5.1 *Palaeontology*

A key assumption with respect to the palaeontological assessment is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing. There is also an inadequate database of fossil heritage for much of South Africa, and most development study areas have never been surveyed by a palaeontologist.

These factors may give rise to either an underestimation or overestimation of the palaeontological significance of a given study area.

5.5.2 *Terrestrial Archaeology*

As indicated above, the archaeological site visit and walkover survey was carried out at the surface only and any completely buried archaeological sites or material will not have been recorded.

The updated 2026 outfall pipeline alignment, from the crossing of the railway line to its terminus on the beach, is outside the area covered by the archaeological survey. This area is, however, either made ground, in the case of the beach, or heavily altered by the construction of the railway lines. The potential for the survival of archaeological material in both of these contexts is considered unlikely, and the lack of coverage in the survey is not considered a material issue.

With respect to previous archaeological assessments in the vicinity, although we believe that most of the relevant reports have been located and reviewed, it is acknowledged that some may not have been identified for review.

5.5.3 *Seabed Prehistory*

Direct evidence for submerged pre-colonial archaeological sites and materials on the South African continental shelf is extremely limited. However, submerged archaeological sites and materials found in offshore contexts elsewhere in the world and the known terrestrial

archaeology of the South African coastal strip, indicate that there is potential for such submerged sites and materials around our coast.

5.5.4 Maritime Archaeology

South Africa's record of maritime and underwater cultural heritage resources is based on a mix of information derived in the main from historical documents and secondary sources and from very limited primary sources such as geophysical data and other field-based observations and site recordings.

While every effort has been made to ensure the accuracy of the information presented below, the reliance on secondary data sources means that there are considerable gaps and inaccuracies in this record and the locations of any wrecks referred to in the following sections and are, for the most part, approximate.

The potential also exists for currently unknown and/or unrecorded maritime heritage sites to be encountered within the marine footprint of the Port of East London desalination plant project although this is considered unlikely.

5.6 Public Participation

5.6.1 Scoping Report and Notice of Intent to Develop

The Scoping Report for the project was submitted to SAHRA and ECPHRA in April 2025 via SAHRIS, and a NID application was made to the latter at the same time.

In an interim comment dated 25 April 2025, SAHRA responded to the Scoping Report by requesting the submission of this HIA and the draft EIA report, before providing further comments on the proposed development.

The ECPHRA, in its NID response dated 4 April 2025, also requested a HIA to cover all aspects of development and comprising:

- A Phase 1 AIA (archaeological and cultural heritage impact assessment), including a desktop/pre-feasibility and field assessment.
- A Phase 1 PIA (paleontological impact assessment) including a desktop/pre-feasibility and field assessment.
- A desktop maritime and underwater cultural heritage assessment.

Based on the results of the PIA, which indicated that the likelihood of a palaeontological site visit producing meaningful results was very low, a formal request for a waiver from the requirement to conduct a palaeontological field assessment as part of the HIA was lodged with the ECPHRA on 20 May. In its response of 26 June 2025, the ECPHRA granted this exemption.

5.6.2 Heritage Impact Assessment

The draft HIA was submitted to SAHRA and the ECPHRA on 16 September 2025.

A final comment dated 22 October 2025, the ECPHRA indicated that “there are no objections to the proposed development. It may proceed as planned provided that the recommendations by specialists and ECPHRA, are adhered to”.

These recommendations are set out in Section 12 of this report below.

The ECPHRA also set the following additional requirements:

- Pre-construction:
 - The project proponent/representative must notify ECPHRA of the date of commencement of the project or share the project schedule and (EA).
 - The project proponent/representative must submit a detailed heritage *chance finds procedure* for ECPHRA to approve before development starts.
 - Heritage induction and training for ground crew (including the ECO) must be conducted, in identifying heritage resources.
 - SAHRA and ECPHRA must be notified of any shipwreck finds.
 - A palaeontologist must be on site, to monitor, during excavations
 - Heritage monitoring and reports to be shared with ECPHRA.
- Post Construction:
 - Upon completion of the project, a final heritage compliance report must be submitted to ECPHRA.

In its Final Comment issued on 28 November 2025, SAHRA stated the following:

“The following comments are made as a requirement in terms of section 3(4) of the NEMA Regulations and section 38(8) of the NHRA in the format provided in section 38(4) of the NHRA and must be included in the Final BAR:

38(4)a – The SAHRA Development Application Unit (DAU) has no objections to the proposed development;

- 38(4)b – The recommendations provided by the heritage specialists are supported and must be adhered to. These further additional comments apply:
- If any shipwrecks and/or artefacts related to shipwrecks in the region are uncovered, the findings must be reported to a maritime archaeologist appointed to inspect potential finds. A report on this inspection must be submitted to SAHRA for further recommendations;
- The Fossil Chance Finds Procedure must be included in the EMP;.

- 38(4)c(i) – If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA DAU (Nokukhanya Khumalo/Natasha Higgitt 021 202 8660) must be alerted as per section 35(3) of the NHRA. Non-compliance with section of the NHRA is an offence in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- 38(4)c(ii) – If unmarked human burials are uncovered, the SAHRA DAU (Nokukhanya Khumalo/Natasha Higgitt 021 202 8660), must be alerted immediately as per section 36(6) of the NHRA. Non-compliance with section of the NHRA is an offence in terms of section 51(1)e of the NHRA and item 5 of the Schedule;
- 38(4)d – See section 51(1) of the NHRA;
- 38(4)e – The following conditions apply with regards to the appointment of specialists:
- If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA;
- The Final BAR and EMPr must be submitted to SAHRA for record purposes;
- The decision regarding the EA Application must be communicated to SAHRA and uploaded to the SAHRIS Case application”.

In addition to any other identified Interested and Affected Parties (I&APs), therefore, this final HIA must be submitted to SAHRA, the ECPHRA and the Buffalo City Metropolitan Municipality for comment as part of this public participation process for the Final BAR.

6 RECEIVING ENVIRONMENT

The Port of East London desalination plant, solar PV facility and associated infrastructure will be constructed on the western bank of the Buffalo River within the boundaries of an operational port (see Plate 4 and Plate 5 below).

As is clear from Plate 1 - Plate 3 above, the areas affected by the proposed development areas have been subject to a substantial degree of human alternation through landscaping or development during the construction and operation of the port.

The archaeological walkover survey confirmed that the landscape of the project area is severely degraded and transformed, reflecting the brownfields, industrial nature of the port and the project site within it.



Plate 4 Aerial view of the Port of East London showing the nature of the receiving environment for proposed desalination plant. The. The plant and associated infrastructure will be located within the area highlighted by the yellow rectangle (Source: Transnet brochure).



Plate 5: Aerial view of the Port of East London looking west from the sea, showing the environment affected by the proposed desalination plant (area highlighted by the yellow rectangle) (Source: <https://www.news24.com/citypress/business/east-londons-port-gets-r29bn-boost-20160708>).

In the area of the seaward of railway line, the marine outfall will be constructed on an artificial revetment created within the last decade to halt a 40 m regression of the reclaimed land between the grain elevator and the sea (see Plate 3 above).

7 HERITAGE BASELINE AND SENSITIVITIES

This section describes the heritage sensitivities of the terrestrial and marine portions of the proposed Port of East London desalination plant project, as they are currently understood.

7.1 Geological Context

Geologically, the Port of East London desalination plant project area lies on the southeastern margin of the Karoo Basin where the Adelaide Subgroup rocks of the Beaufort Group are exposed (Figure 7) (Bamford, 2024).

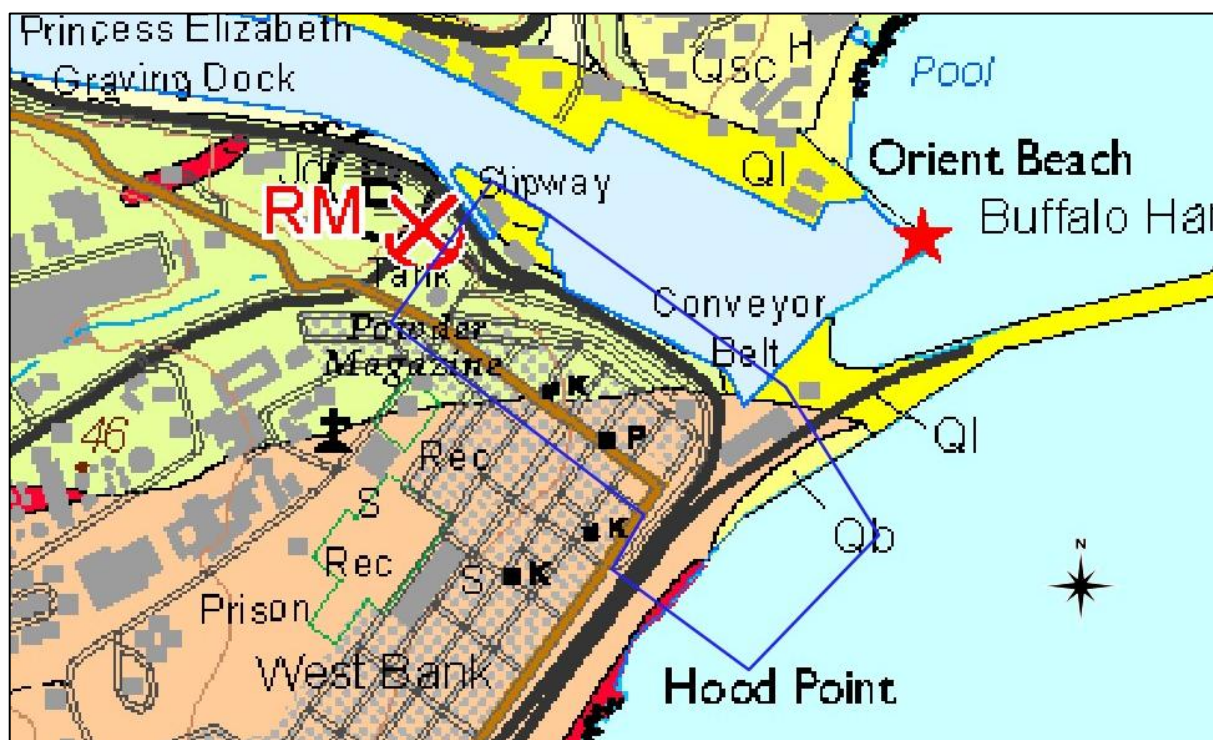


Figure 7: Geological map of the area around the Port of East London. The study area is indicated by the blue polygon. Abbreviations of the rock types are explained in Table 2 below (Source: Geological Survey 1: 50 000 map 3327BB East London).

Table 2: Explanation of symbols for the geological map and approximate ages (Johnson et al., 2006; Roberts et al., 2006). SG = Supergroup; Fm = Formation; Ma = million years.

Symbol	Group/Formation	Lithology	Approximate Age
Qn (pale orange)	Nahoon Fm, Algoa Group	Calcareous sandstone (aeolian), palaeosols	Pleistocene

Symbol	Group/Formation	Lithology	Approximate Age
Jd (red)	Jurassic Dolerite	Dolerite	Jurassic (Ca 183 Ma)
Pa (green)	Middelton Fm, Adelaide subgroup, Beaufort Group, Karoo SG	Grey and red mudstone, sandstone	Middle Permian (Ca 260– 256 Ma)

The rocks of the Beaufort Group have been divided into the lower Adelaide Subgroup for the Upper Permian strata, and the Tarkastad Subgroup for the Early to Middle Triassic strata. In this part of the basin, east of 24°E, three formations are recognised in the Adelaide Subgroup, the basal Koonap Formation, the Middleton Formation and the thick Balfour Formation (Smith et al., 2020).

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Overlying the Beaufort Group, the Cenozoic Algoa Group extends along the entire Eastern Cape coast and has been divided into six formations (Roberts et al., 2006).

The basal Bathurst Formation, centred around the town of Bathurst, comprises a soft marine limestone at its base, with overlying pebbly coquina. It is Eocene in age and rests unconformably on Karoo Supergroup bedrock (ibid). The next formation is the Alexandria Formation that is composed of three strata: a basal conglomerate with scattered oyster shell, a pebbly coquinite, and an overlying calcareous sandstone with horizontal lamination and herringbone cross-bedding.

The Alexandria Formation is Miocene to Pliocene in age and is overlain by the very thick Nanaga Formation that is composed of semi-consolidated calcareous sandstone with aeolian cross-bedding (Roberts et al., 2006; Hassan et al., 2022). The Salnova Formation is much thinner and sporadic with the incorporation of some of the underlying reworked Alexandria Formation materials. The Nahoon Formation aeolianites rests on Mesozoic rocks or disconformably on the Salnova Formation. It has some very high dunes and represents the lithification of aeolian sands prior to the Eemian highstand (Roberts et al., 2006). The topmost layer, the Skelm Hoek Formation, represents the most recent phase of aeolian sedimentation and occurs extensively along the Eastern Cape Coast.

7.2 Palaeontology

The southern half of proposed Port of East London desalination plant project site is located mainly on the Nanaga Formation aeolianites which are given a very high sensitivity rating (red) on SAHRA's palaeo-sensitivity map (see <https://sahris.sahra.org.za/map/palaeo>) (Figure 8).

This sensitivity rating is based on rare occurrences of oyster beds, invertebrate marine shells recorded from road-cuttings farther inland (Goedhart and Hattingh, 1997).

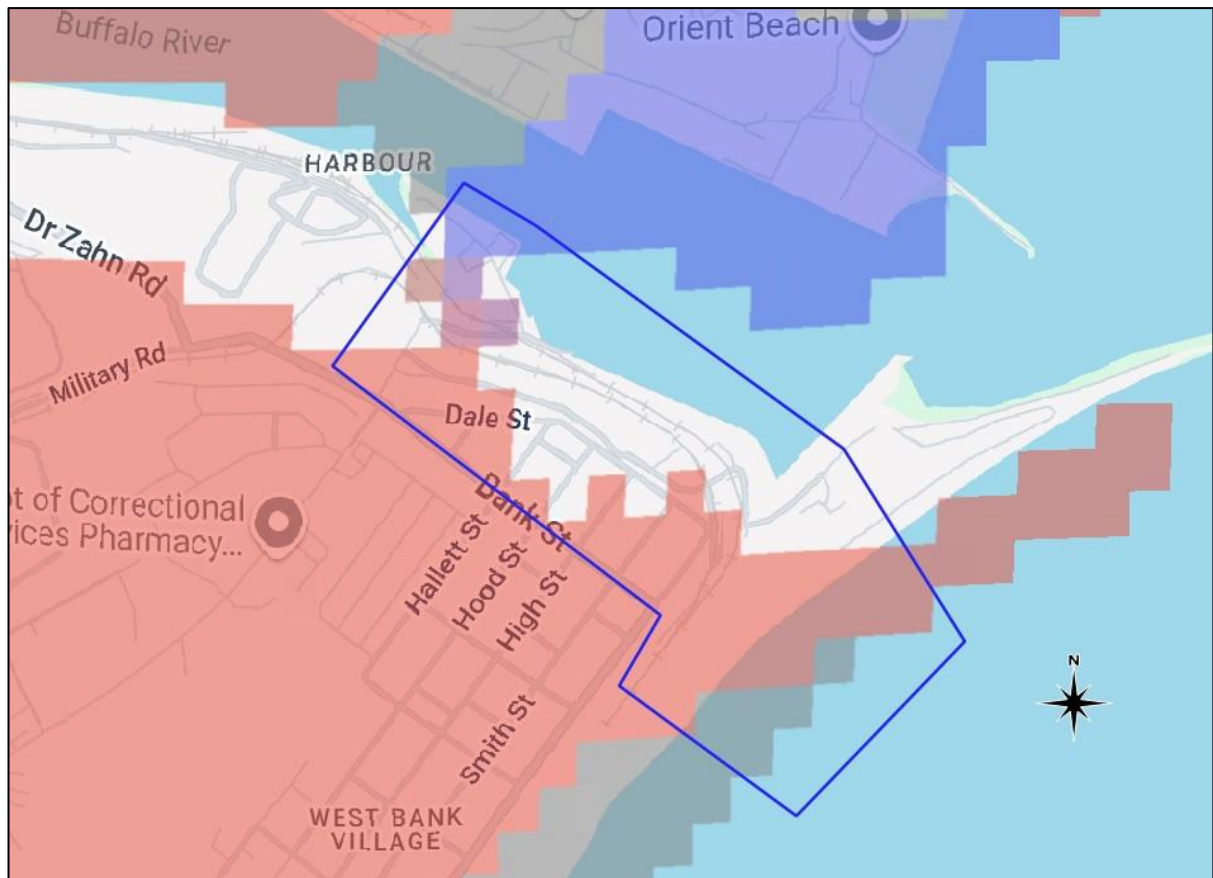


Figure 8: Extract from the SAHRIS palaeo-sensitivity map showing the generally very high (red), insignificant/zero (grey) and unknown (white) palaeontological sensitivity of the Port of East London desalination plant project area (red polygon) (Source: <https://sahris.org.za/map/palaeo>).

In practice, according to Bamford (2024) the fossil occurrences within this formation are very rare and frequently very weathered due to extensive post-depositional diagenesis, the result of such as dissolution and re-precipitation of carbonate by groundwater (Roberts et al., 2006; Almond, 2011).

Bamford (2024) therefore supports Almond's (2011) recommendation that a low palaeosensitivity rating for this formation is more appropriate, with mitigation not required unless rich fossil accumulations are exposed during excavations.

The northern half of the project site is underlain by the Permian Middelton Formation that is also indicated as very highly sensitive (red) on SAHRIS, but according to Bamford (2024), this sensitivity rating is more applicable to the central Karoo Basin where the formation has not been impacted by sea-level rise. Bamford (2024) further indicates that there are no records of Permian vertebrates or plants from this area.

7.3 Terrestrial Archaeology

There has been relatively little formal pre-colonial archaeological research conducted in the East London area, apart from Robin Derricourt's early attempt at synthesising the known prehistory of the region (Derricourt, 1977).

In a Masters thesis dealing with the development of East London as a port, however, Gordon (1932), reports a number of occurrences of pre-colonial archaeological sites and material on the east bank of the Buffalo River. Citing a paper by George McKay dated 1887, Gordon writes that "some years ago, in opening a quarry, a very large mound of shells was discovered on the left bank of the Qigney River at its junction with the Buffalo, where the mound formed a rounded bluff ... The Harbour works engineers have removed upwards of 375,000 cubic feet of these shells to fill up the lagoon behind the Eastern Training Wall. Anyone examining what remains of this mound will find it composed principally of limpet, mussel oyster ... bones of fish and birds ... of antelopes, hippopotamus and other mammalia, layers of ashes, fragments of charcoal, and pieces of coarse pottery. There can be no doubt that this spot was occupied by many successive generations of human beings to permit the accumulation of so large a mass of refuse" (Gordon, 1932:2).

A collection of material from "the "kitchen midden" where the Quigney River ran into the Buffalo", probably the same midden as described above, was presented to the East London Museum by Dr Bruce Bays (Gordon, 1932:3).

According to Gordon (1930:3), McKay also found pre-colonial archaeological material in the valley behind the prison/convict station, where a railway cutting exposed a gravel layer containing "stone implements, spearheads, and some fragments of stone pottery"

Further pre-colonial archaeological material was reported by a Mr Gately, at his property on a small hillock east of the center of East London, near where two streams flowed into First Creek. A thick layer of black mud was present on the site, and from this "Mr Gately has dug up many implements and bones ... pierced round stones, ... spear heads, coarse pottery, teeth and other bones of the hippopotamus" (Gordon, 1930:3).

Lastly, a number of the early historical maps of East London indicate the presence of a Xhosa village and garden on the West Bank, almost directly opposite the mouth of the Qigney stream. The site of this settlement is probably in the area now occupied by the Car Terminal (see Figure 10 below).

More recently, there have been several heritage assessments carried out in the East London, Industrial Development Zone (IDZ), south of the area proposed for the desalination plant (Binneman and Webley, 1996; Anderson, 2009, 2013). These studies indicate a widespread and general occurrence of pre-colonial archaeological material in the West Bank area of East London.

No Early Stone Age archaeological material has been reported from the area, and the reported archaeology is dominated by a "litter" of Middle Stone Age lithic material that is present almost everywhere (Derricourt, 1977; Binneman and Webley, 1996; Anderson, 2009, 2013). Further

evidence of early modern human presence in the East London area during the MSA was found in 1964 when the footprints of a young human child and the tracks of a bird and two mammal species were discovered preserved in sandstone at Nahoon Point, north of the Buffalo River.

The tracks are estimated to be approximately 124 000 years old ago and their presence is an indicator of the antiquity of a human presence in the area around East London (http://www.thegreatkaroo.com/news/heritage_potential_of_the_nahoon_point_trace_fossil_footprints) (Plate 6).



Plate 6: Cast of the Nahoon Point footprints on display at the Nahoon Point Nature Reserve. The original sandstone block containing the tracks is housed at the East London Museum (Source: <http://www.bctourism.co.za/itemdetail.php?id=508&category=18>).

The scatters of MSA artefacts reported around East London are, in the main, in secondary context (i.e. not where they were originally deposited) and cannot generally be said to form discrete archaeological sites. This material is generally considered to be of low archaeological significance and sensitivity.

By contrast, Later Stone Age (LSA) archaeological material, also widely recorded in the area (Derricourt, 1977; Binneman and Webley, 1996; Anderson, 2009, 2013), most often as coastal shell middens, generally occurs as definable sites, sometimes in sealed contexts and accompanied by bone and other archaeological material. These sites are generally of moderate and sometimes high, local archaeological significance.

7.4 Historical Development of East London

The proposed desalination plant, solar PV facility and associated infrastructure will be constructed on the west bank of the Buffalo River where the original port facilities and village of East London were established in the first half of the nineteenth century.

The site was first claimed by Lieutenant Baillie, formerly of the Royal Navy, when he hoisted the Union Jack at Signal Hill in 1836, having persuaded the Governor of the Cape, Sir Benjamin D'Urban, that the Buffalo River might serve as a suitable harbour from which to support military operations during the Frontier Wars (Knox-Johnston, 1989).

The same year, the potential of the river as a port was confirmed when the small coasting brig, *Knysna*, commanded by John Findlay conducted a reconnaissance of Port Rex, as he named it. His visit lasted seven weeks during which time the vessel safely rode out two gales, suggesting that the river had much to recommend it as a port (Knox-Johnston, 1989). However, the departure of D'Urban as Governor shortly thereafter, and a reversal of British policy in the area saw the recently created Province of Queen Adelaide, and Port Rex with it, abandoned (Gordon, 1932; Tankard, 1985).

It wasn't until the start of the Seventh Frontier War a decade later that the usefulness of a Buffalo River port was again recognised. A part of the 73rd Regiment was dispatched to the area in 1847 to start construction on Fort Buffalo, later renamed Fort Glamorgan, on the west bank of the river (Knox-Johnston, 1989) (Figure 9, Figure 10 and Plate 7).



Figure 9: Detail of a map of British Kaffraria dated 1848 showing the Buffalo River mouth and the nascent settlement on the west bank of the river (Source: <http://www.digitalcollections.lib.uct.ac.za/collection/islandora-19528>).



Plate 7: Sketch of shipping at the mouth of the Buffalo River, showing fort Glamorgan and the early layout of East London on the West Bank (Source: DRISA Archive (N58609) http://atom.drisa.co.za/collections/N_Collection_lo-res/N58609.jpg)

The west bank was chosen as the site of the jetty, and by extension, the settlement, because a rocky ledge at water's edge made a natural pier, and landing on this bank of the river was far easier than the other side (Gordon, 1932). A small stone wharf was constructed and four streets, which would form the nucleus of early East London, were surveyed and laid out (https://en.wikipedia.org/wiki/East_London,_Eastern_Cape) (Figure 10).

On 14th January 1848, an area for two miles around Port Rex was annexed to the Cape, and its name was changed to East London by the Governor, Sir Harry Smith (Knox-Johnston, 1989).

Although some improvements were made to the original stone jetty of 1847 and a lighthouse was built at Castle Point in 1856, the real development of the port began in 1872 when construction of the breakwater commenced. The breakwater enhanced the shelter provided by the port, and made it safer for smaller ships, and after 1886, when a steam dredger was delivered and began to remove the bar at the river mouth, most vessels could be guaranteed safe berths within the port (Knox-Johnston, 1989) (Plate 8).

The site on which the PV facility is proposed was previously occupied by a row of four houses, probably built for harbour personnel. This site did not form part of the original East London township grid plan and these buildings which are visible in early aerial photographs of East London dated 1935 and 1938 appear to have been built after the beginning of the twentieth (Figure 11). Google Earth satellite imagery indicates that they were demolished between August 2004 and August 2009 (Figure 12) and the remains of their foundations and floor slabs are all that are visible on the site (Plate 9).

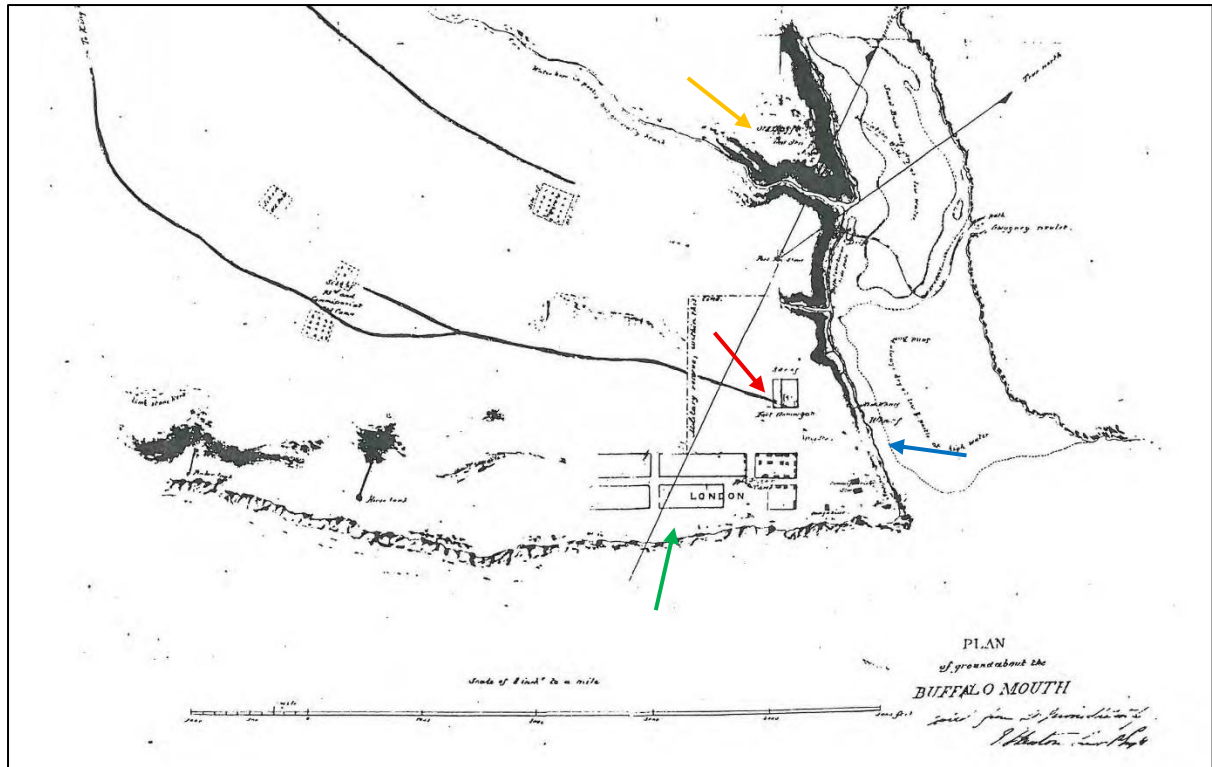


Figure 10: Map of the early settlement on the West Bank, Buffalo River. Probably drawn in 1847-8, it shows Fort Glamorgan (red arrow), the early town layout of East London (green arrow) and the jetty (blue arrow). A Xhosa village/gardens is marked slightly up-river (orange arrow) (After Tankard, 1985:116).

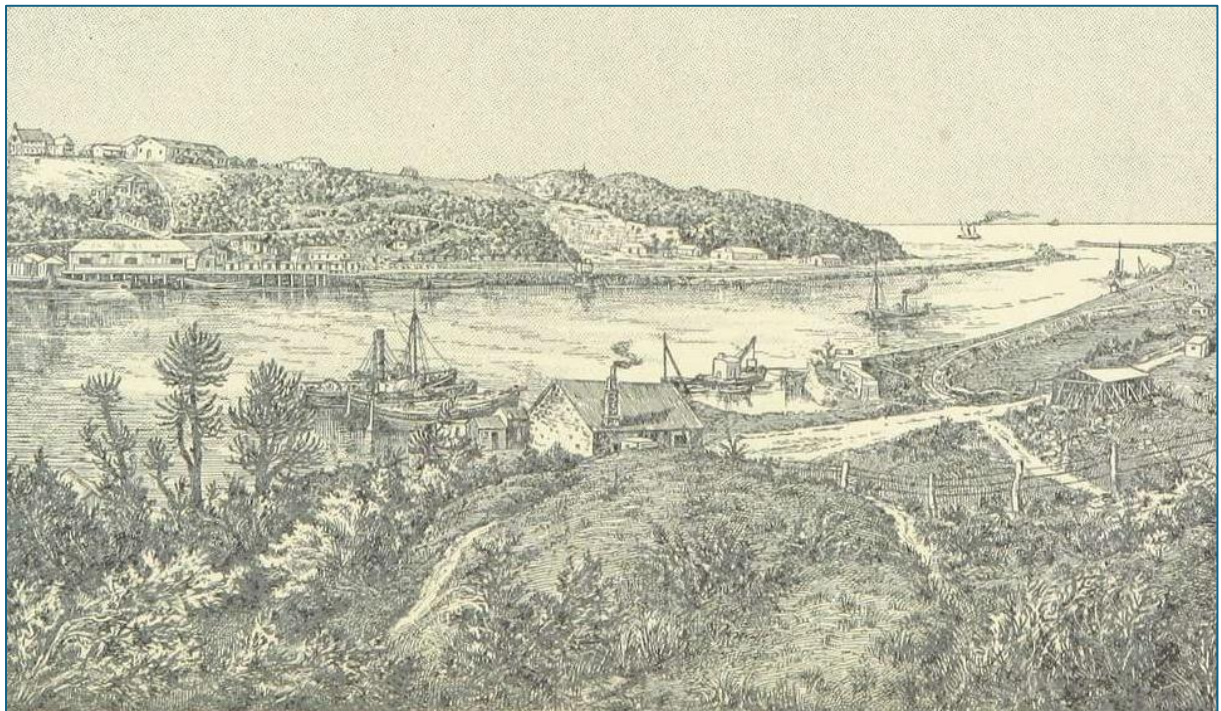


Plate 8: View by Joseph Ingram of the port in the Buffalo River c.1891. Note the steam dredger working in the area of the Victoria Slipway in the centre of the image (Source: <https://itoldya420.getarchive.net/amp/media/ingram1891-pg056-east-london-27cf03>)

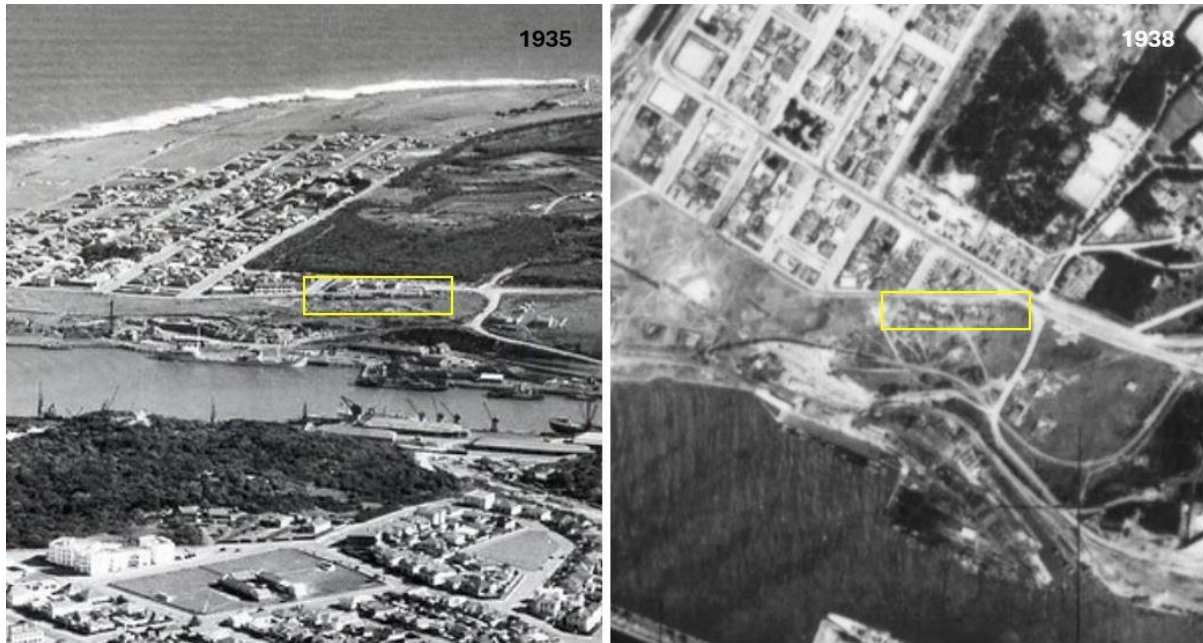


Figure 11: Early aerial photographs dated 1935 (left) and 1938 (right) which indicate the row of three, now demolished houses on the proposed PV facility sites (Source: Hilton T on Flickr (<https://www.flickr.com/photos/hilton-t/>) (left), National Geospatial Information (<http://www.cdngportal.co.za/cdngportal/>) (right)).



Figure 12: Consecutive Google Earth satellite images dated August 2004 (left) and August 2009 (right) showing the four houses on the proposed PV site, pre- and post-demolition (Source: Google earth).



Plate 9: Examples of the remains of the demolished houses on the proposed PV site. The red brick walling visible in the images is typical of much 1930's South African residential housing (Source: Anchor Environmental).

7.5 Submerged Prehistory

Since the start of the Quaternary, approximately 2.6 million years ago, the world has been subject to a series of cooling and warming climatic cycles and sea level was mainly lower than it is today.

During the last 900,000 years, during which our tool-making ancestors were colonising much of the world, global sea levels have fluctuated substantially on at least three occasions, the result of increased and decreased polar glaciation. The dropping of sea levels was caused by the locking up in the polar ice caps of huge quantities of seawater as global temperatures cooled.

The most extreme recent sea level drop occurred between circa 20,000 and 17,000 years ago when, during Marine Isotope Stage 2 (MIS) at the height of the last glaciation, the sea was more than 120 m lower than it is today (Waelbroeck *et al*, 2002; Rohling *et al*, 2009). Similar sea level low stands occurred during MIS 4 (~70,000 years ago), MIS 6 (~190,000 years ago), MIS 8 (~301,000 years ago) and MIS 12 (~478,000 years ago).

Each of these low stands would have “added a large coastal plain to the South African land mass” (Van Andel, 1989:133) where parts of the continental shelf were exposed as dry land (see Cawthra *et al*, 2016) (Figure 13). The exposure of the continental shelf would have been most pronounced on the wide Agulhas Bank off the southern Cape coast, and it is estimated that a new area of land, as much as 80,000 km² in extent, was exposed during the successive glacial maxima (Fisher *et al*, 2010).

The exposed continental shelf was repeatedly populated by terrestrial flora and fauna, and also by our human ancestors who were dependant on these resources (Compton, 2011), and for periods numbering in the tens of thousands of years, on at least three occasions during the last 500,000 years, covering the latter part of the Earlier Stone Age (ESA), the MSA, and the early LSA, our ancestors inhabited areas of what is now seabed around the South African coast. This means that a large part of the archaeological record of the later Earlier, Middle and early Late Stone Age is located on the continental shelf and is now “inundated and for all practical purposes absent from [that] record” (Van Andel, 1989:133-134).

Until relatively recently there was little or no global understanding of the potential for, or access to, submerged prehistoric landscapes and sites on the continental shelf. Increasingly frequent discoveries in various parts of the world of drowned, formerly terrestrial landscapes, often as a result of development-led seabed surveys and sampling, is, however, providing increasing evidence for the survival of prehistoric archaeological sites on and within the current seabed.

Well-known examples of such evidence include archaeological material and late Pleistocene faunal remains recovered in the nets of fishing trawlers in the North Sea between the United Kingdom and the Netherlands throughout the 20th century (Peeters *et al*, 2009; Peeters, 2011) and the University of Birmingham’s archaeological interpretation of 3D seismic data, collected in the same area by the oil and gas industry, which has revealed well-preserved prehistoric landscape features across the southern North Sea (Fitch *et al*, 2005, Gaffney *et al*, 2010).

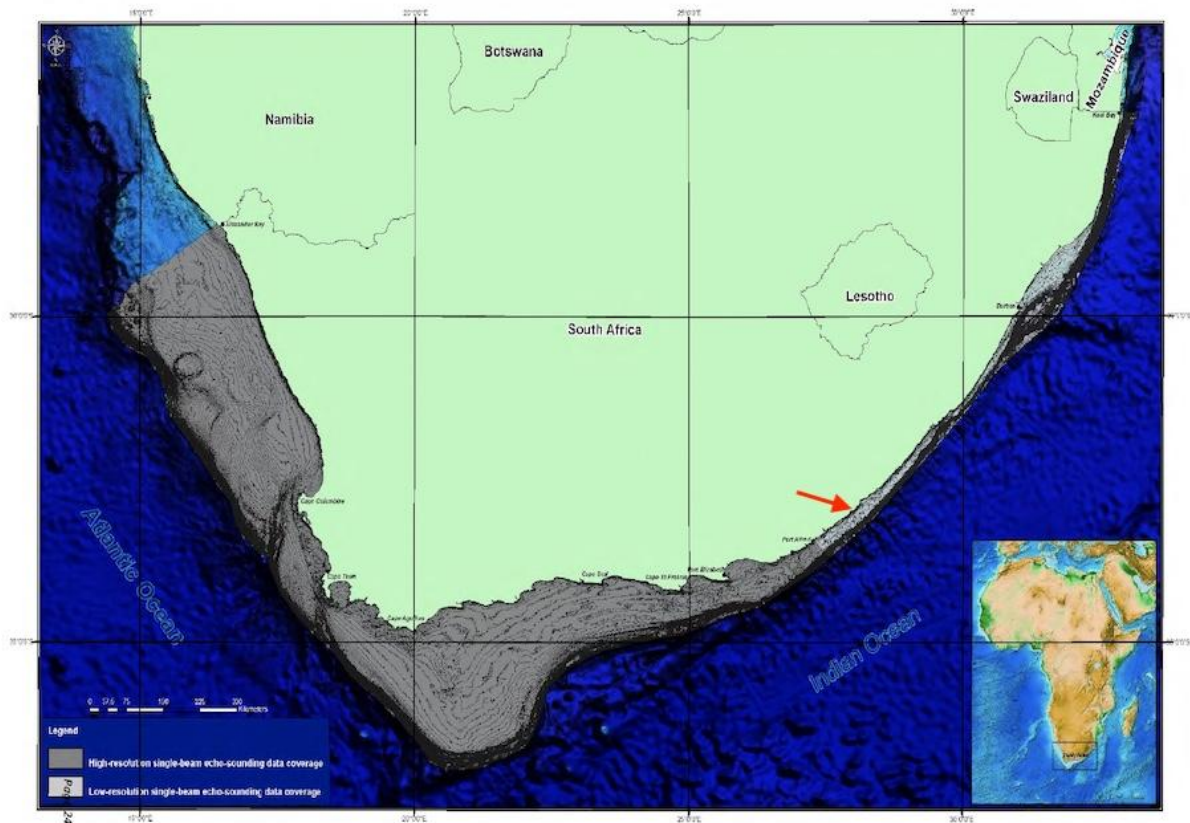


Figure 13: Extent of the South African continental shelf (light and dark grey area). East London is indicated by the red arrow (After De Wet, 2012).

Since the University of Birmingham work there have been increasing numbers of reports of submerged archaeological sites and material, for example, Tizzard et al (2011) and Faught and Gusick (2011) and in Benjamin et al (2011).

In South Africa there is concrete archaeological evidence for a prehistoric human presence in what is now Table Bay where three ESA handaxes were recovered from the seabed during the excavation of two Dutch East India Company shipwrecks (Figure 14).

The stone tools, which are between 300,000 and 1.4 million years old, were found at a depth of 7-8 m below mean sea level and were associated with Pleistocene sediments from an ancient submerged and infilled river channel. Their unrolled and unworn condition indicate that they had not been carried to their current position by the ancient river and suggests that they were found more or less where they were dropped ESA hominins more than 300,000 years ago (possibly during MIS 8 (~301,000 years ago) or MIS 12 (~478,000 years ago)), when the sea level was at least 10 m lower than it is today (Werz and Flemming, 2001; Werz *et al*, 2014).



Figure 14: Location of the find of Table Bay ESA handaxes (inset) off Milnerton (top arrow) overlain on magnetometer data which shows the submerged palaeo-channel (green) of the Salt River (bottom arrow) (Sources: Google Earth; <http://www.aimure.org/index.php/aimure-projects>).

7.5.1 Submerged Prehistory Potential of the East London Area

The seabed of the East London nearshore environment is, according to Maitland (2018) quoting the CSIR (2016:21), “controlled by the prevailing surf conditions [and] is typically devoid of notable sediment accumulations with exposed rock outcrops dominating”. De Wet and Compton (2021) support this view, stating that there is generally no significant sediment accumulation on the Eastern Cape continental shelf due to the narrowness of the shelf and the influence of the Agulhas Current.

This suggests that the survival of *in situ* submerged archaeological deposit is unlikely in this area, except possibly in isolated contexts within incised valleys on the continental shelf which were cut during sea level low stands when river courses extended onto the shelf and which are described by a number of studies for the East Coast (see for example, Green and Garlick, 2011; Dladla, 2013).

Such palaeo-rivers on the exposed shelf would have been attractive resource foci for our human ancestors for nearly 70% of the last 200,000 years, covering ~65 000 years during the MIS 6 ice age, and the period between the start of the MIS 5a marine incursion at 80,000 years ago and about 9,000 years ago. And just as on land, archaeological sites and material, like the Table Bay handaxes referred to above, can be expected to have been deposited within and along the edges of these river valleys.

Along most of the South African coast, however, as the rising sea during post-glacial marine transgression eroded terrestrial sediments, including the fluvial sediments in palaeo-river

channels, and prehistoric archaeological sites present within such deposits are likely to have been destroyed and the artefacts they contained reworked into seabed gravel. Of this material, stone artefacts are most likely to have survived, and ex situ lithic artefacts may thus be present within the coarse gravels and surficial river- and seabed sediments within the estuarine and marine portions of the Port of East London desalination project area.

The marine outfall for the Port of East London desalination plant project will be installed in the current surf zone east of an artificial rock revetment and boulder beach constructed within the last decade to halt a 40 m regression of the reclaimed land between the grain elevator and the sea (see Plate 3 above).

The aggressively erosive surf environment indicated by the need for the revetment and boulder beach suggests that survival of submerged prehistoric archaeological material – either in or ex situ - is extremely unlikely. The installation of the proposed marine outfall pipes on the surface of the constructed rocky beach also suggests that even were archaeological material present, impacts on it are unlikely.

Similarly, within the Buffalo River, the intake pipeline will also be laid on the surface of the riverbed, which itself has been subject to nearly 150 years of dredging and human interference. The survival of submerged prehistoric archaeological material here is also unlikely.

7.6 Maritime History of the South African Coast

In 1498 the Portuguese explorer Vasco da Gama first pioneered the long-sought sea route around Africa from Europe to the East. After that, for more than 350 years, the southern tip of the African continent played a vital role in global economic and maritime affairs, and until the opening of the Suez Canal in 1869, represented the most viable route between Europe and the markets of the East (Axelson, 1973; Turner, 1988; Gribble, 2002; Cliff, 2012; Gribble and Sharfman, 2013).

The geographical position of the South African coast roughly midway on the historical route to the East and the physical conditions mariners could expect to encounter in these waters have, in the last five centuries, been responsible for the large number of maritime casualties which today constitute the bulk of South Africa's maritime and underwater cultural heritage (Gribble, 2002).

At least 2,800 vessels are known to have sunk, or been wrecked, abandoned or scuttled in South African waters since the early 1500s and more than 1,900 of these wrecks are more than 60 years old and, thus, protected by the NHRA as archaeological resources.

The list of maritime casualties is not believed to be complete, however, and certainly does not include the yet unproven potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions along the South African east coast, or historical wrecks lost between ports with no survivors.

The Portuguese and other European nations who followed their lead around the Cape and into the Indian Ocean, however, joined a maritime trade network that was thousands of years old and in which east and south-east Africa was an important partner.

This trade spanned the Indian Ocean and linked the Far East, South-East Asia, India, the Indian Ocean islands and Africa. Archaeological evidence from Africa points to an ancient trade in African products – gold, skins, ivory and slaves – in exchange for beads, cloth, porcelain, iron and copper. The physical evidence for this trade includes Persian and Chinese ceramics excavated sites on African Iron Age like Khami, Mapungubwe and Great Zimbabwe (see Garlake, 1968, Huffman, 1972, Chirikure, 2014), glass trade beads found in huge numbers on archaeological sites across eastern and southern Africa (Wood, 2012, Wood et al, 2012, Wood et al, 2017).

There is shipwreck evidence on the East African coast for this pre-European Indian Ocean trade (see for example Pollard et al 2016) and clear archaeological and documentary evidence that this trade network extended at least as far south as Maputo in Mozambique (Wood et al, 2012). This suggests that there is the potential for shipwrecks and other sites that relate to pre-European, Indian Ocean maritime exploration, trade and interactions to exist along the South African east coast and offshore waters.

The earliest known South African wrecks are Portuguese, dating to the sixteenth and seventeenth centuries when that country held sway over the route to the East. Due to the later, more prolonged ascendancy of first the Dutch and then the British in European trade with the East and control at the Cape, most wrecks along the South African coast are Dutch and British. However, at least 36 other nationalities are represented amongst the other wrecks that litter the coast.

Taken together, South Africa's historical shipwrecks are a vast, cosmopolitan, repository of information about mainly global maritime trade during the last five centuries and potentially much further back into the past. These sites contain a wealth of cultural material associated with that trade and clues to the political, economic, social and cultural changes that accompanied this trade, and which contributed to the creation of the modern world.

7.6.1 Maritime History of East London

As with many ports at river mouths there was, historically, always an element of risk involved in entering and leaving the Port of East London. The sand bar across the mouth meant that initially only vessels smaller than 80 tons could enter the river. Larger vessels were forced to anchor in the roadstead offshore and goods and people were transported to and from the ships in lighters (see Plate 7 above).

The first maritime casualty at the Buffalo River was the coasting schooner, *Ghika* which was wrecked in 1847 (Denfield, 1965). Steam propelled vessels were at less risk of grounding when entering the river, but it wasn't until June 1872 that the German steamer *Bismarck* made the first successful entry into the river by a steamship (Ingpen, 1979).

As indicated above, the construction of what was to become the formal harbour that now exists in the Buffalo River began in 1872 (Ingpen and Pabst, 1985; Knox-Johnston, 1989; <https://www.sahistory.org.za/places/east-london>). Despite these harbour works, which continued until well into the 20th century, the many shipping casualties which occurred in and around the Buffalo River, bear out Denfield's statement that "wrecks have always been a strong feature of the East London seascape" (Denfield, 1965:56).

Records consulted for this study – a shipwreck database maintained by TerraMare Archaeology and a shipwreck database compiled by Fedde Van den Bosch in 2014 – indicate the potential for approximately 90 wrecks within a 1 km radius of the intake and outfall pipelines associated with the proposed desalination plant. These wrecks are listed in Appendix 4.

The bulk of the wrecks occurred within, or close to the Buffalo River, particularly north of the mouth where the historical anchorage was located (Denfield, 1965; Gribble, 2018), but a number are clustered south of the western breakwater in the vicinity of the marine outfall, and there are a number south of this along the coast between the harbour and Hood Point.

It is important to be aware that the positions of very few of South Africa's recorded historical wrecks are accurately known. The positions for most of the wrecks given in the various databases and indicated in the vicinity of the Buffalo River on Figure 15 below are, therefore, approximate, and are based on the descriptions of their loss in the historical records, rather than physical, identifiable wreckage on the seabed. That said, the presence of the remains of most of the vessels shown on Figure 15 should be assumed within the general vicinity of where they are marked on the figure.

It is extremely unlikely that there will be any wrecks present in the vicinity of the water intake pipe because of the widening of the Buffalo River and the major changes to the morphology of the West Bank made since major harbour works commenced in the 1870s.

Figure 16 shows an overlay of an 1887 plan for the development of the harbour and a 1942 plan of the harbour following the creation of the Turning Basin in the 1930s. While not absolutely accurate, the overlay nevertheless indicates that the West Bank was cut back by up to 100 m in places to create the Turning Basin and what's indicated as the Oil Tanker Wharf. Since 1942, there has been further cutting back of the West Bank to its current alignment, as indicated on Figure 17.

This means that the proposed water intake pipe is between 65 and 85 m inland of the original, late 19th century alignment of the west bank of the Buffalo River and there is thus no possibility, prior to the 1930s, of there being wrecks present in the area. Furthermore, there have been no recorded casualties within the Buffalo River since the 1930s so there is no likelihood of new wreckage being present on the widened portion of the riverbed within which the intake pipeline will be installed.



Figure 15: Recorded shipwrecks in the vicinity of the maritime elements (intake and outfall pipeline) of the proposed Port of East London desalination plant (Source: TerraMare Archaeology Shipwreck Database).

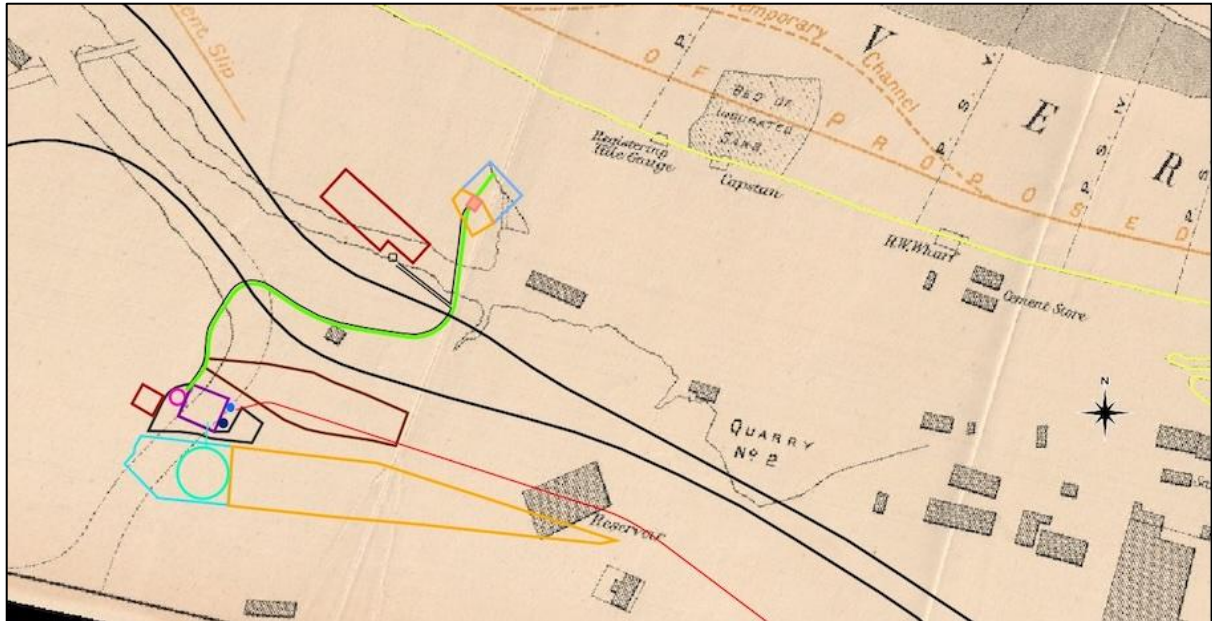


Figure 16: Overlay of the 1887 map of the Buffalo River showing the original alignment of the west bank of the river (yellow line). The infrastructure associated with the proposed desalination plant is located well inland of the original riverbank

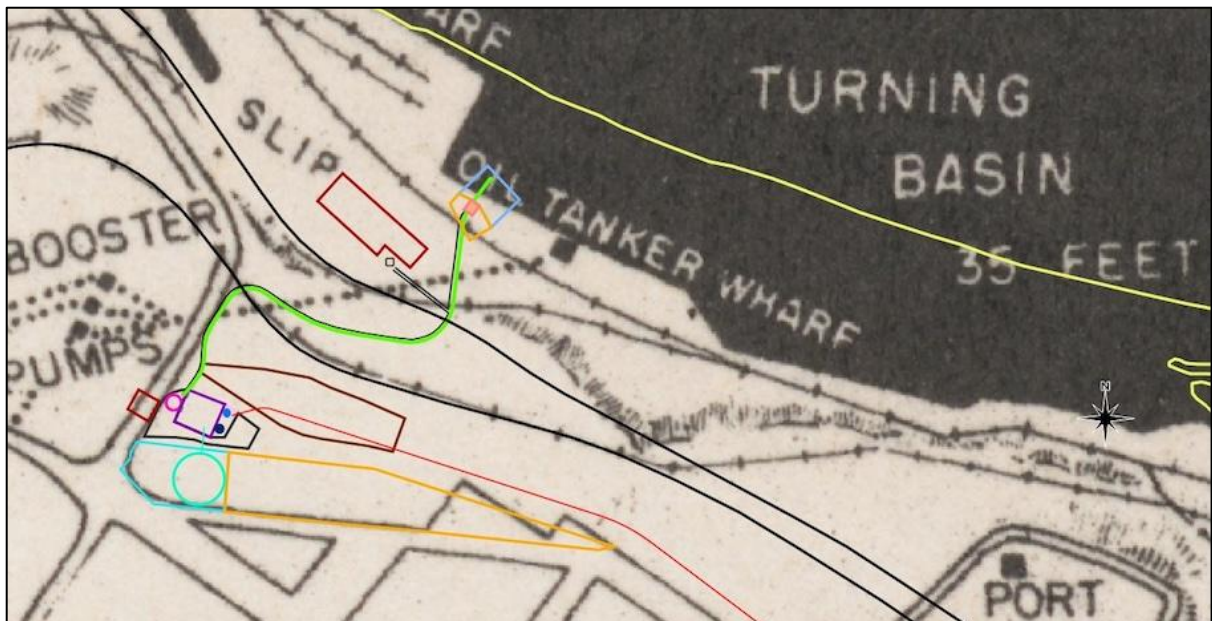


Figure 17: Overlay of the 1942 harbour map with the current alignment of the West Bank, showing the further cuts made in the last 80 years. The original riverbank is indicated by the yellow line.

In respect of the area of the proposed marine outfall, historical records indicate several 19th century maritime casualties on the rocks of the West Bank, which is assumed to refer to the rocky coast south of what was formerly Castle Point (see Figure 18). The historical descriptions of these events are, however, vague and unreliable, and the positions given for the seven wrecks shown within 300 m of the marine outfall on Figure 15 are highly speculative.

Since the late 19th century, there has been substantial alteration to the coastline from Castle Point at the mouth of the river, south towards Hood Point. The development of breakwater

resulted in land reclamation with the creation of coastal defences around Castle Point and south of the river mouth.

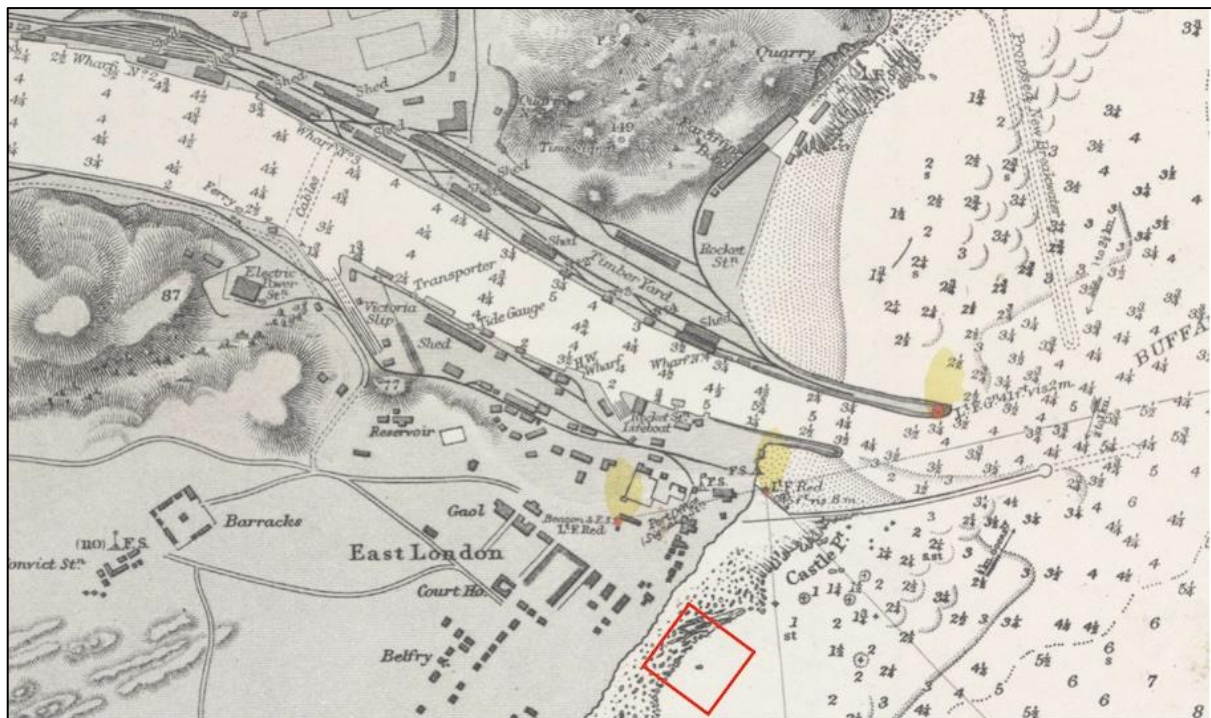


Figure 18: Detail from 1869 Admiralty Chart No. 1843 showing Castle Point and the rocky south of it with the approximate location of the proposed marine outfall indicated by the red square (Source: <https://itoldya420.getarchive.net/amp/topics/buffalo+river+eastern+cape>).

As indicated earlier, these coastal defences were substantially strengthened within the last decade by the renewal of the artificial rocky beach and revetment visible on Figure 15 and Plate 3. The construction of the coastal defences has changed the historical alignment of the coastline and buried it and the adjacent seabed, including any shipwreck remains within its footprint, under the revetment and adjacent rocky beach. Further offshore, and beyond the coastal defences, the remains of wrecks may be present on the seabed where the marine outfall will be installed.

8 IMPACT ASSESSMENT

Heritage resources are fragile, finite and non-renewable, and unlike living resources cannot recover if damaged by activities such as development. The identification, assessment and, where necessary, the mitigation of impacts on such resources that arise from human activity is therefore an essential part of managing such activities.

The approach of this impact assessment is, therefore, to take the project component specifications set out in Section 3 above and assess worst case scenarios.

This impact assessment aims to:

- Identify those project activities and components of the proposed Port of East London desalination plant which may pose risks to heritage resources.

- Identify and define the likely footprint of these risks and impacts.
- Identify and describe the likely project risks and impacts (negative and/or positive, including cumulative impacts if relevant) and their significance, during the construction, operation and decommissioning phases of the project.
- Makes recommendations for measures to manage and mitigate any negative impacts on heritage resources.

Impacts are assessed through the consideration of extent, intensity, duration, and the probability of the impact occurring. Consideration is also given to the degree to which impacts may cause irreplaceable loss of resources, can be avoided, can be reversed, and the degree to which they can be mitigated.

The methodology applied in this impact assessment is provided in Appendix 5.

8.1 Project Activities

8.1.1 Construction

Project activities which disturb the ground, whether on land and related to the construction of the solar array or the desalination plant, for example, or in the marine environment and related to the installation of the intake or outfall pipelines, have the potential to impact heritage resources.

8.1.2 Operation

The normal operation of the Port of East London desalination plant is not anticipated to result in impacts to heritage resources. Where repairs to already installed plant are required, such work will take place in areas already subject to disturbance during the installation of the plant, and the likelihood of significant new impacts to heritage resources is low. These activities are, therefore, scoped out of this assessment.

8.1.3 Decommissioning

Decommissioning activities are assumed to be a reversal of construction and as with operational activities, it is assumed that it will be areas already subject to disturbance during the installation of the desalination plant that will be affected by decommissioning activities. The likelihood of significant new impacts to heritage resources is, thus, deemed to be low and these activities are scoped out of this assessment.

8.2 Potential Impacts of Construction Activities on Heritage Resources

8.2.1 Palaeontology

Fossils are rare objects, often preserved due to unusual circumstances and under very particular conditions. This is especially the case with vertebrate fossils, which tend to be

sporadically preserved and have high value with respect to palaeoecological and biostratigraphic (dating) information.

The southern portion of the terrestrial project site is underlain by potentially very highly sensitive sands of the Nanaga Formation, that might preserve fossil marine shells while in the northern half of sites and offshore in the areas of the water intake and marine outfall pipelines, potentially very highly sensitive Permian Middleton Formation bedrock is present.

Construction-related activities which disturb the ground underlying the project footprint may result in direct impacts on the fossil heritage.

The physical extent of impacts on any palaeontological resources will be local and relate directly to the extents of soil disturbance occasioned by construction and installation activities.

The intensity is expected to be low.

Should impacts to palaeontological resources occur, the non-renewable nature of this heritage resource means that the duration of impacts will be permanent.

Specialist experience, and the lack of any previously recorded fossils from the area, leads Bamford to the conclusion that it is extremely unlikely that any fossils will be preserved in the overlying soils of the Quaternary, while there is a very small chance that fossils may occur in the aeolianites of the Quaternary Nanaga Formation. Project-related impacts to the underlying fossiliferous Middleton Formation bedrock are unlikely. Overall, therefore, impacts to fossil heritage are improbable.

Based on the above, the significance of impacts on palaeontological resources arising from the Port of East London desalination plant, is assessed to be very low, negative.

The level of confidence in this assessment of the impact is medium.

The assessment of impacts on palaeontological resources from the construction of the Port of East London desalination plant can be summarised as follows:

Table 3: Assessment of Impacts to palaeontological resources

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Low 1	Permanent 3	Low 5	Improbable	VERY LOW	-ve	Medium
Essential mitigation measures: Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the environmental officer, or other responsible person once excavations for foundations have commenced then they should be rescued and ECPHRA notified to determine whether a palaeontologist should be called to assess and collect a representative sample.								
With mitigation	1	1	3	5	Improbable	VERY LOW	+ve	Medium

8.2.2 Terrestrial Pre-Colonial & Historical Archaeology

The archaeological survey reported no pre-colonial archaeological sites or material within the Port of East London desalination project footprint, and aside from the foundations of the now demolished 20th century harbour houses, there is also no indication on the ground or on the historical mapping consulted, of historical archaeological remains in the project footprint.

This, and the disturbed nature of the receiving environment for the project, suggests that the survival of significant in situ pre-colonial and historical archaeological sites and material, within the footprint of the proposed desalination project and its associated infrastructure, is unlikely and these receptors have been scoped out of this assessment.

Should pre-colonial or historical archaeological material, or human remains be encountered during the construction of project, the measures to mitigate such discoveries set out in Section 13 below must be implemented.

8.2.3 Submerged Prehistory

The water intake pipe and marine outfall pipes will be laid on the river- and seabed respectively.

According to the record of the development of the port, the riverbed where the water intake will be installed is an artefact of the creation of the Turning Basin in the 1930s, and there will be no in situ submerged archaeological material in or on it.

Offshore, where the marine outfall will be installed, seabed is reported to be devoid of notable sediment accumulations, with exposed rock outcrops dominating. This suggests that the potential for the presence in the active surf zone of sediments which could contain submerged prehistoric archaeological artefacts is limited. In addition, the recent renewal and strengthening of the artificial rocky beach and revetment, east of the grain silo, has buried at least a portion of the original seabed that will be impacted by the marine outfall under modern rock fill.

Impacts to submerged prehistoric archaeological material, arising from the installation of water intake and marine outfall systems are, thus, not expected and this receptor has been scoped out of this assessment.

8.2.4 Maritime Archaeology

Based on the discussion above of the development of the Port of East London, and particularly the widening of the Buffalo River by cutting back the West Bank, it is extremely unlikely that there were or are any wrecks, or related artefacts, present on what is a new riverbed in the vicinity of the water intake pipe. Maritime archaeology as a receptor for the water intake is, therefore, scoped out of this assessment.

In the area of the marine outfall, historical records describe several maritime casualties south of what used to be Castle Point at the mouth of the river. As indicated above, the historical

descriptions of these events are vague and positions given unreliable. The presence of any wrecks within the impact footprint of the marine outfall is, thus, highly speculative.

If wrecks are present in the marine outfall area, any remains close onshore are likely to have been buried under the rocky beach and revetment and will not be impacted by the proposed surface deployment of the outfall pipelines. Beyond the rocky beach the local surf zone regime, which does not favour the accumulation of seabed sediment, suggests that any wreck material in the area would lie on the exposed rocky seabed and would be subject to impacts from the outfall pipelines should their positions intersect.

Marine outfall construction-related activities which affect the seabed offshore of the rocky beach and revetment may result in direct impacts on the shipwrecks and related artefacts.

The physical extent of impacts on any maritime archaeological resources will be local and relate directly to the extents of disturbance occasioned by construction and installation activities.

The intensity is expected to be low.

Should impacts to maritime archaeological resources occur, the non-renewable nature of the resource means that the duration of impacts will be permanent.

The imprecise historical information about the location of the wrecks in the Castle Point area, and the small footprint of the marine outfall infrastructure indicates that impacts on maritime archaeology are improbable.

Based on the above, the significance of impacts on maritime archaeological resources arising from the Port of East London desalination plant, is assessed to be very low, negative.

The level of confidence in this assessment of the impact is medium.

The assessment of impacts on maritime archaeological resources from the construction of the Port of East London desalination plant can be summarised as follows:

The assessment of impacts on maritime archaeological resources from the construction of the Port of East London desalination plant can be summarised as follows:

Table 4: Assessment of Impacts to maritime resources

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local 1	Low 1	Permanent 3	Low 5	Improbable	VERY LOW	-ve	Medium
Essential mitigation measures: - Any wreck or related artefacts identified during any pre-construction ground-truthing of the marine outfall site must be flagged and the information shared with a suitably qualified maritime archaeologist and SAHRA. - A suitably defined construction exclusion zone may be required around any such site or material to ensure that it is not impacted by the installation of the marine outfall. The project maritime archaeologist's advice must be sought on the appropriate size and extent of any such exclusion zone. Any such exclusion zones must be marked on all project mapping as no-go areas for construction contractors. - If seabed debris or a previously unknown wreck are encountered during the installation of the marine outfall, the project maritime archaeologist and SAHRA must be notified immediately and work must cease in the immediate								

vicinity until the maritime archaeologist and SAHRA have assessed the significance of the site and a decision has been taken as to how to deal with it.								
With mitigation	1	1	Permanent 3	Low 5	Improbable	VERY LOW	+ve	Medium

9 CUMULATIVE IMPACTS

For the purposes of this report, cumulative impacts are defined as direct and indirect impacts that act together with the existing or future potential impacts of other activities or proposed activities in the area or region that affect the same resources and/or receptors.

For the most part, cumulative effects are too uncertain to be quantifiable, due in the main to data availability and accuracy issues. This is particularly true of cumulative effects arising from possible future projects, the design or details of which may not be finalised or available and the direct and indirect impacts of which have not yet been assessed.

Except for the proposed Umoja Subsea Fibre-Optic Cable project currently undergoing an EIA process, there is no information about other current or future projects in the vicinity of the proposed Port of East London desalination plant.

The assessment below of the cumulative impacts of current and future terrestrial and marine projects in on heritage resources in the area around the Port of East London desalination project can, therefore, only be qualitative and descriptive.

9.1.1 *Palaeontology*

In respect of palaeontology, the cumulative result of future terrestrial and marine development in the vicinity of the proposed Port of East London desalination plant will be the inevitable and permanent loss of fossils, which is a negative impact.

The relative spatial rarity and weathered nature of both the Nanaga and Middleton Formation fossils in the East London area indicates that the cumulative impact on fossils sequestered in the seabed is likely to be low.

Furthermore, if due attention is given to mitigation and the successful rescue of a representative sample of fossils where they occur, the accumulation of scientific evidence and knowledge about the stratigraphy of the continental shelf seabed formations, their palaeoenvironments, past faunas and their ages, and sea-level history is likely to outweigh the negative cumulative impacts.

9.1.2 *Terrestrial Archaeology*

Cumulative impacts on terrestrial archaeological sites and/or materials are difficult to assess because of the variable distribution of sites and materials across the landscape and because of the differences in the quality of surveys and reporting on different projects.

Field observations made in previous archaeological assessments in the vicinity of the Port of East London desalination plant indicate that significant archaeological sites and materials are not common in the area.

The most common archaeological material reported has tended to be MSA lithic scatters which are of limited archaeological significance due to their generally occurring in secondary contexts.

Provided appropriate mitigation measures are implemented by individual projects, cumulative impacts on the terrestrial archaeological resource in the area Port of East London desalination plant are likely to be low and not cumulatively significant.

9.1.3 Submerged Prehistory

Although there is, as yet, very little concrete evidence for the distribution of submerged prehistoric sites and materials in and on the seabed around the South African coast, it is clear these sites and material will exist.

Using the spatial distribution of terrestrial archaeology as a proxy for the likely distribution of sites on the now inundated continental shelf, it is also clear that significant archaeological sites and material will be highly localised and most of the seabed will not contain such material.

The repeated marine transgressions which have inundated the continental shelf within the last million years have also reworked much of the terrestrial sediment laid down during periods of lower sea levels. Much of the archaeological record within these sediments is thus likely to have been destroyed in the process, and surviving archaeological material is generally likely to now be found in secondary contexts.

Thus, while other current and future seabed activities which disturb the seabed have the potential to impact submerged prehistoric sites and materials, such impacts are unlikely and of low cumulative significance.

9.1.4 Maritime Archaeology

With respect to potential cumulative impacts on historical shipwrecks, the discussion above indicates that there is a high concentration of shipping casualties around East London and the Buffalo River because of its history as a port.

Generally, historical wrecks and related maritime archaeological debris are avoidable through the prior collection and analysis of geophysical data and other survey techniques, and can be, and are actively avoided during seabed development.

Impacts on historical shipwrecks arising from seabed activities are likely to be accidental where they do occur, and once a site has been encountered on the seabed it is likely to be excluded from the area of activities as an operational obstruction or risk.

The potential for cumulative impacts on maritime archaeological resources, principally historical shipwrecks, arising out of current and future seabed activities in the area surrounding

the Port of East London desalination plant are, therefore, unlikely and cumulative impact significance is assessed to be very low.

10 SUSTAINABLE SOCIAL AND ECONOMIC BENEFITS

Section 38(3)(d) of the NHRA requires that a heritage impact assessment must “evaluate the impact of [a] development on heritage resources relative to the sustainable social and economic benefits to be derived from the development”.

The proposed Port of East London desalination plant has the potential to impact palaeontological and maritime archaeological heritage resources, but this can be mitigated through the implementation of the measures proposed in Section 13 below.

Thus, while there may be impacts on heritage resources arising from the project, it is likely that these will be outweighed by the sustainable social and economic benefits accruing from the Port of East London desalination plant.

11 THE NO-GO ALTERNATIVE

If the Port of East London desalination plant is not developed, the proposed project area will stay as it currently is and there will continue to be a generally neutral impact on heritage resources arising from natural environmental agents.

Although the heritage impacts likely to arise from the project will be greater than the existing impacts, the loss of potential socio-economic benefits is more significant and suggests that the no-go option is less desirable.

12 LEVELS OF ACCEPTABLE CHANGE

Any impact to heritage resources is deemed unacceptable until such time as the resource has been assessed by a suitable specialist, and mitigated or studied further, if necessary.

13 RECOMMENDED MITIGATION MEASURES FOR INCLUSION IN ENVIRONMENTAL MANAGEMENT PROGRAMME

This assessment of the heritage resources of the Port of East London desalination plant indicates that palaeontological material and maritime archaeological sites or material may occur within the project footprint. Terrestrial and submerged prehistoric archaeological sites and materials are not expected.

Because of the non-renewable nature of heritage resources, avoidance during development is the preferred mitigation option. While this is usually possible in the case of shipwreck sites, it is unlikely to be possible to achieve in respect of palaeontological material within the footprint of project impacts because the location and extent of this material cannot be predicted.

The following mitigation measures for enhancing positive impacts and avoiding or mitigating negative impacts and risks to heritage resources are, therefore, recommended for inclusion in

an Environmental Management Programme (EMPr) and for implementation during the life of the project, but particularly during the construction phase.

13.1 Palaeontology

Although it is unlikely that significant fossils or prehistoric archaeological sites and material will be disturbed by the construction of the Port of East London desalination plant, there is a small chance that fossils may occur in the Nanaga Formation aeolianites and the Middleton Formation bedrock. It is recommended, therefore, that a palaeontological Chance Find Protocol is implemented under the EMPr, which will ensure the identification, recovery, curation and reporting to SAHRA of any fossil finds.

If fossils are found by the environmental officer, or other responsible person once excavations for foundations have commenced then they should be rescued and SAHRA and ECPHRA notified to determine whether a palaeontologist should be called to assess and collect a representative sample.

Any recovered fossils or artefacts are the property of the State will need to be deposited in a suitable curatorial institution. Information on the sources or contexts of the collected items must accompany them, as far as can be determined.

13.2 Maritime Archaeology

Shipwrecks and shipwreck remains, even in an active marine environment, are generally large and visible on the seabed. If wreck material is present on the seabed in the marine outfall area, therefore, this is likely to become evident in any pre-installation survey or ground investigation and measures can be taken in advance of installation activities to avoid the site or material, thereby mitigating potential impacts to it.

It is recommended, therefore, that wreck or related artefacts identified during any pre-construction ground-truthing of the marine outfall site, are reported to a suitably qualified maritime archaeologist and SAHRA notified.

It is recommended that any wreck is subject to the implementation of a suitably defined construction exclusion zone, which will ensure that it is not impacted by the installation of the marine outfall. The project maritime archaeologist's advice must be sought on the appropriate size and extent of any such exclusion zone. Any such exclusion zones must be marked on all project mapping as no-go areas for construction contractors.

If seabed debris or a previously unknown wreck are encountered during the installation of the marine outfall, the project maritime archaeologist and SAHRA must be notified immediately and work must cease in the immediate vicinity until the maritime archaeologist and SAHRA have assessed the significance of the site and a decision has been taken as to how to deal with it.

13.3 Terrestrial Archaeology

Lastly, should any terrestrial pre-colonial or historical archaeological sites or material be encountered during the construction of the desalination plant, work must immediately cease in that area. The area must be cordoned off and the material made safe but left in situ. A suitably qualified archaeologist must be called to site to assess the significance of the find and SAHRA and the ECPHRA must be notified of the find.

In the event of human remains being uncovered during work, all activities in the vicinity must cease and the site made secure until a suitably qualified archaeologist and SAHRA and the ECPHRA have been notified, the significance of the material has been assessed, and a decision has been taken as to how to deal with it.

14 CONCLUSION

It is our reasoned opinion that the proposed construction of the Port of East London desalination plant and its associated maritime infrastructure could impact on palaeontological and maritime archaeological heritage resources. Impacts on terrestrial and submerged prehistoric archaeological resources are not anticipated.

Provided the recommendations to mitigate and offset any potential impacts are implemented under the EMP, it is our assessment that the proposed Port of East London desalination plant can be considered to be archaeologically and paleontologically acceptable and can be authorised.

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APPENDIX 1: SPECIALIST DECLARATION

(See separate PDF file)

APPENDIX 2: CURRICULUM VITAE – JOHN GRIBBLE

More than 30 years of practical professional archaeological and heritage resource management experience in both public sector compliance agency roles and private sector archaeological consulting. Wide range of archaeological, historical built environment and other heritage skills and knowledge. Hardworking and strive to produce quality deliverables.

Education

- **Master of Arts:** Archaeology, University of Cape Town 1990
- **Bachelor of Arts (Honours):** Archaeology, University of Cape Town 1987
- **Bachelor of Arts:** Archaeology, University of Cape Town 1986

Work Experience

- **Director and Senior Archaeologist** | TerraMare Archaeology (Pty) Ltd - Cape Town (09/2023 – Current)
- **Senior Archaeologist and Heritage Consultant** | ACO Associates – Cape Town (09/2017 - 08/2023)
- **Maritime and Underwater Cultural Heritage Unit: Manager** | South African Heritage Resources Agency – Cape Town (2014 - 08/201)
- **Director** | Sea Change Heritage Consultants Limited – United Kingdom & Cape Town (2012 – 2018)
- **Principal Consultant: Maritime Archaeology** | TUV SUD PMSS - Romsey, United Kingdom (2011 – 2012)
- **Principal Consultant: Maritime Archaeology** | EMU Limited - Southampton, United Kingdom (2009 – 2011)
- **Project Manager: Coastal and Marine** | Wessex Archaeology - Salisbury, United Kingdom (2005– 2009)
- **Maritime Archaeologist** | National Monuments Council / South African Heritage Resources Agency – Cape Town (1996 – 2005)
- **Professional Officer: Boland and West Coast, Western Cape Office** | National Monuments Council – Cape Town (1994 – 1996)

Professional Experience

Archaeological experience includes:

Historical sites:

- Survey and recording of traditional mudbrick vernacular houses at Verlorenvlei, West Coast for Honours and Masters dissertations
- Cobern Street historical burial ground, Cape Town

- Sayers Lane VOC burial ground, Simons Town
- Sea Point Battery
- 66 Wale Street, Cape Town
- YMCA Building, Queen Victoria Street
- Van Riebeeck's Fort, Grand Parade, Cape Town
- 90 Bree Street, Cape Town
- F Block, Castle of Good Hope, Cape Town
- Huntley Street town dump, Grahamstown (Makhanda)
- Piggots Park settler homestead, Eastern Cape
- Fort Double Drift, Fish River, Eastern Cape
- Morgenhof, Stellenbosch
- Paradise, Newlands Forest
- Pre-colonial sites:
- De Aar 2 South Wind Energy Facility Transmission Line site mitigation
- Elandsfontein Phosphate Mine site mitigation
- Vredenburg Peninsula Archaeological Survey 1990-1991
- Leentjiesklip, Langebaan
- Doorspring, Lamberts Bay
- Mauritz Bay, Vredenburg Peninsula
- Spoeg River Cave, Namaqualand
- Kasteelberg E Rock Shelter, Vredenburg Peninsula
- Kasteelberg B, Vredenburg Peninsula
- Witklip Shelter, Vredenburg;
- Driebos Shelter, Tulbagh
- Posberg Peninsula, Langebaan (6 sites)
- Diepkloof Cave, Elands Bay
- Hailstorm Midden, Elands Bay
- Putslaagte Rock Shelters, Northern Cedarberg, Clanwilliam
- Middle East:
- Chalcolithic (Gilat) and Roman / Byzantine (Bet Shean) excavations

- Maritime Surveys:
- 1999 HMS *Pandora* field season, Great Barrier Reef, Queensland, Australia
- *Santa Maria Madre de Deus* (Nahoon Wreck), East London
- *Sao Goncalo*, Plettenberg Bay
- *Colebrooke* (1778), Kogel Bay
- *Brunswick* (1805), Simon's Bay
- *Bato* (1805), Simon's Bay
- *Britannia* (1826), Britannia Bay
- *Philia* (1880), Mossel Bay
- *Clan Stuart* (1914), Simons Bay
- "Simon's Bay Rudder" site
- "Cannon & Ballast Wreck" - Simon's Bay
- "Swemgat" Wreck - Yzerfontein, West Coast
- *Het Huis te Craaiesteyn* (1698), Oudekraal, Cape Town
- "British Musket" wreck, "Sternpost" wreck, "Sunset Beach" wreck, "Milnerton Lighthouse" wreck, "Barrel" wreck, *Oosterland* (1697), *Hermes* (1901) and *Winton* (1934), Table Bay
- *Oakburn* (1906), Maori Bay

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Gribble, J. 2020. Heritage Impact Assessment for Proposed Sand Mining on Portion 2 Of Farm Kleinfontein 312, Klawer District, Western Cape. Unpublished report prepared for Green Direction Sustainability Consulting (Pty) Ltd. ACO Associates.

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Hart, T.G., Gribble, J. & Robinson, J. 2017 Heritage Impact Assessment for the Proposed San Kraal Wind Energy Facility to be Situated in the Northern Cape. Unpublished report prepared for Arcus Consulting. ACO Associates.

Professional Affiliations

- Association of Southern African Professional Archaeologists (Membership No. 043)

Certifications / Accreditations

- ASAPA Cultural Resources Management Section:
- Principal Investigator: Maritime and Colonial Archaeology
- Field Director: Stone Age Archaeology
- Class III Diver (Surface Supply), Department of Labour (South Africa) / UK (HSE III)

Memberships

- ICOMOS International Committee for Underwater Cultural Heritage (2000 - *present*)
- Joint Nautical Archaeology Policy Committee, United Kingdom (2010 - *present*)
- Advisory Board: Southern African Slave Wrecks Project

APPENDIX 3: PALAEONTOLOGICAL IMPACT ASSESSMENT BY MARION BAMFORD

(See separate pdf file)

APPENDIX 4: HISTORICAL SHIPPING CASUALTIES IN THE VICINITY OF THE PORT OF EAST LONDON DESALINATION PLANT PROJECT AREA

Ship Name	Area	Place	Event Type	Ship Type	Nationality	Date	Notes
<i>Albert Edward, Prince of Wales</i>	East London	East London	Grounded			1882/01/23	Grounded according to van der Bosch
<i>Alfred</i>	Buffalo River	Buffalo River Mouth (near)	Wrecked			1866/06/15	No lives lost
<i>Amatola</i>	Buffalo River	Blinders Rock in river mouth	Wrecked	Schooner		1852/05/02	The Amatola was the first casualty at the Buffalo River, and was wrecked trying to enter the river No lives lost
<i>Annie S</i>	Buffalo River	West Bank (opposite old Customs House)	Wrecked	Brigantine	British	1875/12/11	Struck the bar opposite the Old Customs House while being towed into the river by the tug Buffalo. She drifted to the West Wall where she became a total wreck. Denfield (1965) refers to her as a coasting schooner, while another source refers to her as a coasting steamer (?).
<i>Aqua</i>	Buffalo River	Buffalo River				1901/10/16	
<i>Batavier</i>	East London	East London				1876	
<i>Bjorviken</i>	Buffalo River	Mouth / Bar	Condemned	Barque	Norwegian	1893/07/30	Struck the Bar and subsequently condemned. No lives lost.
<i>Bonanza</i>	Orient Beach	South entrance of harbour ?	Wrecked	Barque	American	1894/12/22	Vessel lost steerage way while entering the river, and after becoming unmanageable took ground on the bar shoals.
<i>Campyne</i>	East London	East London				1874	
<i>Carlow Castle</i>	Buffalo River	East London Harbour	Grounded *	Iron Steamship	British	1926/03/12	Vessel became unmanageable due to a strong easterly wind and flood tide. Struck a bank of soft mud in the river bed, and fouled a mooring buoy. No damage apparent.
<i>Castor</i>	Buffalo River	Buffalo River	Grounded?	Man-O-War	British	1851/04/03	This vessel was not wrecked in SA waters. Possibly grounded? Sold and broken up in 1902 in Woolwich - see http://www.pbenyon.plus.com/18-1900/C/00866.html and https://en.wikipedia.org/wiki/HMS_Castor_(1832)

<i>Cichina</i>	East London	East London	Unknown			1873	
<i>Columba</i>	East London	East London	Wrecked	Barque	Russian	1880/11/05	Cables parted during a south-easterly gale. No lives lost.
<i>Elise</i>	Buffalo River	Buffalo River	Wrecked	Barque	German	1878/02/16	Lost in a southerly gale after cables parted. Went ashore at night. No lives lost
<i>Elizabeth and Mary</i>	Buffalo River	Buffalo River Mouth	Grounded?	Schooner		1861/10/17	Grounded
<i>Foam</i>	Buffalo River	East Bank	Wrecked	Schooner	British	1851/09/13	Cables parted in a south easterly (westerly according to vd Bosch) swell, and strong easterly wind. No lives lost.
<i>G M Tucker</i>	Buffalo River	Old Harbour	Wrecked			1895/09/10	
<i>Harriet</i>	Buffalo River	Buffalo River Mouth	?	Schooner		1847/10/22	
<i>Itemaid of Arron</i>	Buffalo River	West Bank	Wrecked	Sailing Vessel		1873	
<i>Johan</i>	West Bank	Castle Point Lighthouse	Wrecked	Barque	Swedish	1882/02/20	Cables parted in a south easterly gale and the vessel wrecked between the Training Wall and the Breakwater. About 100 tons of cargo still aboard. Date of loss may be 21 February - Marsh. Government Gazette # 1362 of 1882 (17/11/1882) - Details of vessel in years before she was wrecked. - May be the same vessel, but called the Johan Brolin. A Swedish sailing vessel of 797 tons. Captained by N F Forsberg, with a crew of 17. Registered in Soderhamn, Sewden, and owned by J Brolin & Son. No lives lost.
<i>Kaffir</i>	Buffalo River	Sandy spit near Western Training Wall	Grounded*	Iron Steamship	British	1890/12/07	The Captain of the Kaffir decided that he could pilot his own vessel up the navigable channel dredged in the Buffalo River when he arrived in the roadstead on 7 December 1890. Unfortunately the vessel struck the South Breakwater and tore a hole in her side (Marsh suggests she sustained several holes in her bilge). Water rushed in and put out her fires, and the captain attempted to beach his vessel between the Breakwater and the West Wall. The vessel, however, took ground sooner than he expected and partly blocked the channel. Divers were soon on the scene and succeeded in stopping the hole, but attempts to raise the ship by means of lighters and barks failed, even with the assistance of the dredger Lucy. Fortunately, the Harbour Master, Mr Tippet had just received a new set of Gwynn's pumps which he used with "miraculous effect". The vessel rose rapidly and was brought into the river. Temporary repairs were made on 12 December. Date of wrecking may be 2 December, although Marsh confirms that the date was in fact 7 December. The vessel was registered in Glasgow, and had an engine capacity of 50hp.

<i>Kanagawa Maru</i>	Buffalo River	Buffalo River Mouth	Grounded *	Iron Steamship	Japanese	1924/02/02	Stranded at the mouth of the Buffalo River through misinterpretation in the engine room of bridge orders when entering the port. Her port side propeller was slightly damaged, but she was later refloated. No lives lost.
<i>La Serena</i>	Buffalo River	Buffalo River	Wrecked	Barque		1876	Struck the bar while being towed into the river by the tug Buffalo. Became a total wreck. No lives lost.
<i>Lady Kennaway</i>	Buffalo River	Buffalo River Mouth (below Protea Hotel)	Wrecked	Ship	British	1857/11/25	The vessel anchored in the East London roadstead on 20 November, and the work of unloading the 231 immigrants began. This took four days to complete, and the last person was brought ashore on the afternoon of the 23rd. On 25 November disaster struck the vessel when she was driven ashore in a south-easterly gale and wrecked on a sandy spit in the mouth of the Buffalo River. She had been anchored in what was considered a safe berth in 12.5 fathoms of water, but her anchor cables were worn. Moreover, they were too light and too short for a vessel of her mass, and she only had two anchors out. When her cables parted in the gale an attempt was made to raise her sails, which resulted in her being driven onto the bar. She remained there for some months, an obstruction to vessels entering and leaving the harbour, until she was blown up to clear the passage.
<i>Lizzie</i>	Buffalo River Mouth	On Bar (near Breakwater)	Wrecked	Tender / Launch	British	1885/05/14	Vessel completed in 1879 as a single screw, iron steam tender for Union S.S. Co. Ltd., for service in South Africa. She was built by Day, Summers and Co. of Southampton, and her official number was 51648. Her tonnage was 19 gross, 14 net, and her dimensions were 52 x 12.5 x 4.9 feet. The type of engines she carried are not known, but she could produce 16hp. She arrived in Algoa Bay on 1 March 1881, and was registered in Cape Town on 12 April that year. Wrecked close to the Breakwater on the Buffalo River Bar while inbound with mails from the Norham Castle.
<i>Lockett</i>	Buffalo River	West Bank (300 yards west of river)	Wrecked	Barque	British	1884/01/04	Wrecked in a south-easterly wind. No lives lost.
<i>Louise</i>	Buffalo River	Bar	Condemned	Barque	Norwegian	1891/05/27	In a heavy sea the vessel struck the bar while being towed into the river. She was later condemned and sold on 10 July 1891. No lives lost.
<i>Lunaria</i>	Buffalo River	West Bank (near Castle Point (?) Lighthouse)	Wrecked	Barque	British	1861/09/11	Wrecked in a south-easterly gale No lives lost.
<i>M M Jones</i>	Buffalo River	West Bank (in present Turning Basin)	Wrecked	Barque		1876/09	Grounded on the West Bank. Her buried remains were uncovered in 1929 during excavations for the present turning basin.

<i>Madelpad</i>	Harbour	In	Wrecked			1891/09/16	
<i>Maid of Arron</i>	Buffalo River	West Bank	Wrecked	Sealer		1873	
<i>Mendeep</i>	East London	East London	?	Schooner		1868/08/27	
<i>Nant-Y-Glo</i>	Buffalo River	East Side	Wrecked	Snow / Brig (?)	British	1872/04/26	Lost in a south easterly gale. No lives lost.
<i>Nundeeeps</i>	Buffalo River	Buffalo River Mouth	Wrecked	Schooner	British	1868/08/28	Lost on the rocks close to the Crusader (1868) and the Constantia (1868) in a south easterly gale. No lives lost.
<i>Puntado</i>	Buffalo River	West Bank	Wrecked			1857/11/14	
<i>Rose Hall</i>	Buffalo River	Bar	Grounded	Brig		1876/04	Struck the bar while being towed into the river by the tug Buffalo. The vessel deviated from the course taken by the tug and lodged on a sand spit in the middle of the river.
<i>Sea Wave</i>	Buffalo River	West Bank (Rocks)	Wrecked	Barque	British	1879/10/08	Wrecked in a gale. No lives lost.
<i>South Easter</i>	East London	East London	Wrecked	Barque	British	1872/06/28	Five lives lost. Bell recovered in 1967. Marsh suggests wreck may have occurred in 1871.
<i>Theresa</i>	Buffalo River	West Bank near Lighthouse (Castle Point?)	Wrecked?	Schooner	South African	1861/09/12	Cables parted in a southerly gale. No lives lost.
<i>Triton</i>	Buffalo River	Buffalo River				1905/10/10	
<i>Vigilant</i>	Buffalo River	Buffalo River Mouth	Wrecked	Snow / Brig (?)	British	1853/12/11	Cables parted in a south easterly gale.

APPENDIX 5: IMPACT ASSESSMENT METHODOLOGY

The significance of all potential impacts that would result from the proposed project is determined to assist decision-makers. The **significance** of an impact is defined as a combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The significance of each identified impact was thus rated according to the methodology set out below:

Step 1 – Determine the **consequence** rating for the impact by determining the score for each of the three criteria (A-C) listed below and then **adding** them. The rationale for assigning a specific rating, and comments on the degree to which the impact may cause irreplaceable loss of resources and be irreversible, must be included in the narrative accompanying the impact rating:

Rating	Definition of Rating	Score
A. Extent – the area over which the impact will be experienced		
Local	Confined to project or study area or part thereof	1
Regional	The region (e.g. the whole of Eastern Cape coast)	2
(Inter) national	Significantly beyond East London and adjacent land areas	3
B. Intensity – the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. Duration – the time frame for which the impact will be experienced and its reversibility		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Permanent	The impact is irreversible	3

The combined score of these three criteria corresponds to a **Consequence Rating**, as follows:

Combined Score (A+B+C)	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

Step 2 – Assess the **probability** of the impact occurring according to the following definitions:

Probability– the likelihood of the impact occurring	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

Step 3 – Determine the overall **significance** of the impact as a combination of the **consequence** and **probability** ratings, as set out below:

		Probability			
		Improbable	Possible	Probable	Definite
Consequence	Very Low	INSIGNIFICANT	INSIGNIFICANT	VERY LOW	VERY LOW
	Low	VERY LOW	VERY LOW	LOW	LOW
	Medium	LOW	LOW	MEDIUM	MEDIUM
	High	MEDIUM	MEDIUM	HIGH	HIGH
	Very High	HIGH	HIGH	VERY HIGH	VERY HIGH

Step 4 – Note the **status** of the impact (i.e. will the effect of the impact be negative or positive?)

Step 5 – State the level of **confidence** in the assessment of the impact (high, medium or low).

Impacts are also considered in terms of their status (positive or negative impact) and the confidence in the ascribed impact significance rating. The prescribed system for considering impacts status and confidence (in assessment) is laid out in the table below. Depending on the data available, a higher level of confidence may be attached to the assessment of some impacts than others. For example, if the assessment is based on extrapolated data, this may reduce the confidence level to low, noting that further ground-truthing is required to improve this.

Confidence rating	
Status of impact	+ ve (beneficial) or – ve (cost)
Confidence of assessment	Low, Medium or High

The significance rating of impacts is considered by decision-makers, as shown below. Note, this method does not apply to minor impacts which can be logically grouped into a single assessment.

- **INSIGNIFICANT:** the potential impact is negligible and **will not** have an influence on the decision regarding the proposed activity.

- **VERY LOW:** the potential impact is very small and **should not** have any meaningful influence on the decision regarding the proposed activity.
- **LOW:** the potential impact **may not** have any meaningful influence on the decision regarding the proposed activity.
- **MEDIUM:** the potential impact **should** influence the decision regarding the proposed activity.
- **HIGH:** the potential impact **will** affect a decision regarding the proposed activity.
- **VERY HIGH:** The proposed activity should only be approved under special circumstances.

Step 6 – Identify and describe practical **mitigation** and **optimisation** measures that can be implemented effectively to reduce or enhance the significance of the impact. Mitigation and optimisation measures must be described as either:

- **Essential:** must be implemented and are non-negotiable; and
- **Best Practice:** must be shown to have been considered and sound reasons provided by the proponent if not implemented.

Essential mitigation and optimisation measures must be inserted into the completed impact assessment table. The impact should be re-assessed with mitigation, by following Steps 1-5 again to demonstrate how the extent, intensity, duration and/or probability change after implementation of the proposed mitigation measures.

Step 7 – Prepare a summary table of all impact significance ratings.

Finally, indicate whether the proposed development alternatives are environmentally suitable or unsuitable in terms of the respective impacts assessed by the relevant specialist and the environmentally preferred alternative.



forestry, fisheries & the environment

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Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

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SPECIALIST DECLARATION FORM – AUGUST 2023

Specialist Declaration form for assessments undertaken for application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

REPORT TITLE

Heritage Impact Assessment for the Proposed Two Megalitre Per Day Solar Powered Seawater Desalination Plant in the Port of East London, Buffalo City Metropolitan Municipality, Eastern Cape Province

Kindly note the following:

1. This form must always be used for assessment that are in support of applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting, where this Department is the Competent Authority.
2. This form is current as of August 2023. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.dffe.gov.za/documents/forms>.
3. An electronic copy of the signed declaration form must be appended to all Draft and Final Reports submitted to the department for consideration.
4. The specialist must be aware of and comply with 'the Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the act, when applying for environmental authorisation - GN 320/2020', where applicable.

1. SPECIALIST INFORMATION

Title of Specialist Assessment	Heritage Impact Assessment for the Proposed Two Megalitre Per Day Solar Powered Seawater Desalination Plant in the Port of East London, Buffalo City Metropolitan Municipality, Eastern Cape Province
Specialist Company Name	TerraMare Archaeology (Pty) Ltd
Specialist Name	John Gribble
Specialist Identity Number	6511155161086
Specialist Qualifications:	Master of Arts (Archaeology)
Professional affiliation/registration:	ASAPA (Membership Number 43)
Physical address:	5 Cannon Road, Plumstead, 7800
Postal address:	5 Cannon Road, Plumstead, 7800
Postal address	5 Cannon Road, Plumstead, 7800
Telephone	078 616 2961
Cell phone	john.gribble@terramarearchaeology.com
E-mail	Click or tap here to enter text.

SPECIALIST DECLARATION FORM – AUGUST 2023

2. DECLARATION BY THE SPECIALIST

I, John Gribble declare that –

- I act as the independent specialist in this application;
- I am aware of the procedures and requirements for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (NEMA), 1998, as amended, when applying for environmental authorisation which were promulgated in Government Notice No. 320 of 20 March 2020 (i.e. “the Protocols”) and in Government Notice No. 1150 of 30 October 2020.
- I will 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;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing –
 - any decision to be taken with respect to the application by the competent authority; and;
 - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 48 and is punishable in terms of section 24F of the NEMA Act.



Signature of the Specialist

TerraMare Archaeology (Pty) Ltd

Name of Company:

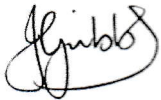
02 May 2026

Date

SPECIALIST DECLARATION FORM – AUGUST 2023

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, John Gribble, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



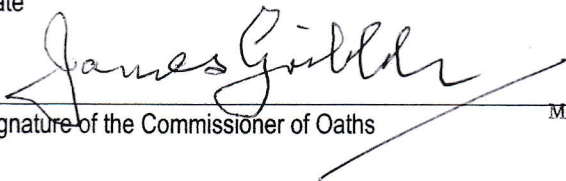
Signature of the Specialist

TerraMare Archaeology (Pty) Ltd

Name of Company

2 May 2026

Date



Signature of the Commissioner of Oaths

Rev. James Gribble
COMMISSIONER OF OATHS

MARRIAGE OFFICER (V3146) - REPUBLIC OF SOUTH AFRICA
"Windfall", 123 Woodgate Road, Plumstead 7800

02 May 2026

Date