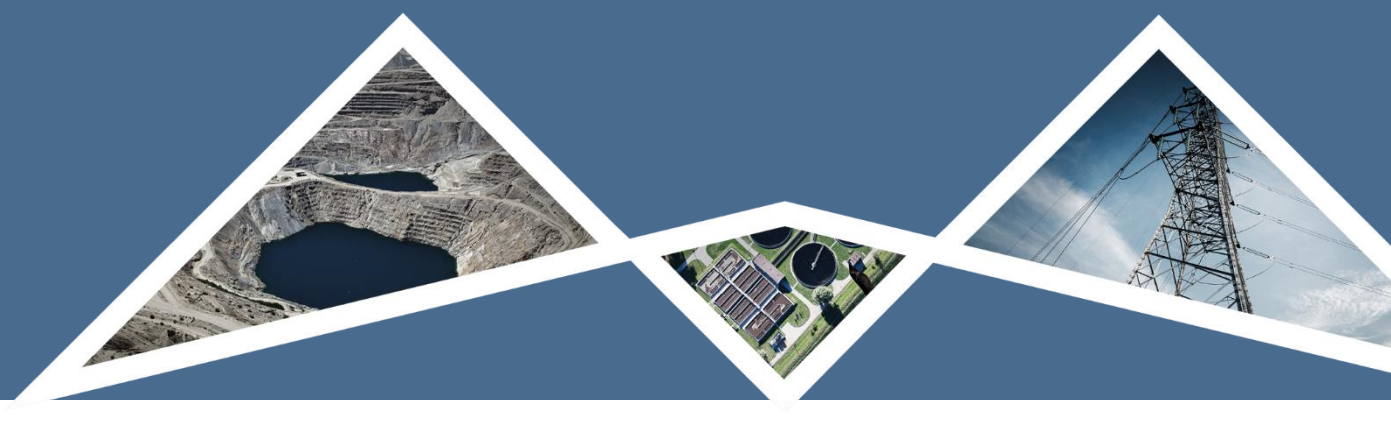
EIMS | ENVIRONMENTAL IMPACT MANAGEMENT SERVICES

T 011 789 7170 E info@eims.co.za W www.eims.co.za

ENVIRONMENTAL MANAGEMENT PROGRAMME

EXPLORATION DRILLING IN BLOCK 9 AND 11A



DOCUMENT DETAILS

EIMS REFERENCE:	1688-3
DOCUMENT TITLE:	Environmental Management Programme: Exploration Drilling Surveys in Block 9 and 11a

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
COMPILED[1]:	Liam Whitlow		2025/05/15
CHECKED:	John Von Mayer		2025/05/15
AUTHORIZED:	Liam Whitlow		2025/05/15

REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2014/06/01	ORIGINAL DOCUMENT	EMPr compiled by ERM
2025/05/15	REVISION 1	EMPr Amendment- based on 2025 Environmental Audit EMPr – Amendments in blue text

[1] The content of this EMPr was copied from the 2014 EMPr compiled by Environmental Resources Management for Block 9 and 11a. EIMS was appointed in 2025 to revise and amend this EMPr based on recommendations from an Independent Audit undertaken in 2025.

Table of Contents

1 Section 1: Introduction 5
1.1 Name of Exploration Area 5
1.2 Contact Person 5
1.3 Area And Location 5
1.4 Brief Description of Drilling Operations 8
1.5 EMPR Context and Purpose 11
1.5.1 2014 EMPr Update 11
1.5.2 2025 EMPr Update 11
2 Section 2: General Context 11
2.1 Overview of Entire Block 9 and 11a Activities 11
2.1.1 Block 9 11
2.1.2 Block 11a 12
2.2 Summary Description of the Affected Environment 13
2.2.1 Regional Overview 14
2.2.2 Project Area Details 15
2.2.3 Ecosystem Services 19
2.3 Environmental Vulnerabilities and Potential Impacts of Drilling 21
2.3.1 Water Column 23
2.3.2 Seafloor 23
2.3.3 Physical Coastline 24
2.3.4 Fisheries 24
2.3.5 Air Quality 24
2.3.6 Diagrammatic Summary of Potential Impacts 25
2.4 Legislative Provisions 26
2.4.1 Diagrammatic Summary of Legislative Provisions 26
2.4.2 Applicable Policies, Conventions, Laws & Permit Requirements 27
2.5 Institutional Framework 33
2.5.1 PetroSA Environmental Management Responsibilities 33
2.5.2 Institutional Linkages 33
3 Environmental Protection Activities 34
3.1 Activity 1: Planning Phase 37
3.2 Activity 2: Subsidiary Plans 40
3.3 Activity 3. Drilling Contractor and Vessel Certification 43
3.4 Activity 4. Stakeholder Engagement 44
3.5 Activity 5: Environmental Training and Awareness 46
3.6 Activity 6: Pollution Prevention 47
3.7 Activity 7: Rig Establishment & Refuelling 57

3.8 Activity 8: Drilling Fluids and Cuttings 65
3.9 Activity 9: Solid Waste Management 67
3.10 Activity 10. Discharge of Effluent 72
3.11 Activity 11 Gaseous Emissions 74
3.12 Activity 12: Incidents and Emergencies 76
3.13 Activity 13: Well Suspension and Abandonment 79
3.14 Activity 14: System Administrative Requirements 83
4 References and supporting documents 92

List of Figures

Figure 1: Location of the offshore license blocks offshore Mossel Bay showing the location of Block 9 and 11a. 6
Figure 2: Coordinates of Block 9 and 11a and the hydrocarbon production areas in Block 9 covered by updated EMPrs. 7
Figure 3: Drilling Rig Types 8
Figure 4: Drilling Subsea BOP Stack 9
Figure 5: Typical well casing arrangement 10
Figure 6: Location of all hydrocarbon production areas in Block 9 (circled with names in black) covered by updated EMPRs. All except Oribi and Oryx are producing gas via the FA Platform. 13
Figure 7: Chart showing bathymetry and location of gas and oil fields offshore of Mossel Bay, South Africa (Map Source 2010). 14
Figure 8: Seafloor sediment distributions offshore of Mossel Bay. The approximate locations of the PetroSA gas and oil fields and the Blues trawling grounds on the central Agulhas Bank are shown (modified from Le Clus et al., 1996). 15
Figure 9: Schematic of thermocline distributions in spring and summer on the Agulhas Bank in relation to the PetroSA gas and oil fields. Dotted lines show thermocline depths whilst solid lines show bathymetry (Modified from Probyn et al., 1994) 16
Figure 10: Distribution of the main commercial fishing activities on the Agulhas Bank relative to the Block 9 and 11a blocks (figure supplied by Japp 2011). 20
Figure 11: Distribution of demersal trawl landings in the commercial grid blocks in the Block 9 project area and respective proportions of annual 'Blues' trawling ground catches (data from Wilkinson and Japp 2005 and Capricorn Fishing (Pty) Ltd). 21
Figure 12: Diagrammatic Summary of Potential Impacts of Drilling Activities 25
Figure 13: Overview of key legislation related to offshore drilling activities 26

List of Tables

Table 1: Wave persistence statistics for waves in the vicinity of the FA Platform (modified from CSIR 2009). ... 17
Table 2: Summary of interaction points between drilling activities and environmental components (modified from CCA 1997). 22

Table 3: List of Legislation and Policies relevant to PetroSA operational activities. 27

Table 4: Permits or licences relevant to environmental aspects of PetroSA Offshore Operations 31

Table 5: International Agreements / Conventions to which SA is a signatory and that have been enacted in domestic legislation 32

Table 6: Table of PetroSA Staff Responsibilities for Exploration Drilling. 33

ACRONYMS & ABBREVIATIONS USED IN THE EMPR

µg chl*a*/litre	micrograms of chlorophyll 'a' per litre
mg C/m^2/hr	milligrams of carbon per square meter per hour
BOP	Blow Out Preventer
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DNV	Det Norske Veritas
EEZ	Exclusive Economic Zone
EMPrs	Environmental Management Programmes
E&P	Exploration and Production
FPSO	Floating Production Storage and Off-loading vessel
GTL	Gas to Liquid
HydroSAN	South African Navy Hydrographic Office (also referred to as SANHO)
IAP	Interested & Affected Party
ICMA	Integrated Coastal Management Act (24 of 2008)
JOC	Joint Operations Centre
MARPOL	International Convention for the Prevention of Pollution from Ships 73/78
MPAs	Marine Protected Areas
MODU	Mobile Offshore Drilling Unit
MPCCLA	Marine Pollution (Control and Civil Liability) Act (6 of 1981)
MPRDA	Minerals and Petroleum Resources Development Act 28 of 2002
MPRDAA	Minerals and Petroleum Resources Development Amendment Act 49 of 2008
MSDS	Material Safety Data Sheet

NADF	Non Aqueous Drilling Fluid
NEMA	National Environment Management Act 107 of 1998 (as amended)
OHS	Occupational Health and Safety 85 of 1993 (as amended)
PASA	Petroleum Agency of South Africa
ROV	Remote Operated Vehicle
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resources Agency
SAMSA	South African Maritime Safety Authority
SCG	South Coast Gas
SHEQ	Safety, Health, Environment and Quality
UCT	University of Cape Town
UNFCC	United Nations Framework Convention on Climate Change
UNCLOS	United Nations Law of the Sea Convention
WBDF	Water Based Drilling Fluid

1 SECTION 1: INTRODUCTION

1.1 NAME OF EXPLORATION AREA

Exploration Well Drilling in Block 9 and 11a

1.2 CONTACT PERSON

Manager:	***Vuyokazi Godongwana***
Position:	Asset Manager: Block 9 and 11a
Phone:	021 929 3218
Facsimile:	021 929 3229
Cell:	076 696 2113
E-mail:	Vuyokazi.godongwana@petrosa.co.za

1.3 AREA AND LOCATION

This EMPR covers potential drilling activities in Petroleum Licence Block 9 and 11a, located offshore the South coast of South Africa within what is known as the Bredasdorp Basin. The location of the lease areas in relation to the coast is illustrated in Figure 1.

PetroSA's Block 9 license area covers a surface area of 22,756 km^2 and is located 140 km south of Mossel Bay. Block 11a covers 1270 km^2, is located 60 km from shore and has water depths ranging from 100 to 140 m. The co-ordinates of Blocks 9 and 11a are indicated in Figure 2. In Block 9 known hydrocarbon prospects are located approximately 50 to 150 km from the Bredasdorp coast.

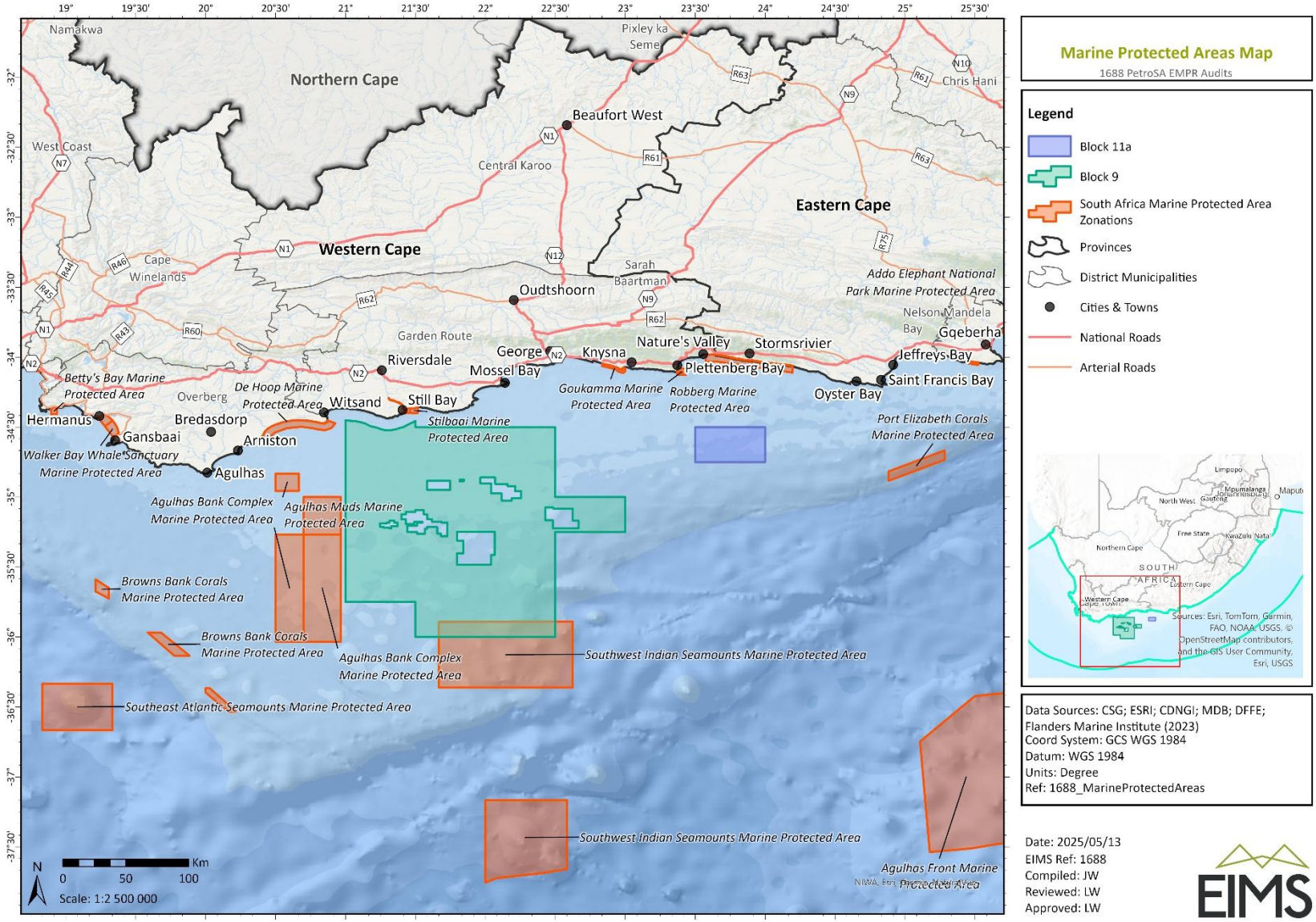
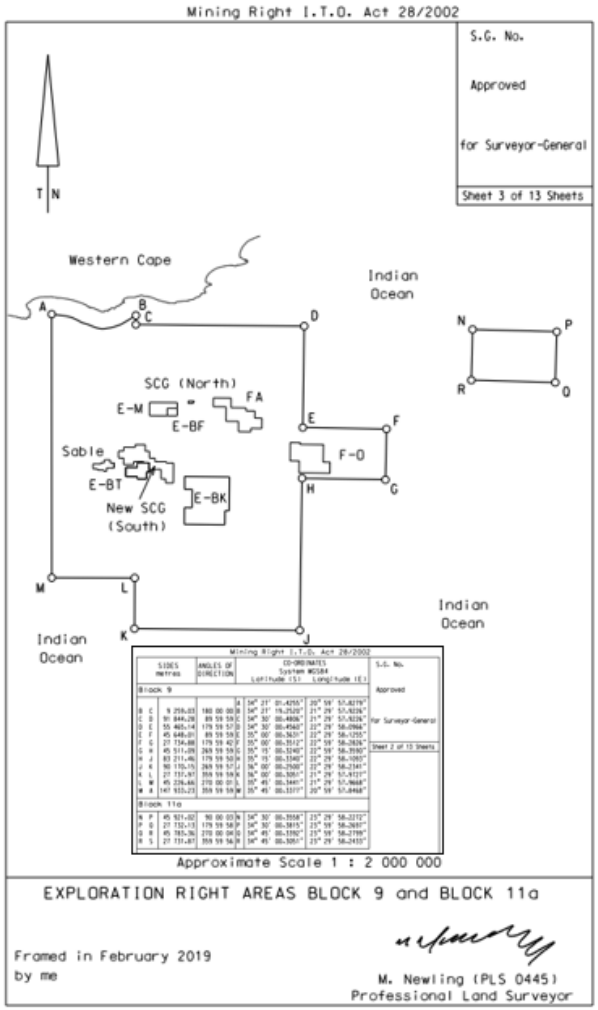


Figure 1: Location of the offshore license blocks offshore Mossel Bay showing the location of Block 9 and 11a.



AREAS EXCLUDED FROM EXPLORATION RIGHT AREA

Production Right: Excluded Area - EBT

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
A1	A2	6 323.86	89 59 57	A1	35°12'18.4169"	21°26'32.9455"
A2	A3	2 557.82	359 59 56	A2	35°12'18.4135"	21°30'42.9561"
A3	A4	6 452.17	89 59 58	A3	35°10'55.4153"	21°30'42.9546"
A4	A5	4 930.74	179 59 57	A4	35°10'55.4130"	21°34'57.9657"
A5	A6	1 315.02	269 59 58	A5	35°13'35.4093"	21°34'57.9684"
A6	A7	3 913.81	179 59 57	A6	35°13'35.4098"	21°34'05.9661"
A7	A8	5 131.42	269 59 58	A7	35°15'42.4070"	21°34'05.9682"
A8	A9	1 294.34	359 59 56	A8	35°15'42.4094"	21°30'42.9592"
A9	A10	6 320.38	269 59 57	A9	35°15'00.4101"	21°30'42.9583"
A10	A1	4 992.41	359 59 57	A10	35°15'00.4136"	21°26'32.9476"

Production Right: Excluded Area - FA

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
C1	C2	9 703.70	89 59 49	C1	34°51'35.4238"	21°57'50.0334"
C2	C3	5 207.76	179 59 56	C2	34°51'35.4029"	22°04'12.0538"
C3	C4	8 149.39	89 59 57	C3	34°54'24.3969"	22°04'12.0573"
C4	C5	1 664.03	179 59 55	C4	34°54'24.3918"	22°09'33.0695"
C5	C6	4 822.76	89 59 58	C5	34°55'18.3900"	22°09'33.0708"
C6	C7	3 913.56	179 59 56	C6	34°55'18.3877"	22°12'43.0785"
C7	C8	3 932.67	89 59 57	C7	34°57'25.3831"	22°12'43.0810"
C8	C9	5 608.44	179 59 56	C8	34°57'25.3808"	22°15'18.0869"
C9	C10	6 034.84	269 59 57	C9	35°00'27.3742"	22°15'18.0906"
C10	C11	1 972.20	179 59 58	C10	35°00'27.3776"	22°11'20.0814"
C11	C12	6 667.30	269 59 57	C11	35°01'31.3750"	22°11'20.0821"
C12	C13	5 700.89	359 59 56	C12	35°01'31.3786"	22°06'57.0722"
C13	C14	6 874.41	269 59 57	C13	34°58'26.3857"	22°06'57.0685"
C14	C15	7 919.56	359 59 56	C14	34°58'26.3899"	22°02'26.0582"
C15	C16	7 007.51	269 59 44	C15	34°54'09.3991"	22°02'26.0530"
C16	C1	4 745.60	359 59 58	C16	34°54'09.4205"	21°57'50.0347"

Production Right: Excluded Area - EBF

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
E1	E2	5 407.29	89 59 58	E1	34° 54' 43.4336"	21° 41' 21.9776"
E2	E3	4 129.29	179 59 58	E2	34° 54' 43.4319"	21° 44' 54.9895"
E3	E4	5 404.86	269 59 58	E3	34° 56' 57.4282"	21° 44' 54.9907"
E4	E1	4 129.29	359 59 59	E4	34° 56' 57.4298"	21° 41' 21.9783"

Production Right: Excluded Area - FO

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
F1	F2	5 320.28	90 00 00	F1	35°04'30.0000"	22°25'39.0000"
F2	F3	832.07	180 00 00	F2	35°04'30.0000"	22°29'09.0000"
F3	F4	12 666.17	90 00 00	F3	35°04'57.0000"	22°29'09.0000"
F4	F5	9 584.23	180 00 00	F4	35°04'57.0000"	22°37'29.0000"
F5	F6	3 795.84	90 00 00	F5	35°10'08.0000"	22°37'29.0000"
F6	F7	6 009.48	180 00 00	F6	35°10'08.0000"	22°39'59.0000"
F7	F8	16 817.07	270 00 00	F7	35°13'23.0000"	22°39'59.0000"
F8	F9	6 410.11	0 00 00	F8	35°13'23.0000"	22°28'54.0000"
F9	F10	4 934.81	270 00 00	F9	35°09'55.0000"	22°28'54.0000"
F10	F1	10 015.67	0 00 00	F10	35°09'55.0000"	22°25'39.0000"

Production Right: Excluded Area - Sable

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
B1	B2	4 237.76	89 59 59	B1	35°11'17.7886"	21°14'48.8446"
B2	B3	616.34	0 00 33	B2	35°11'17.7881"	21°17'36.3477"
B3	B4	1 867.23	89 59 60	B3	35°10'57.7887"	21°17'36.3509"
B4	B5	1 559.30	0 00 13	B4	35°10'57.7886"	21°18'50.1507"
B5	B6	3 160.73	90 00 04	B5	35°10'07.1910"	21°18'50.1538"
B6	B7	1 593.22	180 00 02	B6	35°10'07.1934"	21°20'55.0558"
B7	B8	2 165.84	89 59 56	B7	35°10'58.8916"	21°20'55.0552"
B8	B9	2 813.59	179 59 56	B8	35°10'58.8899"	21°22'20.6572"
B9	B10	4 077.48	270 00 02	B9	35°12'30.1873"	21°22'20.6588"
B10	B11	1 753.48	180 00 04	B10	35°12'30.1861"	21°19'39.4512"
B11	B12	1 400.94	269 59 59	B11	35°13'27.0842"	21°19'39.4501"
B12	B13	520.80	359 59 42	B12	35°13'27.0845"	21°18'44.0516"
B13	B14	3 548.28	270 00 02	B13	35°13'10.1851"	21°18'44.0501"
B14	B15	721.07	0 00 05	B14	35°13'10.1836"	21°16'23.7459"
B15	B16	2 400.34	270 00 02	B15	35°12'46.7857"	21°16'23.7465"
B16	B1	2 742.67	0 00 08	B16	35°12'46.7848"	21°14'48.8411"

Production Right: Excluded Area – SCG North

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
G1	G2	2 920.71	89 59 57	G1	34° 52' 30.4334"	21° 48' 56.0018"
G2	G3	862.83	179 59 58	G2	34° 52' 30.4318"	21° 50' 51.0012"
G3	G4	507.90	269 59 57	G3	34° 52' 58.4311"	21° 50' 51.0075"
G4	G5	523.86	179 59 56	G4	34° 52' 58.4314"	21° 50' 31.0067"
G5	G6	2 412.40	269 59 57	G5	34° 53' 15.4309"	21° 50' 31.0010"
G6	G1	1 386.69	359 59 57	G6	34° 53' 15.4322"	21° 48' 56.0024"

Production Right: Excluded Area - EM

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
D1	D2	15 084.64	89 59 58	D1	34° 53' 02.4396"	21° 35' 00.9550"
D2	D3	3 112.35	179 59 59	D2	34° 53' 02.4350"	21° 44' 54.9892"
D3	D4	5 407.29	269 59 58	D3	34° 54' 43.4319"	21° 44' 54.9895"
D4	D5	4 129.29	179 59 59	D4	34° 54' 43.4336"	21° 41' 21.9776"
D5	D6	9 667.82	269 59 58	D5	34° 56' 57.4298"	21° 41' 21.9783"
D6	D1	7 241.66	359 59 58	D6	34° 56' 57.4334"	21° 35' 00.9574"

Production Right: Excluded Area – New SCG South

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
H1	H2	2 835.88	89 59 57	H1	35°07'28.4253"	21°23'57.9343"
H2	H3	2 064.72	359 59 57	H2	35°07'28.4235"	21°25'49.9390"
H3	H4	6 280.88	89 59 58	H3	35°06'21.4250"	21°25'49.9381"
H4	H5	1 540.83	359 59 54	H4	35°06'21.4222"	21°29'57.9482"
H5	H6	5 420.75	89 59 58	H5	35°05'31.4234"	21°29'57.9467"
H6	H7	3 605.54	179 59 58	H6	35°05'31.4216"	21°33'31.9568"
H7	H8	2 329.50	89 59 58	H7	35°07'28.4187"	21°33'31.9581"
H8	H9	3 790.47	179 59 57	H8	35°07'28.4178"	21°35'03.9627"
H9	H10	3 087.81	89 59 58	H9	35°09'31.4149"	21°35'03.9646"
H10	H11	1 941.47	179 59 57	H10	35°09'31.4140"	21°37'05.9702"
H11	H12	6 174.36	89 59 58	H11	35°10'34.4126"	21°37'05.9711"
H12	H13	647.16	179 59 59	H12	35°10'34.4101"	21°41'09.9845"
H13	H14	3 871.36	89 59 58	H13	35°10'55.4096"	21°41'09.9846"
H14	H15	10 940.11	179 59 52	H14	35°10 55.4079"	21°43'42.9936"
H15	H16	4 170.06	269 59 57	H15	35°16'50.3989"	21°43'43.0075"
H16	H17	2 157.22	359 59 49	H16	35°16'50.4009"	21°40'57.9934"
H17	H18	2 527.86	269 59 58	H17	35°15'40.4027"	21°40'57.9896"
H18	H19	5 177.30	359 59 56	H18	35°15'40.4036"	21°39'17.9830"
H19	H20	6 576.09	269 59 58	H19	35°12'52.4079"	21°39'17.9798"
H20	H21	3 605.60	359 59 57	H20	35°12'52.4103"	21°34'57.9675"
H21	H22	3 011.02	269 59 58	H21	35°10'55.4130"	21°34'57.9657"
H22	H23	647.16	359 59 57	H22	35°10'55.4139"	21°32'58.9603"
H23	H24	5 339.23	269 59 58	H23	35°10'34.4144"	21°32'58.9600"
H24	H25	1 725.75	179 59 56	H24	35°10'34.4167"	21°29'27.9511"
H25	H26	5 515.31	269 59 57	H25	35°11'30.4154"	21°29'27.9522"
H26	H27	3 667.24	359 59 56	H26	35°11'30.4186"	21°25'49.9430"
H27	H28	2 834.70	269 59 57	H27	35°09'31.4208"	21°25'49.9409"
H28	H1	3 790.48	359 59 57	H28	35°09'31.4226"	21°23'57.9361"

Production Right: Excluded Area – E-BK

SIDES metres			ANGLES OF DIRECTION		CO-ORDINATES System WGS84 Latitude (S)	Longitude (E)
J1	J2	24 468.55	90 00 00	J1	35°14'54.0901"	21°47'48.0278"
J2	J3	18 463.83	180 00 00	J2	35°14'54.0901"	22°03'55.8924"
J3	J4	2 280.08	270 00 00	J3	35°24'53.2049"	22°03'55.8924"
J4	J5	7 688.05	180 00 00	J4	35°24'53.2049"	22°02'25.5178"
J5	J6	22 119.40	270 00 00	J5	35°29'02.6620"	22°02'25.5178"
J6	J7	9 133.03	0 00 00	J6	35°29'02.6620"	21°47'48.0278"
J7	J8	4 164.66	90 00 00	J7	35°24'06.3188"	21°47'48.0278"
J8	J9	10 022.44	0 00 00	J8	35°24'06.3188"	21°50'33.0742"
J9	J10	4 169.30	270 00 00	J9	35°18'41.1118"	21°50'33.0742"
J10	J1	6 996.41	0 00 00	J10	35°18'41.1118"	21°47'48.0278"

Figure 2: Coordinates of Block 9 and 11a and the hydrocarbon production areas in Block 9 covered by updated EMPrs.

1.4 BRIEF DESCRIPTION OF DRILLING OPERATIONS

Future drilling operations for Block 9 and 11a have not been confirmed and a generic description of drilling activities is described here.

Drilling for hydrocarbons in the offshore environment involves the use of various mobile offshore drilling units (MODU) whose selection generally depends on the water depth and marine operating conditions experienced at the well site (Figure 3). Jack-up rigs are used in shallower water with legs which are lowered to the seabed to jack the drilling unit above the water. Semisubmersible rigs and drill ships are used in deeper water as floating drilling units which are held in position with a mooring system. Dynamically positioned semisubmersible rigs and drill ships are used in very deep water. The water depth and marine operating conditions experienced in block 9 & 11a to date have required the use of moored semi-submersible rigs.

Mobile offshore drilling units (MODU) are certified for seaworthiness through an appropriate marine certification programme (eg. Det Norske Veritas (DNV), American Bureau of Standards (ABS), etc). This certification, and the application of operating standards and training minimise the possibility of an offshore accident. The Department of Mineral Resources regulates safety on offshore drilling units by application of the Mine Health and Safety Act.

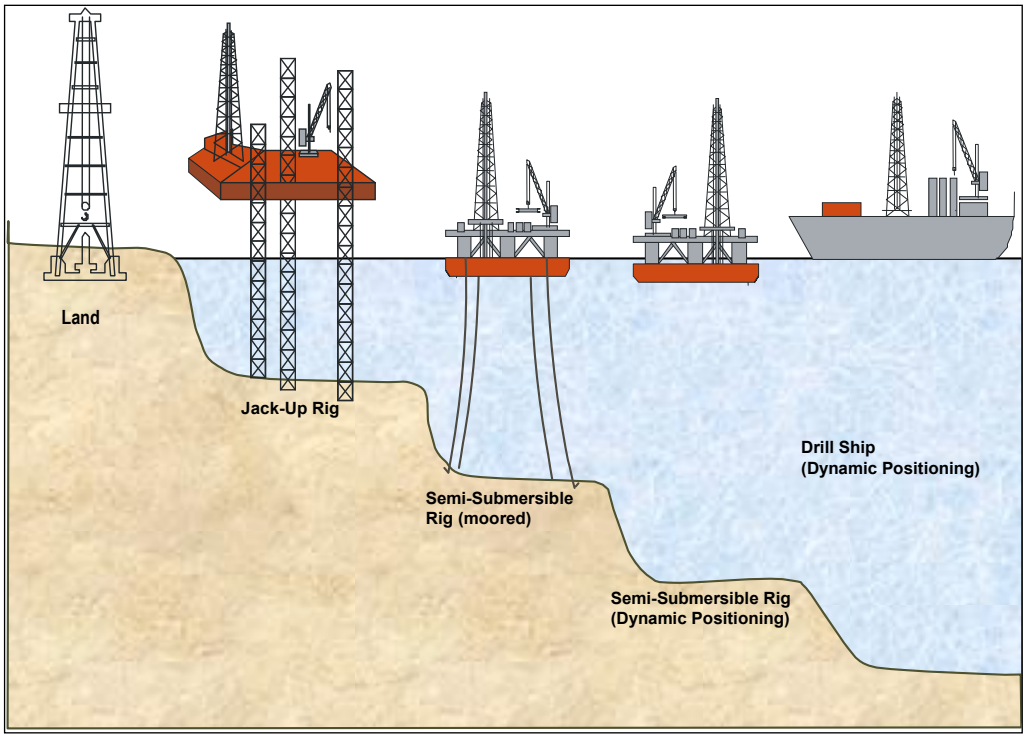


Figure 3: Drilling Rig Types

The duration of drilling operations depends on the type of well being drilled and the depth of the well. During offshore drilling operations a temporary 500m statutory safety zone is placed around the drilling unit and only the drilling unit's support vessels may enter this zone during this period. A bigger safety zone would be required for certain activities (eg. demersal trawling) as the drilling unit's mooring system may extend 1500m or more along the seabed.

After mooring the drilling unit a drill string with a large bit is run to spud a hole in the seabed and conductor pipe is run and cemented in the hole. A smaller bit is then run on the drill string to pass through the conductor pipe and continue drilling below it. A wellhead is then run on casing and cemented in the hole with the wellhead at seabed. A Blowout Preventer (BOP) is run on a marine riser to connect the drilling unit to the wellhead. The marine riser is compensated

to accommodate the movement of the drilling unit and the BOP has seal elements which can be closed to contain well pressure during drilling should this be necessary. A Drilling Subsea BOP Stack is shown in Figure 4.

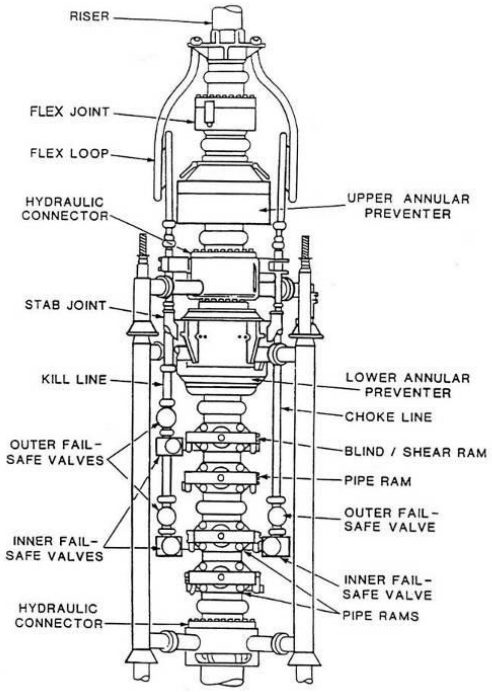


Figure 4: Drilling Subsea BOP Stack

Drilling fluid or 'mud' is used during drilling as the primary method of controlling the well pressure and to stabilise the wellbore, lubricate and cool the drill bit and remove the drilled cuttings from the well. With the marine riser in place the mud circulation system is closed and the mud and drilled cuttings are returned to the drilling unit. A solids control system removes the drilled cuttings from the mud at surface and discharges them below sea level. A smaller bit is run on the drill string through the marine riser and casing to continue drilling and further casings are run and cemented in the hole at certain intervals to isolate subsurface formations and provide structural support until the geological target and total depth are reached. A typical well casing arrangement is shown in Figure 5.

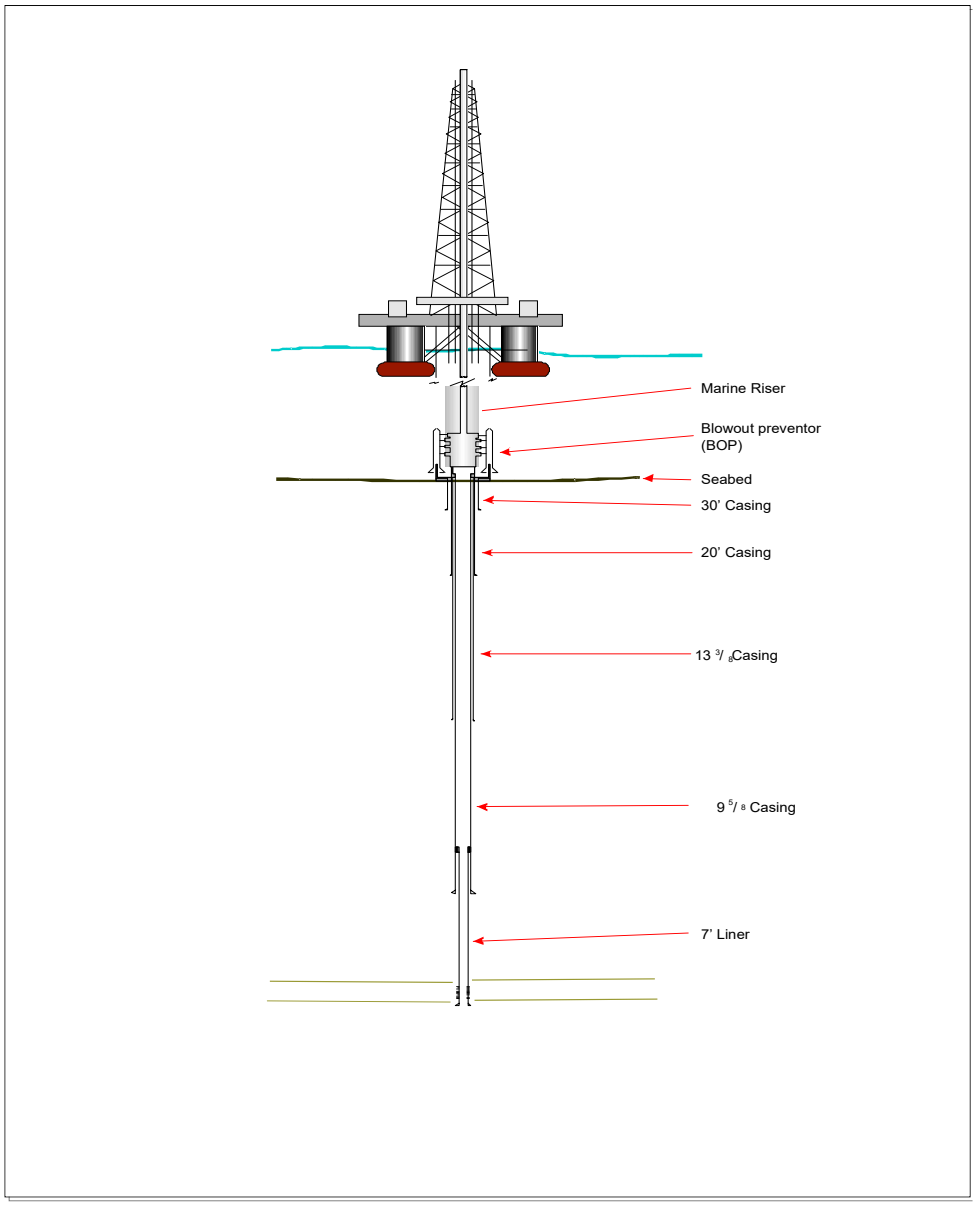


Figure 5: Typical well casing arrangement

Electric logs are run in the well on reaching the geological target and total depth to establish the presence of hydrocarbons. If the electric logs indicate good results the well may be tested in which case a final casing (or liner) will be run and cemented in the hole. The well is then displaced to brine before running perforating guns on tubing with a downhole packer and valves to perform a well test. The tubing is landed in the wellhead and the BOP closed and downhole packer set before perforating the casing (or liner) and flowing the well to surface. Various tests are performed on the well with produced hydrocarbons flared off at surface. The tubing is displaced to brine again and the well killed before pulling out of the well at the end of the test.

Whether the well is tested or not, cement plugs will be set in the well to isolate the formations from each other and surface. The wellhead will be left in place with a corrosion cap if the well is to be suspended for later re-entry or it will be removed if the well is to be permanently abandoned.

1.5 EMPR CONTEXT AND PURPOSE

The original EMPr for Prospect Well Drilling in Block 9 was compiled by CCA in October 1997 for SOEKOR E and P (Pty) Ltd., and was approved in terms of section 39(4) of the Minerals Act No. 50 of 1991. EMPrRs have also previously been compiled for seismic surveys in Blocks 9 and 11a.

PetroSA (formerly SOEKOR E and P) intends to undertake exploration drilling in Block 9 and 11a in the foreseeable future in order to determine the presence of additional hydrocarbon reserves. In support of continual improvement and ensure the documentation reflects current accepted good practice in the oil and gas industry, PetroSA requires a revised EMPr that is in line with current legislation.

The EMPr has been updated and amended at various stages of the ER. The following specific EMPr updates are noted:

1.5.1 2014 EMPR UPDATE

The revised and updated Environmental Management Programme (EMPr) (2014 EMPr ~~this document~~) reflects changes that took ~~have taken~~ place in the company structure, legal requirements and operational best practice for drilling activities. Specifically, the EMPr was ~~has been~~ upgraded to:

- Comply with the requirements of the NEMA and MPRDA (No. 28 of 2002) as amended;
- Supersede previous versions of the EMPrs encompassing drilling activities in Block 9 and 11a;
- Contain the same standards and reporting requirements as the EMPrs for production areas in Block 9.
- Focus on environmentally-related activities for which staff involved in drilling activities is directly responsible. The EMPr therefore does not deal with activities such as:
    - corporate social responsibility programmes, and
    - health and safety (for which operational procedures exist for drilling subcontractors) except where such issues can have environmental consequences.
- Integrate with existing PetroSA management systems and procedures, primarily the environmentally-related issues within the Safety, Health and Environment Quality (SHEQ) procedures. Accordingly, this EMPr summarises key elements of PetroSA's procedures that are relevant to environmental management to facilitate environmental compliance and performance auditing.

1.5.2 2025 EMPR UPDATE

PetroSA is required to implement the exploration activities (as approved in the work programme) in accordance with the requirements of the approved EMPr. A Regulation 34 National Environmental Management Act (Act 107 of 1998-NEMA), Environmental Impact Assessment Regulations (GNR982)(EIA Regulations) compliance audit was conducted in 2025. The findings of the audit included recommendations to amend the EMPr. This EMPr reflects these amendments and will, once approved, form the EMPR to be implemented for future exploration activities. The 2025 amendments focus on addressing insufficient impact management outcomes and actions, as identified in the 2025 Audit.

The 2025 amendments are reflected in the EMPr in blue text for ease of reference. Where aspects of the 2014 EMPr have been removed in this 2025 amendment, such are presented with strike through text.

2 SECTION 2: GENERAL CONTEXT

2.1 OVERVIEW OF ENTIRE BLOCK 9 AND 11A ACTIVITIES

2.1.1 BLOCK 9

- SOEKOR E and P (PTY) Ltd. obtained authorisation for seismic surveys within Blocks 9 offshore the Republic of South Africa through Section 39 (4) Mineral Act 1991 (50 of 1991). The authorisation for

seismic surveys was converted to exploration rights under the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). This right was acquired by virtue of a cession by SOEKOR (PTY) Ltd. to SOEKOR E and P (PTY) Ltd. of its rights and obligations contained in the principle lease OP26 insofar as it relates to Blocks 9. All activities within Block 9 were previously regulated by the terms and conditions of OP26 and the Mining Lease issued pursuant thereto.

- Since 1992, PetroSA (previously SOEKOR and Mossgas) has been undertaking offshore gas and oil production in the Block 9 area (see Figure 2.1).
- PetroSA submitted an application for new order rights in 2007 in line with the MPRDA and applied for renewal of these rights in 2010, 2014 and 2019.
- The seabed in the area also contains structures that have resulted from Soekor and PetroSA's exploration activities. There are a number of wellheads on the seafloor in Block 9, with approximately 24 wellheads within the "Blues" fishing grounds. The well names and co-ordinates of all the wellheads off the South African coast are included in Notice 16 (Offshore Underwater Obstructions) of SAMSA's (or SANHO's) South African Annual Notice to Mariners.
- There are major international and local shipping routes passing through the area, and demersal trawling also occurs. Surface structures such as drilling installation have 500m radius exclusion zones around them which exclude unauthorised traffic. All other infrastructure on the seafloor is demarcated by a 500 m safety zone, around or on either side of it, which does not exclude traffic but prohibits anchoring and trawling. In addition, drilling installations have markings and warning lights to alert shipping and fishing and other vessels to their presence.
- Approximately 90 -120 people are employed on the drilling rig for two – four weeks at a time. Helicopters are used to convey people between George Airport and the drilling unit and supply vessels are used to convey equipment and other goods between Mossel Bay and the offshore drilling unit and return waste to shore as required.
- Operation and maintenance of the installation, requires the use of fuels, biocides, cleaning agents, medical supplies, oils, paints, spare parts and other goods and chemicals.
- Good housekeeping and regular maintenance are undertaken to ensure all is kept in good working order and repaired in time to prevent significant overflows, spills, losses or a major accident.
- PetroSA approved standard procedures form the framework for any mishaps or emergencies as a result of any drilling activities.

2.1.2 BLOCK 11A

- 12 exploration wells have been drilled in Block 11a between 1968 and 1990 to depths ranging from 2273 to 4396 m.
- 2D and 3D seismic surveys have been undertaken.
- No wells are under production in Block 11a.

Figure 6 shows the location of all existing hydrocarbon production areas in Block 9.

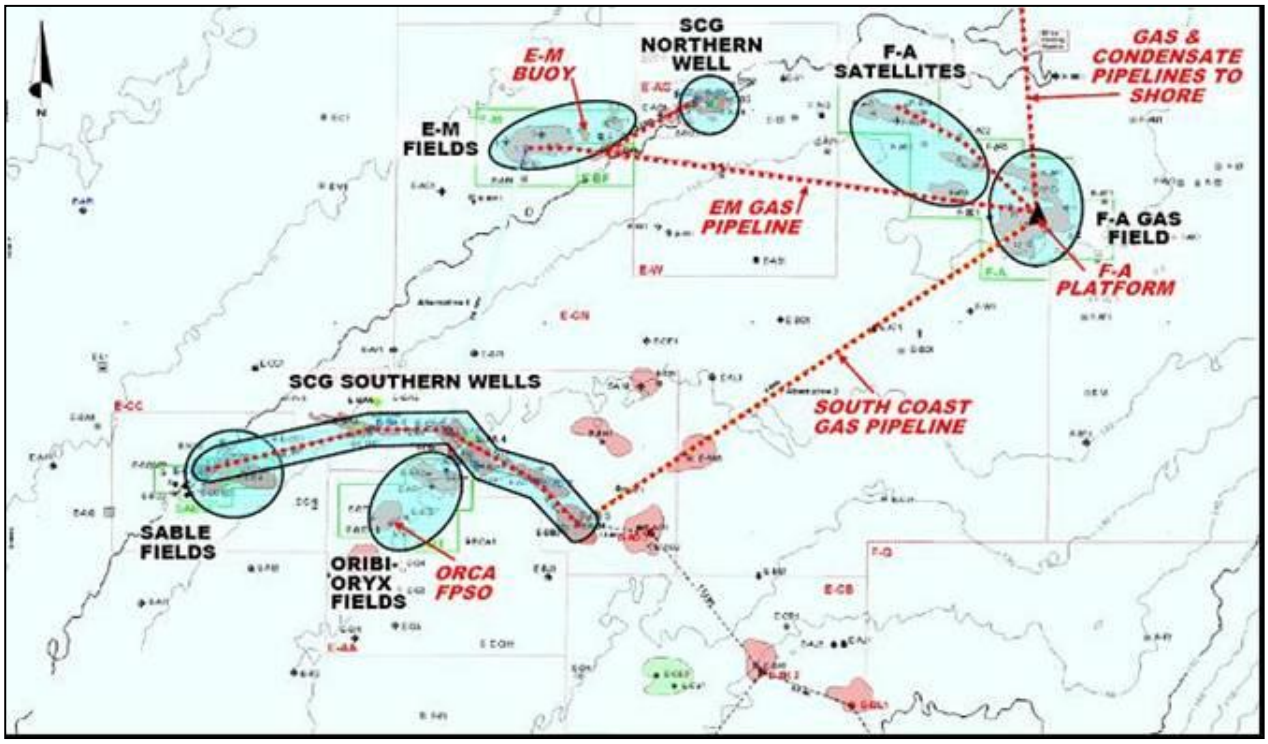


Figure 6: Location of all hydrocarbon production areas in Block 9 (circled with names in black) covered by updated EMPRs. All except Oribi and Oryx are producing gas via the FA Platform.

2.2 SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT

The exploration areas of Block 9 and 11a are located on the Agulhas Bank south of Mossel Bay (Figure 7).

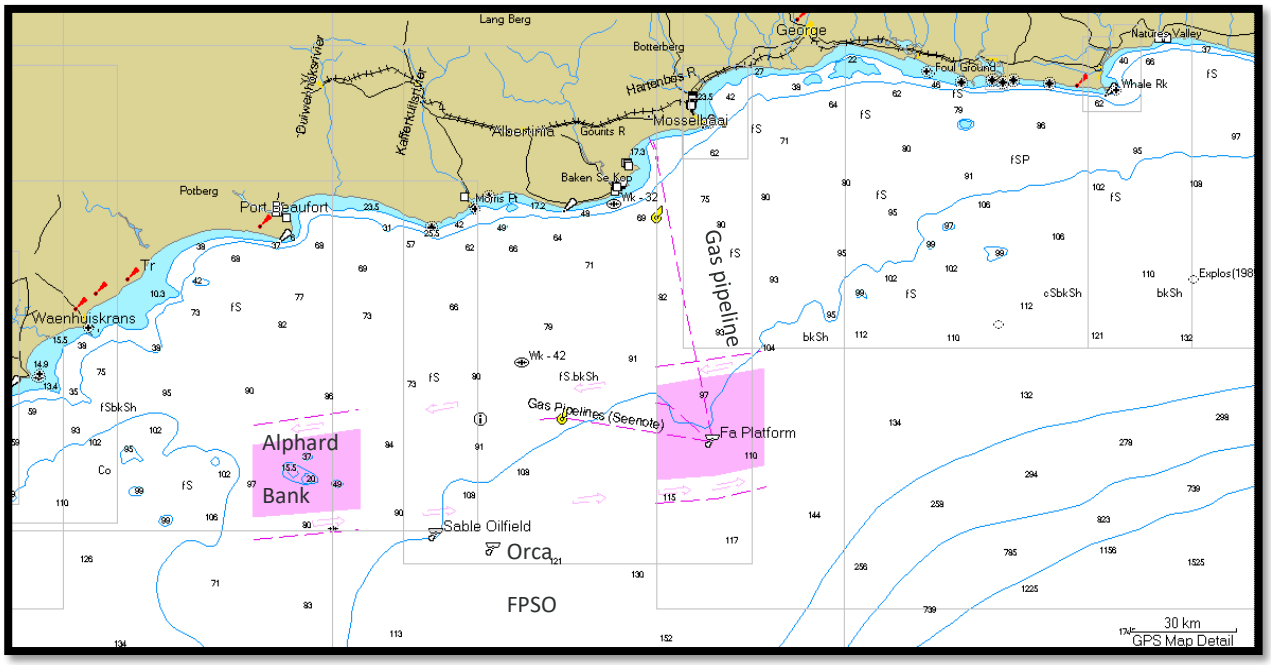


Figure 7: Chart showing bathymetry and location of gas and oil fields offshore of Mossel Bay, South Africa (Map Source 2010).

This summary environmental description has been compiled from scientific publications on the region (see synthesis of research on the Agulhas Bank in the 'South African Journal of Science' Volume 90, 1994) and information contained in assessments for developments and proposed developments in the region, e.g. the South Coast Gas Development Project (PetroSA 2006). Information was also taken from Chapter 4 of the E-BT Environmental Impact Assessment (CSIR, 1995) and this document should be sourced for further details and references. The information presented here provides a broad overview of Agulhas Bank oceanography and ecology and includes a description of the coast and its important features. The description is focused on the environmental components that are most likely to be affected by offshore exploration, operational activities and decommissioning of the facilities. These are the water column and seafloor in the immediate areas of the operation and the dependent ecosystem service of fisheries.

2.2.1 REGIONAL OVERVIEW

The study area comprises the continental shelf area (water depth <200m) extending from Cape Point to Cape Padrone in the east. The major feature of the region is the Agulhas Bank, the largest continental shelf off the South African coast. The Agulhas Bank is roughly triangular and, within the 200 m isobath, encloses an area greater than 100,000 km^2. From the coast, water depths increase sharply to approximately 50 m and then more gradually to 200 m which marks the offshore boundary of the Agulhas Bank. The eastern margin of the Bank is under the influence of the Agulhas Current (the western boundary current of the southern Indian Ocean) whilst the western margin is part of the southern Benguela current with its typical coastal upwelling characteristics. The Agulhas Bank extends over 9° of longitude and for convenience is divided into western, central and eastern sections.

Winds in the project area are mainly zonal with an approximate annual balance between westerly and easterly winds. There is seasonal asymmetry with westerly winds dominant in winter and spring whilst easterly winds occur most frequently in summer. Gales (winds >60 km/hr) are most common during winter whilst calm conditions are characteristic of autumn.

The Agulhas Bank is a transition zone between the major oceanographic features of the warm Agulhas Current to the east and the cooler Benguela Current to the west. The Agulhas Current supplies most of the seawater on the eastern and central portions of the Bank mainly through frictional upwelling on its inshore margin but also through eddies that invade the area. As it is upwelled water from mid-depth in the Agulhas Current subsurface waters on the Agulhas Bank can be cool (10-12 °C) although they may be overlain by warmer water in summer. This leads to the development of very strong thermoclines in the central areas of the Agulhas Bank and, under easterly wind conditions, causes coastal upwelling at the pronounced capes on the coastline in summer. In winter, water column stratification is generally broken down by the vigorous winds and cooler atmospheric temperatures that occur in this season. A prominent summer to autumn oceanographic feature of the central Agulhas Bank is the subsurface ridge of cool water that generally extends offshore in a SW direction from Cape St Francis and terminates on the middle Agulhas Bank ~140 km south of Still Bay. Water (current) circulation on the central Agulhas Bank appears to be mainly cyclonic around the cool water ridge with near-shore flows directed eastwards and a south westward flow offshore.

The Agulhas Bank supports commercially important populations of pelagic fish (sardine, anchovy, horse mackerel), demersal species (hake, kingklip, snoek, kob, sparids, sole, gurnard and monkfish) amongst other species, squid, and large pelagic species, such as tuna. The area is critically important in the life-cycle of sardine and anchovy and associated predators such as African Penguin and Cape Gannet. Whales and dolphins resident on the Agulhas Bank include Bryde's whale (population size = 600), common dolphin (15 000-20 000 individuals), bottlenose and Indo-Pacific humpback dolphin and killer whale (population size <100). Southern right and humpback whales are seasonal (austral winter/spring) visitors with the former breeding in shallow, inshore bays. Humpbacks generally migrate through the region into subtropical waters in and north of Mozambique to breed (Best 2007). A further 24 cetacean species have been recorded as occasional visitors. Loggerhead and leatherback turtles have been recorded in the region as by-catch in the pelagic long-line fishery (Petersen *et al.,* 2009) although frequency of occurrence is low, implying a small population size in the area.

Clearly, the Agulhas Bank is immensely important for marine biodiversity, and the goods and services dependent on this, mainly commercial fishing.

2.2.1.1 PHYSICAL COASTLINE

The coastline between Cape Point and Cape Padrone is exposed and rugged, has few truly sheltered embayments and is dominated by a high energy wave regime and strong winds throughout most of the year. There are 81 small estuaries in the region between Cape Point and Woody Cape which have irregular connections with the sea. In South Africa an estuary is considered to be that portion of a river system which has permanent and/or intermittent contact with the sea.

2.2.2 PROJECT AREA DETAILS

2.2.2.1 TOPOGRAPHY AND SEDIMENT DISTRIBUTIONS

The seafloor in the project area is flat with water depths ranging between 100 m and 115 m. Seafloor sediment texture ranges from silty sand (on the 'Blues' fishing ground) to sand and gravel around the FA Platform (Figure 8). ROV surveys of pipeline routes confirm the presence of silt and clayey sands in the west but show that east of 21°50' E the seafloor becomes rocky.

There are no known high relief rock reefs in the region apart from Alphard Bank, 118 km west of the FA Platform and ~40 km north west of the Sable gas and oil field (Figure 7).

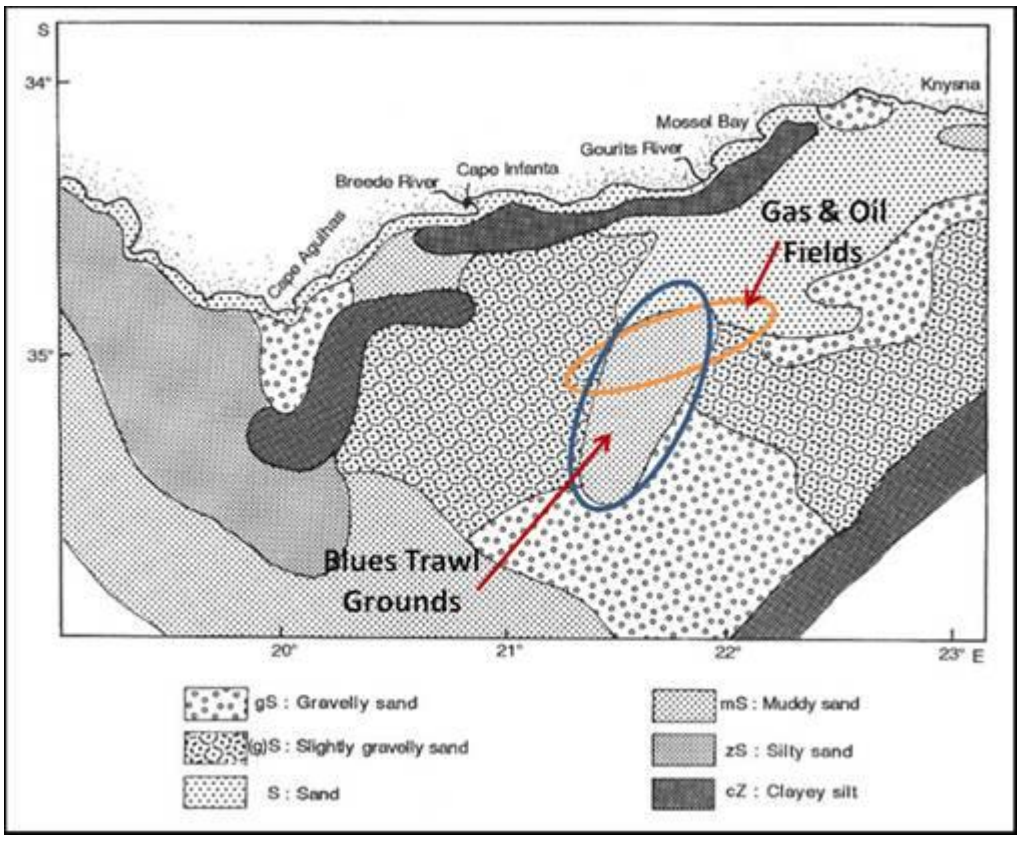


Figure 8: Seafloor sediment distributions offshore of Mossel Bay. The approximate locations of the PetroSA gas and oil fields and the Blues trawling grounds on the central Agulhas Bank are shown (modified from Le Clus et al., 1996).

2.2.2.2 OCEANOGRAPHY

The major oceanographic feature of the project area is the 'cold ridge' that lies across the central Agulhas Bank extending out from the coast between Cape Seal and Cape St Francis along the 100 m isobaths. Figure 9 shows a schematic of this feature in relation to the project area. The 'cold ridge' is a semi-permanent feature of the region in

spring and summer and is considered to be linked to oceanic forcing by the Agulhas Current. The 'cold ridge' separates an area of intense thermocline development in spring and summer (5 °C-11 °C/10 m) in the inner Agulhas Bank waters between Cape Agulhas in the west and Cape St. Francis in the east, from less intensely developed thermal stratification (3 °C-7 °C/10 m) in deeper offshore waters. There is a corresponding difference in circulation with cyclonic flow around the ridge with currents offshore of the ridge flowing westwards whilst to the inshore the flow is mainly eastwards.

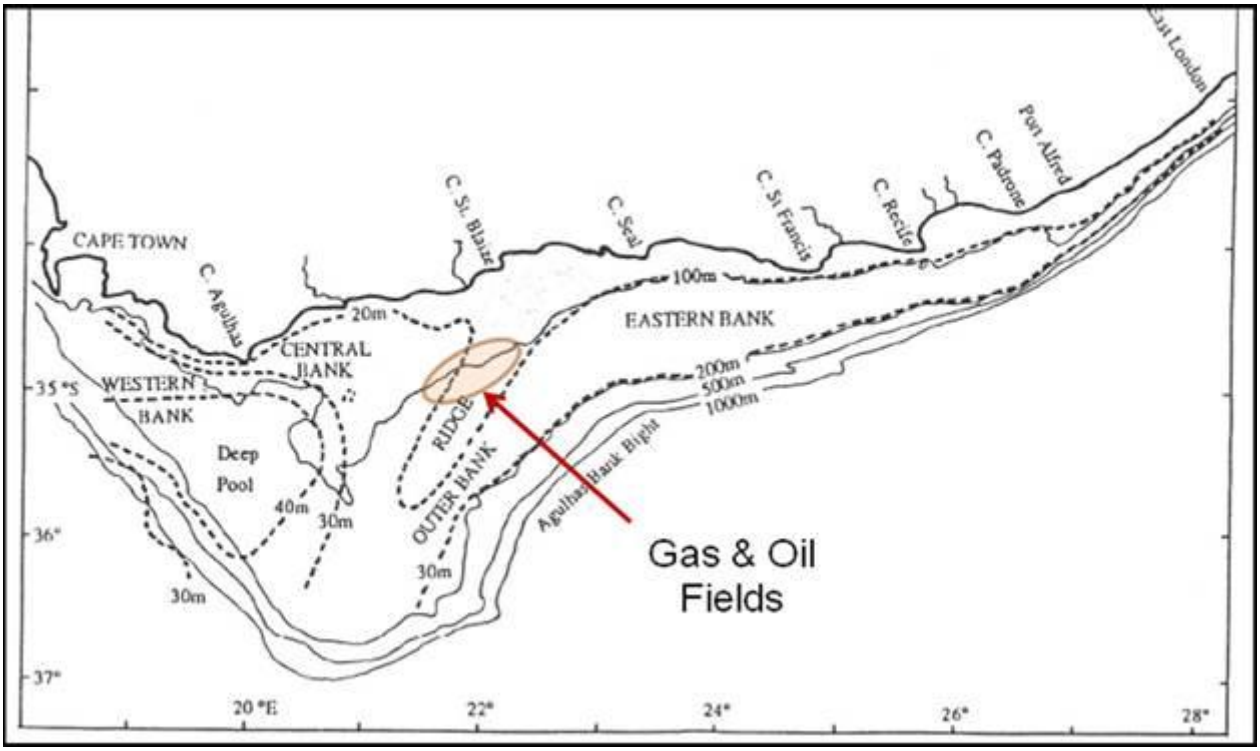


Figure 9: Schematic of thermocline distributions in spring and summer on the Agulhas Bank in relation to the PetroSA gas and oil fields. Dotted lines show thermocline depths whilst solid lines show bathymetry (Modified from Probyn et al., 1994)

Large ocean waves on the Agulhas Bank are generally associated with weather systems passing south of South Africa (e.g. CSIR 2009) and as such they are episodic features and have a seasonal distribution. High wave persistence is also seasonally distributed with mean durations of >3.0 m waves ranging from 15.7 hours in summer to 23.5 hours in the stormier winter (Table 1a). There is an inverse distribution of calmer conditions with longer periods of lower waves being recorded in summer than in the other seasons (Table 1b). Note, however, that wave distributions on the Agulhas Bank are highly variable as indicated by the standard deviations being larger than the mean values listed in Table 1.

Table 1: Wave persistence statistics for waves in the vicinity of the FA Platform (modified from CSIR 2009).

a) Waves >3.0 m

Period	Mean (hrs)	Std dev. (hrs)	N observations
Annual	20.0	25.0	1215
Summer	15.7	20.8	306
Autumn	18.7	21.6	304
Winter	23.5	27.9	401
Spring	20.4	26.1	204

b) Calms (waves <3.0 m)

Period	Mean (hrs)	Std dev. (hrs)	N observations
Annual	62.4	94.5	1214
Summer	87.5	122.7	304
Autumn	65.0	93.0	303
Winter	37.7	51.9	399
Spring	55.4	77.7	208

2.2.2.3 **ECOLOGY**

2.2.2.3.1 PLANKTON

The 'cool ridge' across the central Agulhas Bank and its associated shallow thermoclines lead to the development of intense subsurface phytoplankton biomass maxima at the base of the upper mixed layer or in the thermoclines themselves. Biomass can attain >10 µg chl*a*/litre but these high concentrations are generally restricted to narrow layers of <10 m thick. This phenomenon is interpreted to be a result of the interplay between light and nutrient availability in controlling phytoplankton production. Upper mixed layers are nutrient limited but have high light levels whereas sub-thermocline layers are nutrient rich but dark. Phytoplankton is sustained by vertical diffusion of nutrients into the lower euphotic zone allowing positive net growth. Despite marginal light conditions phytoplankton population doubling times under these conditions can be short ranging from 0.64 to 1.72 days at the depth of maximum phytoplankton production (Carter *et al.,* 1987). Overall phytoplankton production is 200-800 mg C/m^2/hr with generally large-celled diatoms and dinoflaggelates dominating the subsurface phytoplankton community.

The relative seasonal permanency of the 'cool ridge' and its associated productive phytoplankton populations allows the development of substantial populations of the large zooplanktonic calanoid copepod *Calanus agulhensis.* This species dominates the zooplankton comprising 44-64% of the total copepod biomass in the region. The life-cycle of *C. agulhensis* is linked to the development of the 'cool ridge' and its circulation features and is an important prey item of small pelagic shoaling fish (anchovy, sardine, red-eye), and probably juvenile chokka squid, which occur on the Agulhas Bank.

2.2.2.3.2 PELAGIC FISH

The important small pelagic fish species on the Agulhas Bank are anchovy, sardine and red-eye. The estimated collective biomass of these species is estimated at 2 to 3 million tonnes during summer. Horse mackerel are also abundant on the Agulhas Bank with estimated biomass of up to 850 000 tonnes. All of these species forage on plankton, primarily zooplankton, and are thus ultimately critically dependent on oceanographic processes and water quality that sustain local phytoplankton production.

2.2.2.3.3 DEMERSAL FISH

The Agulhas Bank supports a diverse assemblage of demersal fish species with 14 trawl fish species and 16 'common' line fish species listed for the region (Japp *et al.,* 1994). Cape hakes, gurnards and panga dominate the biomass of the former while east coast sole are important on the coast parallel mud belt shown in Figure 8 above. Carpenter, kob, geelbek and yellowtail comprise large proportions of the line-fish assemblage.

2.2.2.3.4 PELAGIC PREDATORS

The important predator groups on the Agulhas Bank, listed by Smale *et al* (1994), comprise:

- Fish such as the migratory tunas, sharks, geelbek, snoek, yellowtail, and the inshore species elf and leervis;
- Seabirds including resident species such as African Penguin, Cape Gannet, Cape Cormorant, gulls and terns and various migratory species such as albatrosses, petrels, shearwaters, prions, terns and skuas, and
- Seals and cetaceans including Cape fur seal, resident cetaceans such as dolphins, killer and Bryde's whale; seasonal visitors including southern right and humpback whales, and occasional visitors to the region including a number of dolphin species, pilot whale species, sperm, beaked, minke, blue, sei and fin whales.

2.2.2.3.5 BENTHOS

There are three main habitat types in the project area; the muddy sand of the 'Blues' fishing ground, gravelly (shell debris) sand and exposed low relief rock and rock debris (Quick and Sink 2005). Benthos distributional data in these habitats are limited to that obtained in opportunitstic and dedicated ROV surveys and the quantitative assessment of benthic infauna on transects extending from an oil well in the Oribi and Orxy field within Block 9 (Sink *et al* 2010).

Benthic epifauna on sand substrates in the Sable field exclusion zone include burrowing heart urchin *Spatangus capensis* (abundant), starfish, sponges, whelks, horsemussels, crabs, the urchin *Echinus gilchristi* and burrowing tube anemones *Cerianthus* sp. This latter species was the dominant epifaunal species present on soft substrates in the 'Blues' fishing ground followed by the burrowing urchin *Brissopsis lyrifera capensis*. Other fauna observed to be present by Sink *et al.* (2010) were starfishs, crabs, horsemussels, seapens and the urchin *E. gilchristi.* The notable differences between the trawled and non-trawled areas in terms of epifauna were the absence of the burrowing heart urchin in the former and the absence of *B. lyrifera. capensis* in the latter. Unfortunately the observational data are too limited to attribute such differences to the disturbance of seafloor fauna by demersal trawling.

No observational data are available for the other natural seafloor habitat types in the gas field but Quick and Sink (2005) predict relatively high benthos biodiversity in the physically stable gravelly sand habitat with fauna including seapens, molluscs, echinoderms, cerianthids, sponges and south coast rock lobster. The low relief rock and rock debris habitat benthos community includes sponges, black corals and ascidians, and probably soft corals, lace corals, bryozoa, echinoderms, south coast rock lobster and other crustaceans. Quick and Sink (2005) consider the low relief rocky reef benthic fauna to be vulnerable to physical disturbance mainly due to the apparent longevity of the characteristic fauna. This also applies to the benthos on the gravelly sand habitat.

Quantitative soft sediment benthic infauna surveys on the adjacent Oribi and Oryx oil field showed that crustaceans and polychaetes were numerically dominant, comprising 91% of the benthos community with echinoderms, molluscs and 'other taxa' making up the remaining 9% of the numbers. Although only contributing ~4% of the taxon abundance, because of their larger body sizes, echinoderms completely dominated the biomass distribution making up 86% of the benthic infauna sampled.

Species diversity was uniform across all of the benthic infauna sites samples but multivariate analysis showed distinct differences between sites closely adjacent (250 m) to the oil well investigated by Sink *et al.* (2010) and those distributed at distances greater than 500 m. These differences are attributable to variations in the abundance of a single crustacean amphipod species and a single polychaete species within the overall infauna community sampled. The ecological significance of these differences is unknown. Following this trend of slight differences down putative disturbance gradients variations in infaunal abundance and biomass between trawled and untrawled sample sites were also slight. Multivariate analyses do indicate differences in that the trawled and untrawled sample sites did form separate groupings but the similarity levels were high at 70%-80%. It is notable that large (and long-lived) fauna such as the burrowing urchin *B. lyrifera capensis* and brittle stars (*Ophiuroidea* sp) appeared to be common in the trawled area sample sites, indicating perhaps that disturbance from trawling was not intense at these sites.

The biofouling community on the gas field infrastructure (FA platform, flowlines, umbilicals, mattresses, well heads etc) has been described by Sink *et al.* (2010). The community is structured with depth; above 30 m depth the community resembles that of the inter- and shallow sub-tidal on the adjacent southern Cape coastline whilst below this depth the biofouling community is largely distinct from this and the benthic communities on deep water reefs in the area. In the shallower depths mussels (*Perna perna* but also *Mytilus galloprovincialis*) and barnacles (giant and gooseneck) form dense clumps along with the ascidian *Pyura,* sponges, anemones and bryozoans. Below 30 m the biofouling community is relatively reduced with barnacles, anemones, sponges and hydroids dominating. Below 70 m biofouling biomass is typically low with the community dominated by anemones (including *Sagartia elegans* and *Metridium senile*, the latter at low numbers) and low densities of barnacles may be present along with hydroids. Piles of mussel/barnacle shells and shell debris are present on the seafloor below and adjacent to the FA platform, most probably derived from the biofouling community on the upper parts of the structure. Starfish (*Marthasterias glacialis*) are present on these piles and the adjacent sandy seafloor and probably prey on dislodged mussels.

Gas field infrastructure lying on or near the seafloor support biofouling communities in which the introduced invasive anemone species *S. elegans* and *M. senile,* and other suspected alien species such as ascidians, are represented due to the habitat created by the infrastructure. Sink *et al.* (2010) recorded these fauna on flowlines and mattresses, wellheads, umbilicals and mooring chains. Other fauna associated with the infrastructure include urchins (*E. gilchristi*¸ *Paraechinus angulosus*), starfish, gorgonians (apparently rare), anemones, crabs, Cape and south coast rock lobster.

The important observations made by Sink *et al.* (2010) include the facts that a) the deep biofouling community is distinct from that on adjacent reefs, b) there were no appreciable populations of sparid reef fish associated with the gas field infrastructure and c) the invasive alien anemone species *S. elegans* and *M. senile* were ubiquitously distributed on it. These indicate that the gas field infrastructure is probably unimportant in maintaining the natural biodiversity of the middle continental shelf region of the Agulhas Bank and that it may be an important reservoir of alien invasive species in the area.

2.2.3 ECOSYSTEM SERVICES

2.2.3.1 **COMMERCIAL FISHERIES**

Commercial fishing is the only ecosystem service in the project area. Figure 10 shows the distribution of the main fishing operations on the Agulhas Bank in the vicinity of Block 9. Demersal trawl fishing on the 'Blues' fishing ground targeting hakes is the dominant activity in the Block 9 project area and is regarded as a prime fishing area. Fishing activities in the vicinity of Block 11a mainly comprises longlining for hake; inshore trawling for sole and line trapping of south coast rock lobster.

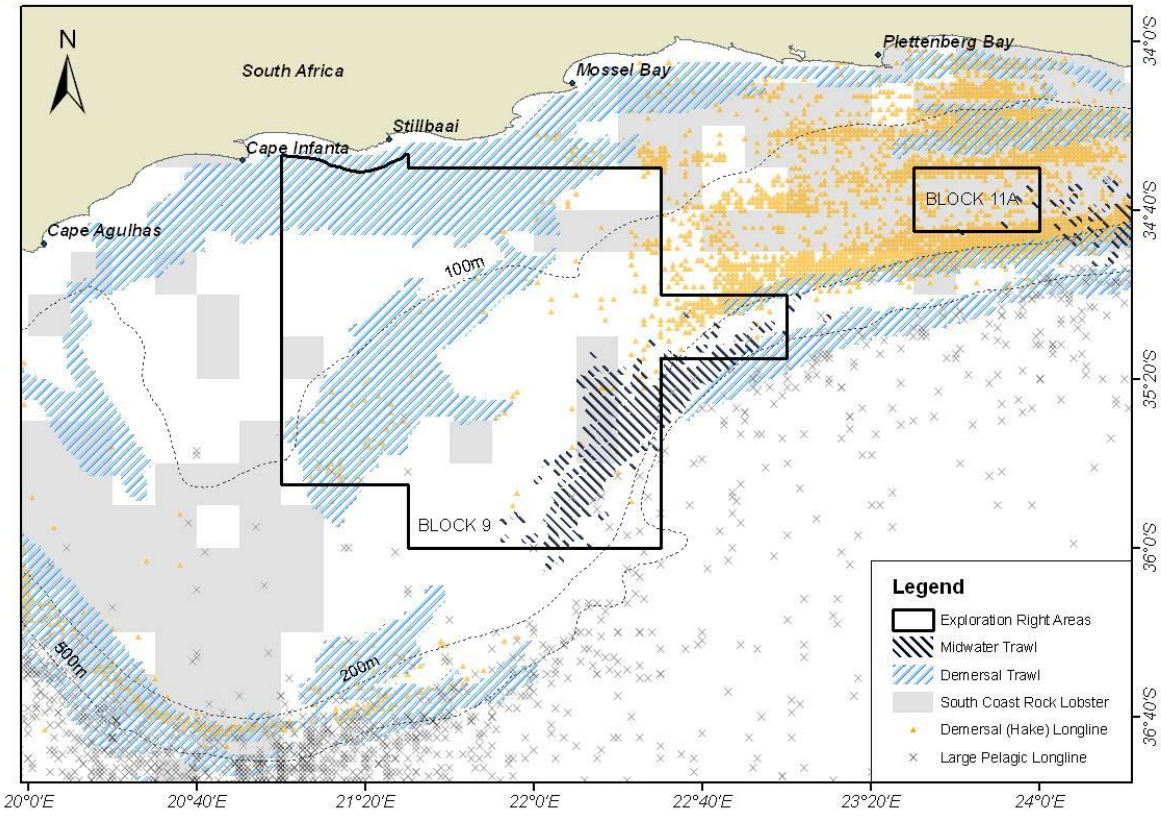


Figure 10: Distribution of the main commercial fishing activities on the Agulhas Bank relative to the Block 9 and 11a blocks (figure supplied by Japp 2011).

South African demersal trawl fish catch data is collected for 1/3 degree squares (i.e. 20nm x 20nm) and the commercial grid blocks for the Block 9 study area are designated as 553, 554, 555, 539, 540 and 541 (Wilkinson and Japp, 2005). Average annual landings from the 'Blues' fishing ground by the inshore trawl fleet over the 10-year period 1999-2008 are 3006 metric tonnes.

Fifty-nine percent of the 'Blues' fishing ground annual landings are derived from the commercial grid blocks in the project area, although catches are not uniformly geographically distributed as commercial grid blocks 554 and 555 contributes 66 % of this. Further, Wilkinson and Japp (2005) state that it is only in commercial grid 554 that there is any important interaction between oil and gas field operations in Block 9 and the fishing industry, mainly. through implementation of exclusion zones around subsea infrastructure. The landings data for the 'Blues' fishing ground summarised above cover the period 1999-2008 when most of the oil and gas infrastructure in the project area had already been established. Therefore associated disturbances, if any, that may have been caused by the infrastructure installation and/or operations are already reflected within the fisheries data.

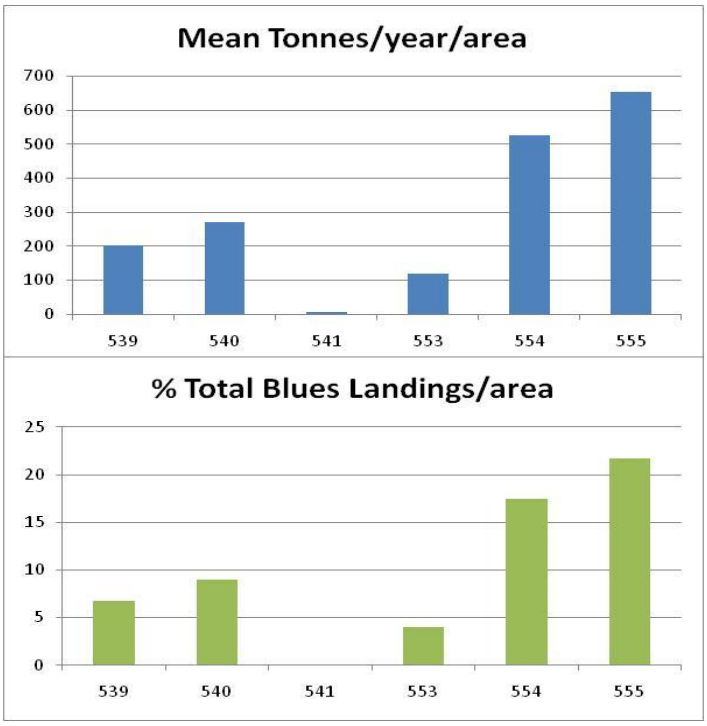


Figure 11: Distribution of demersal trawl landings in the commercial grid blocks in the Block 9 project area and respective proportions of annual 'Blues' trawling ground catches (data from Wilkinson and Japp 2005 and Capricorn Fishing (Pty) Ltd).

2.2.3.2 **CONSERVATION**

The Agulhas Bioregion supports a large proportion of the RSA's endemic marine species including sea breams (Sparidae), octocorals and algae (Lombard *et al.,* 2004) and the sub-photic component of the bioregion is rated as 'vulnerable' according to biodiversity conservation status (http://soer.deat.gov.za/582_ToX-KQ9X4Mk.img). Conserved areas, in the form of Marine Protected Areas (MPAs) comprise <2% of the Agulhas Bioregion. This is insufficient for marine biodiversity protection and falls short of the national biodiversity conservation action plan that targets 30% of untrawlable ground for protection (Quick and Sink 2005). Seafloor areas within the project area may be suitable for this as they fringe the intensely trawled 'Blues' fishing ground and include low relief reef and gravelly sand habitats. Both of these habitats were trawled primarily for panga in the 1980s but have since been left undisturbed (Japp *et al.,* 1994, 2004). However, the status of the benthos and associated fauna in these habitats is unknown and this would need to be determined prior to any steps being taken on biodiversity conservation.

2.3 ENVIRONMENTAL VULNERABILITIES AND POTENTIAL IMPACTS OF DRILLING

The environmental components most likely to be affected by the exploration drilling are the water column and seafloor in the immediate areas of the operation and the fishing activities. Points of interaction between drilling activities and the environment are shown in Table 2 below.

Table 2: Summary of interaction points between drilling activities and environmental components (modified from CCA 1997).

Phase of Activity	Drilling Activity	Geology & Sediment	Oceanography	Physical Surrounds	Fauna & Flora	Historical / Cultural Sites	Recreation	Transport routes / Navigation	Mariculture	Commercial Fishing	Air Quality	Potential for small spills	Potential for large spills
Establishment	Anchor laying	X		X	X					X			
	Rig transport							X		X		X	
Operations	Drilling muds		X	X	X							X	
	Drilling cuttings		X	X	X							X	
	Well drilling		X	X	X							X	X
	Well testing		X		X							X	X
	Deck drainage		X		X							X	
	Sewage		X		X								
	Galley waste		X		X								
	Ballast water		X		X								
	Detergents		X		X								
	Operating lights				X								
	Gas flaring				X						X		
	Power generation										X		
	Fuel bunkering		X		X			X		X		X	X
	Fuel storage											X	X
	Drilling rig presence									X			
	Waste incineration										X		
	Chemical storage											X	

Phase of Activity	Drilling Activity	Geology & Sediment	Oceanography	Physical Surrounds	Fauna & Flora	Historical / Cultural Sites	Recreation	Transport routes / Navigation	Mariculture	Commercial Fishing	Air Quality	Potential for small spills	Potential for large spills
	Waste transfer & disposal to land		X	X	X			X		X	X	X	
	Radioactive materials												
Decommissioning	Capping wells	X			X							X	
	Well plugging	X			X							X	
	Removal of wellheads	X			X								
	Anchor removal	X			X								
Post closure	Exclusion zone - suspended wells				X					X			

2.3.1 WATER COLUMN

The region in which exploration drilling may take place in future is important for the generation and maintenance of zooplankton populations that sustain small pelagic shoaling fish such as anchovy, sardine and red-eye. The dominant copepod found in the area, *Calanus agulhensis*, is considered to be a primary prey item for chokka squid juveniles and may thus be critical in recruitment of squid to the fishery.

Risk sources from drilling activities include discharges of contaminated water from machinery spaces, spillages during fuel bunkering, improperly treated domestic wastes, and discharge of drilling cuttings, etc. Risk sources from upset conditions include the effects of accidently discharged oil, condensate and hydrogen sulphide and other contaminants associated with natural gas (methane is the dominant component of natural gas, and this has a low water solubility, readily disassociates to carbon dioxide and water in the presence of oxygen, and has very low toxicity should this be accidently discharged). Toxic effects on plankton may also occur from accidental release of diesel and other fuels during refuelling of drilling vessels or rigs at sea. Risk sources from decommissioning (suspension or abandonment) of wells are primarily linked to the accidental release of hydrocarbons and associated pollution effects.

2.3.2 SEAFLOOR

The project area may be regionally important for biodiversity conservation. Risk sources from drilling activities on the benthic environment are direct disturbance and/or alteration to seafloor habitats by positioning of the drill rig or vessel, littering of the seafloor by hardware and other materials either accidently or deliberately discarded into the sea, and deposition of drill cuttings around the drilled well. The degree of impact on benthic habitats depend on the type of drilling mud used and the degree of dispersion and weathering by prevailing currents and tides.

2.3.3 PHYSICAL COASTLINE

The coastal components may only be affected by the escape of oils from accidental spillage from the exploration well drilling, but given the distance of drilling offshore no adverse affects are expected to occur on the physical characteristics of the coast line from normal controlled exploration drilling activities.

2.3.4 FISHERIES

The key interactions of drilling activities with fishing is caused primarily by the exclusion of fishing activities from the 500 m (maximum 1500 m) exclusion zone around the drilling vessel for the duration of drilling and well testing. The exclusion zone may be retained indefinitely in the case of suspension of wells, until such time as they are abandoned, and this may create a navigational nuisance to trawling vessels in particular. Minor interactions can also occur through navigational detours required to avoid the drilling rig or support vessels during drilling.

Exclusion zones of 500 m currently exist around all subsea infrastructure in Block 9, including flow lines, umbilicals, mid-water arches and pipeline end manifolds which can be damaged by demersal trawls and *vice versa*. Similar exclusion zones also apply to surface infrastructure such as the FA Platform, the Orca FPSO, and associated oil-loading systems such as the CALM buoy etc. The fishing industry is therefore already familiar with operating under these restrictions, although impacts are greater where wells are located in the Blues Fishing Grounds.

2.3.5 AIR QUALITY

Diesel is the primary fuel used aboard the drilling unit and the supply vessel for generators and motors. Diesel exhaust gases comprise SO_2, CO, CO_2 and NO_x plus “carbon-black” which contains some polyaromatic hydrocarbon particles.

Burning of waste, e.g. domestic packaging materials, aboard can release soot as well as CO, CO_2 and possibly dioxins depending upon the composition of the materials to be burned.

The well flow testing will release CO_2, CO, NO_x and (unburned) hydrocarbons. These compounds are known to contribute to atmosphere problems such as the greenhouse effect, ozone depletion, etc.

The above emissions may affect the air quality in the immediate vicinity of the rig. The operations are not expected to have a significant impact on onshore air quality, especially with the strong prevailing easterly and westerly winds.

2.3.6 DIAGRAMMATIC SUMMARY OF POTENTIAL IMPACTS

This diagram summarises potentially significant impacts on the environment from drilling in Block 9 and 11a.

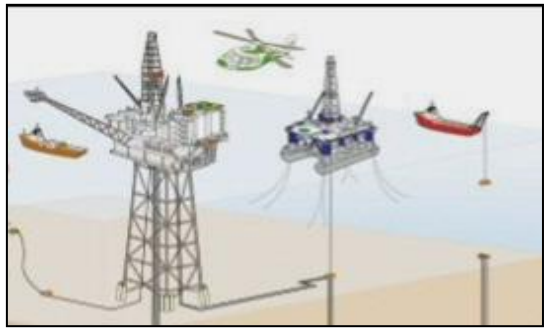
At sea: Operations (and decommissioning) are most likely to affect the quality of the water and modify the characteristics of the seafloor and the dependent ecosystems in the immediate areas of operation. However, ocean currents can move a local disturbance to the coast or other regions of the sea.

On Land: Land-based impacts relate to waste disposal, including overloading of landfill sites, waste of useful materials, health hazards to scavenging animals & birds, and pollution of groundwater from inadequate waste handling. Significant oil spills at sea can cause pollution of beaches.

Fisheries:

-trawling efficiency and fishing areas reduced by exclusion zones.

- potential snags caused by obstructions on the sea bed.



Air quality & climate:

are affected by

-flaring,

- engine exhausts.

Marine mammals & sea birds:

- may ingest, or be strangled, by synthetic / plastic wastes.

- may be affected by major oil spills, or disturbed by service vessels or helicopters.

Marine life in the water column, particularly zooplankton (which fish eat), may suffer toxic effects from:

- discharges of contaminated water
- improperly treated or disposed of domestic wastes, produced water etc.
- Upset conditions including:

- effects of accidently discharged hydrocarbons or other chemicals;

- natural gas with associated contaminants such as hydrogen sulphide leaks, diesel and other fuels spilled during refuelling of platforms at sea.

The seafloor (benthic area):

Biodiversity could be disturbed by:

- hardware and litter dropped overboard,

- positioning and presence of infrastructure on the seafloor

Figure 12: Diagrammatic Summary of Potential Impacts of Drilling Activities

2.4 LEGISLATIVE PROVISIONS

2.4.1 DIAGRAMMATIC SUMMARY OF LEGISLATIVE PROVISIONS

This diagram summarises legislative provisions for the management of drilling activities with potentially significant impacts on the environment.

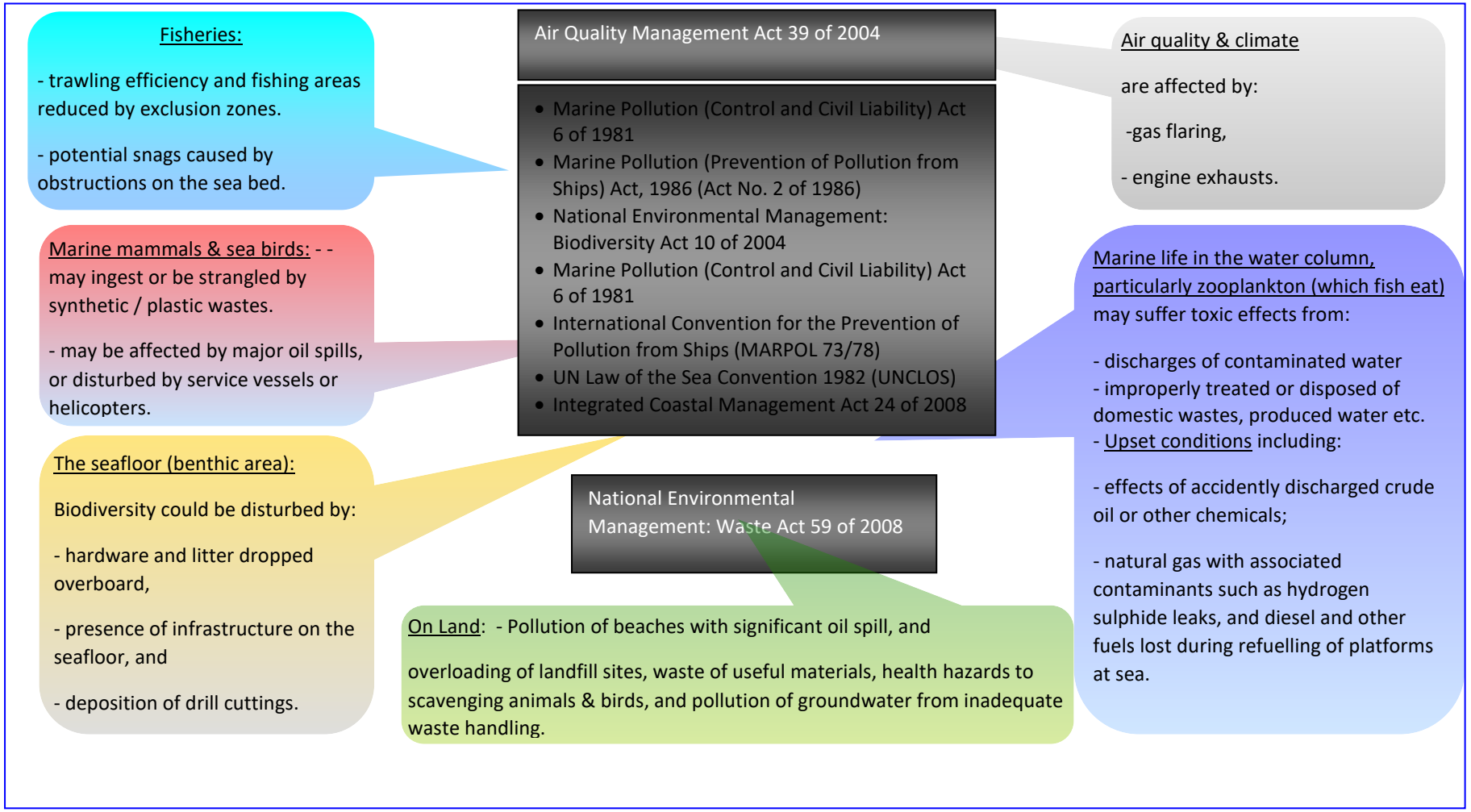


Figure 13: Overview of key legislation related to offshore drilling activities

2.4.2 APPLICABLE POLICIES, CONVENTIONS, LAWS & PERMIT REQUIREMENTS

The tables below summarise legislative provisions for the management of activities with potentially significant impacts on the environment. This is not intended to be an exhaustive list and should be verified against the continually updated legal register. PetroSA's EMPRs are designed to assist drilling projects to comply with the relevant aspects of these laws and conventions.

Table 3: List of Legislation and Policies relevant to PetroSA operational activities.

Legislation or policy	Nature of Issue	Specific requirements
National Environment Management Act 56 of 2002 (NEMA)	EIAs and EMPs	Deals with all aspects of environmental management, including EIAs and EMPs, although specific requirements in this respect have been amended in the NEMAA 62 of 2008.
National Environmental Management Amendment Act 62 of 2008 (NEMAA)	Content of EIAs and EMPrs and delegation of responsibility for permits/ rights/ authorisations.	Specifies the scope of EIAs and EMPs. ~~However, the NEMAA only applies to mining activities 18 months after either NEMAA or the MPRDAA whichever commences last, at which point the Minister of Minerals becomes the competent authority in terms of NEMA for all mining and prospecting activities.~~ Any operation related to prospecting and mining that constitutes listed activities in terms of the prevailing Listed Activities ~~GN No. R. 544, 545, and 546~~ will require environmental authorisation in terms of NEMAA. Listed activities include the reconnaissance, exploration, production and mining as provided for in the MPRDA 28 of 2002, as amended, in respect of such permits and rights. The mining company must also obtain the necessary approvals in terms of MPRDA No. 28 of 2002.
Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA)	EMPRs	Governs the administration of prospecting, exploration and mining and production of minerals and petroleum resources which are subject to an "approved environmental management programme" (now amended to "environmental authorisation") in compliance with the EIA regulations promulgated in terms of Chapter 5 of NEMA (Act 107 of 1998), as amended). In terms of the MPRDA an environmental authorisation issued by the Minister shall be a condition prior to the issuing of a permit or the granting of a right in terms of this Act. ~~an exploration right must be obtained prior to commencing exploration activities, for which an EMPr must be undertaken and approved in accordance with Section 39~~ The MPRDA is underpinned by the principles of NEMA and as such, any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure

Legislation or policy	Nature of Issue	Specific requirements
		that exploitation of mineral resources serves present and future generations. PetroSA is responsible for complying with its EMPrs and for remedying environmental damage caused by its activities or pollution events.
Mineral and Petroleum Resources Development Amendment Act 49 of 2008 (MPRDAA)	EMPrs	Amends the 2002 act (see above) to align the MPRDA more closely with the NEMA environmental authorisation requirements. The Minister (of Mines and Energy) is authorised to issue an "environmental authorisation" if deficiencies in the environmental management plan or environmental management programme compiled under the 2002 act or prior to NEMA 1998 have been addressed and that the requirements in Chapter 5 of the National Environmental Management Act, 1998, have been met.'' Thus, any new EMPrs must conform to the requirements of NEMA. EMPrs cannot be amended without the permission of the Minister. Issuance of a closure certificate requires an application to the Regional Manager in the area where the project is located within 180 days of completion or cessation of the mining operation. The application must be accompanied by the required information, programmes, plans and reports prescribed in terms of the MPRDA (as amended) and NEMA 1998. A closure certificate will be issued subject to approval in writing from the Chief Inspector and each government department with legal jurisdiction for the environment. (No mention is made in MPRDAA of decommissioning requirements).
Mine Health and Safety Act, 1996 (Act No. 29 of 1996)	Health and Safety	Provides for health and safety requirements for mining operations and includes hazard and risk assessments, monitoring and awareness training.
National Environmental Management: Waste Act 59 of 2008	Waste management licence	Regulates all aspects of waste management. It specifies requirements for waste management plans with emphasis on waste minimisation, and recycling. Accordingly, PetroSA must have integrated waste management plans and may be required by the Minister or the Waste Management Officer (Provincial) to provide an annual waste management report.
National Environmental Management: Air Quality Management Act 39 of 2004	Air quality	Regulates all aspects of air quality, including prevention of pollution, providing for national norms and standards regulating air quality monitoring, management and control and including a requirement for atmospheric emissions licenses for

Legislation or policy	Nature of Issue	Specific requirements
		listed activities, such as emissions from the petroleum industry.
Maritime Zones Act 15 of 1994 (MZA)	Maritime zoning	The Act defines the maritime zones. The MZA establishes that all waters inshore of 12 nautical miles and the airspace above it are "territorial waters" regulated by the laws the Republic. The "contiguous zone is defined as the sea beyond the territorial waters but within 24 nautical miles from the low water line and in which the Republic shall have the right to exercise all the powers considered necessary to prevent contravention of any fiscal law or any customs, emigration, immigration or sanitary law and to make such contravention punishable. The "exclusive economic zone" is the sea beyond the territorial waters but within a distance of 200 nautical miles from the low water line and in terms whereof all natural resources in this zone shall vest the same rights and powers as Republic has in respect of its territorial waters. The "continental shelf" is that defined in Article 76 of the United Nations Convention on the Law of the Sea "UNCLOS"), 1982, in terms whereof exploration and exploitation of natural resources, as defined in paragraph 4 of Article 77 of the UNCLOS and any law relating to mining of precious stones, metals or minerals, including natural oil shall be deemed to be unalienated State land.
	Installation jurisdiction	This sub-section provides that the jurisdiction in terms of any disputes or issues arising with regards to an installation will fall within the Municipal jurisdiction of the district as designated by the Minister of Justice or where no designation has been made, within the district nearest to the installation, for example, Mossel Bay. In terms of the MZA an installation includes an exploration vessel.
	Maritime casualties	Provides for measures to be taken against any vessel or aircraft in order to protect the coastline or related interests, to include fishing, from pollution or any threat of pollution resulting from a maritime casualty or an act or omission relating to such casualty which may reasonably be expected to result in major harmful consequences.
Integrated Coastal Management Act 24 of 2008 (ICMA)	Marine and Coastal Pollution / Dumping at Sea	The ICMA supports the authorisation requirements of NEMA but specifies additional criteria for regulating activities or developments and provides for pollution control within the coastal zone, where the coastal zone includes the Exclusive Economic Zone defined in the Maritime Zone Act (see above).

Legislation or policy	Nature of Issue	Specific requirements
		Relevant provisions of the act to PetroSA Offshore activities include the prohibition of incineration and dumping waste at sea without a permit (section 70); issuance of dumping permits (section 71) and emergency dumping at sea (section 72), where dumping at sea includes storage of waste material on the seabed and abandonment of structures as well as deliberate disposal of waste from a vessel or structure. These provisions apply to the EEZ and continental shelf. It also includes requirements for application for a coastal lease or concession for development within the coastal zone. Permits may not be issued if levels of radioactivity are greater than that defined by International Atomic Energy Agency and MARPOL; can lead to floating debris, or poses a serious obstacle to fishing or navigation.
Marine Pollution (Control and Civil Liability) Act 6 of 1981 (MPCCLA) amended by the Marine Shipping (Civil Liability Convention) Act 25 of 2013 w.e.f. 30 May 2014	Marine Pollution	The purpose of this Act is to provide for the protection of the marine environment from pollution by oil and other harmful substances, and for that purpose to provide for the prevention and combating of pollution of the sea by oil and other harmful substances. It also determines liability for loss or damage caused by the discharge of oil from ships, tankers and offshore installations and for related matters. The MPCCLA covers: • reporting of hazardous discharges to authorities; • the transfer of hazardous materials between installations and vessels offshore subject to permission of the South African Maritime Safety Authority; • requirement for safety pollution certificates to operate installations and subject to a contingency plan for combating pollution.
National Ports Act 12 of 2005	Navigation and cargo handling within port limits	Regulates and controls navigation within port limits and the approaches to ports; cargo handling, and the pollution and the protection of the environment within the port limits. Specifies a requirement for a license from the National Ports Authority Limited to operate a ports facility or service.
The Maritime Traffic Act 2 of 1981	Marine traffic	Regulates marine traffic in South Africa's territorial waters. The act prohibits the laying up of vessels outside harbour, specifies the lay-up requirements for vessels, and regulates the entry and dropping of anchor within 500 m safety zone of installations.
The National Heritage Resources Act 25 of 1999	Heritage assessments and procedures in the	Provides for the protection of South Africa's natural heritage, including wrecks or associated debris or

Legislation or policy	Nature of Issue	Specific requirements
	event of finding archaeological or heritage objects.	artefacts that may be found or disturbed on the sea bed. In the event that archaeological or heritage objects are found on the sea floor, PetroSA must cease activities and notify the South African Heritage Resource Authority (SAHRA) of the find, who will then determine the next step. This may include the application for a permit to, inter alia, alter, demolish, relocate, destroy or damage such object/s. A Heritage Assessment is required for any new pipelines exceeding 300m in length or new structures exceeding 5000m^2.
National Environmental Management: Biodiversity Act 10 of 2004.	Protection of marine biodiversity	Regulates the carrying out of restricted activities that may harm listed threatened or protected species or activities that encourage the spread of alien or invasive species subject to a permit. The listed restricted activities do not generally apply to PetroSA activities directly although the "conveying, moving or otherwise translocating any specimen of an alien or listed invasive species" could be brought about during discharge or exchange of ballast water and removal of subsea structures to which alien marine species may have become attached. Under the act, PetroSA has a duty of care towards all protected species such as fish, turtles, seabirds and marine mammals that may be affected by the operation of vessels and helicopters.

Table 4: Permits or licences relevant to environmental aspects of PetroSA Offshore Operations

Act, Regulation or By-law	Permit or licence	Requirements	Implementing Agency	Relevance to PetroSA
Integrated Coastal Management Act 24 of 2008	Dumping permit	Permit to dump waste or man-made structures. Validity: 2 years, renewable for further 2 years maximum.	Marine and Coastal Management (MCM)	Relevant to drilling and abandonment of wells.
Marine Pollution (Control and Civil Liability) Act 6 of 1981	Pollution Safety Certificate	Certificate required to operate an offshore facility	SAMSA	Relevant to offshore vessels and platforms
The National Heritage Resources Act 25 of 1999	Heritage permit	Permit to allow disturbance or removal of a heritage object.	SAHRA	Relevant if heritage objects found on the sea bed during inspection or sea bed surveys prior to positioning a drill vessel.

Table 5: International Agreements / Conventions to which SA is a signatory and that have been enacted in domestic legislation

Convention	Key Provisions
International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)	Provides regulations covering the various sources of ships-generated pollution. It covers regulations for the prevention of pollution by oil, sewage, garbage (galley waste and solid waste) and atmospheric emissions. MARPOL specifies the following standards applicable to PetroSA activities: Drainage and ballast water: 15ppm oil in water. Sewage: maceration of galley waste to <25mm, and disposal seaward of 12 nautical miles. Solid waste: prohibits discharge to sea.
UN Law of the Sea Convention 1982 (UNCLOS)	Covers prevention of marine pollution and the compensation for damage caused by such pollution. It contains provision relating to the prescription and enforcement of pollution standards and contingency plans to prevent and handle pollution. Signatories are required to adopt legislation to reduce marine pollution from sea-bed activities in the EEZ and on the continental shelf. It specifies a requirement for removal of decommissioned platforms but does not expressly exclude disposal through dumping. It does not make reference to subsea structures such as anchors and pipelines.
International Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter 1972 (London Convention)	The "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972", the "London Convention" for short, is one of the first global conventions to protect the marine environment from human activities and has been in force since 1975. Its objective is to promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter. In 1996, the "London Protocol" was agreed to further modernize the Convention and, eventually, replace it. Under the Protocol all dumping is prohibited, except for possibly acceptable wastes on the so-called "reverse list". The Protocol entered into force on 24 March 2006 and there are currently **37 Parties** to the Protocol (including South Africa).
United Nations Framework Convention on Climate Change (UNFCCC) - 1992	This convention aims to stabilise greenhouse gas concentrations in the atmosphere and parties to this convention agree to promote sustainable management and promote and cooperate in the conservation and enhancement of sinks and reservoirs of all greenhouse gases, such as terrestrial, marine and coastal ecosystems.
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal – adopted 22 March 1989	The convention obliges member states to minimise and control the generation and movement of hazardous wastes between states, and to protect the environment in the transport and disposal of such waste. Hazardous waste includes waste mineral oils unfit for their originally intended use; waste oils/water; hydrocarbons/water mixtures, and emulsions.
Convention on Biological Diversity – 5 June 1992	This convention aims to protect biodiversity and in particular, to adopt measures for recovery and rehabilitation of threatened species.

2.5 INSTITUTIONAL FRAMEWORK

2.5.1 PETROSA ENVIRONMENTAL MANAGEMENT RESPONSIBILITIES

Table 6 lists the persons with environmental responsibility as detailed in the EMPr.

Table 6: Table of PetroSA Staff Responsibilities for Exploration Drilling.

PERSONS RESPONSIBLE	ENVIRONMENTAL AREAS OF RESPONSIBILITY EXPLORATION DRILLING
PetroSA VP: New Ventures Upstream	• Overall responsibility for environmental performance of activities within the division including drilling.
PetroSA Asset Manager	• Ensure that all requirements to fulfil the commitments in terms of the Exploration Right are met.
PetroSA Drilling Manager	• Compliance with SAMSA requirements to avoid pollution incidents • Assess and deal with any incidents • Safe keeping of all records/ data/ documentation.
PetroSA SHEQ Manager	• Assess and deal with incidents • Quarterly reporting of monitoring results, waste management and incidents • Environmental Notification and Well Environmental Close Out reporting • Compliance monitoring and performance assessment • Safe keeping of all records/ data/ documentation.
PetroSA Logistics Base Manager	• Waste management and handling • Waste management reporting
Drilling and other Contractor	• Compliance with EMP and best practice operating procedures • Monthly reporting per well • Ensure implementation of environmental awareness • Ensure careful storage, handling, disposal of chemical substances and solid objects to prevent losses and spills • Implement waste management programme • Monitoring of produced water, bilge water, flare emissions' solid waste production and disposal • Assess and deal with liquid spills • Assess and deal with loss of solid objects.

2.5.2 INSTITUTIONAL LINKAGES

PetroSA is the government-owned oil and gas company mandated by cabinet to commercialize all the state-owned assets in the petroleum sector and to manage them as a profitable business for the benefit of all South Africans. As described in its Health, Safety and Environment Policy Statement, PetroSA is committed to minimising its' environmental impacts in areas in which it operates.

Key institutions that PetroSA report to on the environmental aspects of their offshore activities are the Petroleum Agency of South Africa (PASA), Department of Mineral and Petroleum Resources (DMPR), Department of Forestry, Fisheries and the Environment (DFFE) ~~Environmental Affairs (DEA)~~ and the South African Maritime Safety Authority (SAMSA). In addition to the administration of laws listed above, the relevant roles and overarching responsibilities of these bodies are:

- PASA: Is designated in terms of the Mineral and Petroleum Resources Development Act to promote and regulate exploration for onshore and offshore oil and gas resources and their optimal development on behalf of government. The Agency also strives to ensure operators give effect to the general objectives of integrated environmental management as stipulated in the National Environmental Act, 1998.

- DMPR: Is responsible for the administration of South Africa's mining laws and for promoting the development of the industry. They also govern the minerals and energy sectors to be secure, safe, healthy and environmentally sound.

- DEA (now DFFE): Is responsible for the National Environmental Management Act 107 of 1998 which provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for co-ordinating environmental functions exercised by organs of state (etc). The Marine and Coastal Management Branch advises the Minister and the Department about the development and conservation of marine and coastal resources to ensure the sustainable utilisation of such resources, as well as to maintain marine ecosystem integrity and quality.

- SAMSA: Is established in terms of the South African Maritime Safety Authority Act 5 of 1998, and is accountable to the Minister of Transport. It's responsibilities include monitoring and enforcing compliance with safety and environment protection standards, and responding to marine pollution incidents and other maritime emergencies.

3 ENVIRONMENTAL PROTECTION ACTIVITIES

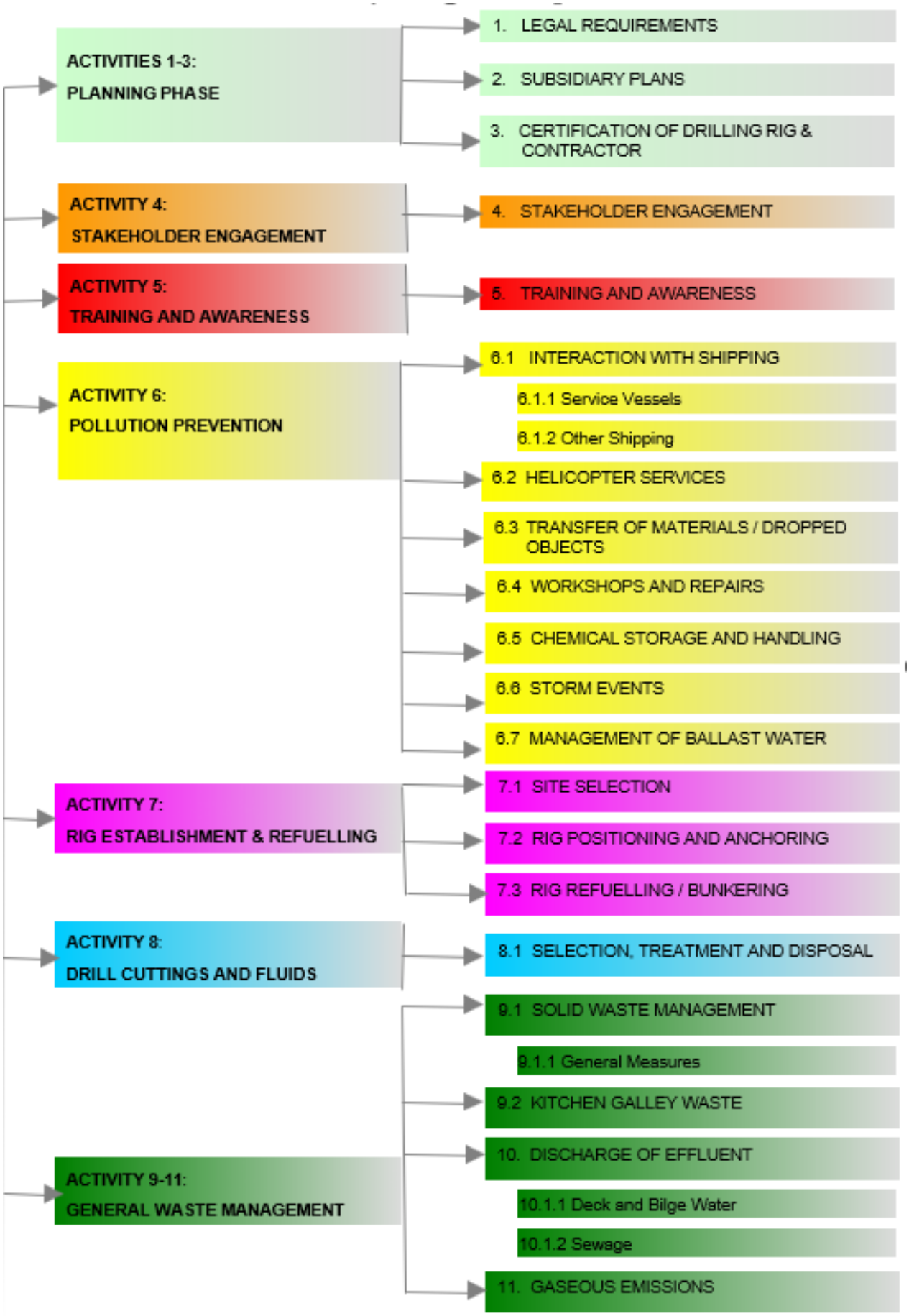
Section 3 lists the specific actions required, or steps which should be taken, by PetroSA to avoid or limit damage to the environment from offshore drilling activities. It draws on the previous EMPR undertaken for drilling in Block 9 by CCA/CSIR in 1997, the update by ERM in 2014, and is updated with additional best practice information as identified during the compliance audits. Management measures are aligned where possible with PetroSA's procedures for support activities e.g. waste management, logistics etc to facilitate environmental compliance and performance auditing.

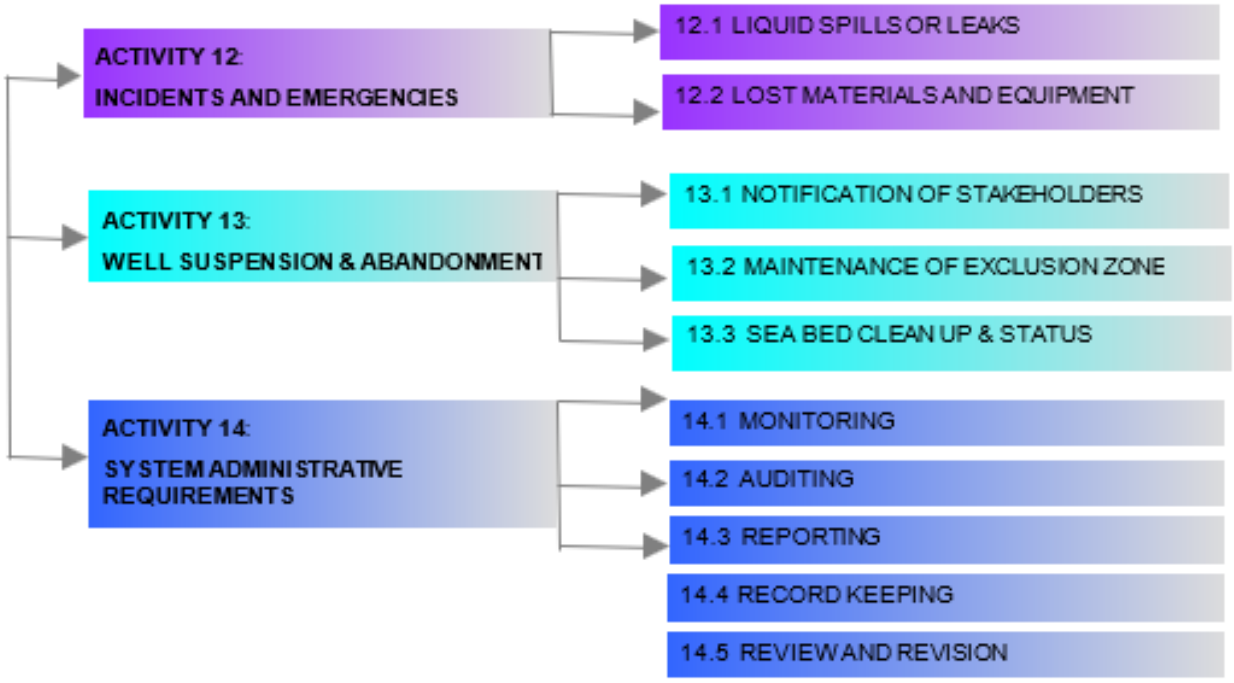
Each sub-section starts with a 'rationale' giving the reasons why specific kinds of damage to the environment should be avoided, and why there is a need to manage specific activities.

Following this, the 'objectives' of what PetroSA is specifically trying to achieve, are set out.

Then, instructions or 'auditable actions' are listed, staff responsibilities allocated, and the required timing or frequency of actions stipulated.

The next page provides a Layout of the Table showing contents and inter-linkages between the sub-sections.


ACTIVITIES 1-3:
PLANNING PHASE
1. LEGAL REQUIREMENTS
2. SUBSIDIARY PLANS
3. CERTIFICATION OF DRILLING RIG & CONTRACTOR
ACTIVITY 4:
STAKEHOLDER ENGAGEMENT
4. STAKEHOLDER ENGAGEMENT
ACTIVITY 5:
TRAINING AND AWARENESS
5. TRAINING AND AWARENESS
ACTIVITY 6:
POLLUTION PREVENTION
6.1 INTERACTION WITH SHIPPING
6.1.1 Service Vessels
6.1.2 Other Shipping
6.2 HELICOPTER SERVICES
6.3 TRANSFER OF MATERIALS / DROPPED OBJECTS
6.4 WORKSHOPS AND REPAIRS
6.5 CHEMICAL STORAGE AND HANDLING
6.6 STORM EVENTS
6.7 MANAGEMENT OF BALLAST WATER
ACTIVITY 7:
RIG ESTABLISHMENT & REFUELLING
7.1 SITE SELECTION
7.2 RIG POSITIONING AND ANCHORING
7.3 RIG REFUELLING / BUNKERING
ACTIVITY 8:
DRILL CUTTINGS AND FLUIDS
8.1 SELECTION, TREATMENT AND DISPOSAL
ACTIVITY 9-11:
GENERAL WASTE MANAGEMENT
9.1 SOLID WASTE MANAGEMENT
9.1.1 General Measures
9.2 KITCHEN GALLEY WASTE
10. DISCHARGE OF EFFLUENT
10.1.1 Deck and Bilge Water
10.1.2 Sewage
11. GASEOUS EMISSIONS


ACTIVITY 12:
INCIDENTS AND EMERGENCIES
12.1 LIQUID SPILLS OR LEAKS
12.2 LOST MATERIALS AND EQUIPMENT
ACTIVITY 13:
WELL SUSPENSION & ABANDONMENT
13.1 NOTIFICATION OF STAKEHOLDERS
13.2 MAINTENANCE OF EXCLUSION ZONE
13.3 SEA BED CLEAN UP & STATUS
ACTIVITY 14:
SYSTEM ADMINISTRATIVE REQUIREMENTS
14.1 MONITORING
14.2 AUDITING
14.3 REPORTING
14.4 RECORD KEEPING
14.5 REVIEW AND REVISION

3.1 ACTIVITY 1: PLANNING PHASE

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
1.1. ADHERENCE TO LEGAL REQUIREMENTS			
Rationale: A number of international conventions and national legislation and guidelines regulate the offshore oil and gas industry. These are primarily focussed on combating marine pollution and maintaining vessel safety at sea. The MARPOL standards are the primary international standards governing pollution at sea and specify limits for release of oily water, sewage, galley waste and solid waste. South Africa's Air Pollution Standards under the NEMA Air Quality Act 39 of 2004) are applicable to air emissions from offshore installations, and apply to drilling vessels. Best practice standards have been included throughout this EMPR where relevant to drilling activities. PetroSA will be responsible for ensuring all the necessary legal requirements including permits are obtained prior to initiating additional drilling in Block 9. This EMPR is also a legal document and the specified measures included here, once approved, are legally binding on PetroSA and the Drilling Subcontractor.			
Objectives: To ensure all legal requirements described in Section 2.4.2 and all provisions specified in these Activity Schedules (1-14) are complied with in order to ensure environmental protection and human and vessel safety at sea.			
1.1.1.	Prepare a legal register of all relevant legislation applicable to drilling activities to ensure that these are applied during drilling.	*PetroSA Legal Counsel*	*Prior to Drilling*
1.1.2.	Prepare an Environmental Notification Report for submission to PASA and DEA (Oceans and Coast). Refer to Section 14.2.2.2 for content of Environmental Notification Report.	*PetroSA SHEQ Rep*	*Prior to Drilling*
1.1.3.	Ensure all relevant permits and approvals are obtained prior to Drilling and adhere to all conditions attached.	*PetroSA Drilling Manager*	*Prior to Drilling*
1.1.4.	Prepare schedule of all legally required monitoring measures including the required frequency and responsibility, using 14.1 as minimum guideline.	*PetroSA SHEQ Manager*	*Prior to drilling*
1.1.5.	Drilling and Support Vessel Contractors to be provided with a copy of the EMPR and written confirmation of receipt to be obtained, and instructed to have the EMPr available on board the drilling rig and support vessels at all times.	*PetroSA SHEQ Manager*	*Prior to Drilling*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
1.1.6. Contracts with service providers shall specifically require that the service provider complies with all relevant legislation and indemnifies PetroSA of any shared liability in the event that the service provider contravenes legislation in spite of being required to adhere to the EMPr. PetroSA reserves the right to inspect drilling activities on the service provider's vessel to assess compliance. Deviations from the EMPr without sound justification may be deemed a breach of contract.	*PetroSA Group Supply Chain Manager*	*Prior to Drilling*
1.1.6.1. Once specific target areas for future drilling are defined the following must be undertaken prior commencement: • Undertake drilling (technical specifications) and location specific oil spill drift modelling and drilling discharge modelling in order to define the magnitude and extent of potential impacts from unplanned well blowouts and discharges of drill cuttings and muds. • Undertake survey (technical specifications) and location specific sound transmission loss modelling (acoustic modelling) in order to define the magnitude and extent of potential underwater noise from drilling and siting activities (e.g. vertical seismic profiling (VSP), Multibeam Echosounder (MBES)). • A cultural heritage impact assessment should be undertaken by a suitable qualified specialist with specific focus on the intangible heritage. • Revise the impact assessment on the basis of the outcomes of the modelling (with inputs from relevant specialists including but not limited to marine ecology, and fisheries). Impact on Small Scale Fisheries must be included. • Supplement the impact management actions and impacts contained in the EMPr to account for the site and drill specific controls. • Obtain relevant approvals from the competent environmental authority in accordance with relevant legal requirements (e.g. amendments to EA and/or EMPR in accordance with NEMA requirements).	PetroSA SHEQ Manager	Well in advance of commencement of survey.
1.1.6.2. • The Holder must appoint an independent Environmental Control Officer (ECO) prior to commencement of any offshore exploration activities. • The ECO should have appropriate training and/or experience in the implementation of environmental management specifications. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field. The ECO's key role is auditing the implementation of the EMPr. • The ECO will be responsible for the auditing function as well as the clarification of environmental conditions contained in this EMPr to anyone working on the site. For the purposes of this project, the role of ECO and MMO can be fulfilled by the same person.	PetroSA SHEQ Manager	*Prior and during drilling activities*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

• The ECO roles include:
  ○ Recommendations for review and update of the EMPr;
  ○ Liaison between the Applicant, Contractors, authorities and other lead stakeholders on high importance environmental concerns;
  ○ Ensures that correct shape files have been uploaded into the vessel navigation systems to support effective implementation of spatial controls
  ○ Review the project induction training to ensure environmental issues receive adequate attention and important site-specific issues are included;
  ○ Conduct environmental audits of the contractors including relevant documentation on a monthly basis;
  ○ Validating the regular inspection reports, which are to be prepared by the relevant contractor's EO or Lead MMO/PAM (who may be tasked with the onsite responsibilities of the ECO);
  ○ Maintain a record of all non-conformances and incidents to ensure that measures are put in place to remedy such;
  ○ Maintain a public consultation register in which all complaints are recorded, as well as action taken; and
  ○ Verification that all environmental monitoring programmes (sampling, measuring, recording etc. when specified) are carried out according to protocols and schedules.
• It is important to note that where opportunity for interpretation occurs within the conditions of this EMPr, the interpretation of the ECO will take preference.
•		

1.1.7. Audit guidelines
• Audits should, through examination of records retained by the drilling contractor and PetroSA verify that:
  ○ Legal register was prepared and is applicable to drilling activities
  ○ **Updated specialist assessments completed, and any additional recommendations and Impact Management Actions incorporated into approved EMPr.**
  ○ All legally required permits were obtained prior to drilling
  ○ All license conditions have been complied with throughout drilling
  ○ Schedule of monitoring requirements prepared for drilling activities
  ○ Drilling Contractor was provided with copies of the EMPR and proof of receipt was obtained.
  ○ A copy of the EMPr was available on-board throughout drilling.
  ○ All monitoring requirements have been undertaken in accordance with the scheduled frequency
  ○ All audit guidelines specified throughout this report have been complied with.
	PetroSA SHEQ Manager	*Prior to and throughout Drilling*

3.2 ACTIVITY 2: SUBSIDIARY PLANS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: This EMPr specifies the requirements for environmental management, pollution control and emergency preparedness and response as far as possible for this generic drilling EMPr. However, under the framework provided by this EMPR, certain subsidiary plans will need to be developed by PetroSA or the Drilling Subcontractor for each drilling campaign, which details the specific measures that need to be taken for certain activities; the roles and responsibilities of staff in this regard, and reporting procedures and lines of communication.		
Objective: • Subsidiary plans are developed and are in place prior to drilling • Subsidiary plans provide the necessary level of detail and are aligned with the requirements provided in this EMPr and relevant existing procedures of PetroSA.		
2.1. Subsidiary Plans		
2.1.1. Ensure that the service providers (drilling, support vessels etc) have the following subsidiary plans / procedures in place: • Oil Spill Contingency Plan • Emergency Response Plan, including MEDIVAC plan • Waste Management Plan • Incident Management and Reporting • Ballast Management Plan • **Regulation 37 of MARPOL Annex I will be applied, which requires that all ships of 400 gross tonnage and above carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). The purpose of a SOPEP is to assist personnel in dealing with unexpected discharge of oil, to set in motion the necessary actions to stop or minimise the discharge, and to mitigate its effects on the marine environment.**	*PetroSA SHEQ Manager*	*Prior to commencing drilling activities*
2.1.1.1. • **Develop response strategy and plan (OSCP), aligned with the National OSCP that identifies the resources and response required to minimise the risk and impact of oiling (shoreline and offshore). This response strategy and associated plans must take cognisance to the local oceanographic and meteorological seasonal conditions, local environmental receptors and local spill response resources. The response strategy must be informed by an Oil**	*PetroSA SHEQ Manager*	*Prior to commencing, and during drilling activities*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Spill Drift Modelling study specific to the drill target area. The development of the site-specific response strategy and plans must include the following: ○ Develop an Oiled Wildlife Contingency Plan (OWCP) in collaboration with specialist wildlife response organisations with experience in oiled wildlife response. The OWCP should be integrated into the site-specific OSCP and include detailed protocols on the collection, handling and transport of oiled marine fauna. ○ Assessment of onshore and offshore response resources (equipment and people) and capabilities at time of drilling, location of such resources (in-country or international), and associated mobilisation / response timeframes. ○ Selection of response strategies that reduce the mobilisation / response timeframes as far as is practicable. Use the best combination of local and international resources to facilitate the fastest response. ○ Well-specific oil spill modelling for planning purposes taking into consideration site- and temporal-specific information, the planned response strategy, and associated resources. ○ Develop intervention plans for the most sensitive areas to minimise risks and impacts and integrate these into the well-specific response strategy and associated plans. ○ The OSCP must include an oiled wildlife contingency plan or any wildlife response strategy developed in consultation with specialist wildlife response organisations, e.g. SANCCOB. Such plan must consider and align with international best practice, including the IPIECA Wildlife Response Preparedness Guidelines. • Schedule joint oil spill exercises including the operator and local departments / organisations to test the Tier 1, 2 & 3 responses. • Ensure contract arrangements and service agreements are in place (e.g. OSRL) to implement the OSCP, e.g. capping stacks at a local venue and other international locations, surface response equipment (e.g. booms, dispersant spraying system, skimmers, etc.), dispersants, response vessels, etc. • Use low toxicity dispersants that rapidly dilute to concentrations below most acute toxicity thresholds. Dispersants should be used cautiously and only with the permission of DFFE. • Ensure a standby vessel is within 30 minutes of the drilling unit, equipped for dispersant spraying and can be used for mechanical dispersion (using the propellers of the ship and/or firefighting equipment). It should have at least 5m3 of dispersant onboard for initial response. • As far as possible, and whenever the sea state permits, attempt to control and contain the spill at sea with suitable recovery techniques to reduce the spatial and temporal impact of the spill • In the event of a spill, use drifter buoys and satellite-borne Synthetic Aperture Radar (SAR)-based oil pollution monitoring to track the behaviour and size of the spill and optimise available response resources.		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
	• **The Operator is to submit all forms of financial insurance and assurances to PASA to manage all damages and compensation requirements in the event of an unplanned pollution event.**		
2.1.2.	Compile a Communications Plan which shall outline the communications procedures for all stakeholder engagement, including the Stakeholder Engagement Register, responsibilities for review of stakeholder comments, feedback to the stakeholder and close out actions and requirements. **The plan must include an effective Grievance Mechanism aligned with the requirements of the IFC, considering mechanisms for grievance input, assessment, action, monitoring, and closure.**	*PetroSA SHEQ Manager*	*Prior to commencing drilling activities*
2.1.3.	Compile an Environmental Notification prior to drilling to be submitted to PASA and DEA, which includes the relevant information from the subsidiary plans as well as: • Describes the type and volume of drilling fluid/s to be used, • Estimates the quantities of drill cuttings to be generated; • Describes the treatment process to be used to minimise oil content, and • Describes the disposal method	*Drilling Contractor*	*Prior to drilling*
2.1.4.	Ensure that subsidiary plans are aligned with national plans (e.g. National Oil Spill Contingency & Response Plan), and other relevant regional, provincial, local and PetroSA plans and procedures (e.g. Integrated Waste Management Plans, Incident Management Plan, Communications Plans etc) as applicable.	*PetroSA Drilling Manager*	*Prior to commencing drilling activities*
2.1.5.	All plans contain the required level of detail such as: • Up to date contact names and numbers • Clear lines of communication for specific tasks • Clear role and responsibilities allocated to specific staff members • Training and awareness needs and activities • Formats for reporting eg filing incident reports, waste manifests etc.	*Drilling Contractor*	*Before and throughout drilling*
2.1.6.	All plans shall be readily available on the drilling and support vessels as appropriate at all times.	*Drilling & Other Contractors*	*Throughout drilling*
2.1.7.	PetroSA to keep copies of all subsidiary plans in the Joint Operations Centre during drilling activities.	*PetroSA SHEQ Manager*	*Throughout drilling*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
2.1.8. Retain copies of all subsidiary plans for five years.	*PetroSA SHEQ Manager*	*Five years post drilling*
2.1.9. The pre-spud meeting agenda between PetroSA and the contractor must include a formal handover of subsidiary plans. Drilling and support vessel staff and relevant PetroSA staff must be familiar with the content of the plans.	*PetroSA SHEQ Manager*	*Prior to drilling*
2.1.10. Audit Guidelines Audits should, through examination of records retained by the facility, visual inspections and targeted interviews, verify that: • The required subsidiary plans are compiled prior to commencing drilling • The plans contain the necessary level of detail to meet the intended purposes while ensuring optimal environmental protection • The plans are aligned with the content of this EMPr • The plans are aligned with relevant National, Provincial and Local Plans where relevant • The plans are available at the Joint Operations Centre. • Relevant information from the plans are included in the Environmental Notification and submitted to PASA and DEA	*PetroSA SHEQ Manager*	*Prior to drilling*

3.3 ACTIVITY 3. DRILLING CONTRACTOR AND VESSEL CERTIFICATION

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Offshore drilling activities are highly specialised with associated safety and environmental risks. For this reason, a competent Drilling Contractor and certified Drilling Vessel are required to ensure maximum safety and environmental protection.		
Objective: • Ensure the Drilling contractor operates to the highest possible safety and environmental protection standards, and are the Drilling Vessel is appropriately certified.		
3.1. Drilling Contractor and Vessel Certification		
3.1.1. The Drilling Contractor shall be registered with the International Association for Drilling Contractors (IADC) and shall be able to demonstrate a track record for maintaining optimum safety and environmental protection.	*PetroSA Drilling Manager*	*Prior to Rig Contracting*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
3.1.2. Ensure the Drilling Vessel is certified for seaworthiness through an appropriate internationally recognised certification programme (e.**g.** Det Norske Veritas, American bureau of Shipping etc.).	*PetroSA Drilling Manager*	*Prior to Rig Contracting*
3.1.3. All anchor chains and anchors to be certified.	*PetroSA Drilling Manager*	*Prior to Rig Contracting*

3.4 ACTIVITY 4. STAKEHOLDER ENGAGEMENT

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Offshore exploration activities involving seismic surveys and drilling operations may have impacts upon a range of stakeholders. These impacts can range from positive impacts such as job creation or second order income generation to negative impacts such as limitations on marine users, and potential disruption of biodiversity. It is incumbent on PetroSA to engage with stakeholders in terms of the principles of NEMA and to this end the Agulhas Offshore Forum has been established, which meets every 6 months and includes representatives from the fishing industry, conservation NGOs, and government departments. The aim of the forum is to provide a mechanism for dissemination of information about PetroSA activities and to receive and answer stakeholder concerns. In so doing, the forum meetings seek to improve the level of transparency of the nature and timing of PetroSA operations and drilling campaigns.		
Objective: • To provide regular feedback to relevant and key stakeholders • To establish and maintain a register of stakeholders • To receive, process and respond to inputs from external and internal stakeholders		
4.1. Stakeholder Engagement		
4.1.1. Prepare an Environmental Notification Report for submission to PASA and DEA (Oceans and Coast). Refer to Section 14.2.2.2 for content of Environmental Notification Report.	PetroSA SHEQ Rep	Prior to Drilling
4.1.1.1.	*FLO*	*Appointment prior to commencement, and throughout drilling activities.*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• An experienced Fisheries Liaison Officer (FLO) should be placed on board the drilling or support vessels to facilitate communications with fishing vessels in the vicinity of the drilling activities. • Ensure project vessels fly standard flags and lights (as appropriate) to indicate that they are engaged drilling activities and are restricted in manoeuvrability. • Notify any fishing vessels at a radar range of 12 nm from the drilling vessel via radio regarding the safety requirements around the rig.		
4.1.2. Fishing stakeholders, and other marine stakeholders who operate in the area shall be notified of drilling operations and the timing and location of exclusion zones at least 30 days prior to the scheduled commencement of drilling activities. Fishing stakeholders should include; the Agulhas Offshore Forum, Association of Small Hake Industries, **FishSA, SA Tuna Longline Association, South African Hake Longline Association (SAHLLA), DFFE Vessel Monitoring, Control and Surveillance (VMS) Unit in Cape Town,** SA Deep Sea Trawling Industry Association, SA Inshore Fishing Industry Association, South East Coast Inshore Fishing Association, SA Midwater Trawling Association, SA Tuna Association, Fresh Tuna Exporters Association, South Coast Rock Lobster Association, SAMSA, relevant Port harbourmasters, the naval hydrographic office and the Department of Agriculture, Forestry and Fisheries (Fisheries branch).	PetroSA SHEQ Manager	30 days prior to drilling
4.1.3. Information regarding drilling should be communicated to the naval hydrographic office so that they can be issued on Notice s to Mariners and all necessary maritime communications followed to ensure marine users are kept informed of restrictions on fishing and other marine uses. This should include: • The co-ordinates of the well drilling activities; • Am indication of the well drilling timeframes; • Location report of the drilling unit; • An indication of the 500m safety zone around the drilling unit; and • A special note on the hazard posed by anchor chains and anchors, where applicable.	PetroSA SHEQ Manager	7 days prior to rig positioning or movement
4.1.4. Stakeholder engagement process shall be undertaken in accordance with a Communications Plan (see section 1.2.2).	PetroSA SHEQ Manager	Throughout drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
4.1.5. Implement and maintain a Stakeholder Engagement Register which shall include the following information: • Contact details of stakeholder • Date and time of stakeholder input • Nature of input • Name of reviewing manager • Stakeholder engagement form reference number • Date of Review • Result of Review • Date of communication with stakeholder	PetroSA SHEQ Rep	Prior and throughout drilling
4.1.6. Any feedback from stakeholders concerning offshore exploration activities shall be reported in PetroSA's Quarterly Report.	PetroSA SHEQ Manager	Quarterly
4.1.7. Audit Guidelines • Audits should, through examination of records retained, verify that: o A stakeholder engagement register has been maintained o Documents notifying stakeholders have been retained o Any stakeholder inputs have been reviewed by the PetroSA SHEQ Manager o The above stakeholder inputs have been responded to appropriately o The stakeholder has been informed of the outcome of the review by the o PetroSA SHEQ Manager.	PetroSA SHEQ Rep	End of drilling

3.5 ACTIVITY 5: ENVIRONMENTAL TRAINING AND AWARENESS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Poor personnel awareness about resource efficiency, waste management and pollution control can result in accidents or avoidable incidents through ignorance. It is important to raise environmental awareness to encourage active participation in implementation of environmental protection measures and human safety. To raise awareness and obtain commitment, personnel need to be informed about the costs of waste; incidents which generate waste; how environmental protection applies to		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
them as individuals and the benefits of resource efficiency to the business. This can assist personnel to be appropriately equipped to conduct their duties in an environmentally responsible manner.			
Objectives: • To equip all personnel involved in the drilling operations to perform their duties in an environmentally responsible manner through regular training • To raise environmental awareness through feedback on environmental performance and any changes in legislation governing best practices			
5.1. Environmental Training and Awareness			
5.1.1.	Utilise suitable regular meetings such as weekly safety meetings for environmental awareness and report back on environmental performance including the content of subsidiary plans. .	Drilling and other Contractors	Monthly
5.1.2.	All personnel shall receive regular training including tool box talks on the handling and management of waste**, and incident response and reporting procedures.**	Drilling Contractor	Throughout drilling
5.1.3.	Audit Guidelines • Audits should, through examination of monthly reports, verify that: o There was regular environmental awareness and performance feedback o All personnel received training in waste management and handling on at least one occasion during drilling.	PetroSA SHEQ Manager	End of drilling

3.6 ACTIVITY 6: POLLUTION PREVENTION

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
6.1. Vessels and Other Shipping		
Rationale: Offshore drilling rigs and supply vessels are potential hazards to marine traffic. Movement of the drilling rig to site and positioning at the drill location can be a risk to other marine users by posing a navigational obstacle. Vessels carrying personnel or supplies to and from the offshore installations may negatively impact on the environment through reckless behaviour, negligence and/or accidents. A collision involving the rig or other vessels can create a pollution risk to the marine environment through the release of oils and fuels and the deposition of objects on the sea bed. PetroSA and/or the drilling contractor may be jointly responsible for the immediate		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
response and remediation of any such environmental damage. Various measures need to be taken to minimise the risk of collisions through alerting shipping to the presence of the drilling vessel and/or operations The drilling rig and all supply vessels should be equipped with and use the appropriate navigational aids and warnings, while a supply vessel must be on standby at all times throughout drilling operations within the exclusion zone to alert other marine users. It is also important that the supply vessels are operated by competent personnel, are seaworthy and appropriate for their tasks, and managed in such a way as to minimise the risk of any environmental damage occurring. In the event that damage does occur, the correct and appropriate response is undertaken by the Master(s) of the vessel(s) concerned.		
Objectives: • To minimise navigational risks to other marine users • To ensure that professional and seaworthy certification is appropriate to requirements • To inform the Masters of the supply vessels of the actions to be taken to minimise environmental damage and the actions to be taken in the event of such damage occurring • To check that the requisite actions are taken and that they are effective in minimising environmental damage. • To ensure that provisions prescribed by SAMSA to ensure that the drilling rig and associated vessels are "visible" to marine traffic and aircraft have been implemented • To ensure that the provisions are effective in maintaining "visibility" of the drilling vessel and associated vessels.		
6.1.1. All measures prescribed by SAMSA to minimise the risks of collision of marine traffic with the drilling vessel must be implemented and maintained.	Drilling Contractor	Throughout drllling
6.1.2. Measures to be implemented include: • Maintenance of safety and exclusion zones through Notices to Mariners issued by SAN Hydrographic Office 24 hours prior to commencement of survey (see Section 7). • 24-hour chase vessel on patrol in exclusion zone at all times • Maintenance of standard watch procedures • Issue Radio Navigational Warnings if visibility of vessel(s) is diminished (e.g. power outages or failure of fog horn) • Radio communication to alert approaching vessels • Use of Flares and Sirens where necessary • Recording of interactions with vessels in a log book • Collisions, near misses or other transgressions with associated pollution risks will be treated as incidents and handled according to the procedure detailed under Activity 12.	Drilling Contractor	Throughout drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
6.1.2.1. • **The vessel operators (incl Captain and crew) should keep a constant watch for marine mammals and turtles in the path of the vessel.** • **Ensure vessel transit speed between the area of interest and port is a maximum of 12 knots (22 km/hr), except in MPAs where it is reduced further to 10 knots (18 km/hr), as well as when sensitive marine fauna are present in the vicinity.** • **Report any collisions with large whales to the International Whaling Commission (IWC) database.** • **Contractors will ensure that the proposed drilling campaign is undertaken in a manner consistent with good international industry practice and BAT.** • **All whales and dolphins are given protection under the South African Law. The Marine Living Resources Act, 1998 (No. 18 of 1998) states that no whales or dolphins may be harassed, killed or fished. No vessel or aircraft may, without a permit or exemption, approach closer than 300 m to any whale and a vessel should move to a minimum distance of 300 m from any whales if a whale surfaces closer than 300 m from a vessel or aircraft.**	Drilling Contractor	Throughout drilling operations
6.1.2.2. The lighting on the drill unit and support vessels should be reduced to a minimum compatible with safe operations whenever and wherever possible. Light sources should, if possible and consistent with safe working practices, be positioned in places where emissions to the surrounding environment can be minimised. Where possible flaring to take place during daylight hours.	Drilling Contractor	Throughout drilling operations
6.2. Helicopter Services		
Rationale: Helicopters are used to transport personnel to and from the drilling vessel. Helicopter operations may disturb coastal and marine life and interfere with coastal activities such as tourism and recreational fishing.		
Objectives: • To minimise disturbance to coastal sea bird populations and large marine fauna from helicopter flights • To minimise disturbance to coastal communities and activities such as tourism and recreational fishing		
6.2.1. Existing PetroSA and aviation service providers' procedures, such as the Materials Handling & Transport and Marine Support Services procedures, shall be implemented to minimise the risk of objects and chemical substances being dropped overboard, during cargo transfer, leaking from storage containers and during handling	Logistics/ aviation Service Provider	Throughout drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
6.2.2. Helicopter transfers to and from the drilling vessel shall fly at a minimum height of 500m above sea level and shall not hover or circle over wholes, dolphins, sharks, turtles or aggregations of seabirds.	Aviation Service Pro11lder	Throughout drilling
6.2.3. ~~**Helicopter flight logs will be kept to demonstrate compliance with set flight paths.**~~ **The following impact management actions apply to helicopter flights:** • **Helicopter flight logs will be kept to demonstrate compliance with set flight paths.** • **Pre-planned flight paths must avoid sensitive areas and colonies.** • **Brief all pilots on the ecological risks associated with flying at a low level along the coast or above marine mammals.**	Aviation Service Provider	Throughout drilling
6.2.3.1. All whales and dolphins are given protection under the South African Law. The Marine Living Resources Act (Act No. 18 of 1998) states that no whales or dolphins may be harassed, killed or fished. No vessel or aircraft may, without a permit or exemption, approach closer than 300m to any whale and a vessel should move to a minimum distance of 300 m from any whales if a whale surfaces closer than 300 m from a vessel or aircraft.	Drilling/ support vessel Contractors Aviation Service Provider	Throughout drilling
6.2.4. Audit guidelines • Audits should, through examination of records retained by the Aviation Service Provider, verify that: o Flight logs are maintained and can demonstrate compliance with set flight paths with reasons provided for any deviations from such routes.	SHEQ Manager	During and post drilling
6.3. Transfer of Materials / Dropped Objects		
Rationale: Drilling vessels are serviced by other supply vessels for loading and off-loading equipment and materials. Such operations may disturb marine life; solid objects and liquids may fall into the sea which could pose a risk to shipping or the fisheries, while certain articles and liquids may also be detrimental to marine life and could pollute the sea. Since all such cargo has a monetary value standard procedures are in place to limit any such loss and to retrieve objects falling overboard wherever possible.		
Objectives: • To minimise the risk of objects being lost overboard during transit or transfer • To retrieve objects which have fallen overboard before they pose a risk to the environment or shipping • To log the existence and location of fallen objects for future reference/ action		

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
• To notify interested parties of the existence and location of un-retrieved fallen objects			
6.3.1.	Procedures shall be implemented to minimise the risk of objects and other materials being dropped overboard during transfer of goods or leaking from storage containers or during handling.	Logistics Service Provider	Throughout drilling
6.3.2.	The incident management procedure should be followed in the event of a lost object or other materials (see Activity 12)	Logistics Service Provider & Drilling Contractor	Throughout drilling
6.3.2.1.	• **Ensure containers are sealed / covered during transport and loads are lifted using the correct lifting procedure and within the maximum lifting capacity of crane system.** • **Undertake a post drilling ROV survey to scan seafloor for any dropped equipment and other removable features around the well site. In the event that equipment is lost during the operational stage, assess safety and metocean conditions before performing any retrieval operations.** • **Notify SAN Hydrographer of any hazards left on the seabed or floating in the water column, with the dates of abandonment/loss and locations and request that they send out a Notice to Mariners with this information.**	Logistics Service Provider & Drilling Contractor	Throughout drilling
6.3.3.	Audit guidelines • Audits should, through examination of records retained by the vessel, verify that: o Incidents involving dropped objects were recorded in the incident reports o The response time of incidents is appropriate to their significance o The decision whether or not to retrieve objects was environmentally appropriate o Incidents were subject to comprehensive evaluation by management o Requisite changes were made to operational procedures to ensure that the incident is not repeated o Incidents resulting from the same root cause(s) are not repeated o Trial runs and/or drills for major incidents are conducted at least annually o The response for major contingencies are formally reviewed by management annually	PetroSA SHEQ Manager	During and post drilling
6.4. Workshops, Repairs and Chemical Handling and Storage			
Rationale: Drilling rigs contain workshops or designated works areas of various descriptions in which machinery containing oils and fuels may be repaired and serviced, and which store oils and fuels and other potentially polluting substances. The workshop and repair operations do not always take place in a defined workshop area but may take			

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
place anywhere on the drilling vessel. While drainage mechanisms exist, there is a risk of polluting substances leaking or spilling into the sea and/ or solid objects falling overboard_(see Activity 6.3 above)		
Objectives: • To manage repairs in a manner that minimises the risk of liquids polluting the sea and to expedite clean up of any such spillages that do occur • To handle, store and dispose of chemicals in such a way as to minimise the risk of spillage or leakage • To minimise the risk of polluting the environment during repairs and maintenance • To respond to any spills and or leaks in such a way that environmental damage does not occur		
6.4.1. All fuels, greases, oils and other chemicals shall be stored and handled as per chemical handling procedures specified in the drilling contractor's standard operating procedures and summarised in the chemical handling procedures below (see Activity 6.5).	Drilling Contractor	Throughout drilling
6.4.2. Repair and servicing of loose equipment or machinery shall be undertaken only in the workshops or within areas of the drilling vessel which has drainage dedicated to containing spilled liquid and suspended debris.	Drilling Contractor	Throughout drilling
6.4.3. Where repair of equipment or machinery must take place in situ, precautions appropriate to the location must be taken to minimise the risk of spills or loss of objects overboard.	Drilling Contractor	Throughout drilling
6.4.4. Any spills of liquids shall be treated as an incident and handled according to the procedure detailed under Activity 12.1 below.	Drilling Contractor	Immediately on occurrence
6.4.5. Audit Guidelines • Audits should, through examination of records retained by the vessel, visual inspections and targeted interviews, verify that: o Repair and servicing of mobile equipment and machinery takes place in the workshops or within areas which drain to effluent tanks o Where such repair is not possible, that the measures taken to minimise o spillage or loss of objects overboard were appropriate to the situation and location o Incidents were managed as per the incident procedure under Activity 12	PetroSA SHEQ Manager	During drilling
6.5. Chemical Storage and Handling		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Drilling vessels store and use a range of chemicals (both solid and liquid) which could potentially contaminate the marine environment. The activities of all personnel dealing with chemicals must minimize the risk of spillage. Not only do spillages constitute waste but they also pose a risk to the environment. Thus the first line of prevention is behavioral. Workshop management has been dealt with above under Activity 6.4. Even with effective plans in place, accidents can still occur. To this end the drilling vessels have dedicated drainage systems which channel onboard spillages to tanks for treatment and/ or disposal if required. Measures are required to contain any leaks and spillages to avoid the development of a hazardous cocktail in the bilge which could not be discharged to the sea and would require treatment and removal as hazardous waste. Many of the procedures for chemical handling and storage are legislated under the Occupational Health and Safety Act 85 of 1993 as amended but the focus of the environmental management plan is to ensure that environmental issues are adequately addressed.		
Objectives: • To handle and store chemicals in such a way as to minimise the risk of spillage or leakage • To dispose of expired chemicals in an environmentally responsible and legal manner • To respond to any spills and or leaks in such a way that environmental damage does not occur To formally evaluate any spills or leaks in order to plan for prevention of recurrence		
6.5.1. A chemical register shall be maintained and will detail: • All chemicals used and stored on the drilling rig/vessel • Chemical characterisation of each chemical including SABS class and hazard rating • Specific storage handling or disposal requirements for each chemical including Personal Protective Equipment • Emergency response actions for each chemical • The proc**ess** used to verify the information contained in the register	Drilling Contractor	Throughout drilling
6.5.2. All containers of hazardous liquids shall be stored inside impermeable bunds (portable or fixed) which have a total capacity of 110% of the total amount liquid stored inside them. This shall apply both in store-rooms and in situations where containers have been temporarily moved from the store room to a position close to where the contents are being used for convenience.	Drilling Contractor	Throughout drilling
6.5.3. All chemicals shall have current Material Safety Dato Sheets (MSDS) prominently displayed at the location of storage and use	Drilling Contractor	Throughout drilling
6.5.4. Incompatible chemicals shall not be stored in the same location	Drilling Contractor	Throughout drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
6.5.5. Personnel using chemicals shall be trained In their use, disposal and clean-up.	Drilling Contractor	Annually
6.5.6. Expired chemicals shall be labelled as waste and treated in accordance with the disposal requirements specified in their MSDS.	Dr/l/Ing Contractor	Throughout drilling
6.5.7. Any chemical spills of more than 5 litres shall be treated as an incident and handled according to the incident procedure detailed under Activity 12.1 below	All staff	Immediately on occurrence
6.5.8. Any loss of chemicals overboard shall be treated as an incident and handled according to the procedure detailed under Activity 12.1.	Drilling Contractor	Immediately on occurrence
6.5.9. Audit Guidelines • Audits should, through examination of records retained by the contractor, verify that: o The chemical register is current and verified o Storage accords with legal requirements and the details contained in the MSDS o All liquids were stored inside bunds of requisite capacity o The bunds are sealed and the containment integrity is checked regularly o All hazardous chemicals were labelled as such and the emergency procedures to be adopted in the event of a spill clearly are detailed on MSDS at the site of storage o All MSDS are current and accurate o Mobile liquid chemical dispensers or drums are positioned on / or over drip trays o Spills are reported and handled according to the liquid incident management procedure under Activity 12.1 o Spill absorbents are available at the location of use and that they are appropriate to the nature of the chemical being used o Expired chemicals are labelled as expired and handled as waste.	PetroSA SHEQ Manager	During drilling
6.6. Drilling Activities and Severe Weather		
Rationale:		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Depending on the type of rig used for drilling and its stability under ocean swell conditions and strong winds, rough seas and bad weather conditions may pose a risk of pollution from accidents arising during drilling activities. Under severe storm conditions it may be essential for drilling to cease until the storm passes and conditions become suitable to resume drilling.		
Objectives: To minimise the risk of spillage, leakage and dropped objects and materials during storm events		
6.6.1. Drilling must only be undertaken in accordance with the Contractor's Operations Manual specifying conditions within which drilling can be safely undertaken	Drilling Contractor	Throughout drilling
6.6.2. During major storm events that could pose a pollution risk during drilling the contractor must: • stop drilling • disconnect the marine riser if necessary, • ballast the drilling vessel to Survival Draft to minimise instability, if necessary • do not undertake bunkering (see section 7.3 on bunkering)	Drilling Contractor	Major storm events
6.7. Management of ballast water		
Rationale: Release of ballast water in areas distant from their collection points may pose a risk of contaminating receiving waters with alien biota leading to possible spread of aliens and replacement of natural indigenous biota with exotic forms. This can be especially where such receiving waters have sensitive species and/or are located in protected marine environments.		
Objectives: To minimise the risk of contaminating receiving waters with exotic biota through the release of ballast water		
6.7.1. **Ballast water from all vessels, discharged will follow the requirements of the International Maritime Organisation's (IMO) 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments. Including:** • **Establishing standards and procedures for the management and control of ships' ballast water and sediments.**	Drilling Contractor	Throughout drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing

• Ships are required to implement a Ballast Water Management Plan, which includes a detailed description of the actions to be taken to implement the Ballast Water Management requirements.
• All ships using ballast water exchange should, wherever possible, do so at least 200 nautical miles (± 370 km) from nearest land in waters of at least 200 m deep. Where this is not feasible, the exchange should be as far from the nearest land as possible, and in all cases a minimum of 50 nm (± 93 km) from the nearest land and preferably in water at least 200m in depth.
• Ships will also have a Ballast Water Record Book to record when ballast water is taken on board; circulated or treated for Ballast Water Management purposes; and discharged into the sea.
• Avoid the unnecessary discharge of ballast water.
• Use filtration procedures during loading in order to avoid the uptake of potentially harmful aquatic organisms, pathogens and sediment that may contain such organisms.
 	
~~Comply with Guideline A.868(20) of the International Maritime Organisation through:~~
 	
• ~~Ensuring the drilling unit has a ballast water management plan in place to ensure safe and effect ballast water management~~
• ~~Reduce the risk of transfer of harmful aquatic organisms by onboard ballast water treatment or exchange by:~~
• ~~Exchange ballast water from a distant area collection point at least 200 nautical miles from nearest land and in water at least 200m deep, or If not possible, as far from nearest land as possible but at least a minimum of 50 nautical miles and in water of 200m deep~~
• ~~Comply with one of the three following ballast water exchange methods:~~
  ○ ~~Sequential method: empty at least 95% or more of the volume of ballast tanks and refill with replacement ballast water (open ocean). However, the emptying of certain tanks may lead to significantly reduced stability, higher stresses, high sloshing pressures, and/or reduced forward drafts. A secondary effect of reduced forward draft would be an increased probability of bow slamming.~~
  ○ ~~Flow through method: This method involves pumping open ocean water into a full ballast tank. Ballast equal to approximately three times the tank capacity must be pumped through the tank to achieve 95% effectiveness in eliminating aquatic organisms. Applying the flow through method does not alter the stability, stress and ship attitude.~~
  ○ ~~Dilution method: This method involves the pumping the replacement ballast water through the top of the ballast tank or hold intended for the carriage of water ballast with simultaneous discharge from the bottom at the same flow rate and maintaining a constant level in the tank or hold. At least three times the tank or hold volume should be pumped through the tank or hold.~~
• ~~When exchanging ballast at sea, take into account guidance on safety aspects of ballast water exchange as set out in Appendix 2 of the IMO Guidelines. When these requirements cannot be met, ballast water exchange~~		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
~~should be undertaken in designated ballast water exchange areas, as determined with the relevant authority (e.g. DEA: Directorate Pollution & Waste Management or Transnet National Ports Authority).~~ • ~~Where practicable, routine cleaning of the ballast tank to remove sediments should be carried out in mid-ocean or under controlled arrangements in port or dry dock, in accordance with the provisions of the ship's ballast water management.~~		
6.7.2. Ensure all equipment (e.g. drill string, wellhead, BOP etc.) that has been used in other regions is thoroughly cleaned prior to deployment Avoid the unnecessary discharge of ballast water.	Drilling Contractor	Throughout drilling

3.7 ACTIVITY 7: RIG ESTABLISHMENT & REFUELLING

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
7.1. Rig Site Survey and Selection		
Rationale: Positioning the drilling vessel may damage reefs or other habitats or possibly shipwrecks on the seabed. Therefore**,** seabed surveys are generally undertaken to check for seabed conditions and can be used to check for sensitive habitats or remains. Such surveys can be used to better plan for drilling vessel positioning and anchoring and in so doing to minimize seabed disturbance. The survey information also provides a baseline for monitoring drilling impacts such as deposition or mounding of drill cuttings and dropped objects.		
Objectives: • To minimise disturbance to sensitive seabed habitats **and marine fauna**. • To check for shipwrecks or other historical remains and thereby allow for excavation if required.		
7.1.1. Undertake a seabed survey using side scan sonar or other appraisal method to determine the presence of sensitive reef habitats or shipwreck, to confirm whether any infrastructure might be affected (pipelines etc), and to confirm the state of the seabed. **The survey should extend over the area likely to be affected by drill cuttings and mud discharges, as defined by a drill cuttings and muds discharge modelling study. The findings of the survey should be documented and shared with the DFFE and the South African National Biodiversity Institute (SANBI) for biodiversity research purposes.**	PetroSA Drilling Manager	Prior to rig positioning

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
7.1.2.	Prepare a written summary of the seabed survey documenting the state of seabed and presence of any key features prior to drilling as a baseline reference condition.	PetroSA Drilling Manager	Prior to rig positioning
7.1.3.	Notify the South African Heritage Resources Agency (SAHRA) if shipwreck or other historical relicts are identified. All rig positioning activities should be suspended until approval is given to proceed by SAHRA.	PetroSA SHEQ Manager	Prior to rig positioning
7.1.4.	Use the seabed survey data to prepare a rig positioning plan taking into account the presence of sensitive features. **The infrastructure position should be adjusted to avoid the identified sensitive habitats or features. If sensitive and potentially vulnerable habitats are detected, seek the advice of a benthic specialist and, adjust the well position accordingly or implement appropriate technologies, operational procedures and monitoring surveys to reduce the risks of, and assess the damage to, vulnerable seabed habitats and communities.**	PetroSA Drilling Manager	Prior to rig positioning
7.1.4.1.	**The following management actions should be implemented to control impacts from noise on the marine environment:** • **For Sonar Surveys, recommendations for mitigation include:** ○ **Appoint a minimum of two dedicated Marine Mammal Observer (MMO)[2], with a recognised MMO training course, on board for marine fauna observation (360 degrees around survey vessel), distance estimation and reporting. One MMO should also have Passive Acoustic Monitoring (PAM) training. The MMO must ensure compliance with mitigation measures during seismic geophysical surveying.** ○ **Ensure survey vessel is fitted with PAM technology (one or more hydrophones), which detects animals through their vocalisations, should it be possible to safely deploy PAM equipment.** ○ **Pre-survey scans should be limited to 15 minutes prior to the start of survey equipment.** ○ **"Soft starts" should be carried out for any equipment of source levels greater than 210 dB re 1 µPa at 1 m over a period of 20 minutes to give adequate time for marine mammals to leave the vicinity.**	PetroSA Drilling Manager	Prior to rig positioning

[2] Non-dedicated MMOs can be implemented for short surveys using low-energy sources. Such personnel are trained MMOs who may undertake other roles on the vessel when not undertaking their mitigation role (JNCC 2017).

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
○ If several types of sonar equipment are to be started sequentially or interchanged during the operation, only one pre-shoot search is required prior to the start of acoustic output. A pre-shoot search will, however, be required for gaps in data acquisition of greater than 10 minutes. ○ Terminate the survey if any marine mammals show affected behaviour within 500 m of the survey vessel or equipment until the mammal has vacated the area. ○ Preference should be given to planning sonar surveys to avoid the migratory periods for cetaceans. ○ No sonar survey-related activities are to take place within declared Marine Protected Areas. • For Drilling Operations, recommendations for mitigation include: ○ The drilling contractor will ensure that the proposed exploration activities are undertaken in a manner consistent with good international industry practice and BAT. ○ All whales and dolphins are given protection under the South African Law. The Marine Living Resources Act, 1998 (No. 18 of 1998) states that no whales or dolphins may be harassed, killed or fished. ○ No vessel or aircraft may, without a permit or exemption, approach closer than 300 m to any whale and a vessel should move to a minimum distance of 300 m from any whales if a whale surfaces closer than 300 m from a vessel or aircraft. ○ The generation of vessel noise and drilling noise cannot be eliminated due to the nature of the drilling operations. The following measures will be implemented to reduce noise at the source: ▪ Implement a maintenance plan to ensure all diesel motors and generators receive adequate maintenance to minimise noise emissions. ▪ Ensure vessel transit speed between the site and port is a maximum of 12 knots (22 km/hr), except within 25 km of the coast where it is reduced further to 10 knots (18 km/hr). • For VSP, recommendations for mitigation include: ○ Key personnel and equipment: ▪ Appoint a minimum of two dedicated Marine Mammal Observer (MMO), with a recognised MMO training course, on board for marine fauna observation (360 degrees around drilling unit), distance estimation and reporting. One MMO should also have Passive Acoustic		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Monitoring (PAM) training should a risk assessment, undertaken ahead of the VSP operation, indicate that the PAM equipment can be safely deployed considering the metocean conditions (specifically current). ▪ Ensure drilling unit vessel is fitted with PAM technology (one or more hydrophones), which detects animals through their vocalisations, should it be possible to safely deploy PAM equipment. ○ Pre-start Protocols for airgun testing and profiling: ▪ VSP profiling should, as far as possible, only commence during daylight hours with good visibility. However, if this is not possible due to prolonged periods of poor visibility (e.g. thick fog) or unforeseen technical issue which results in a night-time start, refer to "periods of low visibility" below. ▪ Undertake a 1-hr (as water depths > 200 m) pre-shoot visual and possible acoustic scan (prior to soft-starts / airgun tests) within the 500 m radius mitigation zone in order to confirm there is no cetaceans, turtles, penguins and shoaling large pelagic fish activity close to the source. ▪ Implement a “soft-start” procedure of a minimum of 20 minutes’ duration when initiating the acoustic source (except if testing a single airgun on lowest power). This requires that the sound source be ramped from low to full power rather than initiated at full power, thus allowing a flight response by marine fauna to outside the zone of injury or avoidance. ▪ Delay “soft-starts” if cetaceans, turtles and shoaling large pelagic fish are observed / detected within the mitigation zone during the pre-shoot visual / acoustic scan. A “soft-start” should not begin until 20 minutes after cetaceans depart the mitigation zone or 20 minutes after they are last seen or acoustically detected by PAM in the mitigation zone. In the case of penguins, shoaling large pelagic fish and turtles, delay the “soft-start” until animals move outside the 500 m mitigation zone. ▪ Maintain visual and possibly acoustic observations within the 500 m mitigation zone continuously during VSP operation to identify if there are any cetaceans present. ▪ Keep VSP operations under 200 pulses to remain within the 500 m exclusion zone for LF cetaceans.		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
○ **Shut-Downs: Shut down the acoustic source if cetaceans, penguins, shoaling large pelagic fish or turtles are sighted within 500 m mitigation zone until such time as the mitigation zone is clear of cetaceans for 20 minutes or in the case of penguins, shoaling large pelagic fish or turtles, the animals move outside the 500 m mitigation zone before the soft-start procedure and production may commence.** ○ **Breaks in Airgun Firing** ▪ **Breaks of less than 20 minutes:** • **there is no requirement for a soft-start and firing can recommence at the same power level as at prior to the break (or lower), provided that continuous monitoring was ongoing during the silent period and no cetaceans, penguins, shoaling large pelagic fish or turtles were detected in the mitigation zone during the breakdown period.** • **If a cetaceans are detected in the mitigation zone during the breakdown period, there must be a minimum of a 20-minute delay from the time of the last detection within the mitigation zone and a soft-start must then be undertaken. In the case of penguins, shoaling large pelagic fish or turtles, the animals move outside the 500 m mitigation zone within the 20 minute period.** ▪ **Breaks of longer than 20 minutes:** • **If it takes longer than 20 minutes to restart the airguns, a full pre-watch and soft-start process should be carried out before the survey re-commences. If an MMO/PAM operator has been monitoring during the breakdown period, this time can contribute to the 60-minute pre-watch time.** ○ **Period of low visibility** ▪ **Ensure that during periods of low visibility (where the mitigation zone cannot be clearly viewed out to 500 m), including night-time, the VSP source is only used if PAM technology is in place to detect vocalisations (subject to a risk assessment indicating that the PAM equipment can be safely deployed considering the metocean conditions) or:**		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• **there have not been three or more occasions where cetaceans, penguins, shoaling large pelagic fish or turtles have been sighted within the 500 m mitigation zone during the preceding 24-hour period; and** • **a two-hour period continual observation of the mitigation zone was undertaken (during a period of good visibility) prior to the period of low visibility and no cetaceans, penguins, shoaling large pelagic fish or turtles were sighted within the 500 m mitigation zone.** **The operations must be managed in compliance with the IFC EHS Guidelines for Offshore Oil and Gas Development, 2015.**		
7.1.5. Audit guidelines • Audits should, through examination of records retained, verify that: ○ The seabed survey was undertaken prior to drilling vessel establishment ○ A summary report of the seabed survey was compiled ○ The summary report was included in the Well Close Out report ○ Any wrecks or historical remains were reported to SAHRA and appropriate action taken.	PetroSA SHEQ Manager	Pre-, during and/or post-drilling
7.2. Drilling Vessel Positioning		
Note: Navigational measures associated with rig transport and positioning are covered in Section 6.1 above. The measures presented here relate to safety and marine protection.		
Rationale: Drilling Vessel positioning, especially if it involves supports and anchoring on the seabed, causes benthic disturbance and may cause habitat destruction. Incorrect positioning or inadequate maintenance and equipment could lead to undue safety risks and potential additional environmental damage.		
Objectives: • To ensure the drilling rig is appropriately secured on the seabed and that all positioning systems are operational and effective. • To minimise the need for measures that cause additional seabed and marine disturbance.		
7.2.1. Drilling vessel positioning should be done in accordance with the following measures:	Drilling Contractor	Prior to Rig Positioning

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
7.2.2. A hazard identification and risk assessment	Drilling Contractor	Prior to Rig Positioning
7.2.3. Compliance with all relevant national codes and standards (e.**g.** maritime and navigational warnings) and good oil field practice (e.**g.** seabed surveys and measures to minimise seafloor disturbance and risks to sea life)	Drilling Contractor	Prior to Rig Positioning
7.2.4. Procedures laid down in the drilling vessel's operation manual as approved by the relevant classification society	Drilling Contractor	Prior to Rig Positioning
7.2.5. Maintain the drilling vessel to class standard throughout drilling	Drilling Contractor	Throughout drilling
7.3. Drilling Vessel Refuelling / Bunkering		
Rationale: Bunkering or transferring fuel to the drilling vessel, poses the risk of fuel spillage, especially when connecting and disconnecting hoses and valves. Spillage may be more likely to occur in rough marine or stormy conditions		
Objectives: • To minimize the risk of spills and marine pollution during bunkering.		
7.3.1. Obtain permission from SAMSA five days prior to bunkering activities.	PetroSA Logistics Manager	During transport and bunkering
7.3.2. Diesel and other fuels must be stored in enclosed and secured tanks, designed to withstand extreme events and conditions	PetroSA Logistics Manager/Driling Contractor/Supply Vessel Contractor	During transport and bunkering
7.3.3. Where feasible, drip trays must be in place to collect leakage from connection and discharge points.	PetroSA Logistics Manager/Driling Contractor/Supply	During bunkering

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
	Vessel Contractor	
7.3.4. Offshore bunkering will not be allowed in the following circumstances: • Wind force and sea state conditions of 6 or above on the Beaufort Wind Scale, • **During any workboat or mobilisation boat operations,** • **At night or times of low visibility,** • During helicopter operations, and • During the transfer of heavy in-sea equipment. **Compliance with COLREGS (the Convention dealing with safety at sea, particularly to reduce the risk of collisions at sea) and SOLAS (the Convention ensuring that vessels comply with minimum safety standards).**	Drilling Contractor / Supply Vessel Contractor	During bunkering
7.3.5. Floating hoses will be made of flexible double carcass sections and will be equipped with a breakaway coupling for protection against excessive tension or overpressures in the fuel system. The closure time will be set to minimise the volume of oil spilled to the sea whilst being slow enough to prevent surge pressure building up. Hoses will also be fitted with marker lights and will have built-in buoyancy with a minimum reserve of 25% (to cope with a situation where the hose becomes filled with seawater and immersed). This will also prevent accidental damage to unseen hoses by supply vessels.	Drilling Contractor / Supply Vessel Contractor	During bunkering
7.3.6. Spillages of fuel during bunkering should be logged as an incident in accordance with the procedures given in Activity 12.	Drilling Contractor/ Supply Vessel Contractor	Immediately

7.3.7. Audit Guidelines
• Audits should, through examination of records retained by the facility, verify that:
  ○ Proof of SAMSA approval for bunkering activities during drilling
  ○ Fuel is stored correctly and drip trays provided and used for bunkering where feasible
  ○ Hoses and other equipment meet the required specifications
  ○ Incidents recorded in the incident register were investigated and closed out.
	PetroSA SHEQ Manager	During and post-drilling

3.8 ACTIVITY 8: DRILLING FLUIDS AND CUTTINGS

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
Rationale: Drill cuttings are fragments of rock and sand generated by the drilling process and range in size from fine silt to coarse gravel, depending on the type of rock strata being drilled. Drill cuttings are dispersed from the point of drilling and settle out within a depositional area around the drill site, in a shape and depth influenced by the prevailing currents and tides. Where drill cuttings are brought to the surface after the marine riser has been run, they are released just below the sea surface, where they can result in a turbidity plume before particles settle out. Deposition of drill cuttings can modify the seabed habitat by altering the particle size distribution patterns and smothering benthic fauna. Depending on the type of drilling mud used (eg. either non-aqueous or water-based) toxicity effects on water column biota or benthic fauna may occur to some degree. Mitigation is focused on selection of drilling muds and requirements for treatment of drill cuttings when non-aqueous drilling fluids are used. Industry best practice seeks to reduce oil content on drill cuttings to <5% by weight, and to release drill cuttings below sea level to restrict the extent of the turbidity plume.			
Objectives: • To minimise turbidity and toxicity effects on the marine environment • To minimise human exposure to non-aqueous drill fluids.			
8.1. Drill Cuttings Selection, Treatment and Disposal			
8.1.1.	In compliance with industry standards, select the lowest toxicity drilling fluid (or mud) available to meet the technical drilling requirements. Water based drilling fluids (WBDF) should be selected in preference to Non-Aqueous drilling fluids (NADF) wherever possible. NADF should not be used in the upper part of a well (with the exception in cases of safety or geological reasons to be described in the Notification Report). Where NADFs are required, use Synthetic Based Drilling Fluid (OGP Type III) with low polycyclic aromatic hydrocarbon content. This information will be documented in the Drilling Fluids programme section of the Drilling Programme. **Careful selection of drilling fluid additives taking into account their concentration, toxicity, bioavailability and bioaccumulation potential. Ensure only low-toxicity, low bioaccumulation potential and partially biodegradable additives are used.**	PetroSA Drilling Manager	Prior to drilling
8.1.2.	Comply with the MSDS specifications of the selected drilling mud relating to handling, storage and disposal.	Drilling Fluids Contractor	Throughout drilling
8.1.3.	Drill cuttings drilled using NADFs must be treated on board the drilling vessel to reduce oil content to less than 5% average weight. No bulk discharge of untreated NADF cuttings are permitted.	Drilling Fluids Contractor	Throughout drilling

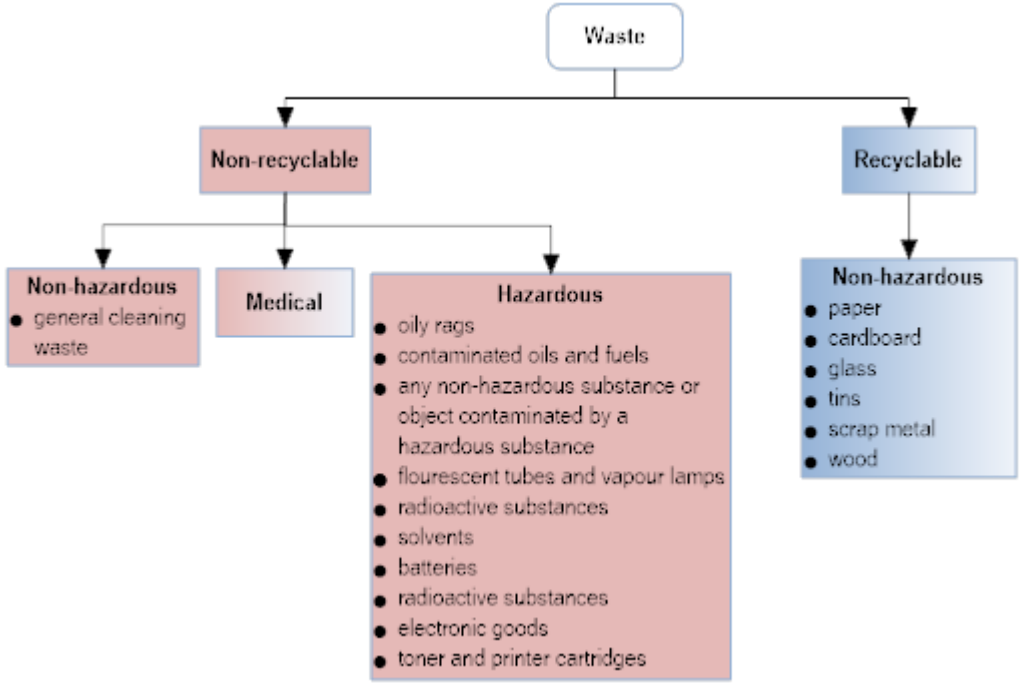
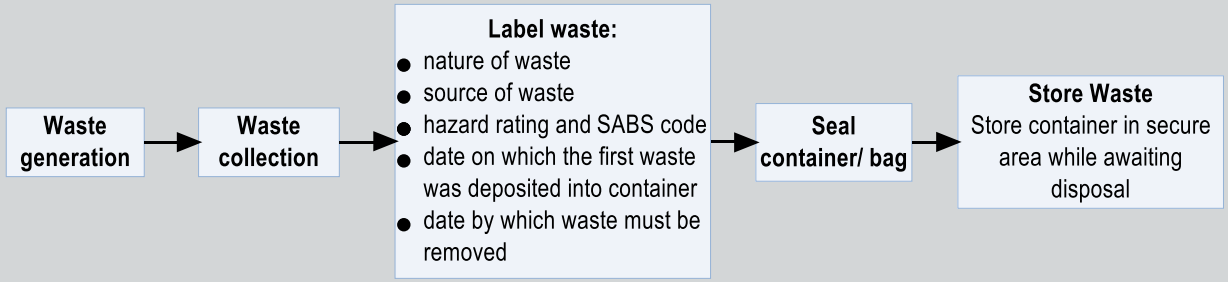
Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
8.1.4.	Drill cuttings brought to the surface for processing should be released via a shunt pipe placed **at least 10m** ~~**5 m**~~ below the sea surface to reduce turbidity plumes and to limit the impact area.	Drilling Contractor	Throughout drilling
8.1.5.	Oil content of drill cuttings must be monitored at least 12-hourly throughout drilling or in accordance with the specified calibration of oil testing equipment.	Drilling Fluids Contractor	Throughout drilling
8.1.5.1.	**Monitor cement returns and if significant discharges are observed on the seafloor terminate cement pumping.**	Drilling Contractor	Throughout drilling
8.1.6.	Monitoring equipment used to monitor oil content is certified for the intended purpose, and has a valid certificate. A copy of this certification is to be provided to PetroSA.	Drilling Fluids Contractor	Throughout drilling
8.1.7.	Monitoring results of oil content must be submitted monthly to PetroSA and areas of non-compliance indicated. Oil content exceeding 5% monthly average should be recorded as an incident (see section 12.3).	Drilling Fluids Contractor	Monthly, throughout drilling
8.1.8.	Drilling Fluids Contractor to record and provide the following information (for inclusion in the Well Environmental Close Out report (see Section 14.2.2.4): • the volume of drill cuttings discharged at the seabed prior to running the marine riser and the volume of drill cuttings discharged from below the seasurface after running the marine riser, • the type and volume of drilling fluids used.	Drilling Fluids Contractor	End of drilling
8.1.9.	Observable drill cutting depositions to be taken note of during post drilling seabed survey (see Section 13.3) and described in Final Seabed Survey report (see Section 14.2.2.4)	Drilling Fluids Contractor	End of drilling
8.1.10.	Recovered non-aqueous drilling fluids shall be returned to shore for reuse or disposal at an approved waste site.	PetroSA Logistics Manager	During / end of drilling
8.1.11.	Audit guidelines • Audits should, through examination of records retained and targeted interviews, verify that: ○ A drilling fluids programme was compiled and contained the stipulated level of detail and information ○ The relevant information from the drilling fluids programme was included in the Environmental Notification report ○ MSDS specifications for storage, handling, and disposal were adhered to.	PetroSA SHEQ Manager	End of drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
○ Proof of certification of oil monitoring equipment retained by PetroSA. ○ Documentation on the volume of cuttings generated and fluids used was compiled, presented in Close Out Report, and submitted to PetroSA. ○ Results of post drilling sonar or ROV surveys record the presence or absence of drill cutting depositions.		

3.9 ACTIVITY 9: SOLID WASTE MANAGEMENT

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
9.1. General Measures for Solid Waste Management		
Rationale: Globally there is a recognition that wastage of resources must cease. A major concern is that final disposal to landfill of potentially renewable resources unnecessarily uses up landfill airspace and wastes resources that still have value. Since the enactment of the National Environmental Management: Waste Act (No 59 of 2008) there is now a positive obligation on waste generators to assess their resource usage and attempt to eliminate or reduce waste production and where this is not possible, to develop ways of re-using or recycling waste. Disposal to landfill should only be adopted as a final resort. This requires an active and ongoing assessment of waste production to identify creative ways of satisfying the objectives of this Act. The procedure below provides an overview of the steps which should be taken.		
Objectives: • To prevent any waste from entering the marine environment except for macerated galley waste and macerated and treated sewage waste • To reduce the amount of waste disposed to landfill by reducing waste generation and maximising recycling and reuse • To comply with waste management legislation • To dispose of all solid waste in an environmentally responsible manner.		
9.1.1. Prior to commencing drilling operations, an integrated waste management plan in line with the waste management hierarchy below.	PetroSA SHEQ Manager	Prior to Drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
9.1.2. Waste Management Hierarchy 		
9.1.3. A Waste Register shall be compiled which shall detail: • Categories and volume estimates of different waste types generated on the drilling and support vessels • Their source • Their SABS class and hazard rating • Their storage requirements • Their disposal methods, including quantities incinerated and to landfill • Any specific precautions or legislative requirements.	PetroSA SHEQ Manager	Prior and throughout drilling
9.1.4. The Waste Register shall be updated to record actual waste volumes generated during the drilling campaign.	Drilling and other Contractors	Monthly
9.1.5. Waste shall be segregated into the following categories shown in the figure below. Recyclables shall be stored separately as shall hazardous waste.	Drilling Contractor/ PetroSA Logistics Manager	Throughout drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
		
9.1.6. All wastes shall be handled according to the flow diagram in the Figure below while awaiting transport to disposal sites. 	Drilling Contractor/PetroSA Logistics Manager	Throughout drilling

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
9.1.7.	No waste may be stored for more than 30 days on any vessel without formal permission from DFFE ~~DEA~~.	Drilling Contractor	Throughout drilling
9.1.8.	Wastes shall be stored in sealed containers or bags and protected from the environment according to specifications for storage in the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste published by Department of Water Affairs and Forestry in 1998 (or the latest update thereof).	Drilling Contractor/ PetroSA Logistics Manager	Throughout drilling
9.1.9.	Incompatible waste may not be stored in the same location (see the hazard ratings for wastes in the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste published by Department of Water Affairs and Forestry in 1998 for compatibility, or the latest update of this document).	Drilling Contractor/ PetroSA Logistics Manager	Throughout drilling
9.1.10.	Galley waste shall be macerated at sea to pieces smaller than 25mm and deposited overboard at a distance at least 12 nautical miles from shore in accordance with MARPOL requirements. No galley waste to be discharged within 3 nautical miles of shore.	Drilling Contractor	Throughout drilling
9.1.11.	Sewage shall be discharged as outlined in action Section 10.2.	Drilling Contractor	Throughout drilling
9.1.12.	The Drilling Contractor shall maintain a waste manifest system which includes: • The quantities of different categories of wastes leaving the vessel • The nature and source of the waste types • The date upon which the waste was removed • The date upon which they were received by the disposal facility, and • Proof of correct disposal by the landfill site (including a safe disposal certificate for any hazardous waste). • Obtaining completed waste disposal certificates including quantities and method of disposal for different waste types.	Drilling Contractor/PetroSA Logistics Manager	Throughout and at the end of drilling
9.1.13.	Hazardous waste shall be disposed of at a registered waste disposal site, and a safe disposal certificate shall be issued for each load of hazardous waste.	PetroSA Logistics Manager	Throughout and at the end of drilling
9.1.14.	Waste manifests shall be provided to PetroSA and reported in the Drilling Contractor's Monthly Report.	Drilling Contractor	Monthly

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
9.1.14.1. Once the produced water has been separated from the hydrocarbon component, the hydrocarbon component will be burned off via the flare booms, while the water will be temporarily collected in a slop tank. The product water is then either directed to: • a **settling tank prior to transfer to support vessel for onshore treatment and disposal; or** • **a dedicated treatment unit where, after treatment, it is either:** • **if hydrocarbon content is < 30 mg/l, discharged overboard; or** • **if hydrocarbon content is > 30 mg/l, subject to a 2nd treatment or directed to tank prior to transfer to support vessel for onshore** treatment and disposal.	Drilling Contractor	Throughout and at the end of drilling
9.1.15 Audit Guidelines • During Drilling, audits should, through examination of records retained, verify that: o The waste register is current and verified o Storage accords with legal requirements and the details contained in the register o All liquid wastes were stored inside bunds of requisite capacity o The bunds are sealed and the containment integrity is checked regularly o All hazardous wastes were labelled as such o No wastes are stored on the rig for longer than 30 days without approval from DEA o The amount of general waste stored on the rig does not exceed 30 tonnes per day or does not exceed a throughput rate of 20m3 per day without approval from DEA o The temporary storage of hazardous waste does not exceed 3 tonnes on any one day without approval. {If the amount of hazardous waste generated exceeds 3 tonnes per day, this is a scheduled activity in terms of the Waste Act and requires approval from DEA via a scoping / Basic Assessment process}. o Each container of waste is labelled with its source and contents o Safe disposal certificates were obtained for every hazardous waste load.	PetroSA SHEQ Manager	During and on completion of drilling
• The post-drilling audit should verify that: o A complete record of waste management was maintained throughout the drilling campaign.	PetroSA SHEQ Manager	After drilling

3.10 ACTIVITY 10. DISCHARGE OF EFFLUENT

Operational Activities/ Aspects & Auditable Actions		Responsibility	Timing
Rationale: Liquid wastes arise from cleaning the decks, works areas, ablutions, and bilges. The discharge has the potential to be detrimental to the marine environment if it does not meet MARPOL discharge standards. Please note: disposal of drilling fluids and drill cuttings are covered in Activity 8 while discharge of ballast water is covered in Section 6.7..			
Objectives: • To contain effluents which could pose a threat to the marine environment • To treat effluents before discharge in order to minimise damage to the marine environment • To comply with legislative obligations for effluent discharge.			
10.1.	**Deck & Bilge Water**		
10.1.1.	Drainage water from deck and bilges shall be routed to separate drainage systems on drilling vessels, and shall include contaminated oily water from closed drains and drainage water from non-process areas (open drains).	Drilling Contractor	Throughout drilling phase
10.1.2.	Drip trays or bunds shall be provided to contain contaminated water from all works areas that do not drain or route to a closed drainage system	Drilling Contractor	Throughout drilling phase
10.1.3.	No deck or bilge water may be discharged to the sea unless the oil concentration is below 15ppm (MARPOL standard). Monitoring must be undertaken to ensure compliance with this standard.	Drilling Contractor	Throughout drilling phase
10.1.4.	In the event that the discharged oil concentration exceeds 15ppm the root cause of non-compliance shall be investigated and rectified.	Drilling Contractor	Twice daily throughout drilling phase
10.1.5.	Oil concentration records shall be retained and submitted to PetroSA in the Monthly Report.	Drilling Contractor	Immediately on occurrence
10.1.6.	Where possible, environmentally-friendly, low toxicity, and biodegradable cleaning materials shall be used.	Drilling Contractor	Monthly

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
10.1.6.1.. **Discharges of oily water (deck drainage, bilge and mud pit wash residue) to the marine environment are regulated by MARPOL 73/78 Annex I, which stipulates that vessels must have:** • **A Shipboard Oil Pollution Emergency Plan (SOPEP).** • **A valid International Oil Pollution Prevention Certificate, as required by vessel class.** • **Equipment for the control of oil discharge from machinery space bilges and oil fuel tanks, e.g. oil separating/filtering equipment and oil content meter. Oil in water concentration must be less than 15 ppm prior to discharge overboard.** • **Oil residue holding tanks.** • **Oil discharge monitoring and control system. The system will ensure that any discharge of oily mixtures is stopped when the oil content of the effluent exceeds 15 ppm.**	Drilling Contractor	Throughout drilling phase
10.2. Sewage		
10.2.1. **Sewage and grey water discharges from vessels are regulated by MARPOL 73/78 Annex IV. ~~Sewage shall be comminuted to <25mm in size before discharge to the sea at greater than 12 nautical miles in accordance with MARPOL standards.~~**	Drilling Contractor	Throughout drilling phase
10.3. General discharges		
10.3.1. **Implement leak detection and repair programs for valves, flanges, fittings, seals, etc**	Drilling Contractor	Throughout drilling phase
10.3.2. **Prohibit operational discharges within MPAs during operations, and transit to and from the drill site.**	Drilling Contractor	Throughout drilling, pre- and post transit
10.4. Audit Guidelines		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• Audits should, through examination of records contained in the Contractor's Monthly and Well Environmental Close Out reports, verify that: ○ The waste water streams were monitored at the specified frequency ○ The laboratory equipment used for analysis has valid certificates, and is calibrated and maintained according to manufacturer's specifications ○ Sewage macerators are maintained and fully functional. ○ Any elevated levels were investigated and the sources identified and appropriate action was taken ○ Any such remedial action was documented and the effectiveness monitored ○ No waste water was discharged from bilge tanks with a concentration of greater than 15ppm oil (MARPOL) ○ Any discharges of concentrations greater than those specified were formally investigated, reported and remedial action taken ○ Any such remedial action was documented and the effectiveness monitored.	PetroSA SHEQ Manager	During and post drilling

3.11 ACTIVITY 11 GASEOUS EMISSIONS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: Gaseous emissions of concern on offshore facilities may include escaped ozone depleting substances from refrigeration units and gases resulting from flaring and use of generators, which may include SO2, CO2, CO, and NOx and sooty particulates. At present there are no legislated limits for the emissions produced by the offshore oil and gas industry in South Africa.		
Objectives: • To reduce the volumes of green house gases emitted and minimise air pollution.		
11.1. Gaseous Emissions		
11.1.1. Any accidental release of Ozone Depleting Substances, if applicable, shall be treated as an incident and be dealt with in accordance with the incident procedure in Activity 12.	Drilling Contractor	If arises

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
11.1.2. Any release of ozone depleting substances shall be reported to DEA.	Drilling Contractor	If arises
11.1.3. The volume of gas flared on a daily basis shall be recorded and submitted to PetroSA in the Monthly Report.	Well Test Contractor	Daily during drilling
11.1.4. Flare test burners shall be equipped with an appropriate enhancement system selected to minimise incomplete combustion, black smoke and hydrocarbon fall out to sea, and should be maintained at highest possible efficiency. Incidents of black smoke exceeding 24 hours in duration shall trigger an investigation of operating efficiency and rectification where feasible.	Drilling Contractor	Throughout flaring
11.1.5. Sustained emission of black smoke for a period of more than 24 hours shall be recorded as an incident (see Section 12.3).	Drilling Contractor	Immediately
11.1.6. All valves, taps and pipe connections should be inspected regularly in accordance with the maintenance and monitoring schedule to check for leaks and should be immediately rectified in the event of leak detection.	Drilling Contractor	According to maintenance & monitoring schedule
11.1.7. Audit Guidelines • Audits should, through examination of records, verify that: ○ Emissions are monitored according to the specified schedule ○ The laboratory equipment used for analysis has valid certificates, or ○ The laboratory equipment use for analysis was calibrated and maintained according to the manufacturer's specifications, and ○ Flare test burners are maintained ○ Incidents of black smoke for extended duration were investigated appropriately and measures taken to rectify the identified problem.	PetroSA SHEQ Manager	During and on completion of drilling

3.12 ACTIVITY 12: INCIDENTS AND EMERGENCIES

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: An incident is an unplanned event which could or does result in harm or loss to people, property, process or environment and covers every incident from minor spills and leaks to large-scale releases and emergencies. In the case of drilling activities, incidents would include: • well blow-outs, • near miss and collisions between vessels and the drilling vessel, • spills during fuel bunkering or any other drilling or maintenance activity, • loss of objects overboard, • non-compliance with 5% average monthly standard of residual oil content on drill cuttings, • extended release of black smoke during flaring, and • release of ozone depleting substances. The single biggest environmental incident risk of drilling operations is of oil spills to the sea from a variety of sources. These include the unlikely event of a well blow out during drilling, a vessel collision and uncontrolled loss of fuel during bunkering operations. PetroSA and drilling contractors have a number of standard procedures which aim to prevent spills during normal drilling operations and emergency situations, and to manage the response in the event of a spill. These include the maintenance and regular full system checks of the Blow Out Preventer. Drilling contractors are required to have a site-specific emergency response plan for each drilling campaign which must be aligned with PetroSA's Oil Spill Contingency Plan and the National Oil Spill Contingency Plan and approved by SAMSA and MCM prior to commencing drilling activities. The incident management procedure is followed at the first stage of a spillage, which includes an assessment of the magnitude and severity of the spill in order to determine whether the incident constitutes an emergency and if the oil spill contingency plan must be activated.		
Objectives: • To undertake all maintenance and system checks to ensure preventive procedures are optimised to minimise the risk of an incident or emergency • To provide a coherent, planned response to any incident which could adversely affect the environment • To improve response time and efficiency of the plans and the activities of staff members through drills and test runs • To provide a process for the management of an incident or emergency depending upon the severity of the occurrence • To minimise the risk of loss of solid objects overboard and to expedite the retrieval (if possible) of any objects which fall overboard • To log the existence and location of fallen objects for future reference/ action • To notify interested parties of the existence and location of un-retrieved fallen objects • Through post-emergency evaluations, minimise the risk of a recurrence of the incident..		
12.1. Uncontrolled Release of Liquids		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
12.1.1. The Drilling Contractor will comply with the Incident Management Procedure and Oil Spill Contingency and Emergency Response Plans developed prior to drilling (see section 1.2). **Project vessels will be equipped with appropriate spill containment and clean-up equipment, e.g. booms, dispersants and absorbent materials. All relevant vessel crews will be trained in spill clean-up equipment use and routine spill clean-up exercises.**	Drilling Contractor	Throughout drilling
12.1.2. Incident management shall entail the following key steps: • Incident detection • Rapid assessment of incident severity • Implement response actions, as follows: ○ Routine Incident: In the case of an onboard spill or leak confined to the drilling vessel or other incident that does not pose a risk of major harm to the environment or people, then the following steps may be taken: ▪ Mobilisation of onboard response person or team to: • contain the spill and shut off or control the source of the incident event, and • clean up the spill or take steps to rectify the incident consequences ▪ Complete an incident report form ▪ Conduct an investigation, and ▪ Close out the incident ○ Major Oil Spill (Emergency): In the case of an oil spill to sea with serious potential consequences to marine and human life, the provisions of the Oil Spill Contingency and Response Plan will be implemented and the following key steps will be required: ▪ Classify the spill scenario, size and nature of the spill ▪ Notify PetroSA, who will in turn notify DEA, SAMSA and other relevant authorities to respond depending on the nature of the emergency ▪ Mobilise on-board resources and take all practical steps on the drilling vessel to contain the oil spill ▪ Adhere to all notification, investigation procedures, and reporting requirements in accordance with the Oil Spill Contingency and Response Plan.	Drilling Contractor, PetroSA and other agencies (as required)	Immediately on occurrence
12.1.3. An incident and the results of any investigation shall be recorded and submitted to PetroSA in the Monthly Report.	Drilling Contractor	Monthly
12.2. Materials and Equipment Lost Overboard		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
12.2.1. If a solid object falls overboard, the incident shall be managed as follows: • Retrieve object if possible to do so • If object not retrievable, record location (GPS Coordinates) and assess whether it will pose a hazard to other marine users • If object poses a hazard then notify PetroSA who in turn will inform SAMSA / HydroSAN • Complete the Incident Report Form and Dropped Object Log • Conduct an Incident Investigation • Close Out Investigation.	Drilling Contractor, PetroSA and other agencies (if required)	Immediately
12.2.2. Notifiable incidents, as set out in the Incident Management Plan, shall be reported by the Drilling Contractor to PetroSA within 48 hours, and must be included in PetroSA's Monthly Report. Incidents posing a threat to human life or significant marine pollution should immediately be reported to the designated Emergency Coordinator of PetroSA.	Drilling Contractor	48 hours of incident or immediately on occurrence
12.3. General Incident Reporting and Auditing		
12.3.1. General Reporting • All incidents that may occur during drilling will require the following investigation and reporting, and which shall be detailed in the Incident Management Plan: o Assessment of the nature and source of the incident o Assessment and evaluation of the impact and affected environmental receptors o Recording the date and time o Description of incident o Actions taken to remedy the incident and report the incident o Investigation into root cause o Identification of measures to prevent reoccurrence and communication of such.	Drilling Contractor	During and after an incident
12.3.2. Audit Guidelines • Audits should, through examination of records retained by the Drilling Contractor or PetroSA, verify that: o Maintenance and system checks were undertaken in accordance with specifications and all spill preventive measures recorded as fully operational. o All incidents have been reported and recorded as incident reporting specifications outlined above. o All incidents have been comprehensively investigated to identify root causes.	PetroSA SHEQ Manager	After incident or during post drilling audit

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
○ The incident reports detail the results of the investigations into root causes and advises on amendments to procedures or equipment as needed. ○ The advised changes are implemented. ○ A trend analysis on incidents is conducted monthly ○ Incidents are reported weekly and monthly along with the root cause analyses. ○ Sufficient oil and chemical spill containment and absorbent equipment are stored in sufficient quantities in areas where spills are most likely. ○ The oil spill contingency plan is current and in particular all contact details are up to date.		

3.13 ACTIVITY 13: WELL SUSPENSION AND ABANDONMENT

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: At the end of drilling, wells will either be suspended in the event of a commercial discovery or abandoned. Well suspension and abandonment must accord with the correct procedures to avoid potential pollution impacts on the marine environment. Suspended wells will require ongoing maintenance of a fishing exclusion zone due to some infrastructure remaining on the seabed. Stakeholders who have been negatively affected by the exclusion zone or whose activities have been curtailed in other ways should be notified of the cessation of drilling activities and the remaining status of the seafloor, ie whether a fishing exclusion zone remains.		
Objectives: • To keep stakeholders informed of the status of the drilling campaign and cessation of activities • To safely abandon or suspend wells in order to minimise the risk of marine pollution • To ensure the location and type of any dropped objects or equipment remaining on the seabed is recorded • Final reporting in the form of a well close out report is complete and provides a record for future reference.		
13.1. Notification of Stakeholders		
13.1.1. Notify PASA of location of wells and status with 60 days from the end of the drilling campaign.	PetroSA Drilling Manager	Within 60 days post-drilling
13.1.2. Compile Well Environmental Close Out Report and submit to PASA within 60 days from the end of drilling (see Section 14.2.2.4 for contents).	PetroSA SHEQ Manager	Within 60 days post-drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
13.1.3. Notify fishing stakeholders and other marine users of the completion of drilling activities, and the location and status of wells.	PetroSA SHEQ Manager	Within 24 hours post- drilling
13.1.4. Information regarding suspended wells should be communicated to HydroSAN so that they can be marked on Notices to Mariners and all necessary maritime communications followed to ensure marine users are kept informed of restrictions on fishing and other marine uses.	PetroSA SHEQ Manager	Immediately on cessation of drilling
13.1.5. Audit Guidelines • Audits should, through examination of records retained, verify that: o Stakeholders have been kept informed of the cessation of drilling and any residual restrictions on marine uses eg fishing o All the appropriate maritime communications have been followed on cessation of drilling (eg Notices to Mariners) o PASA have been informed of the location and status of suspended and abandoned wells within 60 days.	PetroSA SHEQ Manager	Post-drilling
13.2. Well Abandonment		
13.2.1. Safely abandon the well in accordance with good oil field and abandonment practices by inserting cement plugs in the well bore at various levels.	PetroSA Drilling Manager	After drilling
13.2.2. Remove BOP stack, well head structure and lost equipment to leave the seabed free of drilling equipment and waste (apart from drill cuttings).	Drilling Contractor	Well abandonment
13.2.3. Well casings should be cut off approximately 3m below the seabed for permanent abandonments.	Drilling Contractor	Well abandonment
13.2.4. Abandoned wells should be mapped and documented, and records retained by PetroSA indefinitely.	PetroSA Asset Manager	After drilling & well suspension
13.2.5. Audit Guidelines • Audits should, through examination of records retained, and the Well Environmental Close-Out Report (see Section 13.4), verify that: o Wells have been abandoned in accordance with good industry practice and the EMPr provisions. o Abandoned well positions are documented and retained by PetroSA.	PetroSA SHEQ Manager	End of drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
13.3. Well Suspension		
13.3.1. Should economically viable reserves be found at drilling sites, the well(s) will be plugged and temporarily abandoned in accordance with oil industry standards for possible use as a production or monitoring well in future.	PetroSA Drilling Manager	After drilling
13.3.2. Suspended wells should be mapped and documented, and records retained by PetroSA indefinitely.	PetroSA Asset Manager	After drilling & well suspension
13.3.3. Audit Guidelines • Audits should, through examination of records retained, verify that: o There is documented proof of the location of suspended wells and the measures taken to achieve well suspension o Monitoring of the integrity of the suspended wells is undertaken in accordance with the specified frequency Suspended wells are marked on Notices to Mariners.	PetroSA SHEQ Manager	End of drilling
13.4. Post Drilling Survey and Well Environmental Close Out Report		
13.4.1. Undertake a post-drilling seabed survey to check for dropped objects and state of seabed post- drilling, and prepare a report. The survey should document the following as far as possible: • The presence or absence of mounding or unusual depositions of drill cuttings and/or observable influences of drill cuttings on marine life, if evident, for future reference; • The presence and characteristics of any dropped objects, completion waste or other materials in the vicinity of the abandoned or suspended well; and • Validation of the removal of the well head (if removed). • The report should describe the state of the seabed and any observable object.	PetroSA Drilling Manager	On completion of drilling
13.4.2. Prepare an Environmental Well Close Out Report at the end of drilling which shall document compliance with the provisions of this EMPR; deviations from specified standards for discharges; any incidents arising, and the status and requirements relating to any remaining infrastructure on the seabed. Refer to Section 14.2.2.4 for more detail.	PetroSA SHEQ Manager	End of Drilling
13.5. Financial Provision		
<u>Rationale:</u>		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
In terms of the MPRDA PetroSA is required to make financial provision to meet its obligations as described in the Environmental Management Programme report. This provision is applicable to the exploration and operational phase, and includes construction or drilling as applicable, up to and including the closure or abandonment phase.		
Objective: To ensure there is sufficient legal and financial provision for rehabilitation or clean up in the event of a pollution event		
13.5.1. Environmental management actions that would be required as a result of an incident or accident would be covered by PetroSA's insurance[3], as described below: • Third Party liability which includes personal injury, property damage and seepage and pollution as a result of any offshore exploration and production operations is covered up to USD150,000,000 per occurrence • Well control insurance which would include blowouts and seepage and pollution is covered up to USD150,000,000 per occurrence. • **Insurance cover amounts must be updated to reflect activity specific risks. If there are actual losses due to the activities performed by the Applicants, the claimants should be compensated for their losses at market rates. The Applicants must have a claims procedure appropriate to their activities. Compensation should follow the international standards such as the IFC principles, which states that market related prices should be paid, and if anything is restored, it must be to the same or better standards than before.**	PetroSA Insurance Department	Prior and throughout drilling
13.5.2. In addition, as a condition of contract, PetroSA requires contractors to carry the following insurance and will not permit any of its contractors to undertake any work until certificates of insurance are provided • workmen's compensation insurance as required in terms of the provisions of the Compensation for Occupational Injuries and Diseases Act, Act No. 130 of 1993; • employer's liability insurance with a limit of liability at all times of not less than USD1, 000, 000,00 (one million US Dollars) for each occurrence or such larger amounts for which Contractor already have cover; • non-ownership aviation liability with a limit of liability at all times of not less than US$50 000 000,00 (fifty million US Dollars) for each occurrence or such larger amounts for which Contractor already has cover; • comprehensive general public liability insurance including pollution with a limit of liability of not less than USD1,000,000.00 (one million US Dollars) per occurrence; • motor vehicle liability insurance including passenger liability indemnity;	PetroSA Legal Department	Prior and throughout drilling

[3] All figures as for 2010/11 insurance

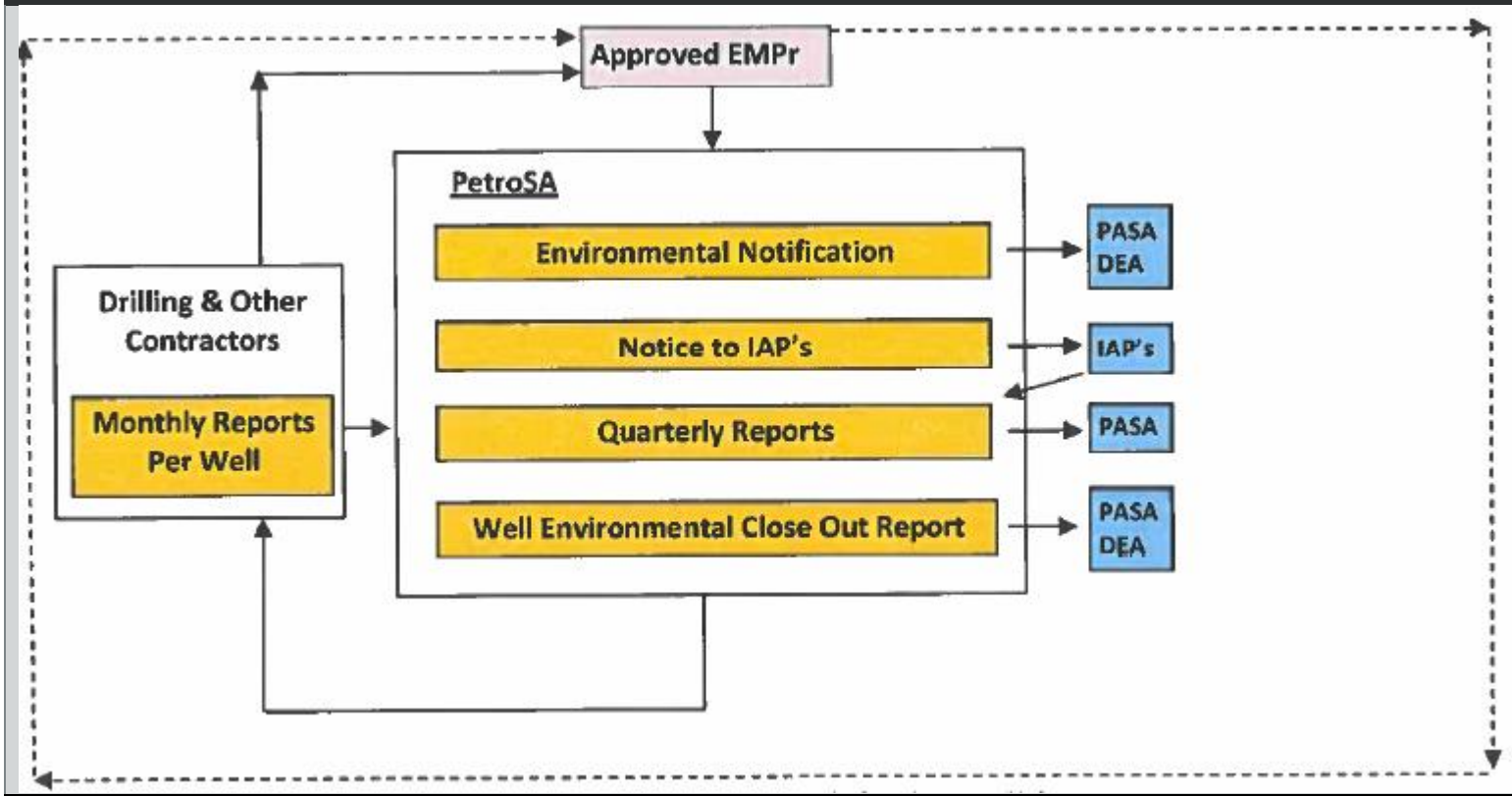
Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• Physical Damage Insurance for loss or damage to contractor's equipment and machinery. Such coverage shall be on All Risks Insurance basis or its equivalent for full value of Contractor Group material and equipment; • Hull and Machinery Insurance in the form of Full Form Hull and Machinery Insurance, including collision liability, with limits of liability at least equal to the full value of the vessel; and • Standard Protection and Indemnity Insurance, at least equal to the value of each vessel owned or chartered (including Towers Liability, where applicable		
13.5.3. Reporting of Financial Provision Proof of Financial Provision will be provided to PASA in the following manner: • A copy of the insurance certificate for the year will be provided on the renewal date of each year. • Copies of the insurance cover carried by the contractors will be provided together with the environmental notification submitted to PASA at least 7 days prior to the commencement of any drilling or seismic activity. • The annual revision of the closure provision will be submitted together with the annual Performance Assessment reports.	PetroSA SHEQ Manager	End of Drilling

3.14 ACTIVITY 14: SYSTEM ADMINISTRATIVE REQUIREMENTS

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
Rationale: A drilling subcontractor generally has its' own administrative requirements for environmental protection that complies with international best practice and legislation. This section outlines the administrative requirements that must be complied with during drilling activities to ensure adherence to legal and best practice, and to demonstrate proof of compliance. Administrative systems and record keeping enable an organisation to: • assure itself of its conformance with its own stated environmental policy • demonstrate conformance, and • ensure compliance with environmental laws and regulations amongst other things		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
This section summarises some key system requirements to ensure the effective implementation of the environmental management plan at different stages of a drilling programme: planning and design, during and post-drilling operations based on the ISO system model of the Plan – Do – Check – Act cycle. • Plan – establish objectives and make plans (analyze your organization's situation, establish your overall objectives and set your interim targets, and develop plans to achieve them). • Do – implement your plans (do what you planned do). • Check – measure your results (measure/monitor how far your actual achievements meet your planned objectives). • Act – correct and improve your plans and how you put them into practice (correct and learn from your mistakes to improve your plans in order to achieve better results next time).		
Objectives: • To provide a comprehensive and coherent system which accesses and stores information pertinent to environmental management from diverse sources to verify responsible environmental practices • To provide a formal platform for reporting on environmental performance • To monitor and audit environmental performance against pre-determined criteria • To use formal management reviews to continuously improve the system itself and thereby environmental performance as a whole.		
14.1. Monitoring		
The following parameters shall be monitored during drilling activities:		
14.1.1. Deck & bilge water discharge: oil concentrations to ensure <15ppm. Section 10.1.3	Drilling Contractor	Dally
14.1.2. Solid waste production and disposal {Refer to Section 9.1.)	Drilling Contractor	Monthly
14.1.3. Flare emissions: Gas volume flared (Refer to Section 11.1.4)	Drilling Contractor	Daily
14.1.4. Drill cuttings: Total volume of drill cuttings generated and quantity discharged to sea (Refer to Section 8.1.12)	Drilling Fluids Contractor	Throughout drilling
14.1.5. Drill cuttings: Oil content on drill cuttings (Refer to Section 8.1.4)	Drilling Fluids Contractor	12 hourly

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
14.1.6. Drill fluids: Quantity of drilling fluids used during drilling and amount recovered for disposal / recycling	Drilling Fluids Contractor	End of drilling
14.1.7. Monitoring results shall be reported to PetroSA in the Monthly Report	Drilling Contractor	Monthly
14.1.8. PetroSA shall report monitoring results to PASA in the Quarterly Report	PetroSA SHEQ Manager	Quarterly
14.1.9. Monitoring results shall be retained for 5 years.	PetroSA SHEQ Manager	Monthly
14.2. Reporting		
14.2.1. Reporting Requirements for a drilling campaign are indicated in the flow chart below:		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
		
14.2.2. Reporting by PetroSA to PASA		
14.2.2.1. Documentation required by SAMSA • Prior to drilling, the following documentation will be provided to PASA by the Licence Holder or a representative: o Oil Spill Contingency Plan to be approved by SAMSA o SAMSA to issue a Pollution Safety Certificate for the drilling unit	PetroSA or Drilling Contractor	Prior to Drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
14.2.2.2. Environmental Notification • Prior to the drilling of any well, PetroSA shall submit an Environmental Notification to PASA and DEA which shall include: • General information • Project description • Communications plan including notification of mariners • Affected environment • Drilling Fluids information • Contractor's receipt of Notification and pre well seabed survey, and insurances • Information on contractor and drilling unit such as seaworthiness certificates, specifications of rig and support vessels, and contractor's environmental policy and proof of receipt of EMPr		
14.2.2.3. Quarterly Reports: PetroSA shall submit Quarterly Reports to PASA, which shall include key information as drawn from contractors monthly reports to PetroSA, on: • the progress of drilling activities and any changes to the drilling schedule • any incidents (eg pollution spills, navigational incidents, loss of equipment etc.), • issues raised by stakeholders, • monitoring information, and • non-compliance with or exceedance of monitoring standards and steps taken to rectify these. • Training and awareness.	PetroSA SHEQ Rep	Quarterly
14.2.2.3.1. Monthly Independent ECO Reports: PetroSA shall appoint an Independent ECO to undertake regular environmental audits of the survey/contractors including relevant documentation on a monthly basis.	ECO	Monthly
14.2.2.4. Environmental Well Close Out Report PetroSA shall submit a Close Out Report to PASA within 60 days of completing a well. The information contained in this report shall be based on the monthly reports compiled by the drilling contractor and other data and records compiled during the drilling campaign. The Close Out Report shall contain a full description of the following per well: • General ○ The drilling contractor details, drilling vessel and supply vessel details;	PetroSA SHEQ Manager	Within 60 days of end of drilling

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
○ Proof of Environmental Notification and communication with other users of the sea, ○ Description of the drilling operation (location, timetable); • Drilling Phase Activities ○ Volume of drilling fluids and cuttings discharged to sea ○ Observable drill cuttings deposited to seafloor from post- drilling seabed survey ○ Volume of cement deposited on sea floor ○ Monitoring information e.g. cuttings, flaring etc. ○ Waste volumes and management ○ Refuelling and bunkering volumes ○ Training and Awareness • Incidents ○ Lost/dropped objects ○ Spills ○ Aircraft or unauthorised vessels approach dangerously close to the rig or its anchors, enter the 500m safety zone or fail to respond to warnings to stay clear. • Well completion and abandonment: ○ Well status ○ End of well seabed survey ○ Results of Performance Assessment against EMPr requirements)		
14.2.3. Contractor Reporting to PetroSA and Documentation Requirements		
14.2.3.1. Pre-drilling Agreements and Documentation Prior to drilling, the following documentation will be provided to PetroSA by the drilling Contractor: • Signed Contractor's Acknowledgement of Receipt of EMPR • Environmental Safety and Health Policy • Certificates of Sea Worthiness such as Classification Certificate, Safety Certificate, Pollution Prevention Certificate and Load line Certificate. • Plan to compile the Environmental Close Out report and the information requirements needed and how it will be compiled.	Contractors	Prior to drilling
14.2.3.2. Monthly Report A monthly report shall be compiled by the drilling contractor, and submitted to PetroSA which shall include: • Incidents, including effluent quality exceedances	Drilling Contractor	Monthly

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• Quantity of gas flared • Quality and quantity of bilge water discharged • Amount and type of waste generated and disposed of • Energy consumed eg fuel • Quantity of drilling fluids used and estimated quantities of drill cuttings generated • Quantity of mud and mud components and cuttings discharged overboard • Quantity of cement deposited on seafloor		
14.2.3.2.1. The environmental monitoring data collected must be made available to the DFFE, SANBI and SAEON for their use in future scientific research.	PetroSA SHEQ Rep	After drilling activities
14.3. Auditing		
14.3.1. General		
14.3.1.1. Compliance with the environmental management plan shall be subject to compliance auditing at various phases of the drilling campaign. The findings of these audits shall contribute towards PetroSA's annual performance report.	*PetroSA SHEQ Manager*	*Completion of drilling phase*
14.3.1.2. The audits shall review and report on the auditing requirements detailed in each section of this management plan	*PetroSA SHEQ Manager*	*Pre-drilling, during , and post-drilling*
14.3.2. Pre-drilling Survey		
14.3.2.1. The pre-drilling audit shall check the following: • The EMP has been approved by PASA and all reporting requirements (described in Section 14.2) have been complied with. • The Drilling Contractor has received a copy of the EMP, understands the content, the content of the EMP is aligned with the drilling rig's standard operating procedures, and has agreed to its implementation. • The Drilling Contractor has the necessary equipment and protocols in place and staff on the drilling rig are suitably trained to implement the monitoring requirements outlined in the EMP.	*PetroSA SHEQ Manager*	*Pre-drilling audit*
14.3.3. During drilling Audit		

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
14.3.3.1. Audits during the drilling shall check the following: • Monitoring is being undertaken In accordance with the requirements described in this EMP for the variables summarised in Section 14.1. • Monitoring data are retained and all deviances reported correctly in the Monthly Reports. • Incidents, where relevant, have been reported as per the incident reporting and investigating requirements (see Section 12). • Observations made on the rig and service vessels check commitments to good housekeeping and waste management protocols, and • General audit measures.	*PetroSA SHEQ Manager*	*During-drilling audit*
14.3.4. Post drilling Audit		
14.3.4.1. The post-drilling audit shall check and include the following: • A Well Environmental Close Out report was compiled by PetroSA. • All records comply with EMP requirements and are stored in • an accessible and logical manner.	*PetroSA SHEQ Rep*	*Post drilling audit*
14.4. Record Keeping		
14.4.1. All records shall be retained for 5 years.	*PetroSA SHEQ Manager*	*Ongoing*
14.4.2. The following records shall be maintained as part of the Environmental Management Plan and cross-referenced for auditing purposes: • Environmental Notification • Quarterly reports • Environmental Well Close Out report.	*SHEQ Manager & Drilling Contractor*	Ongoing
14.5. EMPr Review and Revision		
14.5.1. The environmental management plan shall be subject to review at least upon renewal of exploration right and updated if required. The review shall consider the following information: • Audit and Performance Assessment reports	*PetroSA Asset Manager*	*Renewal of exploration rights (every 2-3 years)*

Operational Activities/ Aspects & Auditable Actions	Responsibility	Timing
• Feedback from stakeholders • Technology changes • Changes in regulations/legal compliance		

4 REFERENCES AND SUPPORTING DOCUMENTS

REFERENCES

BCLME 2006. The development of a common set of water and sediment quality guidelines for the coastal zone of the BCLME. CSIR Report No. CSIR/NRE/ECO/ER/2006/0011/C. 164pp + Appendices

Carter R.A., H.F. MacMurray and J.L. Largier 1987. Thermocline characteristics and phytoplankton dynamics in Agulhas Bank waters. *S. Afr. J. mar. Sci*., 5: 327-335

CSIR, 1995. Chapter 4 of the E-BT Environmental Impact Assessment. Report for PetroSA.

CSIR, 2009. Updated metocean conditions for an LNG terminal off Mossel Bay. CSIR Report.

CSIR/BE/IE/ER/2009/6422/B.323 pp.

Japp DW, P. Sims and M.J. Smale 1994. A review of the fish resources of the Agulhas Bank. *South African Journal of Science,* 90: 123-134.

Japp DW 2011. Proposed 3D seismic surveys within Block 9 (South Coast, South Africa): Specialist study on the Expected Interaction with the Fishing Industry

Le Clus F., HF_KO Hennig and J. Rogers 1996. Bathymetry and sediment type effects on catch rates of

Austroglossus pectoralis (Soleidae) on the inner Agulhas Bank. *S. Afr. J. Mar. Sci.*, 17: 79-92.

Lombard, A. T., Strauss T., Harris, J., Sink, K., Attwood, C., Hutchings, L. 2004. South African National Spatial Biodiversity Assessment 2004 Technical Report. Volume 4: Marine Component. Pretoria: South African National Biodiversity Institute

PetroSA 2006. Environmental Impact Report for the proposed South Coast Gas development project in petroleum licence Block 9 situated off the south coast of South Africa. PetroSA, South Africa.

Probyn, T.A., B.A. Mitchell-Innes, P.C. Brown, L. Hutchings and R.A. Carter 1994. A review of primary production and related processes on the Agulhas Bank. *South African Journal of Science,* 90: 166-173.

Quick R. and associates and K. Sink 2005. PetroSA: South coast gas development project. Specialist benthic study. Appendix 3. Final Environmental Impact Report: Environmental impact assessment for the proposed South Coast Gas development project in petroleum licence block 9 situated off the south coast of South Africa. PetroSA, South Africa.

Petersen S.L., M.B. Honig, P.G. Ryan and L.G. Underhill 2009. Turtle bycatch in the pelagic longline fishery off southern Africa. *African Journal of Marine Science,* 31(1): 87-96.

Sink K.J., L.I. Atkinson, S. Kerwath, and T. Samaai. 2010. Assessment of offshore benthic biodiversity on the Aghulhas Bank and the potential role of petroleum infrastructure in offshore spatial management. Report prepared fro WWF South Africa and PetroSA through a SANBI intiative. pp77.

Smale M.J., N.T. Klages, J.H.M. David and V.G. Cockroft 1994. Predators of the Agulhas Bank. *South African Journal of Science,* 90: 135-142.

Wilkinson S. and D.W. Japp 2005. Assessment of the impact of the proposed PetroSA *South Coast Gas* Development on the south coast fishing industry. Appendix 4. Final Environmental Impact Report: Environmental impact assessment for the proposed South Coast Gas development project in petroleum licence block 9 situated off the south coast of South Africa. PetroSA, South Africa.

SUPPORTING DOCUMENTS

CCA, 1997. Environmental Management Programme Report for Prospect Well Drilling in Block 9 Situated off the Southern Cape Coast. Report for Soekor E and P (Pty) Ltd.

Lwandle, 2009, EMPrs for Block 9 Production Areas (FA-EM, South Coast Gas, Oribi Oryx, Sable)

PetroSA, 2009. Operational Procedures particularly PR-EOP LOG 000-002 Marine Support Services (2006); and EP-SHE-PO-001 Environmental Management Plan (2004)

PetroSA, 2009. Performance assessments for offshore oil and gas operations on the south coast: Block

9 (Block 11a, F-A, E-M and South Coast Gas, Oribi / Oryx, Sable). Prepared by CCA Environmental (Pty) Ltd., July 2009. PSA09PA/Performance Assessments.