



**Onshore Maintenance, Corrosion  
and Inspection Organisation  
(Civil/Structural Asset Integrity  
Inspection & Maintenance)**

**REPORT OF STRUCTURAL  
INTEGRITY ASSESSMENT OF  
GBARAN JETTY TOPSIDES &  
UNDERWATER STRUCTURES**

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# REPORT OF STRUCTURAL INTEGRITY ASSESSMENT OF GBARAN JETTY TOPSIDES & UNDERWATER STRUCTURES

## Revision History

REVISION STATUS			SIGNATORIES		
Rev	Date	Description	Originator	Reviewer	Approver
R01	18.05.22	Issued for Review	Chinedu Odiaka	Ajiri Ivovi	Tamunoemi Efebeli
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<ul style="list-style-type: none"> <li>Preliminary issue will be issued as P01</li> <li>Revisions for review will be issued as R01, with subsequent come as R02 etc.</li> <li>Revisions approved for Implementation/Design Issue/Eng. will be issued as A01, with subsequent come as A02 etc.</li> <li>Revisions approved for Tender will be issued as T01, with subsequent come as T02 etc.</li> <li>Revisions approved for Construction (AFC)/Purchase will be issued as C01; with subsequent comes as C02 etc.</li> <li>Highlights of sections revised from previous approved issues or reasons for version change are to be listed in the description box</li> <li>All revisions to this document must be signed by the relevant Technical Authority (TA1, TA2 or TA3)</li> </ul>					

## Signatures for This Revision

Role	Name	Signature	Date
Originator	Chinedu Odiaka		
Reviewer	Ajiri Ivovi		
Approver	Tamunoemi Efebeli		

More field(s) could be added for signature if additional agreement/approval is required.

# REPORT OF STRUCTURAL INTEGRITY ASSESSMENT OF GBARAN JETTY TOPSIDES & UNDERWATER STRUCTURES

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# REPORT OF STRUCTURAL INTEGRITY ASSESSMENT OF GBARAN JETTY

## EXECUTIVE SUMMARY

The structural integrity assessment of Gbaran Jetty was carried out on the 22<sup>nd</sup> of April to 3<sup>rd</sup> of May, 2022. The objective of the assessment was to determine the structural condition of the Gbaran Topside and Underwater Structures in order to come up with a scope for maintenance for the jetty. The objective of the inspection also include focussed attention of the failed section in order to probe and determine the root cause of the failures while leveraging the UVAS technology. The assessment involved General Visual Inspection (GVI), physical measurements and taking pictures of defects observed for the development of scope of repair works and cost estimate in line with Reliability Centred Maintenance (RCM) Methodology.

The major high risk defects observed includes

- Large perforations on section of the jetty sheetpile wall close to the military hut leading to severe loss of earth material and collapse of 1 No. lighting pole
- Severe scouring underneath section of concrete hardstand
- Severe corrosion and deformation of anchor tie rods

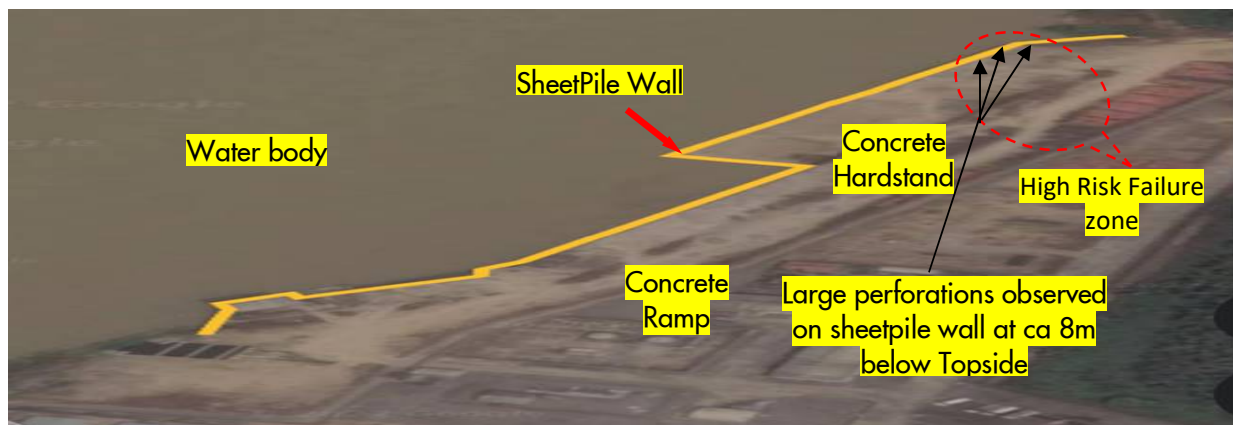


Figure 1 - Area View Of Gbaran Jetty showing high risk failure zone

Details of the defects, risk categorizations and remedial actions are provided in this report. In line with Civil Infobases, these defects are listed in **Extreme damage failure mode** with potential consequence of posing high risk to people and asset.

The estimated total cost of repairs based on an existing call off contract is **\$281,779.47** (including mobilisation and demobilisation costs). **This price is advisory and should be validated by the execution team prior to implementation.**

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The asset owners are advised to include the cost of refurbishment works in the OP22 Budget plan. In addition the asset planners should raise Z1 notifications in SAP to assure tracking and close out of the recommended remedial actions.

## 1. INTRODUCTION

The Gbaran Ubie Integrated Oil and Gas Facility was commissioned in 2011 with a production capacity of 1Bscfd of gas and an estimated oil output of 70,000b/d at full capacity. The Gbaran Ubie CPF processes hydrocarbon from Gbaran, Zarama, Kolo creek, Korama, Etelebou, and Epu field.

The Gbaran Jetty was designed to provide marine logistics support for business operations at the Gbaran facility. The Gbaran Jetty has an estimated length of about 513m and was designed and built with the functional purpose of safely providing a fixed location for safe berthing/mooring of vessels for transfer of goods and people. The Jetty also supports topside facilities such as Fire water shed, concrete hardstand and ramp, handrails, fenders and bollards, etc.

The components inspected are:

- **Topside Structures** - Handrails, bollards, fenders, lighting poles and concrete hardstand and ramp.
- **Underwater Structures** – Sheetpiles walls

## 2. RESPONSIBILITIES & SCOPE

The work scope for these integrity assessments are as detailed below:

- General Visual Inspection of the Civil Structures using the inspection checklist in Civil Infobase.
- Physical measurements and taking of pictures
- Use of Underwater Vision Augmentation System (UVAS) Equipment to inspect the underwater structures.

## 3. TEAM

- Ajiri Iyovi - Civil/Structural Asset Integrity Engineer.
- Chinedu Odiaka - Civil/Structural Asset Integrity Engineer.

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## 4. RISK CATEGORIZATION TABLE

The table below is an extract from the Table 5.1 of Civil InfoBase – Steel Structural Elements, GS.06.50607 for the Steel Structural Elements; the Template in Annex A (Deterioration Template) of Civil Infobase GS.06.50607 – Concrete Structures and Foundations; and the deficiencies/defects of buildings in Table 3.1 of civil Infobase GS.06.50651 – Buildings at Process Plants.

The observed defects would be categorized using the classification in the table below

Priority	Action	Danger	Possible reasons	Examples
1	Immediate action required	High	Corrosion/deterioration, Construction error, Design error, Deficient repair, Missing parts, Mechanical damage, others.	Major corrosion, deterioration or damage, seriously effecting current structural integrity. Missing damaged or seriously corroded parts which may affect personnel safety such as for instance missing or damaged floor elements, railings, and ladders/stairs.
2	Action required at short term, i.e. within 1-2 years	Medium	Corrosion/deterioration Construction/ Design error Deficient repair Missing parts Mechanical damage Other	Medium to serious corrosion or deterioration, which does not affect structural integrity at short term Ri 4Table 5.3. Deformed stair treads due to overloading. Missing bolt and/or nut. Limited damage to stair or ladder footing, not leading to instability. (Personnel safety not at risk).
3	Action required at longer term, i.e. 2-5 years	Limited	Corrosion Mechanical damage Other	Limited corrosion or deterioration up to Ri 3-4 Table 5.3. Minor mechanical damage or deformations. (Personnel safety not at risk).
4	No action required	Not existing		

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# REPORT OF STRUCTURAL INTEGRITY ASSESSMENT OF GBARAN JETTY

## 5. TABLE OF OBSERVATIONS AND REMEDIAL ACTIONS FOR GBARAN JETTY

ASSET	GBARAN JETTY		
COMPONENTS INSPECTED	DEFECTS OBSERVED	MEASURE/SIZE OF DEFECTS/REMEDIAL ACTION	PRIORITY
SHEETPILE WALL CLOSE TO MILITARY CHECK POINT	3 No. large cavities on section of the jetty sheetpile wall at ca 8m below the topside close to the military check point	<b>Option 1</b> <ul style="list-style-type: none"> <li>Remove the 400mm concrete slab panel close to the - 400mmx6mx8m</li> <li>Cut off anchor tie rods across failed section to allow for excavation/access to the openings.</li> <li>Provide, mix and seal up openings with concrete grade 40</li> <li>Back fill around the openings using sand bags (1:3 cement/sand mix)</li> <li>Replace the cut sections of tie rod</li> <li>Provide, spread and fill and compact area with sharp sand - 18m x 9m x 2.5m</li> <li>Reconstruct hardstand and re-erect lighting pole</li> </ul>	1
	Severe loss of earth material and collapse of 1 No. lighting pole		1
	Severe scouring underneath section of concrete hardstand		1
	Severe corrosion and deformation of anchor tie rods		1
		<b>Option 2</b> <ul style="list-style-type: none"> <li>Remove the 400mm concrete slab panel close to the - 400mmx6mx8m</li> <li>Cut off anchor failed tie rods across</li> <li>Weld plates to cover the openings - 0.85m x 3m long x 4Nos.</li> <li>Provide, spread and fill and compact area with sharp sand - 18m x 9m x 2.5m</li> </ul>	1
FENDERS	Moderately corroded	Prepare surface and apply self-priming Epoxy primer, Epoxy	2

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	fender supports	mid coat and Polyurethane topcoat, or other approved coating materials to the prepared surface 0.5 X 0.5m steel plate x 20Nos. x 40Nos.	
<b>CONCRETE JETTY RAMP</b>	Vegetative growth and silted section of jetty ramp	Remove vegetative growth with hand tool. Desilt ramp and make good	2
	Concrete spalling/broken sections with exposed reinforcements on edges of the concrete ramp	Prepare surface of exposed rebars. Provide, mix and treat spalled section with cement grout 0.85 x 2.5 x 0.3m x 2Nos.	2
	Broken section of Handrail	Provide, fix and weld Handrail Prepare surface and apply self-priming Epoxy primer, Epoxy mid coat and Polyurethane topcoat, or other approved coating materials to the prepared surface 0.045mm dia. CHS, 1.8m long	2
	Water seepages from wall of concrete ramp and moderate corrosion on sheet piles	Seal up opening with mortar mixed with water repellant cement additive. 0.8m x 0.4m x 2Nos.  Prepare surface and apply self-priming Epoxy primer, Epoxy mid coat and Polyurethane topcoat, or other approved coating materials to the prepared surface 5.5m x 250m wide	2
	Bollards – In good condition	No action is required	4
<b>RAMP STEEL WALK WAY CLOSE TO FIRE WATER SHED</b>	Gratings, Grating supports, steel structural frame, Handrail and steel landing	No action is required	4

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## PICTURES FOR GBARAN JETTY



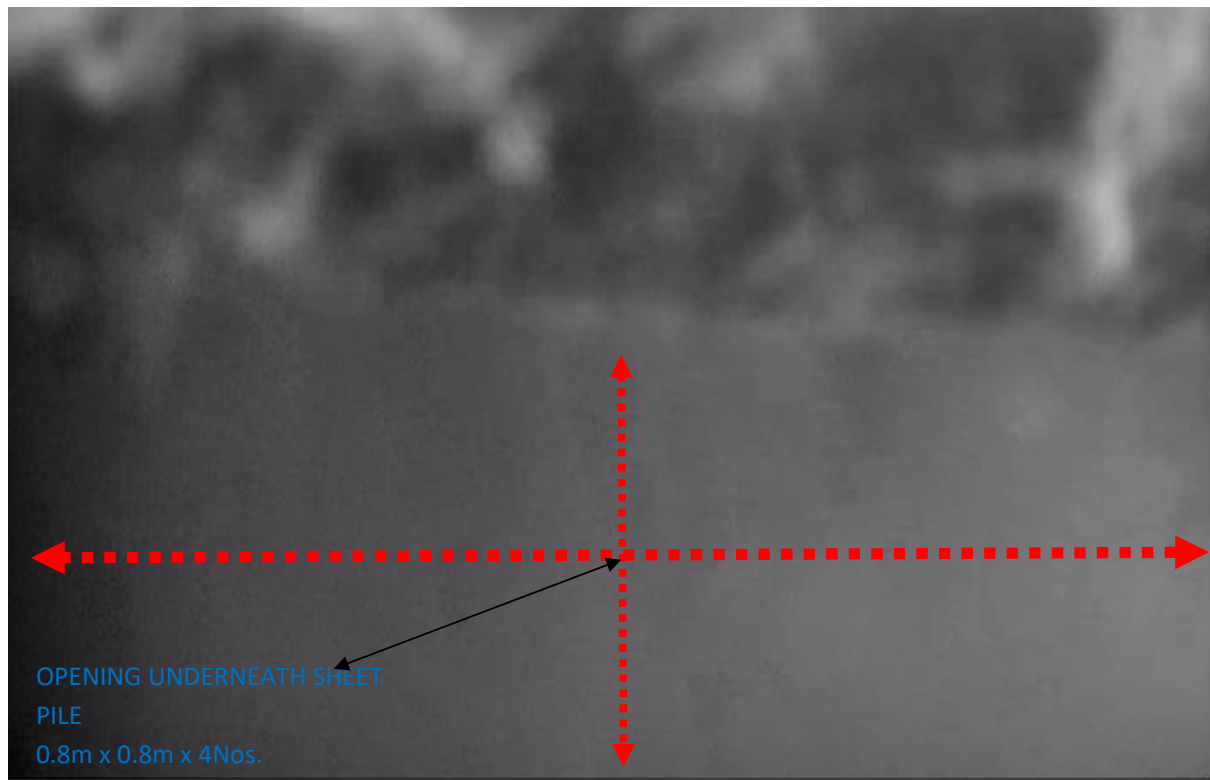
**COLLAPSED SECTION OF JETTY DUE TO SEVERE LOOSE OF EARTH MATERIAL BEHIND SECTION OF THE JETTY SHEET PILE CLOSE TO THE MILITARY POST.**



**COLLAPSED SECTION OF JETTY.**

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# REPORT OF STRUCTURAL INTEGRITY ASSESSMENT OF GBARAN JETTY



**OPENING UNDERNEATH SHEET PILES AS A RESULT OF ERODED BOLDER BY RIVER CURRENT.**



**ERODED BOLDER**

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## REPORT OF STRUCTURAL INTEGRITY ASSESSMENT OF GBARAN JETTY



**VEGETATIVE GROWTH AND SILTED SECTION OF JETTY RAMP.**



**WATER SEEPAGES FROM WALL OF CONCRETE RAMP AND MODERATE CORROSION ON SHEET PILES.**

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# REPORT OF STRUCTURAL INTEGRITY ASSESSMENT OF GBARAN JETTY



RAMP STEEL WALK WAY CLOSE TO FIRE WATER SHED: GRATINGS, GRATING SUPPORTS, STEEL STRUCTURAL FRAME, HANDRAIL AND STEEL LANDING.

**PICTURE SHOWING AREA OF OPENING** (the labeled picture gives an example of what is happening under water)



Affected area with openings  
(0.8m x0.8m x 4Nos.)

## 6. REFERENCES

The codes employed for this assessment include:

- GS.06.50607: Civil InfoBase on Concrete Structures and Foundation
- GS.06.50620: Civil Infobase on Steel Structural Elements
- GS.06.50617: Civil Infobase on Personnel Access Facilities
- GS.06.50624: Civil Infobase on Roads and Pavings

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