

SAPREF Business Management System		ASSET	Procedure	Level 2
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Maintenance and Inspection Strategy – SBM Pipeline				

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1. Purpose, scope and target group [\[back to TOC\]](#)

1.1 Purpose

The purpose of this document is to provide a Maintenance and Inspection Strategy which will ensure that the integrity of the SBM Pipeline is assured.

1.2 Scope

This document is applicable to the SBM pipeline system

1.3 Target Group

Operational, Inspection (including Pipeline Supervisor), Maintenance and Marine Team

2. Description [\[back to TOC\]](#)

2.1 SBM Pipeline

The single buoy mooring (SBM) is located 2.5km offshore and is linked by a 48" pipeline to the SAPREF refinery. The SBM is jointly owned and financed in conjunction with a number of partners. The pipeline was commissioned in 1999 and is used to import about 70% of South Africa's crude oil. At the beach, the 48" pipeline connects to a 40" section of pipeline commissioned in 1970 which runs underground into SAPREF refinery's South Tank Farm (STF). The integrity of the SBM pipeline is managed by the SAPREF in conjunction with experts from Shell Projects and Technology EMEA.

2.2 Pipeline Integrity Management

- The following activities shall be performed to establish the integrity of the SBM pipelines:
- 1) Intelligent pigging – every 5 years – confirm the internal and external wall loss on the pipeline
 - 2) Subsea Pipeline survey – every 2 years – monitoring of mechanical/structural integrity and geotechnical stability
 - 3) PLEM inspection and CP monitoring – every 6 months
 - 4) Monthly checks of rectifier performance and potential readings – Perform a trend analysis of data for both rectifier performance and protection potentials on a yearly basis. (applicable to **onshore** pipeline section only)

The extent of remedial work, based on the results of these activities, is determined by the Pipeline Supervisor and if required the Materials and Corrosion Engineer (MCE) and Marine Team. The Economic & Scheduling and Maintenance teams should be consulted for input when planning to execute remedial work in order to minimize impact on the business.

The above activities may require specialized service providers. However, all activity shall be performed under the supervision of the Pipeline Supervisor.

The safety surrounding any maintenance work carried out on the SBM lines within the perimeters of SAPREF site is the responsibility of the Oil Movements (OMUTDE) Area Engineer. He has a legal obligation under his OSHA appointment (Regulation GMR 2.1). Even if the maintenance work is conducted by a third party, the SAPREF AE must satisfy himself that all reasonable safety measures are in place. Outside of the SAPREF perimeter all safety responsibilities fall to the contracting company charged with doing work.

It is not required to complete all the above tasks on the old 40" pipeline since subsea section has been decommissioned.

2.2.1 Intelligent Pigging

Internal inspection by intelligent pigging is one of the main component of pipeline integrity assessment. Intelligent pig inspection is required to provide actual data to establish the remaining life of the pipeline. The data obtained from intelligent pigging will provide internal, and external wall loss and manufacturing defects, and external damage to pipeline (e.g. dents).

The inspection frequency is time based and shall be completed every 5 years. Any revision to the inspection frequency should be documented in the Pipeline Annual Report and requires a deferment/ extension form signed by all relevant stakeholders.

The selection of the particular inspection technology is based on the expected degradation mechanism and the design and operating conditions of the pipeline. The Pipeline Supervisor and Materials and Corrosion Engineer (MCE) are responsible selection of the intelligent pig tool to provide required information to determine the integrity status of the pipeline.

Activity	Activity Ownership			
	Plan	Execute	Assess	Resultant Action
Intelligent Pigging	Pipeline Supervisor	Zone Operations	Pipeline Supervisor & M&C Engineer	Pipeline Supervisor & M&C Engineer

The operational aspects of an intelligent pigging inspection should be given full consideration in the planning stage, especially requirement for pig trap (including maintenance of existing pig traps), and requirement for cleaning pipeline prior to inspection.

Finding	Action
No integrity issues found	Update information in IDMS 1. IP report 2. Close out report
Minor issues identified, long term integrity threat	A. Pipeline Supervisor and MCE shall review consequence of integrity issues and recommend mitigating measures. B. Present finding to Pipeline Owner C. Update IDMS 1. IP report 2. Close out report
Issues identified emerging integrity threat (Remaining life < 5 years)	Resolve issues within 2 years
Issues identified short-term integrity threat (Remaining life < 1 years)	Resolve issues ASAP

The results from the surveys should be reviewed by the Pipeline Supervisor and the MCE. These should be considered when determining the integrity status of the pipeline and documented in the Pipeline Annual Report.

2.2.2 Subsea Pipeline Survey

Subsea pipeline survey provides the information about the physical condition of the pipeline with respect to pipeline profile, free-spans and breakages, depth of pipeline burial, and any third party interference.

This activity shall be completed every 2 years in less assessment of results indicate frequency change is required. If pipeline survey frequency is revised, the reasons should be documented in the Pipeline Annual Report

Activity	Activity Ownership			
	Plan	Execute	Assess	Resultant Action
Subsea Pipeline Survey	Marine Engineers	Marine Engineers	Pipeline Supervisor & Marine Engineer	Pipeline Supervisor & Marine Engineer

The following table identifies possible findings and actions to be taken by the Marine Engineers and/or Pipeline Supervisor

Reports issued from specialized service providers shall be reviewed by the Pipeline Supervisor and Marine Team. If remedial actions are required, these should be planned and executed before the next subsea pipeline survey (i.e. within 2 years).

Finding	Action
Scouring of seabed around pipeline	No action. Continue to monitor area in bi-yearly surveys.
Excessive scouring leading to spanning or uneven seabed leading to pipeline	Investigate further using ROV and determine whether span is within acceptable limits. Otherwise mitigate by

	dredging or other suitable mitigation option.
Third party interference	Assess damage to pipeline and mitigate as required.

All findings shall be documented in the Annual Report and IDMS.

2.2.2.1 PLEM Inspection and CP monitoring

The pipeline end manifold (PLEM) is considered part of the pipeline system and must be inspected and maintained to ensure overall integrity of the pipeline.

Inspection of the PLEM shall be completed every 6 months and should include the following:

1. External visual inspection of the PLEM (including report of coating condition)
2. UT wall thickness measurement on key locations on the PLEM
3. Condition of the anodes and potential readings

Activity	Activity Ownership			
	Plan	Execute	Assess	Resultant Action
PLEM Inspection and CP monitoring	Marine Engineers	Marine Engineers	Pipeline Supervisor & MCE	Pipeline Supervisor & Marine Engineer

Finding	Action
Potential readings inside protection window	No action.
Potential outside protection window	MCE & Pipeline Supervisor – investigate the reasons or cause for this. Review available inspection data to check for wall loss.

2.2.3 Onshore Pipeline CP monitoring

The rectifier performance shall be checked every month in the monthly reports provided by the service provider. The potential readings measured should also be reviewed and actions taken when required.

When required (at least once every 5 years), direct current voltage gradient (DCVG) and closed interval potential (CIPs) surveys shall be performed on the onshore pipeline.

Activity	Activity Ownership			
	Plan	Execute	Assess	Resultant Action
CP monitoring	Pipeline Supervisor	Pipeline Supervisor	Pipeline Supervisor & MCE	Pipeline Supervisor & Marine Engineer

DCVG Survey	Pipeline Supervisor	Pipeline Supervisor	Pipeline Supervisor & MCE	Pipeline Supervisor & Marine Engineer
CIPS	Pipeline Supervisor	Pipeline Supervisor	Pipeline Supervisor & MCE	Pipeline Supervisor & Marine Engineer

	Finding	Action
Rectifier	Sudden voltage and current loss	Indication of power or rectifier failure. Investigate and resolve issue ASAP.
	Sudden current loss while maintaining voltage	Indication of cable break or open fuse. If potentials are not maintained within protection window, investigate and resolve issue ASAP
	Continuous increase of current to maintain potential level	Indication of either coating failure or short circuits, inspection recommended. CIPS is recommended to find exact location.
	Increase of rectifier voltage to maintain current level	Indication of anode bed deterioration, inspection of rectifier recommended. Investigate and replace anode bed if required
Protection Potential	Potential readings inside protection window	No action.
	Potential outside protection window	MCE & Pipeline Supervisor – investigate the reasons or cause for this. Review available inspection data to check for wall loss.
	Sudden decrease (within year) of protection level for same current output	Indication of short circuit, check for stray currents. Investigate and resolve issue within 2 years

3. References [\[back to TOC\]](#)

3.1 Records

ID No.	Title	Holder	Location	Working Duration	Archive Duration
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3.2 External References

Document Reference	Title	Issued by	Revision / Date
ASME B 31.4	Transportation Systems for Liquid Hydrocarbons and Other Liquids	ASME	1998

DEP's On CP, transport lines etc.

SGSI

various

3.3 Internal References

Doc. ID	Title
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4. Keywords [\[back to TOC\]](#)

SBM pipeline, inspection, subsea maintenance, pipeline survey, intelligent pigging, cathodic protection

5. Definitions and abbreviations [\[back to TOC\]](#)

Refer to [SITE.RG.0001](#)

Additions to this list must be sent via e-mail to the Bms Administrator.

6. Revision list [\[back to TOC\]](#)

Revision	Date	Description	Checked by	Approved by
0	May 2017	First Issue		

7. Appendices [\[back to TOC\]](#)