Professional Consultancy Services for Coastal Engineering Infrastructure
Proclaimed Fishing Harbours Western Cape

HARBOUR MAINTENANCE
CHECKLIST FOR SUBMISSION TO DEA
GANSBAAI HARBOUR

Gansbaai Harbour

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For:
Coega Development Corporation

Date: 24 February 2017

CONTENTS

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1 Project description & proposed works

Please note that the overall project has been divided into four consultancy contracts. Since the project is for the same client information generated by other consultants have been used as applicable to compile this document. Further extracts have been made from technical reports compiled by Mott MacDonald Consulting Engineers (MM).

1.1 Background information

1.1.1 Project Background

The National Department of Public Works (NDPW) has appointed the Coega Development Corporation (CDC) as implementing agents for the repair, maintenance and upgrade of the 13 proclaimed Western Cape fishing harbours. The 13 fishing harbours have been split into four separate work packages. MM have been appointed by CDC for the professional consulting services required to repair, maintain and upgrade the marine infrastructure for Work Package 4, which includes Stilbaai, Arniston, Gansbaai and Struisbaai.

Gansbaai Harbour is situated approximately 170 km south east of Cape Town and consist of the old and new harbours as shown in Figure 1.1.1a and 1.1.1b. The coastline is orientated South-West to North-East (facing North-West) and is exposed to south westerly swell. Harbour breakwaters generally trap longshore transport and induce accretion and erosion. However, from satellite images, no apparent accretion and/or erosion of the shoreline adjacent the breakwaters are evident. This is due to the rocky coastline at the site and potentially the absence of high longshore sediment transport rates.

Figure 1.1.1a: Old Harbour layout

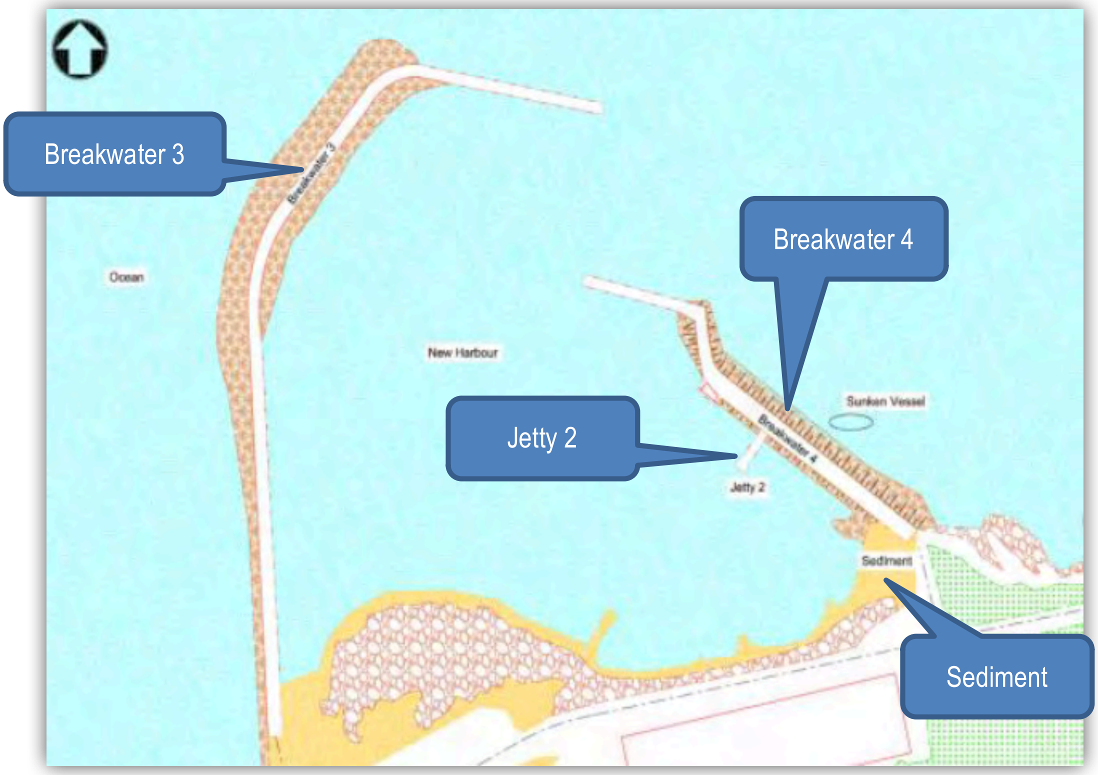


Figure 1.1.1b: New harbour layout

1.1.2 Hydrographic and Geophysical Characteristics

Gansbaai harbour has a natural access channel (-10 m CD) which is orientated south west to north east and more or less in parallel with the dominant wave direction.

During November 2016 Tritan Survey conducted a hydrographic geophysical survey of Gansbaai Harbour. The extent of the survey area is illustrated in Figure 1.2.1 below. The dark blue areas represent deeper water, up to -15 m CD and the red areas represent 0 m CD.

The average water depths at the quay within the old harbour basin are between 3 and 4 m CD. The dark to light green area inside the "new" basin varies between 5 and 8 m CD.

The site comprises of mainly Sandstones from the Table-mountain Group, overlain by calcarenites of the Bredarsdorp Group. With regards to the geophysical characteristics, the survey data indicated that the entire harbour basin and outer area is covered with fine to medium grain sediments with a layer thickness which varies between 0.3 m to 3 m (Tritan, 2016). From the Isopach drawing plotted from the survey results, it is clear that the average sand thickness in the harbour is between 0.5 and 1 m. However, there are sediment deposits at the centre of the natural access channel between the new and old basin entrances as well as within the new basin.

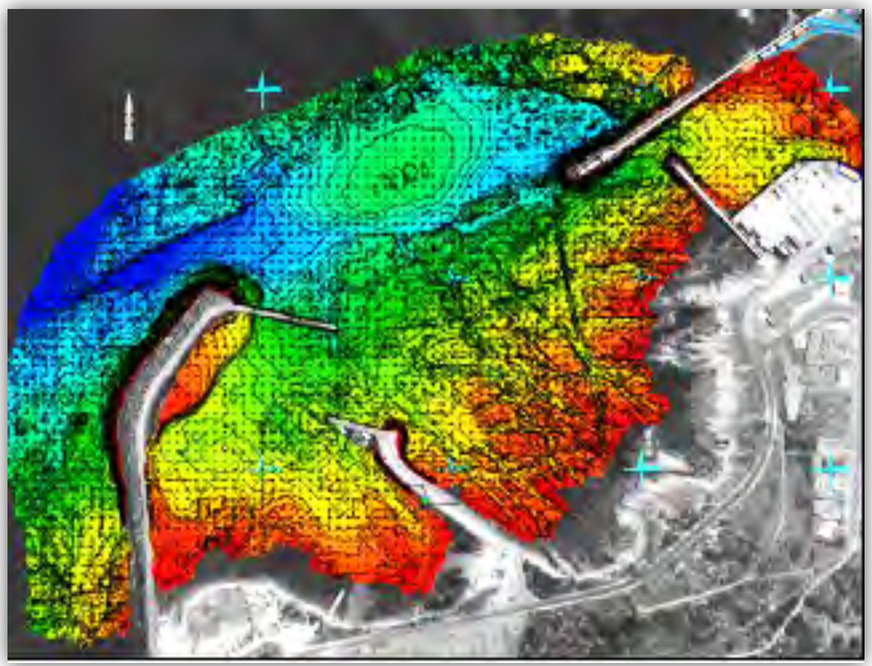


Figure 1.2.1: Geophysical survey

1.1.3 Tides

South Africa tides are semi-diurnal (two tides per day). Table 2 lists the predicted tidal levels for Cape Town, which are assumed to be applicable to the Gansbaai sites.

Table 2: Cape Town tidal levels (San 2016)

Description		Level (m)	
		Relative to Mean Sea Level	Relative to Chart Datum
Highest Astronomical Tide	HAT	1.195	2.02
Mean High Water of Spring Tide	MHWS	0.915	1.74
Mean High Water of Neap Tide	MHWN	0.435	1.26
Mean Level	ML	0.155	0.98
Mean Low Water of Neap Tide	MLWN	-0.125	0.7
Mean Low Water of Spring Tide	MLWS	-0.575	0.25
Lowest Astronomical Tide	LAT	-0.825	0

1.1.4 Offshore Wind and Wave characteristics

The wave height and wave period roses in the Figures below were created from historical wave conditions sourced from the NOAA WAVEWATCH III Model (WWIII). The historical wind conditions was sourced from the National Centres for Environmental Prediction (NCEP) Global Forecast System (GFS) Atmospheric Model.

The location of the representative wind and wave offshore extraction points are listed in the Table 3 below:

Table 3: Location of offshore wind and wave extraction points

Location	Data grid point coordinates		Wind			Wave		
	Lat	Long	Record start	Record end	Nr entries	Record start	Record end	Nr entries
Gansbaai	35°S	18.5°E	2011/05/07	2016/02/07	16227	2010/11/08	2016/02/08	41580
Struisbaai	35°S	20°E	2011/05/07	2016/02/07	16227	2010/11/08	2016/02/08	41580
Arniston								
Stilbaai								

Representative offshore wind and wave conditions at Gansbaaiare illustrated in the Figures 1.4.1 to 1.4.3 below.

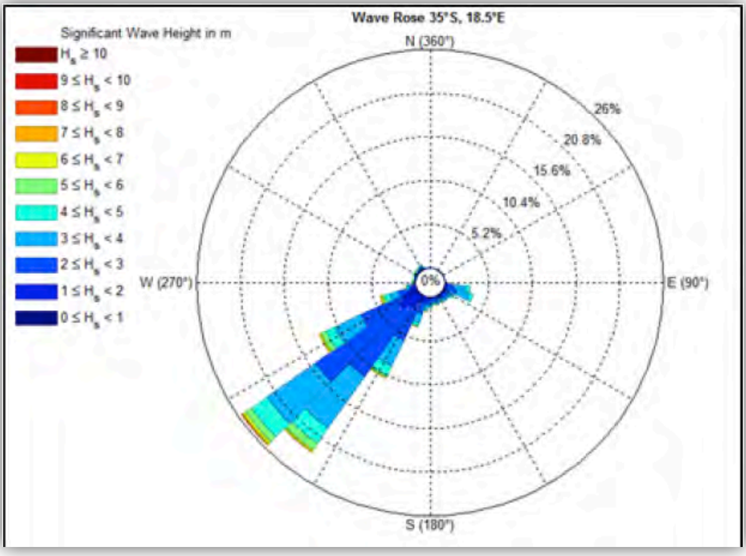


Figure 1.4.1: Deep water wave height (WWIII)

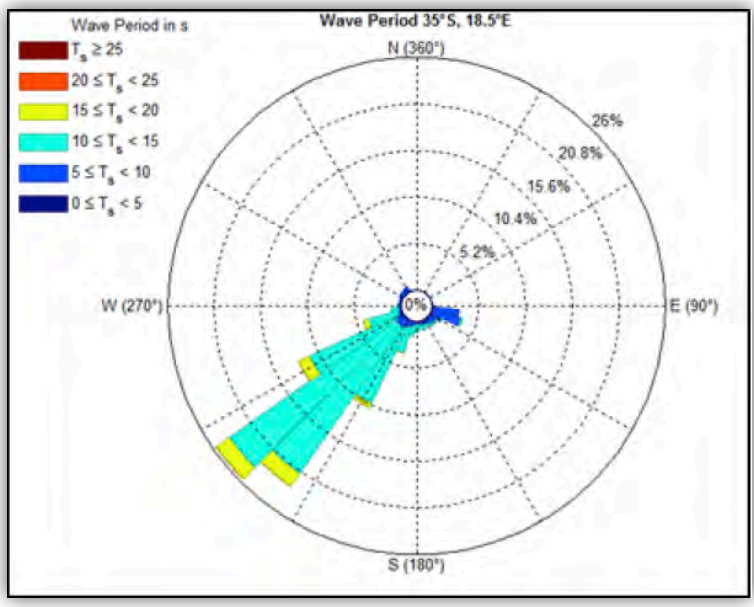


Figure 1.4.2 Deep water wave period (WWIII)

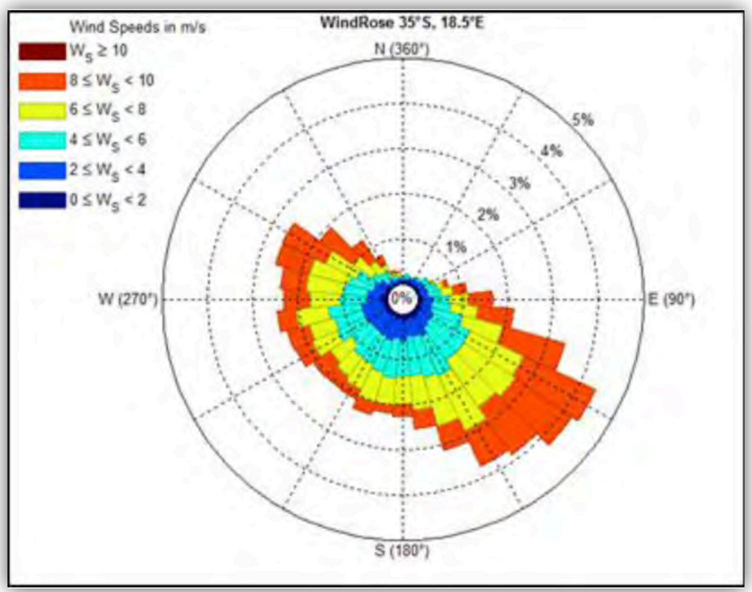


Figure 1.4.3: Annual wind rose (NCEP)

1.1.5 Nearshore currents and circulation

Nearshore waves, wind and tides predominantly govern the nearshore circulation pattern (nearshore currents). The nearshore hydrodynamics are generally complex and expensive to simulate in a numerical model. For the design of the repair/upgrade of the various harbour structures, the modelling of the detailed nearshore hydrodynamics is not considered feasible. This shall be confirmed during detail design phase.

1.1.6 Sediment transport

The dominant wave direction along the southern coastline of South Africa is south westerly and therefore the net longshore transport at the site should be eastbound. However, due to the rocky coastline and absence of sandy beaches at the site, the net longshore transport rate is limited by the availability of sand to be transported.

Considering the absence of a long stretch of sandy beach area (i.e. a relative large source of dry, loose sand) adjacent the site, it is assumed that the aeolian sediment transport rate is very low.

1.1.7 Sediment sampling

Sediment sampling was undertaken by Lwandle Marine Environmental Services (see full report in Appendix 3.1). The report concluded as follows:

> *The comparisons show that Arniston, Gansbaai, Stilbaai and Struisbaai sediments are uncontaminated by heavy metals or the measured organic compounds and would qualify for unconfined open ocean disposal. Nevertheless, should harbour dredging be required, the dredge spoil disposal site(s) will need to be carefully selected.*

1.2 Project General Scope of Work and Maintenance

1.2.1 Gansbaai Old Harbour

Gansbaai consists of two harbours: the old harbour and the new harbour. The old harbour is situated directly north from new harbour and is primarily used for fish processing and ship repair services. The marine infrastructure of the old harbour consists of a 370m long main breakwater, a 140m long secondary breakwater, two quays with fixed mooring facilities, 7.5 ton Derrick crane, two slipways and a small offloading jetty.

Figure 1.2.1: Old Harbour layout

1.2.1.1 Breakwater 1

1.2.1.1.1 Investigation and findings

The main northern breakwater of the old harbour consists of a 370m long mass concrete breakwater protected with concrete cubes and armour units. The armour units (dolosse) are located only on the seaward face. (see Figure 1.2.1.1). The crown wall/crest element serves as an access road to Quay Wall and the head of the breakwater.

Figure 1.2.1.1: Breakwater 1

Observed condition of existing structure

The overall condition of this breakwater is very poor. There is evidence of severe cracking and settling at the end of the breakwater. The extensive movement is likely to affect the structural integrity of the structure. Displacement, movement and breakage of concrete cubes and primary armour units (dolosse) were noted on both sides of the breakwater. Severe undermining of the breakwater was observed in several places, on both the seaward and leeward slopes, of the breakwater.

It was noted that by the Dock Master that approximately 100m of the breakwater has been strengthened and repaired.

The breakwater offers protection to several landside infrastructures and importantly an industrial fish processing factory.

Conceptual design

The deterioration of the breakwater is due to subsidence of the structure from wash out of core material from wave action. To arrest the deterioration of the breakwater it is recommended that the core be stabilised (through cement grouting) and the armour protection rehabilitated to provide its original design function (see Figure 1.2.1.2a for detail of existing footprint and proposed work). A detailed study (Crane and ball survey) of the positioning of the armour units is required to evaluate the extent of the repair and rehabilitation of the breakwater.

It is not anticipated that works will be carried out to level the concrete cap, but cracks will be pressure grouted where required.

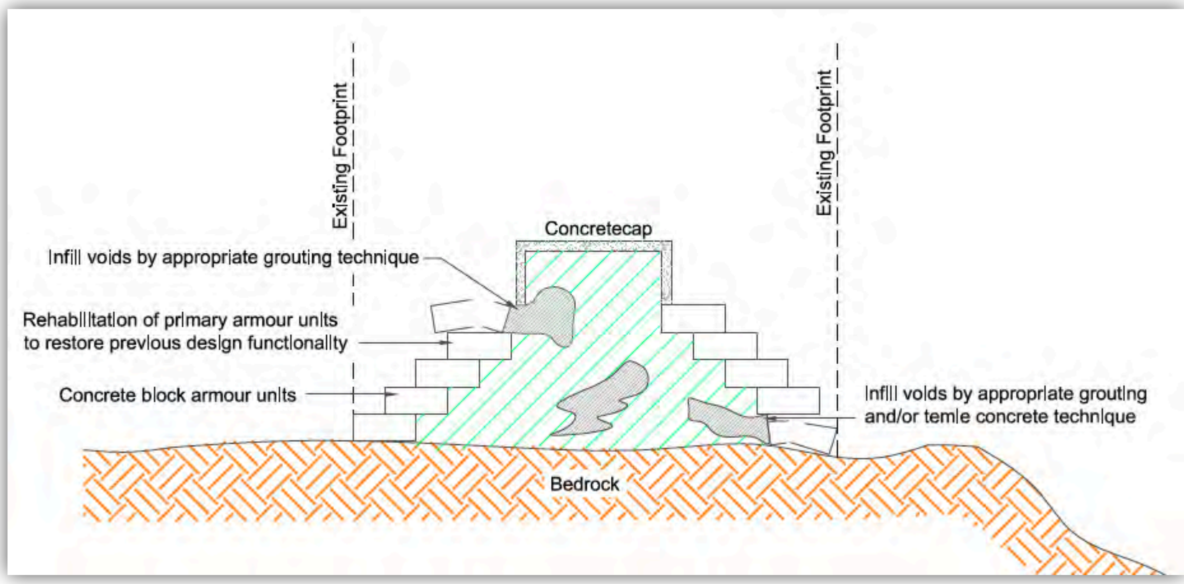


Figure 1.2.1.2a: Section through Breakwater 1

Construction methodology:

- Stabilising existing founding blocks by tremie concrete. Same detail as per Stilbaai with geotextile bags acting as a shutter.
- Horizontal and vertical cracks to be pressure grouted (cement)
- Localised concrete repair and patching as required
- Rehabilitation of toe of structure to original design function

Outcome: repair and maintenance

Examples of void and undermining damage are shown in Figure 1.2.1.2b.

Figure 1.2.1.2b: Voids to be filled and undermining to be capped

1.2.1.2 Breakwater 2

The breakwater is 140m long and comprises of mass concrete cast on bed rock and foundation block work, with cube armour units protecting the seaward face to approximately the high water mark.

1.2.1.2.1 Investigation and findings

Figure 1.2.1.1: Breakwater 2

Observed condition of existing structure

Severe structural cracking and movement was noted at the head of the breakwater. This is most likely due to undermining of the breakwater at the head. A long longitudinal structural crack can be seen along the crest of the breakwater. Copings were found to be in poor condition due to spalling of concrete and corrosion of reinforcing. Visually the navigational light is in poor condition (see Figure 1.2.1.1).

Conceptual design

It is envisaged that a solution could be carried out in short term that would provide protection to the harbour in the long term while not jeopardising harbour operations. Remedial work envisaged is stabilising the existing breakwater to arrest further settlement. This is to be done by:

- Stabilising the founding concrete blocks under the mass concrete breakwater using tremie concrete. A diving survey is required to analyse the extent of the repairs required.
- Horizontal and vertical cracks to be filled by pressure pointing (cement grout) as required
- Cement pressure grouting of cracks in the breakwater concrete units

Figure 1.2.1.2 shows detail of the proposed filling of cracks and rehabilitation of concrete cubes on the existing footprint.

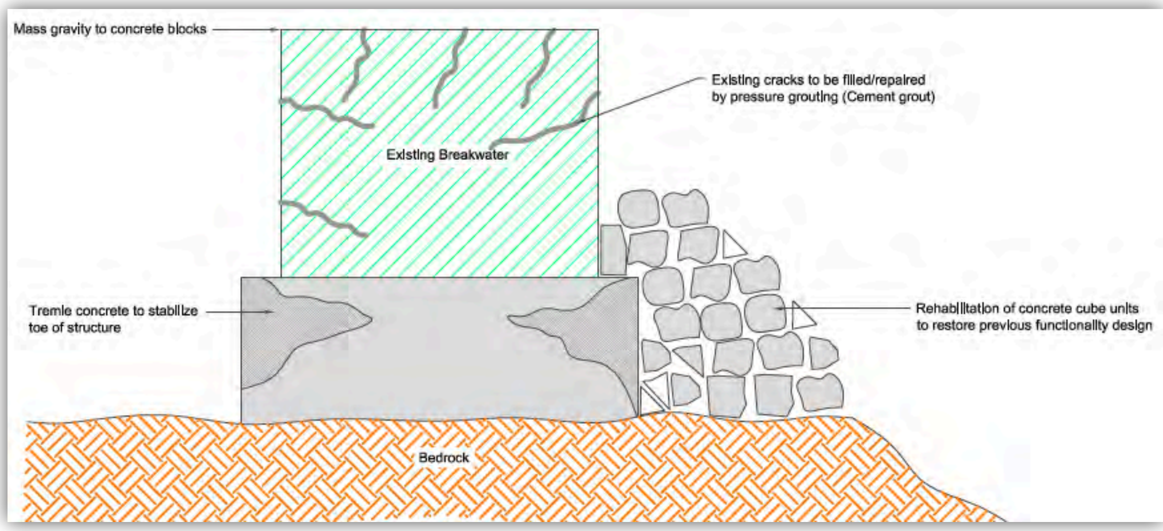


Figure 1.2.1.2: Section through Breakwater 2

Construction methodology:

- Stabilising existing founding blocks by tremie concrete. Same detail as per Stilbaai with geotextile bags acting as a shutter.
- Horizontal and vertical cracks to be pressure grouted (cement)
- Localised concrete repair and patching as required
- Rehabilitation of toe of structure to original design function

Outcome: repair and maintenance

1.2.1.3 Slipway 1 and 2:

Slipway 1: This is a mechanised slipway with a steel cradle running on steel rails to launch and retrieve vessels by means of a special winch. It Can be used for vessels up to 50t and has a side slip for vessel maintenance. The slipway has recently been extended.

Slipway 2: 30m wide slipway that tapers seawards with a 20m long jetty boarding the slipway on the west side.

The slipways are shown in Figure 1.2.2.1.

1.2.1.3.1 Investigation and findings

Slipway 1: The mechanised slipway is in good condition and recently extended with repair work done. The concrete apron surrounding the side slip at the top of the slipway has cracks, and sections are showing settlement. A severe structural crack was noted at the corner of the seawall.

Slipway 2: Minor cracking and abrasion of concrete was observed. Marine growth/algae were observed on the lower end of the slipway below the high water mark. The jetty is in good condition and no major defects were observed.

Figure 1.2.2.1: Slipway 1 (left) and Slipway 2 (right)

1.2.1.3.2 Construction methodology and concept drawings

Since the slipway was identified as requiring an upgrade in the Client's RFP, work has been completed on extending the slipway. The Doc Master indicated that they are now satisfied with the slipway management and no major works are required to Slipway 1.

It is still, however, recommended that a specialist service provider undertake a full diagnostic report to confirm the integrity of the mechanised system.

Maintenance and concrete repair works are required for both slipways, and a pick list will be developed in the detail design to attend to the more critical items identified.

Construction methodology:

See Figure 1.2.2.2 for a view of the mechanised slipway and other cracks .

- Repair and maintenance of mechanised slipway.
- Refurbishment of plant and equipment of the mechanised slipway to original design parameters.
- Crack to corner of slipway to be pressure grouted (cement)
- Localised concrete repair and patching where required to both slipways

Outcome: repair and maintenance.

Figure 1.2.2.2: Proposed maintenance of slipways

1.2.1.4 Slipways 1, 2 and 3

1.2.1.4.1 Investigation and findings

This 162m long concrete caisson quay wall consists of a 90m long suspended reinforced concrete slab structure and a 72m long concrete block structure as shown in Figure 1.2.3.1a.

Figure 1.2.3.1a: Quay wall

Concrete fender blocks where tyres are attached have structural cracks and concrete spalling. Reinforcing is exposed and is corroding. The reinforced slab deck has structural cracking and previous repair methods have failed (see Figure 1.2.3.1b).

Figure 1.2.3.1b: Structural cracks to be repaired

1.2.1.4.2 Concept design

Maintenance and concrete repair work to concrete fenders and reinforced concrete slabs. Examples of damage shown in Figure 1.2.3.1b.

1.2.1.4.3 *Construction methodology and concept drawings*

Construction methodology:

- General concrete repair and maintenance

Outcome: repair and maintenance.

1.2.1.5 Shore Crane Replacement

The derrick crane is rated as a 7.5 SWL ton crane used for ship to shore lifting as shown below in Figure 1.2.3.1c.

Figure 1.2.3.1c: Structural cracks to be repaired

1.2.1.5.1 Investigation and findings

Corrosion is evident throughout the structure as shown in Figure 1.2.3.1d. However, there were no immediate indications of duress to the steel structure.

Figure 1.2.3.1d: Damage to vertical members and fixing detail

1.2.1.5.2 *Construction methodology and concept drawings*

For its operational requirements, the crane is deemed to be adequate. In conversation with the Doc Master, he gave no indication that the crane is negatively affecting the harbour operations. It is anticipated that only rehabilitation is required by providing maintenance through sand-gritting and recoating with corrosive protection paint.

It is however recommended that a specialist service provider do a full diagnostic to verify the operational capability of the crane and inform on the way forward.

Construction Methodology

- Worst case scenario to replace crane with "like to like" (further site investigations to take place)
- If not replaced repair and maintenance. Grit blasting and recoating with non-corrosive paints where required.

  Outcome: repair and maintenance.

1.2.2 Gansbaai New Harbour

The new harbour is primarily used for mooring, taking on supplies and minor maintenance for vessels. The harbour contains a 550m long main breakwater, a 210m long secondary breakwater, 4 berths, and a jetty. A sunken vessel is wrecked on the outside of the secondary breakwater.

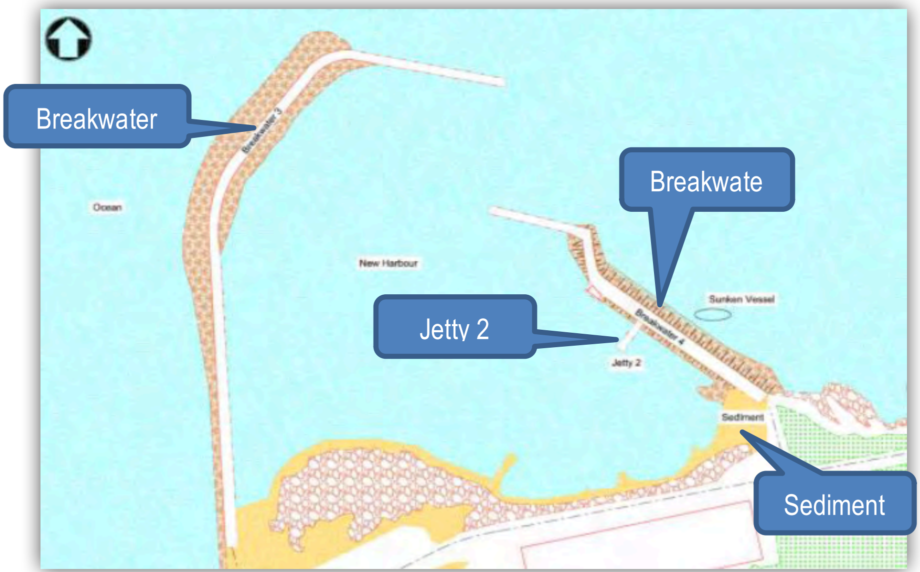


Figure 1.2.2: New Harbour layout

1.2.2.1 Breakwater 3

1.2.2.1.1 *Investigation and findings*

The 550m long breakwater consists of reinforced concrete caissons (300m) and rubble mound structure (130m), with a concrete deck (+5.5m) above low water mark. The width of the breakwater varies between 6m and 7.3m. 20 and 25 ton armour dolosse are placed to a slope of 1:2 on a core of 8t corrugated rectangular blocks (see Figure 1.2.2.1).

Figure 1.2.2.1: Breakwater 3

Observed condition of existing structure

Waves overtop the structure during storms and the Dock Master made mention that during severe storms vessels have to be moored away from the breakwater for safety. Dolosse on the leeside of breakwater have broken into pieces. Mention was made of scouring/undermining of the inside of breakwater but this could not be viewed, however, it was seen that water passes through the breakwater at the joints. Cracking and spalling of concrete was observed in localised sections with staining due to corrosion. Rebar has not been exposed (also see Figure 1.2.2.2).

Figure 1.2.2.2: Damage to Breakwater 3 and area where water is allowed through (see blue circle)

Conceptual design

The washing of water through the breakwater via the joints in caissons is transporting sediment through the breakwater and depositing the material in the harbour basin. It is proposed that the joints be sealed by grouting.

Further detailed analysis of the bathymetric survey is required to confirm the condition of the toe and to what extent remedial work is required. The toe will be reinstated using tremie concrete as per Breakwater 2 detail.

Concrete remedial works are required to the capping slab and crown wall. A list of critical works will be identified during detail design after in depth concrete assessments have been completed.. A detailed study (Crane and ball survey) of the positioning of the armour units is required to evaluate the extent of the repair and rehabilitation of the breakwater.

It is not anticipated that works will be carried out to level the concrete cap, but cracks will be pressure grouted where required.

Construction methodology:

- Remedial work to the toe as per Breakwaters 2 and 3
- Sealing of joints through the breakwater by grouting (cement)
- Localised concrete repair and patching as per concrete repair methodology section 9

Outcome: repair and maintenance, no increase in footprint.

1.2.2.2 Jetty 2

The main structure (Dolphin Berth) is a reinforced concrete caisson filled with concrete. A reinforced concrete bridge provides access from the berth to the landside.

1.2.2.2.1 Investigation and findings

Figure 1.2.2.3: Jetty 2

Observed condition of existing structure

The dolphin berth is in good condition but the concrete access bridge is in very poor condition. The concrete bridge has deflected and shows severe structural cracking and corrosion. The structural integrity of the structure is compromised. The hand rails are in poor condition and require replacing. It was noted that this jetty is used for tourism (see Figure 1.2.2.4).

Figure 1.2.2.4: Damage to Jetty 2

Conceptual design

- Replace the "bridge" with a new reinforced concrete structure as a like for like. The dolphin berth is in good condition and minor concrete repairs are required.

Construction methodology:

- Demolish "reinforced concrete bridge"
- Replace with new concrete bridge
- New fencing to side
- Minor localised repairs and maintenance to the dolphin structure

Outcome: maintenance and repair to dolphin structure and replacement of bridge using "like for like" principle.

1.2.3 Dredging

View of Gansbaai (new) Harbour basin

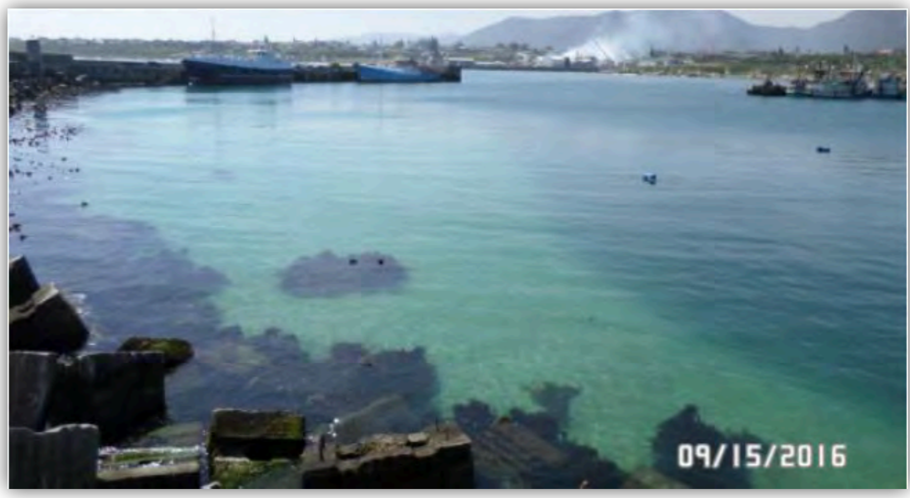


Figure 1.2.3.1: View of new harbour

1.2.3.1 Investigation and findings

Gansbaai is on a rocky shoreline with little sediment transport across the entrance channel. The Dock Master mentioned that there is currently no dredging maintenance plan in place and there has been little build-up of sand during his tenure in the old harbour. He, however, noted that at the end of the mechanised slipway near to the off load quay, rocks have become a hazard to vessels at low tide. These rocks could not be observed at the time.

Similarly, to the old harbour there has been no maintenance dredging to the new harbour; however, sediment build-up is occurring on the leeside of breakwater 3. The Dock Master mentioned that the build-up of sand is affecting the port operations.

1.2.3.2 Concept design

The Gansbaai facility requires dredging of the old harbour and new harbour in order to re-instate the water-depths to acceptable levels.

The sediment present in the Gansbaai facility mostly comprises sandy alluvial deposits. From the limited information on the small number of grab samples taken at the facility during the Bathymetric Survey, it appears to be fine to medium well graded slightly silty sand with some shell and gravel fragments present.

Large portions of the Gansbaai harbour area's seabed floor exhibits typical characteristics of an exposed rocky seabed. The littoral drift process seems to be the main source of sediment being transported to and deposited in the harbour area, as there are negligible exposed beach areas in the facility supplying sediment load here.

The areas that require dredging include the entrance to the old harbour where a sandbank seems to have formed, and the Eastern face of Breakwater 3 of the new harbour. Both the old harbour's Eastern extent and the new harbour's Southern extent will benefit from dredging, but the presence of shallow rock and the geological degree of variability should be considered carefully (see Figure .

The old harbour and the new harbours' current depth will allow most small and medium dredging equipment to safely enter and dredge the material required.

It is estimated that the old harbour requires dredging of about 6200m^3 of sediment and that the new harbour requires dredging of about 36100m^3 of sediment, totalling about 42300m^3 of dredging. This is deemed the critical dredging works and costed in the preliminary cost estimates.

The Gansbaai main harbour entrance and the old harbour basin appears to have some natural sand-trap features which could be dredged out in order to create capacity for future sediment to be deposited there in order to maximise the time required prior to the next maintenance dredging campaign. It is estimated that an additional 67000m^3 could be dredged to create a sand trap. This additional dredging could amount to a total of R8.5 million. To accurately analise future maintenance dredging in terms of frequency and amount of material to be dredged, a long shore sediment study is required.

The disposal of the dredged material would require special attention as this greatly affects production, risk and overall dredging costs dramatically.

The possibility of a beach nourishing exercise should be considered during Environmental studies, as this disposal technique could lead to some cost reductions. Land disposal is not deemed feasible considering the volumes, nature of material and access constraints of the areas to be dredged. Should no other option become available, disposal at sea at an approved disposal site would need to be facilitated, but this will greatly increase costs and environmental risk.

Further analysis of the bathymetric survey (to confirm dredged volumes) and results from sediment sampling analysis (contaminated materials) will dictate the method of disposal.

When the material type, dredging volumes and dredge material distribution is considered, it is anticipated that the dredging campaign will be conducted utilising a Suction Hopper Dredger or alternatively a Barge mounted DOP dredger.

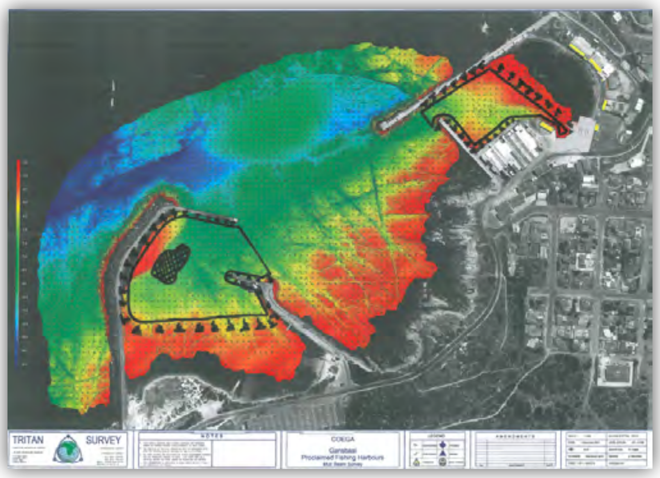


Figure 1.2.3.2: Proposed area for dredging Gansbaai harbour

As indicated above beach nourishment is a potential option. The site(s) will have to be selected carefully taking into account the longshore drift and pumping distance. Possible sites are shown below in Figure 1.2.3.3.

Figure 1.2.3.3: Proposed spoil area for dredge material

Construction methodology

- Approx. 42 500 m^3 of material to be dredged and disposed. Disposal likely to be outside harbour.

Outcome: MMP required

1.2.4 Sunken vessel

1.2.4.1 Observed condition

The steel hull of the vessel, which sanked about 2-3 years ago, remains mostly intact. Most of the smaller pieces of metal have already been stripped. The vessel has been wrecked up against rock armour unit of breakwater 4 and is not fully submerged. The access concrete road on breakwater 4 is 10m from the wreck.

Figure 1.2.4.1: Remains of vessel

1.2.4.2 Concept design

Gansbaai has only one sunken vessel that can be verified visually. The sunken vessel does not pose a hazard to port operations but over time will deteriorate and sections of the wreck could break off and drift into areas used by vessels. The deterioration of the vessel will also become aesthetically unpleasing and a hazard to public should they attempt to board the wreck.

It was agreed with SAHRa that the vessel could be removed and a tender is being prepared. The generic control measures as compiled for the project will be used when removing the vessel.

2 Gansbaai checklist - DEA

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Chief Directorate: Integrated Environmental Authorisations

Minimum requirements for the determination of Environmental Impact Assessment (EIA) applicability

The information requested in this form consists of the minimum requirements that this Department requires to address your query. The information below is required to assist the assessing officer in responding to your query. All fields are compulsory. Please note that if the requested information is deemed insufficient, this Department may request additional information to be submitted.

Any queries related to this form may be addressed to 012 399 9371.

Please submit the completed form in one of the following ways:

(1) **Post:**

The Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Private Bag X447
Pretoria
0001

(2) **Hand Deliver:**

Department of Environmental Affairs
Environment House
473 Steve Biko Road
Arcadia
Pretoria

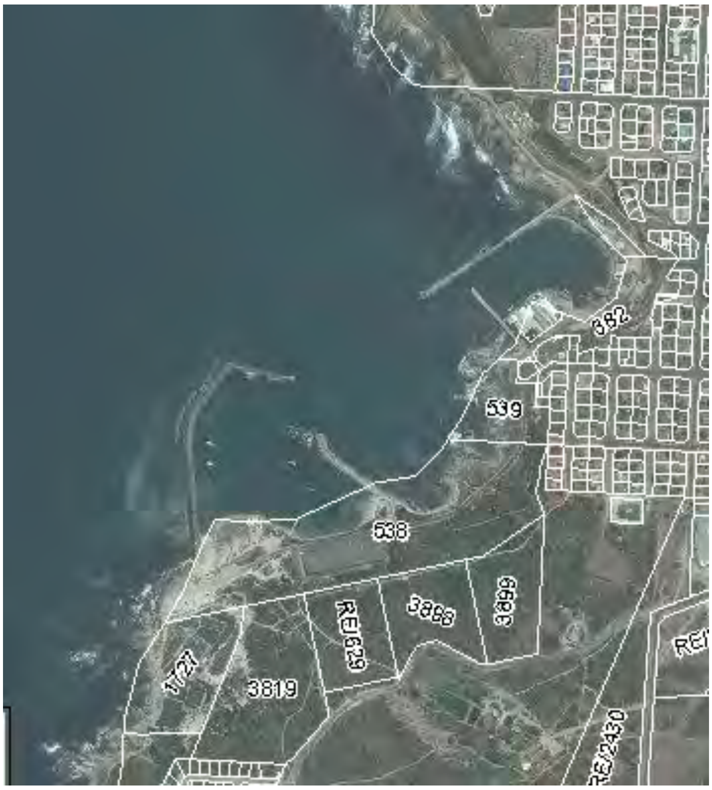
(3) **E-mail :**

EIAAdmin@environment.gov.za

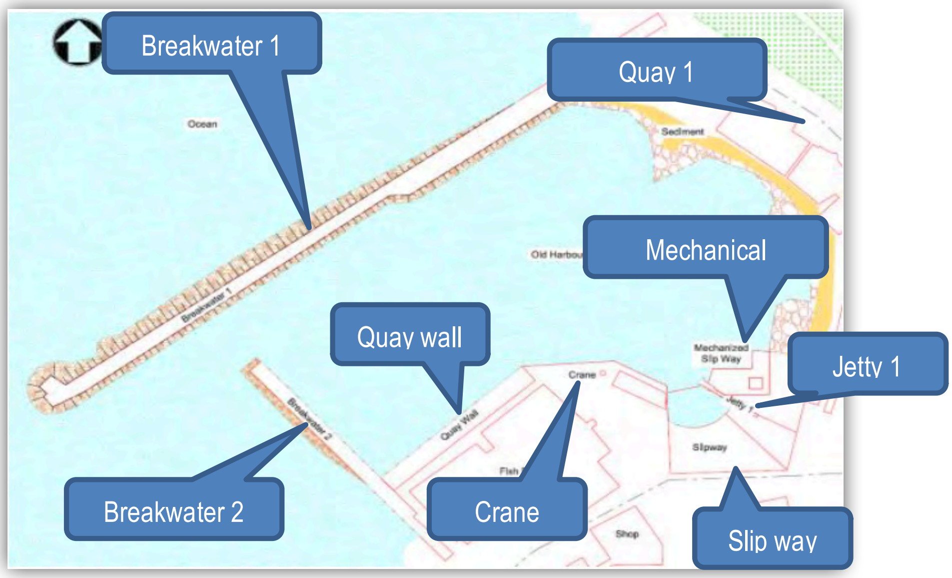
2.1.1 BACKGROUND INFORMATION

Name of Contact person	Pieter Badenhorst	
Postal Address	PO Box 1058, Wellington 7654	
Telephone Number	W: 021 8737228	C: 0827763422
Fax Number	0866721916	Email: pbps@iafrica.com

2.1.2 GEOGRAPHICAL INFORMATION

<table>
<tr><td>Property Description</td><td colspan="2">GansbaaiFishing Harbour</td></tr>
<tr><td>Physical Address where the development will take place</td><td colspan="2">Hawe Weg, Gansbaai</td></tr>
<tr><td>Farm name(s)/ Erf No</td><td colspan="2">The locality of harbour is shown below with surrounding property boundaries. The harbour buildings are on erven 538, 539, 535, 382 and 614. No erf indicated for the harbour walls and water body.

</td></tr>
<tr><td>Local Municipality</td><td colspan="2">Overstrand</td></tr>
<tr><td>District Municipality</td><td colspan="2">Overberg</td></tr>
<tr><td>SG21 Digit code(s) for the proposed site</td><td colspan="2">C01300090000053800000
C01300090000053900000
C01300090000053400000
C01300090000038200000
C01300090000061400000</td></tr>
<tr><td rowspan="2">Co-ordinates of the proposed site/s (DDMMSS)</td><td>Latitude (S)</td><td>Longitude (E)</td></tr>
<tr><td>34° 35' 07,42”</td><td>20° 20' 35,32”</td></tr>
</table>

2.1.3 DETAILS OF THE PROPOSED ACTIVITY AND ENVIRONMENTAL CONTEXT

Does the proposed development involve the construction of a new facility or the expansion of a new facility?	No
Have any activities physically commenced? If so, provide the date of commencement of these activities.	No
What is the current zoning and current land use of the site(s)?	According to available information Gansbaai Harbour itself is not on an erf and has no zoning. Zoning for erven unknown. The property is used as a small fishing harbour, fishing vessels and a ski boat launch.
State the extent of proposed development (ha/m^2)	The exact footprint of the works within the harbour has not yet been finalised, but all activities are proposed inside the cadastral boundaries of the Harbour as indicated on Figures 1 and 3 below. Dredged sand (about 42500m^3) will be deposited on the beach as show below (see Figure 2 below). Proposed works inside the harbour (upgrades and repairs to harbour infrastructure) will remain within the existing footprint of the relevant infrastructure. Figure 1 – Old and New Harbour 

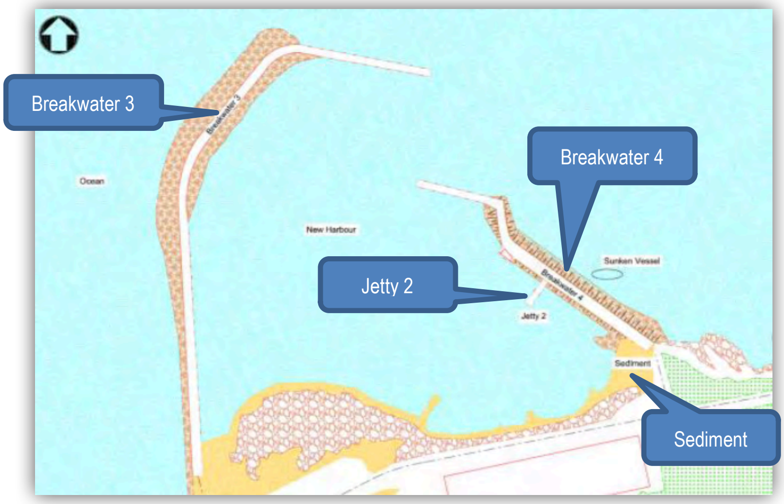
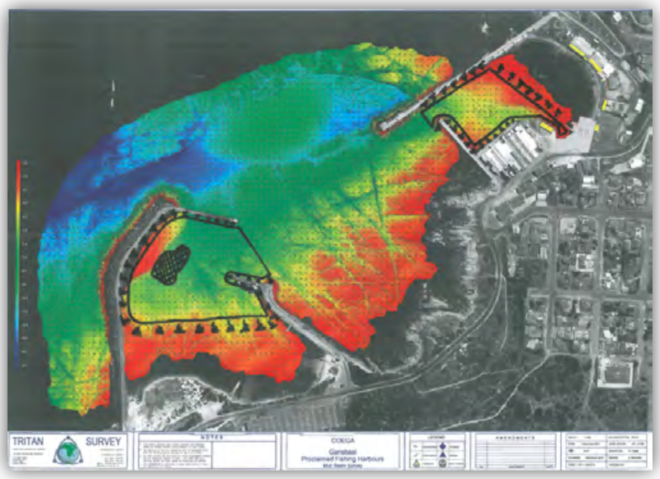

Breakwater 3
Breakwater 4
Jetty 2
Sediment
Ocean
New Harbour
Sunken Vessel

Figure 2


Possible replenishment
Possible replenishment
Harbour
796 m
2004
Imagery Date: 12/14/2016

	Figure 3 
Describe the proposed development in detail (include capacities, output, etc.) and provide a concise description of all associated infrastructure with respect to the proposed development (e.g. the diameter and lengths of pipelines that may be required)	The description of work is shown in section 1 (starting page 1) of the report. The proposed works all constitute repairs and maintenance to existing infrastructure in the harbour and maintenance dredging. Although only the dredging exercise (activity 19 of Listing Notice 1) could activate a listed activity, the listed activity indicates that it is excluded should the work be for maintenance purposes under a Maintenance Management Plan (MMP). It is therefore the intention, should DEA agree, to submit a (MMP) addressing relevant activities for DEA's approval (this MMP will be compiled as per the requirements of DEA&DP but will be submitted to DEA for approval).
Will the proposed development result in waste generation, effluent discharges, air emissions or impacts on the natural or cultural environment - briefly explain?	The project largely involves repairs and maintenance to existing infrastructure in the harbour, which are not expected to result in any waste effluent or emissions, other than those normally associated with construction activities and which will be managed on site. The project includes maintenance dredging within the harbour, for which the it is proposed to submit a MMP. Sampling of sediments to be dredged (see report by Lwandle as Appendix 3.1 (page 28) indicates that sediments are not contaminated (contaminants are well within guideline levels) and as such are suitable for offshore disposal (i.e. onshore disposal at a hazardous waste facility is not required). As indicated above the intention is to nourish beach areas to the south and north of the harbour. Correspondence between other consultants for this project with DEA: Oceans and Coasts regarding the proposed project confirms that no Coastal Waters Discharge Permit (or any other application) will be required in terms of the NEM:Integrated Coastal Management Act 36 of 2014. At this stage it is not clear whether any of the structures are older than 60 years but should it be the case the necessary permit application will be made to the South African Heritage Resources Agency (SAHRA) in terms of the National Heritage Act 25 of 1999.

Does the site(s)/route(s) form part of the Critical Biodiversity Area - If so, provide details	No
Are there any watercourses on the site(s)/route (includes rivers, wetlands, drainage lines, streams etc.) or does the site fall within 32 m from the edge of a watercourse. If so, provide details.	No
Does the site fall within 100 m of the high-water mark of the sea or an estuary?	Yes.
Does the proposed development fall inside an urban area?	This is likely since the harbour is on the edge of town as shown below. 
Describe what investigation or assessment have already been undertaken (if any) to inform this request. Provide attachment herewith.	Engineering assessments and studies were undertaken to assess the requirements for maintenance. These are described in section 1 of this report. A sediment specialist study has been undertaken by Lwandle (Appendix 3.1, page 28) to determine the level of contaminants in the sediment to be dredged.

2.1.4 PROVIDE A DETAILED DESCRIPTION OF POTENTIALLY LISTED ACTIVITIES THAT MAY BE APPLICABLE TO THE PROJECT

Listed activity as described in GN R. 983, GN R. 984 and GN R.985	Description of project activity that may trigger the listed activity
e.g. GN R.983 Item XX(x): The development of bridge exceeding 100 square metres in size within a watercourse	***e.g. A bridge measuring 110 square metres will be constructed within the watercourse***

GN R.983 Activity 19: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from – (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, or a distance of 100 m inland of the high water mark of the sea, whichever distance is the greater – But excluding where such infilling, depositing, dredging, excavation, removal or moving – (b) is for maintenance purposes undertaken in accordance with a maintenance management plan.	Maintenance dredging is required in the harbour basins of both the Old and new harbours and entrance channel, as indicated in Figure 3 above. The intention is to replenish the beach as shown in Figure 2 above. A MMP will be compiled for ongoing maintenance dredging in the harbour basin and at the entrance channel and the deposition/disposal thereof and submitted to DEA for approval prior to the start of dredging activities. Should DEA agree that the activity can be undertaken under a MMP then it is not activated.
GN R.983 Activity 52: The expansion of structures in the coastal public property where the development footprint will be increased by more than 50 square metres, excluding such expansions within existing ports or harbours where there will be no increase in the development footprint of the port or harbour.	Strenghtening/repair of the various structures as described will be required. Section 1 describes how this work will be undertaken within the existing footprint and thus no increase in development footprint will take place. The activity is therefore not activated.
GN R.983 Activity 55: Expansion (i) in the sea; (iii) within the littoral active zone; and (v) within a distance of 100 m inland of the high water mark In respect of: (d) breakwater structures; (f) coastal harbours or ports But excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.	Strenghtening/repair of structures will be required. Section 1 describes how this work will be undertaken within the existing footprint and thus no increase in development footprint will take place. The activity is therefore not activated.
GN R.983 Activity 65: The expansion and related operation of an island, anchored platform or any other permanent structure on or along the sea bed, where the expansion will constitute an increased development footprint, excluding expansion of facilities, infrastructure or structures for aquaculture purposes.	As described above maintenance and repair work is required on permanent structures in the harbours and on the sea bed, however, none of these are considered to increase the footprint of the actual structures and this activity is thus not applicable.

Identified Competent Authority to consider the application:	Department of Environmental Affairs
Reason(s) in terms of Sec 24C of NEMA 1998, as amended	The activity is proposed by a national department: The National Department of Public Works

DECLARATION BY THE PROPONENT / ENVIRONMENTAL PRACTITIONER

I…**Pieter Badenhorst**…in my personal capacity or duly authorised thereto by hereby declare that I:

- regard the information contained in this checklist to be true and correct;
- am fully aware of my responsibilities in terms of the National Environmental Management Act (NEMA) Act No. 107 of 1998), the Environmental Impact Assessment Regulations (EIA Regulations), 2014 in terms of NEMA (Government Notice No. 982 refers) and the relevant specific environmental management Acts, and that failure to comply with these requirements may constitute an offence in terms of the environmental legislation;
- am fully aware that the Department's determination of the applicability of the EIA Regulations,2014 is based on information at my disposal that is relevant to this request;
- aware that the response from the competent authority, to this request, is specific to the EIA Regulations, 2014 and does not exempt me from my legal obligations in terms of any other applicable legislation; and
- am aware that a false declaration is an offence in terms of regulation 48 GN R No. 982

P. Badenhorst.

24 February 2017

Signature of the proponent / environmental practitioner: Date:

PBPS for Mott MacDonald

Name of company (if applicable):

3 Appendices

3.1 : Sediment sampling report

MARINE ENVIRONMENTAL SERVICES

SEDIMENT SPECIALIST STUDY

WESTERN CAPE SMALL HARBOURS

Data Report

PREPARED FOR:

TRITAN SURVEY

REPORT REF.: LT-JOB-521 - Deliverable 2 -V- 1

January 2017

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Date	Report No. and Revision No.	Created	Reviewed
08/12/2016	LT-JOB-521 - Deliverable 2 -V- 1	Raissa Philibert	Laura Weston and Craig Matthysen

EXECUTIVE SUMMARY

As part of the National Department of Public Works (NDPW) Small Harbours Programme, Tritan Surveys has been awarded the work package covering the proclaimed fishing harbours in the Western Cape at Arniston, Gansbaai, Stilbaai and Struisbaai. Sediment properties were measured at sites in each of the four harbours and then compared against the National Action List (DEA 2012) and the BCLME (2006) sediment quality guidelines.

The comparisons show that Arniston, Gansbaai, Stilbaai and Struisbaai sediments are uncontaminated by heavy metals or the measured organic compounds and would qualify for unconfined open ocean disposal. Nevertheless, should harbour dredging be required, the dredge spoil disposal site(s) will need to be carefully selected.

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COEGA DEVELOPMENT CORPORATION

1 INTRODUCTION

The Coega Development Corporation is responsible for the implementation of the National Department of Public Works (NDPW) Small Harbours Programme. The aim of this programme is to accelerate projects pertaining to the improvement of infrastructure, day-to-day operations and aesthetics at 13 proclaimed harbours in the Western Cape. These projects include repairs of existing infrastructure, dredging of harbour basins, characterisation of basin sediments and identification of suitable disposal locations for the dredged material. The 13 proclaimed harbours were divided into several work packages and the contracts for services in each work package awarded separately.

Tritan Surveys (Tritan) has been awarded the work package covering the proclaimed fishing harbours at Arniston, Gansbaai, Stilbaai and Struisbaai in the Western Cape, and envisage the need for dredging at all four. As such, Tritan has contracted Lwandle Technologies (Lwandle) to analyse the sediment composition and levels of contaminants within the sediments, in order to determine whether the dredge material can be safely disposed at sea.

2 BACKGROUND

Sediment is an important sink for many contaminants that are anthropogenically introduced into the water column, and any form of disturbance to this sediment may have ecological effects through re-suspension. Hence sediments removed from one area and disposed of elsewhere can lead to detrimental environmental impacts. The 1996 London Protocol, to which South Africa is a signatory, regulates the disposal of dredged sediments and other waste materials in the marine environment. This protocol requires the screening of target dredge sediments based on their constituents and potential effects that they may have on the environment, to determine whether the material can be dredged and disposed of without further testing. As part of this screening process, contaminants of concern therefore need to be tested within target dredge sediments.

Consequently, sediment measurement campaigns were carried out in Arniston, Gansbaai, Stilbaai and Struisbaai harbours, where dredging activity is envisaged, during November 2016. Samples were collected by Tritan and were analysed for particle size (PSA), heavy metals, total organic carbon and total oxidised nitrogen. This document presents and discusses the results of the sediment surveys conducted at the three harbours and concludes whether or not the sediments present at each harbour comply with the requirements for unconfined open ocean disposal of dredge material.

3 ARNISTON

Arniston Harbour is located on the south coast of the Western Cape. Sediment grab samples were collected by Tritan from three sites located adjacent to the slipway (Figure 3.1). One sample was obtained from each site and was analysed for sediment particle size distribution (PSA), heavy metals, total organic carbon content (TOC), and total oxidised nitrogen (TON). Results are detailed below.

Figure 3.1 Arniston Harbour sediment sampling sites for the November 2016 field trip.

3.1 PARTICLE SIZE ANALYSES

Sediment texture classes are defined as **clay** (< 0.002 mm), **silt** (0.002 - 0.075 mm), **sand** (0.075 – 4.75 mm) and **gravel** (>4.75 mm) (Wentworth 1922). Sediment samples obtained during the survey in Arniston harbour consisted mainly of sand (Table 3.1). The median particle size (D_{50}) of the samples ranged between 0.14 mm and 0.35 mm, classifying the sediment as fine to coarse sand.

Table 3.1 Sediment texture classification (% by weight) for Arniston Harbour.

Site	Percentage Gravel	Percentage Sand	Percentage Silt	Percentage Clay	D50 (mm)

AGS 1	0	94	0	6	0.140
AGS 2	0	97	0	3	0.350
AGS 3	0	94	0	6	0.140

3.2 Heavy Metals

Concentrations of aluminium, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc were analysed for in the sediment samples. The three sample sites were treated as replicates and the mean of the measured metal concentrations were compared against the recommended environmental quality guidelines for the BCLME region (BCLME 2006) and the National Action List values (DEA 2012) (Table 3.2). It is evident that measured heavy metal concentrations from Arniston harbour did not exceed the probable effect concentration (BCLME) or the low action level (National Action List) thresholds.

Table 3.2 Heavy metal concentrations (mg/kg) measured in sediments at the three sites at Arniston harbour, during the November 2016 field survey. The probable effect concentration (BCLME) and the low action level (LAL) and upper action level (UAL) (National Action List) are also shown.

	AGS 1	AGS 2	AGS 3	Mean	PEC	LAL	UAL
Aluminium	6660	4070	3760	4830			
Arsenic	0.9	0.8	1	0.9	41.6	30	150
Cadmium	0.2	0.1	0.1	0.1	4.21	1.5	10
Chromium	6.8	4	8	6.3	160	50	500
Copper	<1	1	<1	1.0	108	100	500
Lead	<5	<5	<5	<5	112	100	500
Mercury	<0.1	<0.1	<0.1	<0.1	0.7	0.5	5
Nickel	2.9	0.7	1.4	1.7	42.8	50	500
Zinc	15.4	9.6	8.6	11.2	271	150	750

3.3 Organic Compounds and Total Oxidised Nitrogen

Sediment samples from each site were analysed for their weight percentage of total organic carbon (TOC) and total oxidised nitrogen (TON). TON levels in all samples were below the detection limit (<2.5 mg/kg). Low levels of TOC were detected (Table 3.3) suggesting that there is minimal organic matter present in the sediment.

Table 3.3 Total Organic Carbon percentage concentrations for all sites in Arniston Harbour.

	AGS 1C	AGS 2C	AGS 3C	Mean
Total Organic Carbon (%)	0.03	0.04	<0.02	0.04

4 GANSBAAI

Gansbaai is located is located on the south coast of the Western Cape, South Africa. Grab samples were obtained, by Tritan, from six sites within the harbour, during a field survey in November 2016 (Figure 4.1). One replicate was obtained from each site and samples were analysed for PSA, heavy metals, TON and TOC. Results are detailed below.

Figure 4.1 Gansbaai sediment sampling sites for the November 2016 field trip.

4.1 Particle Size Analyses

Sediment samples obtained during the survey in Gansbaai harbour consisted mainly of sand (Table 4.1). The median particle size (D_{50}) of the samples ranged between 0.10 mm and 0.20 mm, classifying the sediment as fine to medium sand.

Table 4.1 Sediment texture classification for Gansbaai Harbour.

Site	Percentage Gravel	Percentage Sand	Percentage Silt	Percentage Clay	D50 (mm)
GS 1	0	93	0	7	0.200
GS 2	0	76	16	8	0.100
GS 3	3	77	12	7	0.150
GS 4	3	91	0	6	0.180
GS 5	1	86	3	10	0.150
GS 6	0	87	7	6	0.120

4.2 Heavy Metals

Heavy metal analyses (for concentrations of aluminium, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) were conducted on samples obtained from all six sites. The six sample sites were treated as replicates and the mean of the measured metal concentrations were compared against recommended environmental quality guidelines for the BCLME region (BCLME 2006) and the National Action List values (DEA 2012) (Table 4.2). The concentrations of the measured heavy metals in the sediment samples from Gansbaai did not exceed any of the recommended values (BCLME and National Action List).

Table 4.2 Heavy metal concentrations (mg/kg) measured in sediments at the six sites in Gansbaai harbour, during the November 2016 field survey. The probable effect concentration (BCLME) and the low action level (LAL) and upper action level (UAL) (National Action List) are also shown.

	GS 1	GS 2	GS 3	GS 4	GS 5	GS6	Mean	PEC	LAL	UAL
Aluminium	4590	7480	4530	4540	3940	3620	5533			
Arsenic	0.9	2.9	3.7	3.6	4.7	9.1	2.5	41.6	30	150
Cadmium	0.2	0.16	0.6	0.5	0.6	0.9	0.3	4.21	1.5	10
Chromium	2.3	18.9	9.1	18.3	4.3	13	10.1	160	50	500
Copper	2	7	16	14	20	62	8.3	108	100	500
Lead	<5	<5	<5	10	<5	10	<5	112	100	500
Mercury	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.7	0.5	5
Nickel	0.7	7.7	3.5	4.5	1.2	3.2	4.0	42.8	50	500
Zinc	9.1	41.1	49	38.4	27.1	82.9	33.1	271	150	750

4.3 Organic Compounds and Total Organic Nitrogen

Sediment samples from each site were analysed for their weight percentage of total organic carbon (TOC) and Total oxidised nitrogen (TON). TON levels in all samples were below the detection limit

(<2.5 mg/kg). Low levels of TOC were detected (Table 4.3) suggesting that there is minimal organic matter present in the sediment.

Table 4.3 Total Organic Carbon percentage by weight concentrations for all sites in Gansbaai Harbour.

	GS 1	GS 2	GS 3	GS 4	GS 5	GS 6	Mean
Total Organic Carbon (%)	0.13	1.63	1.01	0.34	0.43	0.45	0.67

5 STILBAAI

Stilbaai harbour is located on the south coast of the Western Cape, South Africa. Grab samples were obtained from three sites located within the vicinity of the harbour (Figure 5.1), with one replicate obtained at each. All samples were analysed for PSA, heavy metals, TON and TOC.

Figure 5.1 Stilbaai sediment sampling sites for the November 2016 field trip.

5.1 Particle Size Analyses

The particle size analysis results show that the median particle size (D_{50}) of the sediment samples ranged between 0.180 mm and 0.300 mm, classifying the sediment as medium to coarse sand (Table 5.1).

Table 5.1 Sediment texture classification for Stilbaai Harbour.

Site	Percentage Gravel	Percentage Sand	Percentage Silt	Percentage Clay	D50 (mm)
StGS 1A	19	74	2	5	0.300
StGS 2A	0	90	3	7	0.180
StGS 3A	0	90	4	6	0.200

5.2 Heavy Metals

Heavy metal analyses (for concentrations of aluminium, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) were conducted on samples obtained from all three sites. The three sites were treated as replicates and the mean of the measured metal concentrations were compared against recommended environmental quality guidelines for the BCLME region (BCLME 2006) and the National Action List values (DEA 2012) (Table 5.2). The concentrations of the measured heavy metals in the sediment samples from Stilbaai did not exceed any of the recommended values (BCLME and National Action List).

Table 5.2 Heavy metal concentrations (mg/kg) measured in sediments at the seven harbour sites in St Helena Bay harbour during the November 2016 field survey. The probable effect concentration (BCLME) and the low action level (LAL) and upper action level (UAL) (National Action List) are also shown.

	StGS 1	StGS 2	StGS 3	Mean	PEC	LAL	UAL
Aluminium	3760	3200	3640	3533			
Arsenic	4.7	4.3	4.6	4.5	41.6	30	150
Cadmium	0.1	0.2	0.2	0.2	4.21	1.5	10
Chromium	5.4	4.9	4.4	4.9	160	50	500
Copper	1	1	<1	1.0	108	100	500
Lead	<5	<5	<5	<5	112	100	500
Mercury	<0.1	<0.1	<0.1	<0.1	0.7	0.5	5
Nickel	2.2	1.1	0.9	1.4	42.8	50	500
Zinc	8.7	9.6	8.4	8.9	271	150	750

5.3 Organic Compounds and Total Organic Nitrogen

Sediment samples from each site were analysed for their weight percentage of total organic carbon (TOC) and Total oxidised nitrogen (TON). TON levels in all samples were below the detection limit (<2.5 mg/kg). Low levels of TOC were detected (Table 5.3) suggesting that there is minimal organic matter present in the sediment.

Table 5.3 Total Organic Carbon percentage by weight concentrations for all sites in Stilbaai Harbour.

	StGS 1	StGS 2	StGS 3	Mean
Total Organic Carbon (%)	0.12	0.12	0.09	0.11

6 STRUISBAAI

Struisbaai harbour is located on the south coast of the Western Cape, South Africa. Sediment grab samples were obtained from three site located within the harbour, with one replicate obtained at each (Figure 6.1). Particle size, heavy metals, TOC and TON were analysed for all three sites.

Figure 6.1 Struisbaai sediment sampling sites for the November 2016 field trip.

6.1 Particle Size Analyses

The particle size analysis results show that the median particle size (D_{50}) of the sediment samples ranged between 0.150 mm and 0.500 mm, classifying the sediment as medium to coarse sand (Table 6.1).

Table 6.1 Sediment texture classification for Struisbaai Harbour.

Site	Percentage Gravel	Percentage Sand	Percentage Silt	Percentage Clay	D50 (mm)
StrGS 1	0	91	2	7	0.150
StrGS 2	0	94	3	8	0.500
StrGS 3	0	94	4	6	0.500

6.2 Heavy Metals

Heavy metal analyses (for concentrations of aluminium, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) were conducted on samples obtained from all three sites. The three samples were treated as replicates and the mean of the measured metal concentrations were compared against recommended environmental quality guidelines for the BCLME region (BCLME 2006) and the National Action List values (DEA 2012) (Table 6.2). The concentrations of the measured heavy metals in the sediment samples from Struisbaai did not exceed any of the recommended values (BCLME and National Action List).

Table 6.2 Heavy metal concentrations (mg/kg) measured in sediments at the three sites in Struisbaai harbour during the November 2016 field survey. The probable effect concentration (BCLME) and the low action level (LAL) and upper action level (UAL) (National Action List) are also shown.

	StrGS 1	StrGS 2	StrGS 3	Mean	PEC	LAL	UAL
Aluminium	3320	2710	3510	3180			
Arsenic	0.8	0.9	0.8	0.8	41.6	30	150
Cadmium	0.2	0.1	0.1	0.1	4.21	1.5	10
Chromium	2.4	0.9	0.7	1.3	160	50	500
Copper	1	<1	<1	1.0	108	100	500
Lead	<5	<5	<5	<5	112	100	500
Mercury	<0.1	<0.1	<0.1	<0.1	0.7	0.5	5
Nickel	0.8	0.5	<0.5	0.7	42.8	50	500
Zinc	8.7	7.3	9.5	8.5	271	150	750

6.3 ORGANIC COMPOUNDS AND TOTAL ORGANIC NITROGEN

Sediment samples from each site were analysed for their weight percentage of total organic carbon (TOC) and total oxidised nitrogen (TON). TON levels in all samples were below the detection limit (<2.5 mg/kg). Low levels of TOC were detected (Table 6.3) suggesting that there is minimal organic matter present in the sediment.

Table 6.3 Total Organic Carbon percentage by weight concentrations for all sites in Struisbaai Harbour.

	StrGS 1	StrGS 2	StrGS 3	Mean
Total Organic Carbon (%)	0.14	0.1	0.11	0.12

7 CONCLUSIONS

The values reported above are below the set guidelines according to the South African National Action List for the screening of dredged sediment for disposal. Therefore, sediments from Arniston, Gansbaai, Stilbaai and Struisbaai harbours can be safely disposed of at an authorised location with low probability of associated contaminants generating negative effects on the receiving sediment body. At the sites analysed within each of the harbours, no chemical substances were present at higher than 'normal' concentrations. Although these sediments are safe to be disposed of, effort needs to go into the investigation of a suitable dredge disposal location and disposal should only occur at an authorised site. Potential disposal sites should be inspected to assess whether they are suitable for disposal and that there will be limited, mainly physical, detrimental impacts caused by the dumping of sediments.

8 REFERENCES

BCLME (2006). The Development of a Common Set of Water and Sediment Quality Guideline for The Coastal Zone of the BCLME. Benguela Current Large Marine Ecosystem Programme. *CSIR Report No CSIR/NRE/ECO/ER/2006/0011/C*

DEA (2012). Revision of National Action List for the Screening of Dredged Material.

Wentworth (1922). A Scale of Grade and Class Terms for Clastic Sediments. *The Journal of Geology*. **30** (5). University of Chicago Press. Pp 377-392.