



agriculture,
forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

ALGOA BAY SEA-BASED AQUACULTURE DEVELOPMENT ZONE

PRE-APPLICATION BASIC ASSESSMENT REPORT

BASIC ASSESSMENT PROCESS IN TERMS OF THE
NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998)

APPENDIX F: ENVIRONMENTAL MANAGEMENT PROGRAMME



ALGOA BAY SEA-BASED AQUACULTURE DEVELOPMENT ZONE

PRE-APPLICATION BASIC ASSESSMENT REPORT

BASIC ASSESSMENT PROCESS IN TERMS OF THE
NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998)

APPENDIX F: ENVIRONMENTAL MANAGEMENT PROGRAMME

March 2019

EMPr Prepared by:

Anchor Research and Monitoring (Pty) Ltd.

8 Steenberg House, Silverwood Close, Tokai 7945, South Africa

<https://anchorenvironmental.co.za>



Authors¹: Vera Massie, Ken Hutchings and Barry Clark

Citation: Massie V, Hutchings K and Clark B, 2018. Algoa Bay sea-based Aquaculture Development Zone – Pre-application basic assessment report: Appendix F Environmental Management Programme. Supporting documentation for the Basic Assessment process conducted in terms of the National Environmental Management Act (No. 107 of 1998). Report prepared for the Department of Agriculture, Forestry and Fisheries by Anchor Research and Monitoring (Pty) Ltd. Anchor Report Number: 1808/3, March 2019.

Title Page Photo Credit: Shutterstock

¹ Contributing authors from previous reports: Melissa Mackay - CapeEAPrac; Prof Jonathan Bloom –Umcebis Business Advisers (Pty) Ltd; Stephen Stead, Genie de Waal and Heather Stead - Visual Resource Management Africa cc; Professor Peter Britz, Professor Warwick Sauer, Stephen Hosking, Willem Schoonbee, Gavin Johnson – Rhodes University.

PROJECT DETAILS

Objective	Application for Environmental Authorisation in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998)
Applicant	Department of Agriculture, Forestry & Fisheries
Environmental Assessment Practitioner (EAP)	Vera Massie and Dr Barry Clark from Anchor Research & Monitoring (Pty) Ltd
Anchor Project Name	Algoa Bay Sea-Based Aquaculture Development Zone Basic Assessment Process
Anchor Project Number	1808
Report name	Pre-application Basic Assessment Report
Status	Pre-application
Application submission date	Not submitted
Competent Authority Reference	Not currently assigned
Case Officer	Not currently assigned

OVERVIEW OF PROJECT OUTPUTS BASIC ASSESSMENT REPORT AND APPENDICES

Basic Assessment Report (BAR)	Pre-Application BAR, Draft BAR, Final BAR
Appendix A	Details of EAP, Expertise and Declaration
Appendix B	Details of Specialists, Expertise and Declaration
Appendix C	Background Information Document
Appendix D	<p>Specialist studies:</p> <ol style="list-style-type: none"> 1. Benthic Mapping Assessment for the Proposed Algoa Bay Sea-Based Aquaculture Development Zone (Dawson <i>et al.</i> 2019) 2. Dispersion Modelling Study for the Proposed Algoa Bay Sea-Based Aquaculture Development Zone (Wright <i>et al.</i> 2019) 3. Marine Specialist Study 2019 (Hutchings <i>et al.</i> 2019) 4. Maritime Underwater Heritage Specialist Study (Gribble 2019) 5. Comparative Assessments for the Development of the Proposed Sea Based Aquaculture Development Zone Located within Algoa Bay in the Eastern Cape in South Africa (Rhodes University August 2016) <ol style="list-style-type: none"> a. Socio-economic Report b. Ecological Report c. Feasibility study
Appendix E	Stakeholder Consultation Report
Appendix F	Environmental Management Programme (EMPr)
Appendix G	Additional Information

PROFILE AND EXPERTISE OF EAP

Anchor Research and Monitoring (Pty) Ltd (Anchor) have been appointed by the Department of Agriculture, Forestry and Fisheries as the independent consultants to undertake the Basic Assessment (BA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA).

The Anchor group of companies is based in Cape Town, South Africa and have a core staff of sixteen professionals with tertiary level qualifications in environmental science and management. We offer ecological and economic expertise to inform management and decision making regarding the use and conservation of natural resources. Our main areas of focus are marine, estuarine and freshwater ecosystems, terrestrial, ecosystems, ecosystem services, livelihoods and socio-economics, resource economics, conservation policy, strategy and planning, natural resource management, environmental management and environmental flows. Our work includes ecological and socio-economic research and baseline studies, environmental impact assessments, environmental management plans and environmental flow assessments. We are experienced in ecological sampling methods, social survey methods, statistics and econometrics, ecological-economic modelling, geographic information systems as well as stakeholder coordination, engagement and maintaining of stakeholder relations.

As required by NEMA, the qualifications and expertise of the key individual practitioners responsible for this project are detailed below.

Project Director: Dr Barry Clark

Dr Barry Clark has twenty-one years' experience in marine biological research and consulting on coastal zone and marine issues. He has worked as a scientific researcher, lecturer and consultant and has experience in tropical, subtropical and temperate ecosystems. He is presently Director of an Environmental Consultancy firm (Anchor Environmental Consultants) and Research Associate at the University of Cape Town. As a consultant has been concerned primarily with conservation planning, monitoring and assessment of human impacts on estuarine, rocky shore, sandy beach, mangrove, and coral reef ecosystems as well as coastal and littoral zone processes, aquaculture and fisheries. Dr Clark is the author of 27 scientific publications in class A scientific journals as well as numerous scientific reports and popular articles in the free press. Geographically, his main area of expertise is southern Africa (South Africa, Lesotho, Namibia, Mozambique, Tanzania, Seychelles, Mauritius and Angola), but he also has working experience from elsewhere in Africa (Cote d'Ivoire, Ghana, Nigeria), the Middle East (UAE) and Europe (Azerbaijan).

Project Manager: Vera Massie, BSc Hons (Environmental Management), MSc (Conservation Biology)

Vera earned degrees in marine biology, environmental management and conservation biology (MSc) from the University of Cape Town. Her training has equipped her to consult on research projects incorporating the maintenance and conservation of marine and estuarine ecosystems. She also consults on the biophysical, socio-economic and legal aspects in the assessment of human impacts on coastal and terrestrial environments in the temperate and tropical regions of South Africa. Working at Anchor Environmental Consultants, she has gained experience in conducting environmental impact assessments, drafting environmental legislation, preparing guidelines and developing frameworks to facilitate successful implementation of legislation. Many of her projects involve the monitoring and evaluation of compliance with environmental laws and their associated regulations across varying economic sectors.

Project Review: Dr Ken Hutchings

Dr Hutchings has research and consulting experience in the fields of fisheries management, mariculture, estuarine research and management, marine and estuarine spatial planning, marine impact assessment, research and conservation strategy development, fishery socio-economic surveys and analyses, biological sampling and life-history analyses of fish (age and growth, reproduction, mortality, migration, diet, ecology), taxonomic methodology, population genetics, fisheries modelling, marine ecotoxicity trials, trace metal pollution and physico-chemical, ecological and biodiversity surveys of marine, estuarine and freshwater habitats. Dr Hutchings is experienced in developing estuarine and coastal management plans and in conducting public participation processes. Dr Hutchings is a research associate of the University of Cape Town's Marine Research Institute. He has excellent verbal and writing communication skills, is competent with most software packages used in scientific research and consulting projects. He has published 17 scientific papers and compiled more than 50 consulting reports. Dr Hutchings is comfortable working as part of a team in both a leadership and mentoring position or as a team member. Dr Hutchings has participated in international collaborative studies in Angola, Tanzania, Namibia, Sierra Leone and Mauritius and has visited and participated in fisheries in Mozambique, Madagascar, Seychelles, New Zealand and Belize. He was actively involved in commercial fishing around Cape Town for 14 years, has practical experience in several sectors and has good understanding of most commercial fishing methods (line, spear, pole, gill net, trammel, net, beach seine net, trap, longline, trawl and purse-seine). He has personally collected scientific data for the demersal trawl and longline hake fisheries, designed, implemented and managed fishery observer training programmes for line, longline, lobster trap and demersal trawl fisheries. He has project managed and completed two, three-year contract research projects for the South African Department of Environmental Affairs and Tourism (Marine and Coastal Management) and numerous consulting projects for state and private sector clients.

STATEMENT OF ANCHOR ENVIRONMENTAL INDEPENDENCE

Neither Anchor nor any of the authors of this report have any material present or contingent interest in the outcome of this report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of Anchor.

Anchor has no prior association with the Department of Agriculture, Forestry and Fisheries (DAFF) in regard to the development that is the subject of this report, other than being the sub-consultant marine specialist during the previous EIA process conducted between 2010 and 2014. Anchor has no beneficial interest in the outcome of the assessment, which is capable of affecting its independence.

The fee paid to Anchor for completing this report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the report.

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	CONTENT OF THE ENVIRONMENTAL MANAGEMENT PROGRAMME	3
2	SITE AND PROJECT DESCRIPTION	5
2.2	ADZ PRECINCTS	5
2.3	ALTERNATIVE OPTIONS	8
2.5	FINFISH PRODUCTION VOLUMES	10
2.6	SEA-BASED AQUACULTURE ACTIVITIES.....	11
2.7	ASSOCIATED SEA-BASED INFRASTRUCTURE.....	11
2.8	ASSOCIATED LAND-BASED INFRASTRUCTURE AND ACTIVITIES	11
2.10	PROJECT PHASING	13
2.10.1	CONSTRUCTION PHASE	13
2.10.2	OPERATIONAL PHASE.....	13
2.10.3	CLOSURE AND DECOMMISSIONING PHASE.....	13
3	POTENTIAL IMPACTS	14
3.1.1	PLANNING AND DESIGN PHASE.....	15
3.1.2	CONSTRUCTION PHASE.....	15
3.1.3	OPERATIONAL PHASE IMPACTS	15
3.1.4	DECOMMISSIONING PHASE IMPACTS.....	19
3.1.5	IMPACT SIGNIFICANCE OF ALTERNATIVE OPTIONS.....	20
4	ADZ MANAGEMENT	22
4.1	ADZ MANAGEMENT COMMITTEE (AMC)	23
4.1.1	INCEPTION.....	23
4.1.2	FUNCTIONS OF THE AMC	23
4.1.3	STRUCTURE AND ROLES	24
4.2	CONSULTATIVE FORUM	25
4.2.1	MEMBERSHIP OF THE CONSULTATIVE FORUM	25
4.2.2	FUNCTIONS OF THE CONSULTATIVE FORUM (CF)	26
4.3	ENVIRONMENTAL INDUCTION AND TRAINING.....	26
4.4	SOCIAL ENGAGEMENT CO-ORDINATOR (SEC).....	27
5	MEASURES APPLICABLE TO THE DESIGN PHASE.....	28
5.1	ROLES AND RESPONSIBILITIES	28
5.2	ENVIRONMENTAL MANAGEMENT MEASURES	29
6	MEASURES APPLICABLE TO THE CONSTRUCTION PHASE	35
6.1	ROLES AND RESPONSIBILITIES	35
6.2	ENVIRONMENTAL MANAGEMENT MEASURES	37
7	MEASURES APPLICABLE TO THE OPERATION PHASE	43
7.1	ROLES AND RESPONSIBILITIES	43
7.2	REPORTING	44
7.3	ENVIRONMENTAL MANAGEMENT MEASURES	44
8	MEASURES APPLICABLE TO THE DECOMMISSIONING PHASE	60

8.1	ROLES AND RESPONSIBILITIES	60
8.2	ENVIRONMENTAL MANAGEMENT MEASURES	61
9	ENVIRONMENTAL MANAGEMENT AND MONITORING	63
9.1	ROLES AND RESPONSIBILITIES	64
9.2	LIST OF ENVIRONMENTAL MONITORING PROGRAMMES AND MANAGEMENT PLANS/PROTOCOLS/GUIDELINES.....	65
9.3	MONITORING MEASURES	68
10	REPORTING AND CORRECTIVE ACTION	73
10.1	AQUACULTURE FARM MONITORING REPORT	73
10.2	ENVIRONMENTAL SAMPLING REPORT.....	73
10.3	SOCIO-ECONOMIC MONITORING REPORT	74
10.4	EMPR COMPLIANCE REPORT	74
10.5	EA AND EMPR COMPLIANCE AUDIT REPORT.....	74
10.6	CORRECTIVE ACTION.....	74
11	REFERENCES.....	76

GLOSSARY

Abalone	Abalone is a common name for any of a group of small to very large sea snails, marine gastropod molluscs in the family <i>Haliotidae</i> . Here it refers to the species <i>Haliotis midae</i> .
Alien	An organism occurring outside its natural past or present range and dispersal potential including any parts of the organism that might survive and subsequently reproduce (organisms whose dispersal is caused by human action).
Biosecurity	A set of preventive measures designed to reduce the risk of transmission of infectious diseases, quarantined pests, invasive alien species, and living modified organisms.
Conditional buffer zone	A sensitive area within a specified activity is not allowed unless the relevant specialist study has been conducted.
Invasive	Alien organisms that have naturalised in a new area and expanding their range.
No-go area	An area within no activities other than rehabilitation of the natural environment is permitted. (Note that this excludes areas outside the property boundary such as the Estuarine Functional Zone of the Buffels Estuary).
Partial no-go area	An area within no activities other than those specified in the Environmental Authorisation is permitted.
Solid waste	All solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
Species	Defined in terms of the National Environmental Management: Biodiversity Act (Act No 10 of 2004), which means a kind of animal, plant or other organism that does not normally interbreed with individuals of another kind, and includes any subspecies, cultivar, variety, geographic race, strain, hybrid or geographically separate population.

LIST OF ABBREVIATIONS

ADZ	Aquaculture Development Zone
AEC	Anchor Environmental Consultants (Pty) Ltd.
AMC	Aquaculture Development Zone Management Committee
BA	Basic Assessment
BAR	Basic Assessment Report
BBBEE	Broad-Based Black Economic Empowerment
CDC	Coega Development Corporation
CF	Consultative Forum
COD	Chemical Oxygen Demand
CWDP	Coastal Waters Discharge Permit
DAFF	Department of Agriculture Forestry and Fisheries
DEA	Department of Environmental Affairs
DEA:O&C	Department of Environmental Affairs Branch: Oceans & Coasts
DEDEAT	Eastern Cape Provincial Department of Economic Development, Environmental Affairs and Tourism
DM	District Municipality
DO	Dissolved oxygen
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
I&AP	Interested and Affected Party
ICMA	National Environmental Management: Integrated Coastal Management Act (Act 24 of 2008)
IDP	Integrated Development Plan
LM	Local Municipality
MCM	Marine Coastal Management
MLRA	Marine Living Resources Act (Act 18 of 1998)
MPA	Marine Protected Area
NEM: WA	National Environmental Management: Waste Act (Act 59 of 2008)
NEM:BA	National Environmental Management: Biodiversity Act (Act No 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act (Act 57 of 2003)
NEMA	National Environmental Management Act (Act 107 of 1998)

NHRA	National Heritage Resources Act
RMZ	Recommended Mixing Zone
SAHRA	South African Heritage Resources Agency
SAMSA	South African Maritime Safety Authority
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SEZ	Special Economic Zone
SoE	State owned Enterprise
TSS	Total Suspended Solids
U.S.	United States
UNFAO	United Nations Food and Agriculture Organisation
VIA	Visual Impact Assessment
VRM	Visual Resource Management Africa CC
WWTW	Waste Water Treatment Works

1 INTRODUCTION

The Department of Agriculture, Forestry and Fisheries (DAFF), as the lead agent for aquaculture management and development in South Africa, intends to establish and manage a sea-based Aquaculture Development Zone (ADZ) in Algoa Bay in the Eastern Cape. A Sea-based ADZ typically consists of a selection of designated precincts that provide opportunities for existing aquaculture operations to expand and new ones to be established. ADZs are intended to boost investor confidence by providing ‘investment ready’ platforms with strategic environmental approvals and management policies already in place, allowing commercial aquaculture operations to be set up without the need for lengthy, complex and expensive approval processes. It is anticipated that an ADZ will create incentives for industry growth, provide marine aquaculture services and enhance consumer confidence. An ADZ provides economic benefits to the local community through job creation and regional economic diversification.

Aquaculture is one of the sectors that form part of Operation Phakisa under the Ocean’s Economy in South Africa. Operation Phakisa is an initiative of the South African government which aims to implement priority economic and social programmes better, faster and more effectively. Operation Phakisa was launched by the President of the Republic in October 2014. The sector offers significant potential for rural development, especially for marginalised coastal communities. The proposed development will provide employment opportunities for the local and regional communities.

DAFF appointed Anchor Research & Monitoring (Pty) Ltd (Anchor) to undertake the Basic Assessment (BA) process for the proposed Aquaculture Development Zone in terms of the National Environmental Management Act 107 of 1998, as amended (NEMA). NEMA requires that an Environmental Management Programme (EMPr) be submitted with the Basic Assessment Report (BAR) to demonstrate how environmental management and mitigation measures will be implemented. An Environmental Management Programme (EMPr) applicable to the full project cycle of the proposed development is required for the effective management of environmental impacts.

The original EMPr for the ADZ during the previous EIA process was compiled by CapeEAPrac (Mackay and van Zyl 2012)². Selected components of the EMPr compiled by CapeEAPrac were integrated into this EMPr and were updated where appropriate. The ADZ management structure and management measures contained in the EMPr produced by SRK Consulting for the Saldanha Bay ADZ (du Toit and Reuther 2017)³ were also integrated into this EMPr. The organisational structure as detailed in du Toit and Reuther (2017) is currently being implemented for the Saldanha Bay ADZ by DAFF (pers. comm. Michelle Pretorius) and a similar structure for both ADZs will assist in the successful implementation of the EMPr.

² Mackay and van Zyl 2012. Algoa Bay Sea-based Marine Aquaculture Development Zones –Basic Assessment Report: Appendix G Environmental Management Programme. Supporting documentation for the Basic Assessment process conducted in terms of the National Environmental Management Act (No. 107 of 1998). Report prepared for the Department of Agriculture, Forestry and Fisheries by CapeEAPrac, Report Reference: NMM101/18 Version 30 July 2012.

³ du Toit J and Reuther S. 2017. Proposed Sea-Based Aquaculture Development Zone in Saldanha Bay. Environmental Management Programme. Report prepared by SRK Consulting for the Department of Agriculture, Forestry and Fisheries. Report Number 499020/6. August 2017.

This document, once approved by the DENC, represents the binding EMPr for the full project cycle of the ADZ. Each operator must compile a farm-specific EMPr based on this ADZ EMPr, which is to be approved and continuously reviewed by the ADZ Management Committee (AMC) (i.e. adaptive management process).

The management and mitigation measures identified during the BA process apply to the following phases of the development:

- The Design Phase: These measures are applicable to the planning and design of the ADZ (Section 4). Note, however, that no environmental impacts are associated with the planning phase. All mitigation measures listed in this section have the purpose to minimise impacts during the construction and operational phase.
- The Construction Phase: These measures are applicable during the construction phase of the development (Section 6).
- The Operation Phase: These measures are applicable during the long-term operation and maintenance of the ADZ (Section 7).
- The Decommissioning Phase: These mitigation measures are applicable during the decommissioning phase and refer to removal of mariculture infrastructure at sea (Section 8).

The measures listed for the various phases are either:

- **Essential**: Mitigation measures which must be implemented and are non-negotiable; or
- **Best practice**: Recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented. *These measures have been italicised for ease of reference.*

Note that the EMPr will be submitted to DEA for approval along with the BAR. In the event that an Environmental Authorisation is issued by the DEA, this document may need to be updated to ensure that all relevant conditions of authorisation are adequately captured. It is also recommended that the EMPr is reviewed regularly and, where necessary, amended and submitted to the DEA for acceptance.

1.1 Content of the Environmental Management Programme

The 2014 EIA Regulations (as amended in 2017) prescribe the required content of an EMPr. These requirements, and the sections of this EMPr in which they are addressed, are summarised in Table 1.

Table 1 Content of the EMPr as prescribed by the 2014 EIA Regulations.

GN 326	Item	Section Ref.:
(a)(i)	Details of the EAP who prepared the EMPr	Title Page, Page i
(a)(ii)	Expertise of that EAP to prepare an EMPr, including a curriculum vitae (company profile enclosed)	Page i
(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Chapter 2
(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Chapter 1
(d)	A description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	Chapter 3
(d)(i)	Planning and design	Chapter 3
(d)(ii)	Pre-construction activities	Chapter 3
(d)(iii)	Construction activities	Chapter 3
(d)(iv)	Rehabilitation of the environment after construction and where applicable post closure; and	N/A
(d)(v)	Where relevant, operation activities	Chapter 3
(f)	A description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to —	5-8
(f)(i)	Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	5-8
(f)(ii)	Comply with any prescribed environmental management standards or practices;	5-8
(f)(iii)	Comply with any applicable provisions of the Act regarding closure, where applicable; and	N/A
(f)(iv)	Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	N/A
(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	9
(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	9
(i)	An indication of the persons who will be responsible for the implementation of the impact management actions;	5-9
(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	5-9
(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f)	5-9
(l)	A program for reporting on compliance, taking into account the requirements as prescribed	10

GN 326	Item	Section Ref.:
	by the Regulations;	
(m)	An environmental awareness plan describing the manner in which-	
(m)(i)	The applicant intends to inform his or her employees of any environmental risk which may result from their work; and	5-8
(m)(ii)	Risks must be dealt with in order to avoid pollution or the degradation of the environment;	5-8
(n)	Any specific information that may be required by the competent authority.	5-8

2 SITE AND PROJECT DESCRIPTION

Aquaculture is defined as the propagation, improvement, rearing, regular stocking, feeding or protection from predators and harvesting of aquatic organisms (plant and animal) in controlled or selected aquatic environments (fresh, sea or brackish waters, on land or at sea) for any commercial, subsistence, recreational or other public or private purposes (DEA&T 2007, South African Aquaculture Development Bill 2018). Marine aquaculture, or mariculture, is the process of cultivating and harvesting sea based aquatic organisms. Marine aquaculture includes the commercial farming of all marine organisms such as finfish, shellfish (i.e. abalone, mussels, prawns) and seaweed. Operations generally involve some form of intervention in the rearing process to enhance production (i.e. regular stocking, feeding, and protection from predators). The proposed Aquaculture Development Zone is sea-based, which means that marine organisms are reared in the sea. Land-based facilities for the processing of fish and bivalves are not included in this project and therefore the project does not have any water, sewage, waste, and electricity requirements. These aspects are therefore not covered by this Environmental Management Programme.

2.1 Site description

Algoa Bay is located on the south eastern coast of South Africa. Port Elizabeth is the largest city in the area and is South Africa's second oldest city. Port Elizabeth represents the commercial capital of the Eastern Cape. Port Elizabeth is a major seaport, with the most significant ore loading facilities in the southern hemisphere. Industrial activities have lately shifted towards Coega where a Special Economic Zone (SEZ) was established in 1999. The Coega Development Corporation (CDC), a state-owned enterprise (SoE), is mandated to develop and operate the 9 003 hectares. Situated on the shores of Algoa Bay the area also has a thriving tourist economy based on activities such as scuba diving, game fishing charters, surfing and kiteboarding with many popular scenic beaches. A detailed description of the receiving environment is included in the Basic Assessment Report Chapter 8.

2.2 ADZ precincts

A Sea-based ADZ typically consists of a selection of designated precincts that provide opportunities for existing aquaculture operations to expand and new ones to be established. The precincts considered in this application include Algoa 1, 6 and 7 (refer to the BAR for more information on the site selection process) (Figure 1). Each of these sites has been described in more detail below.

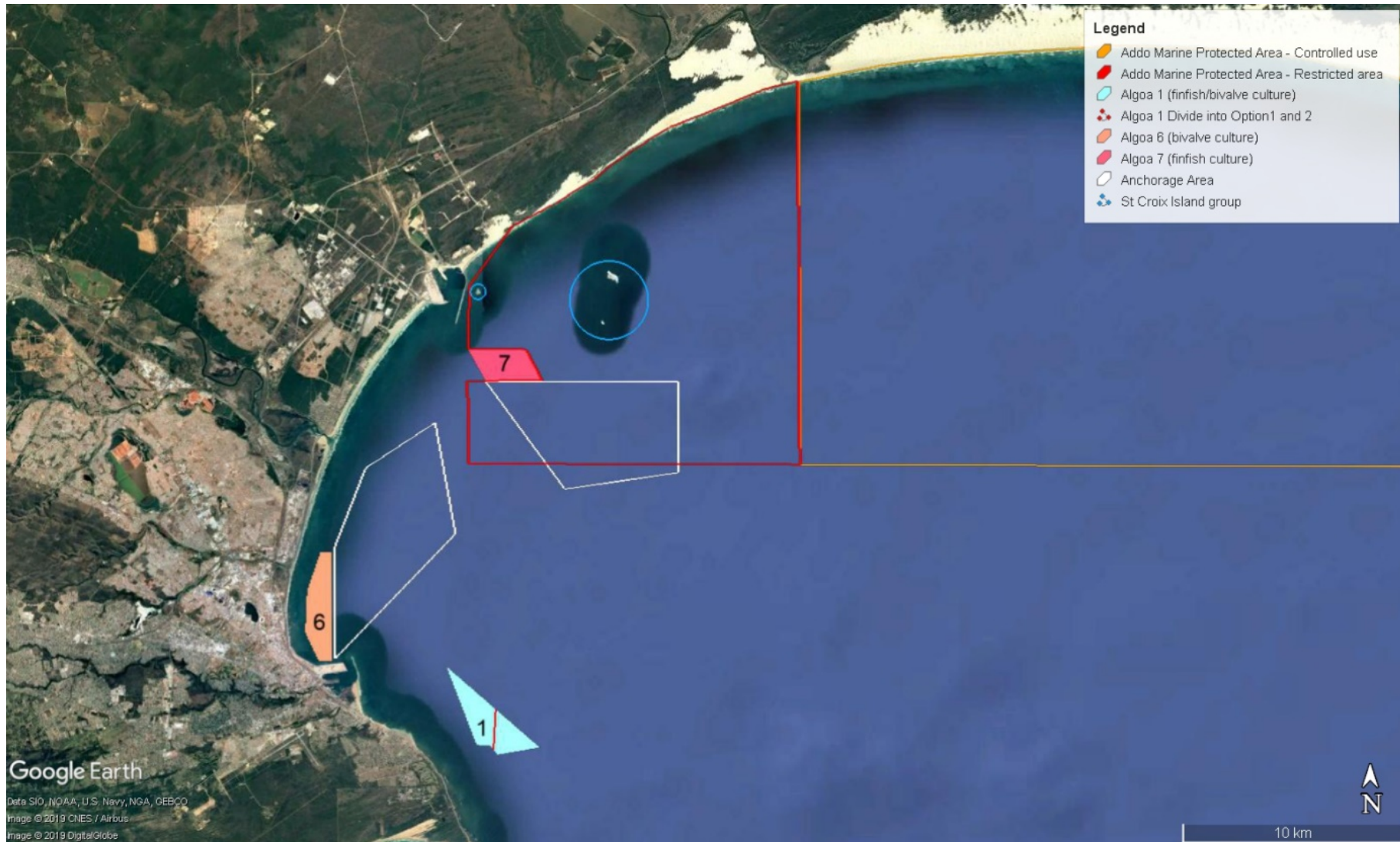


Figure 1 Precincts considered during the 2019 application for environmental authorisation for a sea-based Aquaculture Development Zone in Algoa Bay, Eastern Cape. Precincts 1, 6 and 7 constitute feasible precincts and have been considered during the present Basic Assessment process. Department of Environmental Affairs Branch Oceans and Coasts has indicated that Algoa 7 could potentially be excised from the Addo Marine Protected Area should Environmental Authorisation be granted for this precinct.

2.2.1 Algoa 1 (Summerstrand Site)

Algoa 1 has been identified a potential site for bivalve and/or finfish culture. The site measures approximately 522 ha and lies approximately 2 km offshore from the popular beaches of Summerstrand and Humewood. Algoa 1 was identified in the initial SEA study as the best option due to its proximity to Port Elizabeth Harbour (<5 km) and relatively low wave energy conditions. Marine, visual and social-economic specialists identified potentially significant negative impacts on other users and the environment should the entire extent of Algoa 1 be developed. A phased approach in conjunction with rigorous environmental monitoring (socio-economic as well as bio-physical) is critical in determining the intensity of farming that can be supported by the environment (carrying capacity and economic impacts on existing activities).

Centre coordinates: 33° 58.860'S; 25° 42.595'E

Coordinates of corner points, clockwise from the northwest corner are listed below:

33° 57.424'S; 25° 41.369'E

33° 59.354'S; 25° 44.055'E

33° 59.519'S; 25° 42.844'E

33° 59.308'S; 25° 42.614'E

33° 59.296'S; 25° 42.224'E

2.2.2 Algoa 6 (Port Elizabeth Harbour Site)

Algoa 6 has been identified a potential site for bivalve culture. The site measures approximately 470 ha and is located in water ranging in depth from 5-12 m. This site is considered suitable for bivalve culture only, as it is too shallow for adequate dispersal of waste from finfish cages. This site is situated adjacent to the Port Elizabeth harbour wall and extends parallel to the shoreline for approximately 4.8 km. The immediate coastal area is characterised by urban industrial development and a mostly modified shoreline fringed by railway tracks and the Settlers Highway (M4). During the previous EIA, stakeholders indicated support for Algoa 6 due to much reduced conflict with other user groups when compared to Algoa 1 (recreational, fisheries, tourism activities and conservation). Economic feasibility of this site is considered good for bivalve aquaculture.

Centre coordinates: 33° 56.020'S; 25° 37.651'E

Coordinates of corner points, clockwise from the northwest corner are listed below:

33° 54.624'S; 25° 37.668'E

33° 54.619'S; 25° 37.979'E

33° 57.258'S; 25° 37.998'E

33° 57.259'S; 25° 37.602'E

33° 56.571'S; 25° 37.210'E

33° 55.551'S; 25° 37.272'E

2.2.3 Algoa 7 (Ngqura Harbour site)

Algoa 7 has been identified a potential site for bivalve culture. This site measures 355 ha in size and is positioned approximately 3 km offshore from the Ngqura harbour. Algoa 7 is not expected to impact significantly on shipping traffic. This site overlaps slightly with the recently approved Addo Marine Protected Area (MPA) but the Department of Environmental Affairs Branch Oceans and Coasts has indicated that the affected portion of this site could potentially be excised should Environmental Authorisation be granted for this precinct. However, a pre-cautionary and risk adverse approach would be applied as the operation of an aquaculture farm is in direct conflict with conservation goals of an MPA.

Centre coordinates: 33° 50.105'S; 25° 43.098'E

Coordinates of corner points, clockwise from the northwest corner are listed below:

33° 49.722'S; 25° 41.996'E

33° 49.717'S; 25° 43.652'E

33° 50.472'S; 25° 44.148'E

33° 50.468'S; 25° 42.497'E

2.3 Alternative options

DAFF is seeking to promote farming of both bivalves and finfish in Algoa Bay. Rather than considering each of the three sites (Algoa 1, 6 and 7) in isolation, three alternative configurations of precincts, Options A, B and C, as outlined in Table 2, are being considered in this Basic Assessment process. Potential environmental impacts associated with each of these options have been assessed in this Basic Assessment Report.

Table 2 Proposed alternative options to be assessed in the Basic Assessment process for the proposed Algoa Bay Aquaculture Development Zone.

Alternative options	Algoa 1 – 522ha (Summerstrand)	Algoa 6 – 470ha (PE Harbour)	Algoa 7 – 355ha (Ngqura Harbour)	Total area
A	Finfish & bivalves	Bivalves	Finfish	1347 ha
B	Bivalves	Bivalves	Finfish	1347 ha
C	X	Bivalves	Finfish	825 ha
D (No-go option)	X	X	X	0 ha

The environmental impacts of various farming intensity levels in Algoa Bay are assessed by way of three options. **Option A** includes both finfish and bivalve culture at Algoa 1. This option would allow for finfish farming at two precincts. Furthermore, this option would offer a protected environment as a nursery site for bivalves (Algoa 6) as well as a clean, comparatively unpolluted environment as a bivalve grow-out site (Algoa 1). **Option B** includes only one site for finfish farming (Algoa 7) but

provides the same opportunities to bivalve farmers as Option A. **Option C** excludes Algoa 1 altogether and limits bivalve culture to Algoa 6.

The **Status Quo Alternative** proposes that the Algoa Bay ADZ does not go ahead. The Eastern Cape coast is one of the few areas along the South African coastline considered suitable for marine based aquaculture. Therefore the 'No-go/Status Quo' alternative will eliminate the potential associated with the area as a whole, which will result in the loss of potential benefits associated with the aquaculture industry, as well as the opportunity to meet growing seafood product demand. Not establishing ADZ will leave only current fishing production methods to supply the growing demand for seafood products. The sustainability of these methods is questionable in the long term, and the negative impact on wild stocks has been flagged by DAFF as a critical concern. Irrespective of the potential positive impacts, a number of negative impacts are associated with developing an ADZ and as such, the No-Go option must be considered as the status quo against which the alternative options must be measured.

2.4 Proposed species and farming methods

The following species are considered for farming in the ADZ:

- Currently cultivated bivalve species
 - Pacific oyster *Crassostrea gigas* (alien)
- New bivalve species:
 - Cape Rock Oyster *Striostrea margaritacea* (indigenous)
 - Black mussel *Choromytilus meridionalis* (indigenous)
 - Brown mussel *Perna perna* (indigenous)
 - Mediterranean mussel *Mytilus galloprovincialis* (alien)
- New finfish species (only indigenous species are considered):
 - Yellowtail (*Seriola lalandi*)
 - Dusky kob (*Argyrosomus japonicas*)
 - Silver kob (*Argyrosomus inodorus*)
 - Yellowfin tuna (*Thunnus albacares*)
 - Sole
 - Geelbek (*Atractoscion aequidens*)
 - Spotted grunter (*Pomadasys commersonii*)
 - White steenbras (*Lithognathus lithognathus*)
 - White stumpnose (*Rhabdosargus globiceps*)
 - Red roman (*Chrysoblephus laticeps*)

Note that environmental conditions are suitable for the above listed species, however, suitability for cage farming must be established through research.

The following production methods are considered most viable for farming in the ADZ:

- Longlines for bivalve culture, comprising a surface rope with floats and moored at each end to fix the line in position. The production ropes for mussels or oyster racks are then suspended from the surface rope;

- Rafts for bivalve culture, comprising of a floating top structure moored to the seabed from which mussel ropes are suspended;
- Cages for finfish production, constructed of circular flexible high density polyethylene with multimooring systems;

2.5 Finfish production volumes

In this current EIA process a dispersion modelling study was undertaken to estimate carrying capacity and inform the assessment of potential impacts (Wright *et al* 2019). Carrying capacity was estimated on the premise that:

1. the benthic fauna beneath the farm site must not be allowed to disappear due to accumulation of organic material;
2. the water quality in the net pens must be kept high; and,
3. the water quality in the areas surrounding the farm must not deteriorate.

The estimated **maximum** carrying capacities for each of the two proposed precincts are summarized in Table 3 below. These results do not, however, account for disease control. Alvial *et al.* (2012) recommended a minimum 2.5 km buffers zone be implemented to prevent disease transferral between farms. Should this buffer zone be implemented, Algoa 1 and 7 each have the capacity for one farm of either *S. lalandi*, or *A. regius*.

Table 3 Summary of dispersion modelling results as per Wright *et al.* (2019) showing carrying capacities for Algoa 1 and 7 for two species, namely *Seriola lalandi* and *Argyrosomus regius*. Note that for each site carrying capacity is shown per species, which means that for example either 3 farms of *S. lalandi* OR 12 farms of *A. regius* can be maintained at Algoa 1.

Precinct	Species	Number of farms	Total annual production per farm (t)
Algoa 1	<i>Seriola lalandi</i>	3	3 252
	<i>Argyrosomus regius</i>	12	4 911
Algoa 7	<i>Seriola lalandi</i>	2	3 555
	<i>Argyrosomus regius</i>	7	4 947

A precautionary phased approach is proposed for finfish farming in the ADZ, where activities in the first year of operation would be limited to pilot operations producing 1000 tons finfish per annum for the entire ADZ. Bio-physical and socio-economic monitoring studies would be conducted during the first phase of the establishment of the ADZ (see Chapter 9) and would determine the acceptable maximum scale of the ADZ based on observed environmental impacts. The phased approach would be overseen by the ADZ Management Committee (AMC) and the Consultative Forum (See Chapter 4).

2.6 Sea-based aquaculture activities

Sea-based activities associated with aquaculture in the ADZ include:

- Servicing and maintenance of aquaculture structures (such as rafts, lines, cages);
- Seeding/acclimating and harvesting of cultivated species;
- Initial processing of bivalves, including de-clumping and grading, typically on the raft or support vessel; and
- Vessel trips between the shore and aquaculture areas, e.g. to service structures or harvest species.

2.7 Associated sea-based infrastructure

Aside from rafts, lines, cages and barrels (including moorings and flotation devices) required for aquaculture, the following associated sea-based infrastructure is required:

- Navigational lights demarcating aquaculture areas;
- Mooring facilities for boats.

2.8 Associated land-based infrastructure and activities

Land-based infrastructure and activities depend on cultivated species, production methods and processing. Mussels can largely be harvested, de-clumped and graded on the raft or support vessel.

Basic land-based support infrastructure includes:

- Landing quays (catering to personnel, equipment and product) that are accessible for vehicles;
- Mooring space in protected harbour areas for support vessels; and
- Product holding facilities (which can be off-site if they do not rely on seawater).

The capacity of existing quays at Port of Port Elizabeth and Port of Ngqura is deemed sufficient to accommodate a moderate expansion of the aquaculture industry.

Detailed information on land-based facilities, as would be required for the authorisation of such facilities in terms of NEMA and the ICMA, could not be provided as part of this study. As such, no land-based facilities that require Environmental Authorisation are included in this assessment. Where authorisations or permits are required, these must be obtained by individual applicants. A more detailed project description is provided in Chapter 3 of the BAR (Massie *et al.* 2019a).

2.9 Overview of the project development cycle

Many international assistance institutions distinguish between five stages in the cycle of existence of a project, namely, identification, preparation, appraisal and agreement, implementation, and monitoring and evaluation (Insull and Nash 1990). Individual operators will first enter the pilot phase to establish feasibility, environmental impacts and scalability of the finfish and bivalve projects. Only then will the project enter full scale production. The project development cycle is illustrated in Figure 2.

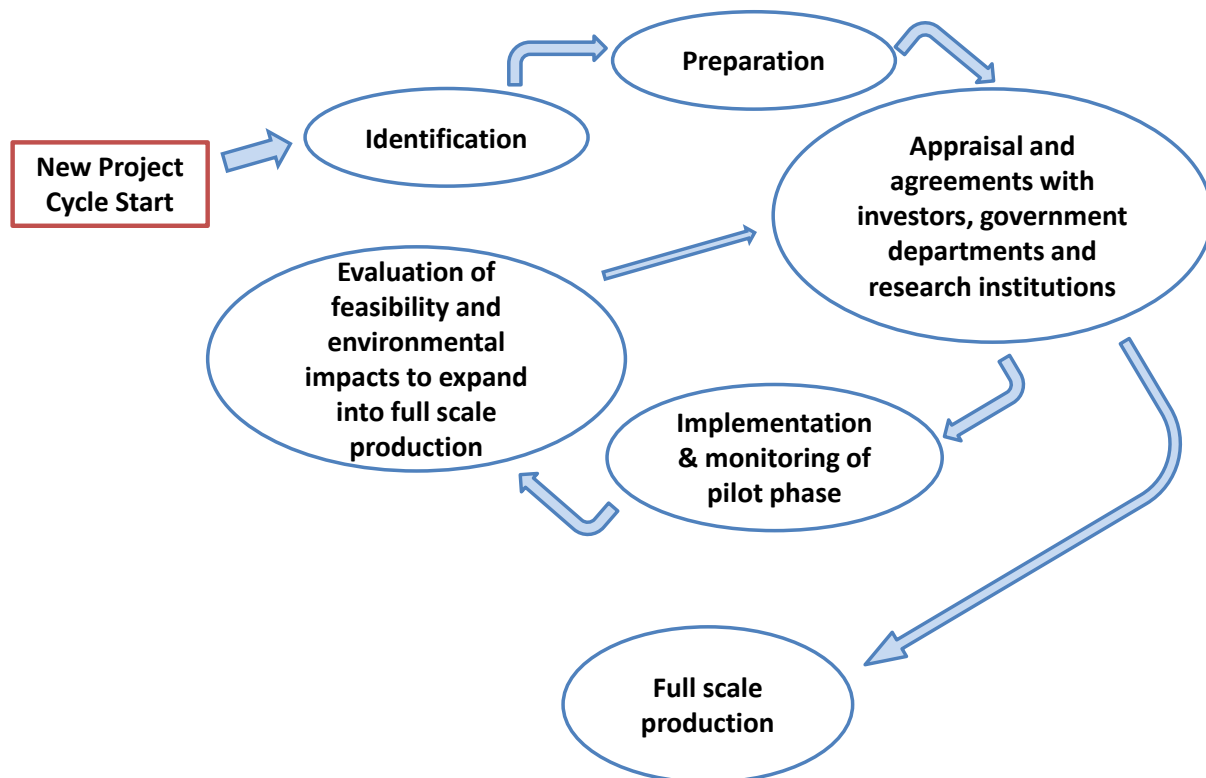


Figure 2 Schematic of the project cycle for the proposed Aquaculture Development Zone in Algoa Bay, Eastern Cape.

2.10 Project phasing

2.10.1 Construction phase

The construction phase of the development refers to the actual construction of the development. This refers to the placing of the sea cages, longlines and/or mussel rafts within the designated areas, as well as the anchoring / mooring activities required. Although the construction process of a farm is relatively swift and associated with few environmental impacts, it must be noted that the construction phase within the ADZ is an ongoing process as individual operators will develop farms until the capacity of the ADZ is reached. This means that the construction and operational phases for the ADZ as a whole will overlap. Individual operators will therefore be required to submit a construction programme to the AMC. The farm specific EMPr for the construction phase remains applicable should an extension to the construction phase be required.

2.10.2 Operational phase

The operational phase of the development will commence once the construction activities are completed and the development is officially handed over to the Concessionaires/Operators. This would also include the transfer of any properties to new owners and/or companies. This EMPr includes several recommendations regarding the Operational Phase of the project, but should not be seen as exhaustive. The Concessionaires/Operators should ensure that the Operational Phase of the projects maintains the underpinning principles and ideals of sustainable development.

2.10.3 Closure and decommissioning phase

Decommissioning refers to the process of removing the operating assets of the project after completion of the operating life cycle. Due to the nature of the proposal and the fundamental uncertainties associated with such a new industry in South Africa, the likelihood exists that the project may have to be decommissioned in the event that that the monitoring protocol identifies impacts of concern. In the event that decommissioning is required, all relevant legal processes must be complied with.

3 POTENTIAL IMPACTS

Based on the professional experience of the environmental assessment practitioner, legal requirements, the nature of the proposed activity, the nature of the receiving environment, the following key environmental issues – potential negative impacts and potential benefits – were identified:

- Marine ecology – potential alteration of the marine ecology due to sea-based farming in Algoa Bay.
- The proposed development will have visual impacts. Visual impacts will alter the sense of place in the area, which can have socio-economic knock on effects such as beach front property devaluation and marine-based tourism activities.
- Social and socio-economic – potential socio-economic benefits to the wider community in the form of job creation, skills development, increased investment and growth. Negative impacts due to user conflict (recreational boating, yachting, swimming, surfing, SCUBA diving etc.). The local fishing industry could also be affected if sites overlap with productive fishing grounds.
- Heritage – potential impact on underwater heritage resources, notably wrecks and associated artefacts.

Note that due to the scale of the proposed ADZ and potential long-term impacts on the marine environment, Anchor conducted a marine ecology specialist study, which is included in Appendix D of the Basic Assessment Report. The disturbance on the seabed will be associated with mooring/anchoring mechanism for the cages.

The proposed project will affect the surface environment of the ocean more so than the sea bottom. The disturbance on the seabed will be associated with mooring/anchoring mechanism for the cages. Anchor appointed ACO Associates cc to conduct a desktop Maritime and Underwater Cultural Heritage Study as the Maritime and Underwater Cultural Heritage (MUCH) Unit at SAHRA indicated that such a study would likely to be requested (the specialist study has been included as a standalone document in Appendix D).

A summary of the potential impacts of the proposed development are presented in Sections 3.1.1 - 3.1.5. Potential impacts are denoted by first listing the phase of the development (i.e. CP = Construction Phase; OP = Operation Phase) followed by the impact category:

- Marine Ecology = ME
- Visual and aesthetics = VA
- Socio-Economy= SE
- UMH = Underwater and Maritime Heritage Resources

Impacts are numbered consecutively and separately for the construction and operation phases.

3.1.1 Planning and design phase

The planning and design phase of the proposed sea-based Aquaculture Development Zone is not associated with any environmental impacts.

3.1.2 Construction phase

Table 4 Summary of potential impacts for the construction of the proposed Aquaculture Development Zone in Algoa Bay without and with mitigation. CP stands for Construction Phase. The following codes are used for the various impact types: ME = Marine Ecology, SE = Socio-economic.

Impact	Description	Significance
Biological	Disturbance of subtidal habitat	VERY LOW (-ve)
Socio-economic	Investment in the local, regional and national economy for Algoa Bay (all precincts)	LOW (+ve)
	Increased employment, income and skills development (all precincts)	LOW (+ve)
Underwater cultural heritage	Impacts on Submerged Prehistoric Heritage Resources: All Precincts	VERY LOW (-ve)
	Impacts on Maritime Archaeological Resources: Algoa 1 & 7	INSIGNIFICANT (-ve)
	Impacts on Maritime Archaeological Resources: Algoa 6	INSIGNIFICANT (-ve)

3.1.3 Operational phase impacts

Table 5 Summary of potential impacts of finfish culture and finfish culture on marine ecology (denoted ME) for the operation of the proposed Aquaculture Development Zone in Algoa Bay without and with mitigation. OP stands for Operation Phase.

Impact	Description	Significance
Marine Ecology – finfish culture	Disease and parasite transmission to wild fish stocks (ongoing, may be reversible).	HIGH (-ve)
	Organic waste discharge impacting on the water column and benthic environment arising from mariculture operations (ongoing but reversible).	MEDIUM(-ve)
	Genetic contamination of wild stocks with escapees from finfish cage culture at Algoa 1 & 7 (ongoing and irreversible).	LOW (-ve)
	Use of chemical therapeutants and antifoulants in finfish cage culture at Algoa 1 (ongoing but reversible).	LOW (-ve)
	Use of chemical therapeutants and antifoulants in finfish cage culture at Algoa 7 (ongoing but reversible).	MEDIUM (-ve)
	Accidental entanglement of cetaceans in mariculture infrastructure (ongoing but reversible).	LOW (-ve)

Impact	Description	Significance
	Possible impacts on cetaceans resulting from alterations in habitat use or migration patterns (ongoing but reversible).	LOW (-ve)
	Piscivorous marine animals interfering with finfish cage culture operations at Algoa 1 (ongoing but reversible).	LOW (-ve)
	Piscivorous marine animals interfering with finfish cage culture operations at Algoa 7 (ongoing but reversible).	MEDIUM (-ve)
	Possible impacts on the proposed Addo Elephant MPA, Algoa 7 (irreversible).	MEDIUM (-ve)

Impact	Description	Significance
Marine Ecology – bivalve culture	Introduction of alien bivalve species (Mediterranean mussel <i>Mytilus galloprovincialis</i>) to the wild.	VERY LOW (-ve)
	Introduction of alien bivalve species (Pacific oyster <i>Crassostrea gigas</i>) to the wild	LOW (-ve)
	Introduction of alien fouling species to the wild and provision of habitat to alien fouling species	LOW (-ve)
	Disease and parasite transmission to wild bivalve stocks (ongoing, may be reversible).	LOW (-ve)
	Organic pollution and habitat modification (ongoing but reversible).	LOW (-ve)
	Genetic contamination of wild stocks from bivalve mariculture at Algoa 1 and 6 (ongoing and irreversible).	VERY LOW (-ve)
	Accidental entanglement of cetaceans in bivalve mariculture infrastructure (ongoing but reversible).	LOW (-ve)
	Possible impacts on cetaceans resulting from alterations in habitat use or migration patterns (ongoing but reversible).	LOW (-ve)

Table 6 Summary of potential impacts of finfish culture and bivalve culture on the seascape character (denoted VA) for the operation of the proposed Aquaculture Development Zone in Algoa Bay without and with mitigation. OP stands for Operation Phase.

Impact	Description	Significance
Visual aesthetics – <u>finfish and bivalve culture</u>	Negative impact on seascape character by Algoa 1 by <u>finfish culture</u>	MEDIUM (-ve)
	Negative impact on seascape character by Algoa 1 by <u>bivalve culture</u>	LOW (-ve)
	Negative impact on seascape character by Algoa 6 <u>bivalve culture</u>	VERY LOW (-ve)
	Negative impact on seascape character by Algoa 7 <u>finfish culture</u>	VERY LOW (-ve)

Table 7 Summary of potential impacts by finfish and bivalve culture on the socio-economic environment (denoted SE) for the operation of the proposed Aquaculture Development Zone in Algoa Bay without and with benefit enhancing measures/mitigation. OP stands for Operation Phase.

Impact	Description	Significance
Socio-economic impact for finfish and bivalve culture	Investment in the local, regional and national economy (All precincts)	MEDIUM (+ve)
	Increased employment, income and skills development for Algoa Bay. (All precincts)	HIGH (+ve)
	Negative economic impact on specialist tourism and recreational businesses by <u>finfish</u> culture at Algoa 1	MEDIUM (-ve)
	Negative economic impact on specialist tourism and recreational businesses by <u>finfish</u> culture at Algoa 7	LOW (-ve)
	Negative economic impact on specialist tourism and recreational businesses by <u>bivalve</u> culture at Algoa 1	LOW (-ve)
	Negative economic impact on specialist tourism and recreational businesses by <u>bivalve</u> culture at Algoa 6	VERY LOW (-ve)
	Negative impacts on water sport recreational activities by <u>finfish</u> culture at Algoa 1 & 7	LOW (-ve)
	Negative impacts on water sport recreational activities by <u>bivalve</u> culture at Algoa 1 & 6	VERY LOW (-ve)
	Negative impacts on SCUBA diving activities for Algoa 1	VERY LOW (-ve)
	Negative impacts on SCUBA diving activities for Algoa 7	VERY LOW (-ve)
	Assessment of negative impacts on SCUBA diving activities for Algoa 6	VERY LOW (-ve)
	Risk of collision between vessels and aquaculture farms as a result of drifting ships from the anchorage area for Algoa 6	VERY LOW (-ve)
	Risk of collision between vessels and aquaculture farms as a result of drifting ships from the anchorage area for Algoa 7	LOW (-ve)
	Negative impact on vessel navigation routes for Algoa 1, 6 and 7	MEDIUM (-ve)
	Positive impacts on existing mariculture activities for Algoa 1, 6 and 7	N/A
	Negative impact on local fisheries for Algoa 1	MEDIUM (-ve)
	Negative impact on local fisheries for Algoa 7	MEDIUM (-ve)
	Negative impact on local fisheries for Algoa 6	LOW (-ve)
	Negative impact on land-based infrastructure (all precincts)	LOW (-ve)
	Impact on coastal real estate due to aesthetic nature of views and sense of place for Algoa 1	MEDIUM (-ve)
Impact on coastal real estate due to aesthetic nature of views and sense of place for Algoa 6	VERY LOW (-ve)	
Positive impact on local community development (all precincts)	MEDIUM (+ve)	

Impact	Description	Significance
	Negative impact of income leakage on local economic development of the area for Algoa 1 & 7 by <u>finfish farming</u>	MEDIUM (-ve)
	Negative impact of income leakage on local economic development of the area for Algoa 1 & 6 by <u>bivalve farming</u>	LOW (-ve)
	Positive impact on small businesses, individual and informal sector development (all precincts)	MEDIUM (+ve)
	Increased risk of bird strikes affecting aircrafts landing at and departing from the Port Elizabeth International Airport by <u>finfish culture</u>	INSIGNIFICANT (-ve)
	Increased risk of bird strikes affecting aircrafts landing at and departing from the Port Elizabeth International Airport by <u>bivalve culture</u>	INSIGNIFICANT (-ve)

Table 8 Summary of potential impacts by finfish culture on the socio-economic environment (denoted SE) for the operation of the proposed Aquaculture Development Zone in Algoa Bay without and with benefit enhancing measures/mitigation. OP stands for Operation Phase.

	Impact identified (SE finfish)	Consequence	Probability	Significance	Status	Confidence
OP-SE3	Negative economic impact on specialist tourism and recreational activities (i.e. loss of jobs and income) without and with mitigation measures for Algoa 1	High (7)	Definite	HIGH	-ve	High
	With mitigation	Medium (6)	Definite	MEDIUM	-ve	High
	Negative economic impact on specialist tourism and recreational activities (i.e. loss of jobs and income) without and with mitigation measures for Algoa 7	Low (5)	Probable	LOW	-ve	High
	With mitigation	Low (5)	Possible	VERY LOW	-ve	High
OP-SE3a	Negative impacts on water sport recreational activities for Algoa 1	Medium (6)	Possible	LOW	-ve	Low
	With mitigation	Medium (6)	Possible	LOW	-ve	Low
	Assessment of negative impacts on water sport recreational activities for Algoa 7	Low (5)	Possible	VERY LOW	-ve	Low
	With mitigation	Low (5)	Possible	VERY LOW	-ve	Low
OP SE10	Negative impact of income leakage on local economic development of the area for Algoa 1 and 7	High (7)	Probable	HIGH	-ve	Medium
	With mitigation	Medium (6)	Probable	MEDIUM	-ve	Medium

Table 9 Summary of potential impacts by *bivalve culture* on the socio-economic environment (denoted SE) for the *operation* of the proposed Aquaculture Development Zone in Algoa Bay without and with benefit enhancing measures/mitigation. OP stands for Operation Phase.

	Impact identified (SE bivalve)	Consequence	Probability	Significance	Status	Confidence
OP-SE 3	Negative economic impact on specialist tourism and recreational activities (i.e. loss of jobs and income) without and with mitigation measures for Algoa 1	Medium (6)	Definite	MEDIUM	-ve	Medium
	With mitigation	Low (5)	Definite	LOW	-ve	Medium
	Negative economic impact on specialist tourism and recreational activities (i.e. loss of jobs and income) without and with mitigation measures for Algoa 6	Low (5)	Improbable	VERY LOW	-ve	Medium
	With mitigation	Low (5)	Improbable	VERY LOW	-ve	Medium
OP-SE 3a	Assessment of negative impacts on water sport recreational activities for Algoa 1 & 6	Low (5)	Possible	VERY LOW	-ve	Low
	With mitigation	Low (5)	Improbable	VERY LOW	-ve	Low
OP-SE 10	Negative impact of income leakage on local economic development of the area for Algoa 1 & 6	Medium (6)	Probable	MEDIUM	-ve	Medium
	With mitigation	Low (5)	Probable	LOW	-ve	Medium

3.1.4 Decommissioning phase impacts

The DAFF facility does not have a specified life span. Partial or full decommissioning of the farm may or may not occur. Potential impacts associated with the decommissioning phase include:

- Conditional need for rehabilitation of terrestrial and coastal environment
- Loss of jobs

The foreseen activities associated with the decommissioning of the DAFF will not trigger additional listed activities to those identified in this BAR. Any disturbance of vegetation or habitat is considered to be low. The EMPr compels DAFF to ensure that decommissioning is conducted in an environmentally responsible manner. An impact assessment for the decommissioning phase has therefore not been completed here. Rehabilitation should be conducted as detailed in the EMPr.

Rehabilitation of bare soil resulting from the decommissioning of infrastructure will not be required on land (i.e. Farm 654 Portion 1 or any part thereof) that is decommissioned as part of a legal agreement between DAFF and the buyer of the land, and where the buyer assumes responsibility for rehabilitation. Rehabilitation requirements should be explicitly mentioned in the sales agreement. In the event that the sales agreement is not followed through and the land remains in the possession of DAFF, rehabilitation must be completed as per the conditions contained in this EMPr.

3.1.5 Impact significance of alternative options

The outcomes of the impact assessments for Algoa 1, 6 and 7 as well as for finfish and bivalve culture (as shown in the summary tables above) were summed for each alternative option (after mitigation). Positive impacts (or benefits) cannot cancel out negative impacts and therefore have to be assessed separately (Table 10 and Table 11 respectively). Positive impacts are limited to socio-economic benefits arising from increased employment, business opportunity and skills development in the aquaculture sector. Furthermore, note that in Option A, both finfish and bivalve culture are proposed for Algoa 1, however, these impacts are not additive and therefore the impact scoring for the best/worst case scenario was considered for positive and negative impacts respectively.

After benefit enhancing measures Option A and B have the same number of high, medium and low positive impacts on the socio-economic environment (Table 10). Option C excludes Algoa 1 which means that less area will be available for mariculture and therefore the benefits will be lower when compared to option A and B. The number of negative socio-economic impacts for options A and B are however substantially higher than option C.

Table 10 Comparison of the sum of positive (i.e. socio-economic) impact significance of alternative options A, B, C and D for the proposed sea-based Algoa Bay Aquaculture Development Zone (after mitigation). In Option A, both finfish and bivalve culture are proposed for Algoa 1, however, these impacts are not additive and therefore the impact scoring for the best case scenario (i.e. finfish only) was considered.

Impact significance after mitigation	A	B	C	No-go
Activities	Algoa 1: finfish and bivalves Algoa 6: bivalves Algoa 7: finfish	Algoa 1: bivalves Algoa 6: bivalves Algoa 7: finfish	Algoa 6: bivalves Algoa 7: finfish	No Go
High	3	3	2	0
Medium	12	12	8	0
Low	0	0	0	0
Very low	0	0	0	0
Insignificant	0	0	0	0
Total	15	15	10	0

Table 11 Comparison of the sum of negative impact significance of alternative options A, B, C and D for the proposed sea-based Algoa Bay Aquaculture Development Zone (after mitigation). In Option A, both finfish and bivalve culture are proposed for Algoa 1, however, these impacts are not additive and therefore the impact scoring for the worst case scenario (i.e. finfish only) was considered.

Impact significance after mitigation	Alternative Option A	Alternative Option B	Alternative Option C	Alternative Option D (No-go)
Activities	Algoa 1: finfish and bivalves Algoa 6: bivalves Algoa 7: finfish	Algoa 1: bivalves Algoa 6: bivalves Algoa 7: finfish	Algoa 6: bivalves Algoa 7: finfish	No Go
High	2	1	1	0
Medium	16	12	10	0
Low	32	28	18	0
Very low	12	12	10	0
Insignificant	6	6	4	0
Total	66	59	43	0

Option C would involve bivalve farming at Algoa 6 and finfish farming at Algoa 7, excluding Algoa 1 altogether and is the most favourable option from an environmental impact perspective. This Alternative option has a total of 43 negative impact ratings, of which most are considered very low after mitigation measures have been implemented. A moderate number of low and medium impact ratings and only one high impact rating makes Option C the most environmentally acceptable option aside from the No-go option (Option D). The comparatively low environmental impact is mostly attributable to reduced socio-economic impacts associated with the exclusion of Algoa 1.

Option A and B have 66 and 59 negative impact ratings respectively as both options include Algoa 1 as a precinct, although Option B only allowing bivalve culture at this precinct. The exclusion of finfish at Algoa 1 makes Option B generally more environmentally favourable with fewer medium and more very low and low ratings than Option A. This difference can be ascribed to fact that bivalve culture is less likely to attract sharks, has a lower visual impact and contributes less to water quality deterioration. Option A is the most farming intensive alternative option, where both finfish and bivalve can be farmed at Algoa 1, bivalve at Algoa 6, and finfish at Algoa 7.

The proposed development has the potential to create job opportunities, increase skill development and contribute towards the local economy. However, the impact assessment also showed that the relatively high number of negative impacts rated moderately significant after mitigation (mainly socio-economic and marine ecology) and at least one high rating for each alternative option indicate that a rigorous approach to adaptive management must be implemented.

4 ADZ MANAGEMENT

The Project proponent/developer is the person or entity who is responsible for carrying out the Activity that is authorised in terms of NEMA and/or this EMPr. In this case the Project Proponent is the Department of Agriculture, Forestry & Fisheries (DAFF), which is responsible for the management of the ADZ. The ADZ comprises of three precincts within which individual operators (i.e. companies or individuals) can manage finfish or bivalve aquaculture farms. Individual operators lease sea space from the Transnet National Port Authority (TNPA) within the boundaries of the ADZ and obtain a mariculture right (valid for 15 years) and annually renewed mariculture permits from DAFF. Individual operators are permitted to engage in activities as per the Environmental Authorisation for the ADZ. The EMPr is applicable to DAFF as the manager, individual operators and sub-contractors. Note however, that each individual operator must compile, have approved and implement a farm specific EMPr.

This Chapter has been adopted from du Toit and Reuther (2017) and has been amended by DAFF based on experiences in establishing the ADZ Management structure for the Saldanha Bay ADZ.

Two management bodies are to be established:

- An ADZ Management Committee (AMC), comprising of DAFF, DEA (Oceans and Coasts / Biodiversity Branches), DEDEAT (Eastern Cape Provincial Department of Economic Development, Environmental Affairs and Tourism), The Nelson Mandela Bay Municipality and TNPA, to fulfil a coordinating and supervising role and ensure compliance with the EMPr throughout all phases of aquaculture farming in the ADZ (see Section 4.1); and
- A Consultative Forum that includes other relevant government departments, authorities (e.g. SANParks, ACSA) and relevant local/public interest organisations, to review environmental monitoring data, advise on management and recommend measures (see Section 4.2).

Due to the sensitivity of the environment it is strongly recommended that a suitably qualified Environmental Control Officer (ECO) be appointed to oversee all activities for the duration of the Construction, Operation and decommissioning phases and to ensure compliance with the EMPr. The ECO will constitute an integral part of AMC (see Section 4.1). The ECO must have a minimum of a tertiary level qualification in the natural sciences field. The ECO should have at least 3 years of experience and proven competency as an ECO. It is recommended that the ECO has some experience in the marine environment, including diving or marine observation experience.

4.1 ADZ Management Committee (AMC)

4.1.1 Inception

The ADZ Management Committee (AMC) comprises of DAFF, DEA (Oceans and Coasts / Biodiversity Branches), DEDEAT (Eastern Cape Provincial Department of Economic Development, Environmental Affairs and Tourism), The Nelson Mandela Bay Municipality and Transnet National Port Authority. DAFF must establish the AMC promptly after the declaration of the ADZ.

Upon establishment, a notice shall be published in a local newspaper announcing the inception of the AMC, providing contact details for the AMC Secretariat and inviting interested stakeholders to register on a stakeholder database for the Consultative Forum (CF) (see below) to receive relevant notifications about the ADZ.

4.1.2 Functions of the AMC

The overarching function of the AMC is to oversee, facilitate, manage and monitor aquaculture operations in the ADZ. DAFF, as the applicant, is primarily responsible for day-to-day management of the ADZ and ensuring the implementation of and adherence to the EMPr, with appropriate support and guidance provided by the other AMC Departments:

Key functions of the AMC are to:

- Monitor aquaculture operators' compliance with the EMPr and ADZ EA conditions;
- Oversee environmental monitoring related to aquaculture in Algoa Bay;
- Monitor production volumes in the ADZ;
- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised ADZ;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents related to aquaculture operations;
- Review and comment on new / expanded aquaculture farm proposals within the approved ADZ; and
- Provide updated information to the public (e.g. farm coordinates, water quality information, notification of new aquaculture operations).

4.1.3 Structure and roles

It is suggested that the AMC organisational structure should make provision for various functions, including:

- **Chairperson** - Calls and chairs meetings of the AMC;
- **Secretariat** - Fulfils secretariat functions, including:
 - Maintenance of member details and arrangement of meetings;
 - Compiling and distribution of meeting notes;
 - Distribution of communication to AMC members and aquaculture farmers in the ADZ;
 - Maintenance of a database of registered (public) stakeholders;
 - Drafting and distribution of regular (at least biannual) AMC Reports to all Consultative Forum members and registered stakeholders on activities in the ADZ;
 - Administration of and responding to stakeholder comments on aquaculture activities in the ADZ; and
 - Reporting on stakeholder aspects at AMC meetings;
- **Environmental Control Officer** - Fulfils environmental control functions, including:
 - Liaising with the suitably qualified service provider(s) appointed to attend to environmental sampling, monitoring and auditing aspects in the ADZ to ensure that monitoring is implemented as per the requirements;
 - Receiving and reviewing monthly Farm Monitoring Reports;
 - Receiving and reviewing environmental sampling, monitoring and audit results;
 - Notifying the Chairperson in the event any aspects require immediate attention of the AMC;
 - Notifying the Secretariat in the event any aspects require immediate attention of other aquaculture farmers in the ADZ; and
 - Reporting on environmental aspects at AMC meetings.

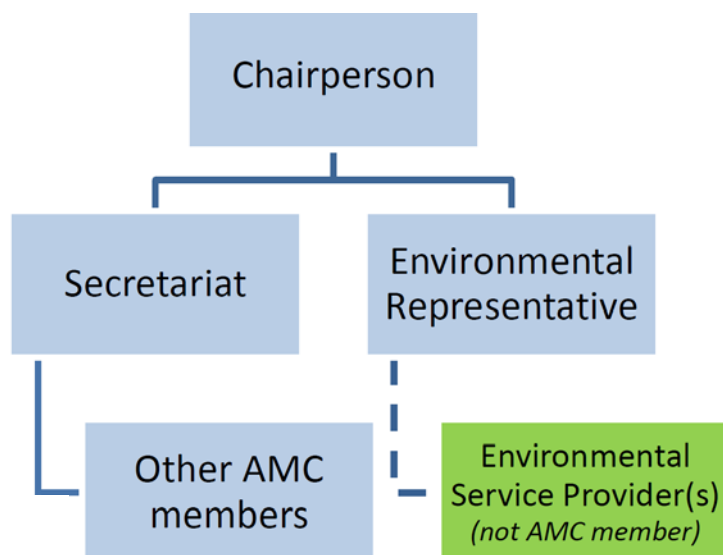


Figure 3 Suggested Organisational Structure of the Aquaculture Development Zone Management Committee (Source: du Toit and Reuther 2017).

4.2 Consultative Forum

The Consultative Forum (CF) must be established prior to any construction commencing. The body must remain active for the lifespan of the activity.

4.2.1 Membership of the Consultative Forum

DAFF should invite representatives of relevant government departments, authorities, local organisations and ADZ operators to become members of the Consultative Forum, including following institutions / organisations:

- Government and authorities:
 - (2) South African National Parks (SANParks);
 - (3) Eastern Cape Department of Agriculture and Land Affairs;
 - (4) South African Heritage Resource Agency (SAHRA) – Maritime and Underwater Cultural Heritage (MUCH) Unit;
 - (5) Nelson Mandela Bay Metropolitan Municipality;
 - (6) Sarah Baartman District Municipality
- Aquaculture industry:
 - (1) Local industry association representing operators in the ADZ;
 - (2) Farmers operating in the ADZ;
- Other organisations:
 - (1) Eastern Cape Parks and Tourism Agency; and
 - (2) Representatives from the various user groups (tourism, fisheries, squid, diving, yachting etc. estate agents);
 - (3) Representatives of the local fishing industry;
 - (4) Scientific representatives from NMU and/or Rhodes Universities;

- (5) SAEON;
- (6) Wildlife and Environmental Society of South Africa (WESSA);
- (7) Southern African Foundation for the Conservation of Coastal Birds (SANCCOB);
- (8) Endangered Wildlife Trust (EWT); and
- (9) Ratepayers Associations and members of the public.
- (10) Airports Company South Africa Port Elizabeth

Forum members will join on a voluntary basis and at no costs to DAFF.

4.2.2 Functions of the Consultative Forum (CF)

Key functions of the Consultative Forum are to:

- Review environmental monitoring data related to aquaculture in Algoa Bay;
- Make recommendations to the AMC based on the outcomes of environmental monitoring; and
- Provide a platform for discussion of environmental management in the ADZ.

4.3 Environmental Induction and Training

The ECO in consultation with the contractor shall ensure that adequate environmental awareness training of senior site personnel takes place and that all construction workers receive an induction presentation on the importance and implications of the EMPr. The presentation shall be conducted, as far as is possible, in the employees' language of choice. The contractor should provide a translator from their staff for the purpose of translating should this be necessary.

As a minimum, training should include:

- Explanation of the importance of complying with the EMPr and the employee's accountability.
- Discussion of the potential environmental impacts of construction activities.
- The benefits of improved personal performance.
- Employees' roles and responsibilities, including emergency preparedness (this should be combined with this induction, but presented by the contractors Health and Safety Representative).
- Explanation of the mitigation measures that must be implemented when carrying out their activities.
- Explanation of the specifics of this EMPr and its specification (no-go areas, etc.)
- Explanation of the management structure of individuals responsible for matters pertaining to the EMPr.
- Induction attendance registers must be included in any ECR documents.
- Should the staff turnover be high and with additional appointment of sub-contractors, it may be necessary to undertake additional induction training sessions. This is at the discretion of the ECO.

- The contractor must keep records of all environmental training sessions, including names, dates and the information presented.

4.4 Social engagement co-ordinator (SEC)

The Socio-Economic specialist has recommended that a Social Engagement Co-ordinator (SEC) is appointed for the activity. Continuous and periodic monitoring and evaluation is required to ensure the achievement of milestones and the overall success of achieving the socio-economic objectives envisaged for the project and stated below. The following activities are geared towards achieving acceptable and on-going monitoring standards:

- Regular field visits to the project and stakeholders benefiting from the social engagement programme shall be conducted by the Social Engagement Co-ordinator (SEC), which in turn shall prepare a quarterly report to the AMC and a copy will be provided to the Project Managers of the Developer and the Consultative Forum. The reports shall be both narrative and financial.
- A review after the first six months after implementation shall be conducted focusing on an assessment of the overall progress and achievement of the objectives and milestones related to the specified targets of employment, enterprise development, preferential procurement and socio-economic development.

5 MEASURES APPLICABLE TO THE DESIGN PHASE

The design phase of the ADZ will be applicable to ADZ as a whole (i.e. aquaculture specifications) during the inception phase. Furthermore, aquaculture farms will establish over time and the design measures are therefore applicable to each individual farm that is proposed for the ADZ. Finally, environmental measures are also applicable to existing farms that are intending to expand their aquaculture facilities.

The overall management structure, roles and responsibilities of each party involved in this project are detailed in Chapter 4. The specific roles and responsibilities for this phase are explained in Section 5.1 below (adopted and amended from du Toit (2017)).

5.1 Roles and Responsibilities

The key role players during the design phase of the project are (1) AMC (with DAFF primarily responsible); and (2) Concessionaries/operators of new or expanding ADZ aquaculture farms. Their roles and responsibilities during the detailed design phase with respect to the implementation of the EMPr are outlined below.

AMC (with DAFF primarily responsible)

- Ensure that the individual aquaculture operators are aware of and implement relevant measures in the EMPr and EA;
- Review and comment on new/expanded aquaculture farm proposals within the ADZ;
- Review and approve EMPr for individual farming operations;
- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA; and
- Provide updated information to the public (e.g. notification of proposed new aquaculture operations).

Aquaculture operators:

- Take cognisance of all relevant measures in the EMPr and ensure integration thereof in the design of aquaculture operations;
- Submit proposals for aquaculture farm establishment/expansion to the AMC for review and comment prior to installation; and
- Take into account formal AMC review comments and amend proposals accordingly.

DAFF and other authorities will fulfil specific authority oversight functions as per legal requirements.

5.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the design phase, as well as timelines for the implementation of these measures and monitoring thereof, are laid out below:

- Table 12 specifies ADZ-level measures that must be implemented by the DAFF / AMC; and
- Table 13 specifies farm-level measures that must be implemented by individual operators.

Environmental monitoring requirements during the design phase are addressed in Chapter 9.

Table 12 Aquaculture Development Zone (ADZ) – level management and mitigation measures that must be implemented during the Design Phase of the Algoa Bay ADZ by the Department of Agriculture, Forestry and Fisheries (DAFF)/ Aquaculture Development Zone Management Committee (AMC) (adopted from du Toit and Reuther 2017).

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
ADZ Layout	(1) Ensure that individual operators have completed an underwater archaeological survey that identifies any ship wreck material at the mooring sites and that exclusion zones identified by a qualified archaeologist are avoided by the proposed layout (note that avoidance is only applicable to structures anchored into the seabed and not the entire footprint of the farm).	Upon establishment of the ADZ	Survey and map farm boundaries.
	(2) Compile detailed site-layout plans for ADZ precincts approved as part of the EA, including recommended layout of farms within precincts and longlines / rafts / cages within individual farms.	Within 6 months of establishment of the ADZ	Review layout maps against approved boundaries.
	(3) Do not restrict access to fishing rights areas where practically possible.	Upon establishment of the ADZ	Map fishing grounds and confirm access is maintained.
ADZ phasing	(4) Implement a phased approach for the development of finfish cage culture in the ADZ: First phase: Pilot phase, no more than 3 operators, restriction to 1000 t for entire ADZ. Only if monitoring results indicate that environment health has been maintained and impacts remain manageable, expand to full commercial scale (i.e. up to carrying capacity per species).	Until maximum production per farm is phased in, or production limits are reduced due to environmental impacts	Compare actual production to phasing requirements
ADZ management specifications	(5) Specify requirements applicable to all existing and future operators with regards of aquaculture farms, which must be in compliance with farm-specific measures listed in the EMPr and include specifications with regards to: <ul style="list-style-type: none"> a. Lighting; b. Equipment visible at the surface; c. Safety and security; d. Waste management; e. Biosecurity management; and f. Vessel launch, mooring and loading / offloading protocols. g. Environmental awareness training. h. Communicate such requirements to all existing and prospective operators. 	Within 6 months for existing farms and at least 2 months before the first new farms establish	Relevant guidelines and communication
	(6) Confirm with key stakeholders (notably Port Captain, representatives of water users in the area and the South African National Defence Force / South African Navy) whether certain boundaries of the ADZ located away from night-time traffic require lighting at all.	At least 1 month before the first new farms establish	Relevant guidelines and communication
	(7) Develop maintenance and operational guidelines and standards in relation to potential entanglement risks at farms, including loose ropes, lines, buoys or floats.	At least 1 month before the first new farms establish	Relevant guidelines and communication
	(8) Specify a period within in which existing operators must adhere to specifications applicable to all operators.	Within 6 months of establishment of the ADZ	Relevant guidelines and communication

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
Expansion of existing farms/establishment of new farms	(9) Develop a template for individual operators to provide farm establishment / expansion proposals to the DAFF for review and comment. Such proposals should contain information on the proposed: <ol style="list-style-type: none"> a. Location b. Stocking density, with reference to the maximum production volume authorised; c. Mooring plan, with reference to heritage resources on the seabed; d. Measures to ensure equipment is securely in place; e. Emergency procedures in the event of loose equipment, loss of stock, entanglement of animals etc; and f. Any other aspects deemed relevant. 	At least 6 month before the first new farms establish	Relevant guidelines and communication
	(10) Review farm establishment / expansion proposals of individual operators and provide comment to proponents.	Within 1 month of submission of proposal to the DAFF	Clear advice to prospective operators on way forward
Emergency response	(11) Draw up emergency response protocol(s) to respond to a range of potential incidents in the ADZ, including: <ol style="list-style-type: none"> a. Loose / drifting equipment; b. Accidents (collisions) with other water users; c. Loss of stock; and d. Disease outbreak or algal bloom. e. Communicate the protocol to all ADZ aquaculture operators and registered stakeholders. 	Before the construction of the first new farm and within 6 months of establishment of the ADZ	Relevant guidelines and communication
	(12) Develop disentanglement protocols in collaboration with DAFF, DEA and the SA Whale Disentanglement Network and establish a rapid response unit to deal with entanglements.	Within 6 months of establishment of the ADZ	Relevant guidelines and communication
Stakeholder communication	(13) Invite the general public to register as stakeholders on a stakeholder database maintained by the AMC.	Within 6 months of establishment of the ADZ	Advert / communication to public
	(14) Make available updates to all registered stakeholders / consultative forum on aspects relating to the ADZ, including: <ol style="list-style-type: none"> a. Location of existing and planned aquaculture farms; b. Results of environmental monitoring in the reporting period; c. Any other relevant aspects. 	At least biannually	Relevant regular communication

Table 13 Farm – level management and mitigation measures that must be implemented during the Design Phase of the Algoa Bay ADZ by individual operators.

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
EMPr	(1) Compile an individual environmental management programme (EMPr) for each farm to allow for efficient management at the individual farm scale. The EMPr must be compatible, supportive and facilitative of the EMPr for the ADZ.	During design of farm / application for mariculture right. Within 6 months of EA for existing farms.	Review farm-level EMPr
Farm layout	(2) Consult the AMC specifications regarding the layout of aquaculture farms.	Before design of farm	Compliance of layout
	(3) Ensure a minimum width of 10 m between long-lines to allow for access.	During design of farm	Review layout
	(4) Fish farming: Ensure that finfish cages are suspended at least 15 m above the seabed to allow for adequate dispersion to prevent build-up of wastes (uneaten food and faeces) below the cages.	During design of farm	Propose layout
	(5) Ensure that finfish cages do not occupy more than 30% of the total area allocated for finfish farming at any one time, both within individual licence areas and overall within the portions of the ADZ identified for finfish culture.	During design of farm	Propose layout
	(6) Ensure that sensitive areas are avoided to mitigate impacts on visual aesthetics, socio-economic environment and underwater heritage resources.	During design of farm	Propose layout
	(7) Submit detailed proposals for expansions / new farms to the DAFF, reporting on the following aspects: <ul style="list-style-type: none"> a. Location (coordinates, size); b. Species; c. Equipment specifications; d. Layout (location and orientation of individual structures); e. Mooring plan; f. Surveys to be conducted prior to installation; g. Measures to ensure equipment is securely in place; h. Stocking density; i. Feeding protocols (if any); and j. Any other information deemed relevant or requested by the AMC. 	At least 2 months before installation of farm	Relevant submission
	(8) The mariculture farm layout must be designed such that mooring structures to be anchored on the sea floor avoid underwater maritime heritage resources. An appointed archaeologist must identify exclusion zones, which must be clearly demarcated on the farm layout map. Exclusion zones must be determined in the following way: <ul style="list-style-type: none"> a. Any geophysical data generated to support the development of aquaculture in this area must be archaeologically reviewed for the presence of historical shipwrecks or related material and to ground truth proposed mooring locations. Datasets that are particularly useful in this regard are 	During design of farm	Record of diver surveys, placement of farms in layout with mooring and anchorage sites outside of exclusion areas identified by the qualified archaeologist.

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	<p>magnetometer, side scan sonar and multibeam bathymetric data. It is recommended that the archaeologist is consulted before data are collected to ensure that the survey specifications and data outputs are suitable for archaeological review;</p> <p>b. Any video footage collected support to development of aquaculture in the three areas should ideally also be reviewed by the archaeologist for evidence of shipwreck material on the seabed;</p> <p>c. If geophysical data are not collected, the proposed positions of all moorings must be ground truthed by suitably qualified divers;</p> <p>d. Should the reviews and ground truthing set out above identify wreck material at or near the location of any proposed mooring, micro-siting of the mooring and the possible implementation of an exclusion zone around the archaeological feature should be sufficient to mitigate the risks to the site.</p> <p>(9) Submit a detailed anchor / mooring distribution plan to the Maritime and Underwater Cultural Heritage Unit at the South African Heritage Resources Agency (SAHRA).</p>		
Equipment	<p>(10) Use aquaculture structures and equipment that are suitable for the environmental conditions in the farming area, e.g. that can withstand the maximum recorded wave / swell heights.</p> <p>(11) Ensure mooring systems will prevent / limit movement of anchors and chains over the sea floor.</p> <p>(12) Minimise entanglement by using mesh size less than 6 cm.</p> <p>(13) Use environmentally safe aquaculture infrastructure to prevent entanglement of faunal species such as fish, whales, dolphins and turtles.</p> <p>(14) All precincts:</p> <p>a. Use, as far as possible, grey based hues for all project components (rafts, cages, barrels, buoys/flotation devices) visible above the surface of the water.</p> <p>b. Ensure project components are of a similar style and scale to promote visual cohesiveness.</p> <p>c. Utilise the minimum number of safety / warning buoys as far as possible. Only demarcate the corner points of each precinct and the minimum interval distance along the precinct boundary to meet Ports Authority (Transnet) safety requirements.</p>	<p>During design of farm</p> <p>During design of farm</p> <p>During design of farm</p> <p>During design of farm</p> <p>During design of farm</p>	<p>DAFF / AMC approval of layout and design Proven design in similar conditions Review order specifications</p> <p>DAFF / AMC approval of layout and design Proven design in similar conditions Review order specifications</p> <p>Review netting specifications Review order specifications</p> <p>Review netting specifications Review order specifications</p> <p>Review order specifications</p>

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	(15) Algoa 1 specific: a. Use exclusively long-lines for bivalve culture (i.e. no rafts).		
Decommissioning	(16) Plan and make adequate financial provision for removal of all infrastructure upon cessation of farming operations.	Before installation of farm commences	Review financial provision documents

6 MEASURES APPLICABLE TO THE CONSTRUCTION PHASE

The construction phase measures will apply to (1) new farms that are installing infrastructure and equipment in the ADZ; and (2) Existing farms that are installing new infrastructure and equipment in the ADZ as part of an expansion.

6.1 Roles and Responsibilities

The key role players during the construction phase of the project are anticipated as follows:

- AMC (with DAFF primarily responsible);
- DAFF;
- Aquaculture operators; and
- Contractors responsible for construction / placement of infrastructure.

Individual operators retain the final responsibility with regards to compliance with the EMPr and EA. All instructions relating to the EMPr will be given to contractors via the respective aquaculture operators. Contractors will report issues of concern to the aquaculture operator, who in turn will report on progress to the AMC.

Key roles and responsibilities during the construction phase with respect to the implementation of the EMPr are outlined below.

Roles and responsibilities relating to environmental monitoring are laid out in Section 7.1.

AMC (with DAFF primarily responsible)

- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents;
- Provide updated information to the public (e.g. notification of proposed new aquaculture operations).
- Record and if necessary, respond to, environmental aquaculture-related incidents.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of construction activities and the implementation of the EMPr. Operators are required to:

- Ensure that contractors are aware of and comply with the conditions of the EMPr;
- Ensure that staff are aware of and comply with the conditions of the EMPr;
- Inform the DAFF/AMC should there be any notable changes to submitted plans; and
- Report any incidents and initiate the emergency protocol if required.

Contractors:

All contractors will be required to:

- Ensure that all employees are aware of and comply with the EMPr;
- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Immediately notify the aquaculture operator of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the AMC.

6.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the construction phase, as well as timelines for the implementation of these measures and monitoring thereof, are detailed below:

- Table 14 species ADZ – level measures that must be implemented by the DAFF/AMC; and
- Table 15 specifies farm-level measures that must be implemented by individual operators.

Environmental monitoring requirements during the construction are addressed in Chapter 9.

Table 14 Aquaculture Development Zone (ADZ) – level management and mitigation measures that must be implemented during the Construction Phase of the Algoa Bay ADZ by the Department of Agriculture, Forestry and Fisheries (DAFF)/ Aquaculture Development Zone Management Committee (AMC) (adopted from du Toit and Reuther 2017).

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
Stakeholder communication	(1) Make available updates to all registered stakeholders on aspects relating to the ADZ, including: <ol style="list-style-type: none"> Location of existing and planned aquaculture farms; Results of environmental monitoring in the reporting period; Any other relevant aspects. 	At least biannually	Relevant communication
Complaints register	(2) Maintain and disclose a complaints / comments register. The register must record: <ol style="list-style-type: none"> Name and contact details of person complaining / commenting; Date submission was lodged; Person who initially received the submission; Nature of the submission; Operator that is subject to the submission; Actions taken to investigate a complaint and outcome of the investigation; Action taken to remedy the situation; and Date on which feedback was provided to the complainant. 	Duration of farm installation activities	Keep records of all complaints
Response to environmental incidents	(3) Contingency plans in the event of accidental spills must be prepared and immediately implemented in the event of a spill.	Prior to construction.	Contingency plans must be in place
	(4) Record all environmental incidents related to aquaculture farm construction / expansion, including: <ol style="list-style-type: none"> Loose / drifting equipment; Accidents (collisions) with other water users; Entanglement of marine animals; Spill of pollutants; and Waste in the marine environment. Underwater Maritime Heritage Resources are disturbed 	In the event of an incident	Maintain register of incidents and response Following resumption of activities, frequently inspect area to ensure issue was properly addressed
	(5) Coordinate a response to environmental incidents related to aquaculture operations, if necessary.	In the event of an incident	Time taken to address the incident
	(6) Initiate the emergency response protocol to respond to an environmental incident if it cannot be dealt with at farm level.	In the event of an incident	Time taken to address the incident

Table 15 Farm – level management and mitigation measures that must be implemented during the Construction Phase of the Algoa Bay ADZ by individual operators.

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
Environmental Control Officer	(1) Appoint an Environmental Control Officer (ECO) during the construction phase (installation of new farms) to ensure compliance with stipulations in the Environmental Authorisation and EMPr.	During installation of new (including extension of existing) farms	ECO reports submitted to the DAFF / AMC
Complaints register	(2) Forward all public submissions received by operators to the DAFF/AMC	Within one week of receiving the submission	Keep record of all complaints
	(3) Provide a response to the submission, where required.	Within one week of receiving the submission	Keep record of all complaints
Environmental awareness training	(4) Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: <ul style="list-style-type: none"> a. Potential impact of waste and construction activities on the environment; b. Suitable disposal of waste. Suitable handling and disposal protocols must be clearly explained and sign boarded on the vessels and the 'Reduce, reuse, recycle' hierarchy should be implemented. c. Key measures in the EMPr relevant to worker's activities; d. How incidences and suggestions for improvement can be reported. e. Sensitive marine habitats; f. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names. 	Before workers start working on-site and before new activities are undertaken.	Training attendance register. Observe whether activities are executed in line with EMPr requirements
Waste management	(5) Ensure that no litter and debris reaches the marine environment during construction activities.	Throughout farm installation	Visual
	(6) Train all staff in the effects of debris and litter in the marine environment.		
	(7) Minimise waste through reducing and re-using (packaging) material.		
	(8) Prevent littering by construction staff at work sites by providing bins or waste bags in sufficient locations.		
	(9) Provide separate bins for hazardous / polluting materials and mark these clearly.		
Land-based activities: Hazardous substances	(10) All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	Throughout farm installation	Visual inspection of hazardous materials handling and storage areas
	(11) Develop (or adapt and implement) procedures for the safe transport, handling and storage of potential pollutants.	Throughout farm installation	Visual inspection of hazardous materials handling and storage areas

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	(12) Avoid unnecessary use and transport of hazardous substances.	Throughout farm installation	Visual inspection
	(13) Keep Material Safety Data Sheets (MSDS) for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials.	Throughout farm installation	Visual inspection of MSDS
Response to environmental incidents	(14) Report all environmental incidents related to aquaculture farm construction / expansion to the DAFF, including: <ul style="list-style-type: none"> a. Loose / drifting equipment; b. Accidents (collisions) with other water users; c. Entanglement of marine animals; d. Spill of pollutants; and e. Waste in the marine environment. 	Throughout farm installation	Maintain register of pollution events and response Appropriate communication
	(15) Initiate steps to contain the environmental incident at a farm level.	Throughout farm installation	Record of events
	(16) Request and support assistance with environmental incidents from the DAFF / AMC if the incident cannot be dealt with at farm level.	Throughout farm installation	Appropriate communication
Response to environmental pollution	(17) In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.	Throughout farm installation	Maintain register of pollution events and response
	(18) Only resume activity once the problem has been stopped, the equipment has been repaired and/or the pollutant can be captured without reaching the marine environment.		Following resumption of activities, frequently inspect area
	(19) Repair faulty equipment as soon as possible.		Visual inspection Time to address issue
Equipment	(20) Ensure that, upon installation of the aquaculture structures: <ul style="list-style-type: none"> a. Primary longline / raft / net is secured appropriately so that it is kept taut and rigid at all times. Nets of fish cages should be weighted; b. Ropes and anchor lines are taut, especially after rough seas; and c. There is adequate separation between rafts and longlines, even during strong currents and rough seas; or d. There is adequate separation between the primary and secondary nets of fish cages, even during strong currents and rough seas. 	Following installation	Visual inspection (above and below water)

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
Vessel operation	(21) Implement maritime safety protocols while working on vessels and at sea. (22) Do not discard any waste overboard. (23) Take waste generated on vessels back to shore and dispose of properly. (24) In the event of litter and debris entering the sea, remove these as soon as possible. (25) Maintain vessels for safety of crew and to prevent environmental pollution	Throughout farm installation	Visual inspection
Marine ecological impacts	(26) Do not moor cages over long lived biogenic habitats (e.g. reefs)	Throughout the construction phase.	Visual inspection
	(27) <i>Ensure mooring system is well designed to prevent/limit movement of anchors and chains over the sea floor.</i>	Throughout the construction phase.	Design concept, Visual inspection
	(28) <i>Do not move mooring anchors or blocks when undertaking cage net maintenance or fallowing sites, as replacement of moorings when site is used again will increase impact footprint.</i>		
Employment/ procurement	(29) Procure goods and services from local, provincial or South African suppliers as far as possible, giving preference to Black Economic Empowerment (BEE) suppliers. (30) Preferentially use local and regional labour (31) Preferentially employ previously disadvantaged individuals.	Throughout the construction phase.	B-BBEE compliance, Procurement records, staff profiles
Visual impacts	(32) Use grey based hues for all project components (rafts, cages, barrels, buoys/flotation devices) visible above the surface of the water as far as possible. This mitigation measure has to be weight against bright infrastructure required to minimise entanglement.	During installation of farms Within specified timeframe for existing farms	Visual inspection
	(33) Ensure project components are of a similar style and scale to promote visual cohesiveness.		
	(34) Utilise the minimum number of safety / warning buoys as far as possible. Only demarcate the corner points of each precinct and the minimum interval distance along the precinct boundary to meet Ports Authority (Transnet) safety requirements.		
	(35) Maintain all project infrastructure in good working order		
	(36) Demarcate all equipment (buoys, raft and cage components) with the operators logo /name to enable tracing of lose equipment / debris.		
Protection of heritage resources	(37) Should any archaeological material, be accidentally encountered during the course of developing aquaculture operations in any of the proposed areas, work must cease in that area until the project archaeologist and SAHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it.	During installation of farm	Record of diver surveys
	(38) Provide the location and nature of any identified maritime and underwater cultural heritage	During installation if	Appropriate communication

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	resources to a maritime archaeologist and to SAHRA for inclusion on their shipwreck database.	required	
	(39) Obtain a permit from SAHRA prior to continuing with activities that have disturbed a wreck site or part thereof, including objects or artefacts.	During installation if required	Appropriate communication
	(40) Submit a detailed anchor / mooring distribution plan to the Maritime and Underwater Cultural Heritage Unit at the South African Heritage Resources Agency (SAHRA).	Before installation commences	Record of diver surveys, placement of farms

7 MEASURES APPLICABLE TO THE OPERATION PHASE

Operation Phase measures will apply to aquaculture farms that are operating with the ambit of the Algoa Bay ADZ.

7.1 Roles and Responsibilities

The key role players during the operation phase of the project are the AMC (with DAFF primarily responsible) and aquaculture operators. Individual operators retain the final responsibility with regards to compliance with the EMPr and EA.

Key roles and responsibilities during the operation phase with respect to the implementation of the EMPr are outlined below.

Roles and responsibilities relating to environmental monitoring are laid out in Chapter 9.

AMC (with DAFF primarily responsible)

The AMC has oversight over environmental management at the ADZ. In terms of environmental management, the AMC will:

- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents or pollution related to aquaculture operations;
- Provide updated information to the public (e.g. updated maps/coordinates, water quality information, notification before new aquaculture operations start)
- Record and if necessary, respond to, environmental aquaculture-related incidents.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of operation activities and the implementation of the EMPr. Operators are required to:

- Comply with the conditions of the EMPr;
- Ensure that staff are aware of and comply with the conditions of the EMPr;
- Inform the DAFF/AMC should there be any notable changes to operations; and
- Report any incidents and initiate the emergency protocol if required.

7.2 Reporting

The AMC must make available biannual **ADZ Reports** to registered stakeholders including at a minimum the following information:

- Extent of current operations;
- Location and type of proposed new operations;
- Key environmental monitoring results;
- Feedback on stakeholder concerns; and
- Any other relevant aspects.

Note that environmental monitoring reports are addressed in Chapter 9.

7.3 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the operation phase, as well as timelines for the implementation of these measures and monitoring thereof, are laid out below:

- Table 16 specifies ADZ-level measures that must be implemented by the DAFF / AMC; and
- Table 17 specifies farm-level measures that must be implemented by individual operators.

Environmental monitoring requirements during the operation phase are addressed in Chapter 9.

Table 16 Aquaculture Development Zone (ADZ) – level management and mitigation measures that must be implemented during the Operation Phase of the Algoa Bay ADZ by the Department of Agriculture, Forestry and Fisheries (DAFF)/ Aquaculture Development Zone Management Committee (AMC) (adopted from du Toit and Reuther 2017).

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
Demarcation of ADZ precincts	(1) Ensure that all active aquaculture farms are accurately marked on navigational charts.	Throughout operations	Accurate charts Notification of stakeholders
	(2) Ensure that the outside boundaries of all active aquaculture areas are accurately marked day and night using markers compliant with South African Marine Safety Authority (SAMSA) regulations.	Throughout operations	Visual inspection
	(3) Monitor that markers are fully functional.	Throughout operations	Visual inspection
	(4) If the Ports Authority requires flashing lights, ensure the lights flash simultaneously.	Throughout operations	Visual inspection
	(5) Do not restrict access to fishing rights areas where practically possible.	Upon establishment of the ADZ	Map fishing areas and confirm access is maintained
Supervision of farming activities	(6) Enforce maintenance and operational guidelines and standards in relation to potential entanglement risks at farms, including loose ropes, lines, buoys or floats.	Throughout operations	Record of visual inspection and (non)compliances
	(7) Implement monitoring as per the environmental monitoring requirements stipulated in Chapter 9 of the EMPr.	Within 3 months of establishment of the ADZ	Monitoring records
	(8) Update the dispersion model with monitoring information as it becomes available to inform further monitoring and the phased implementation of the ADZ.	Throughout operations as advised by AMC	Record of model updates
Stakeholder communication	(9) Notify registered stakeholders before installation of new farms commences. Provide detail on the proposed farm type and location.	Throughout operations	Record of notification of stakeholders
	(10) Make available ADZ Report updates to all registered stakeholders on aspects relating to the ADZ, including: <ul style="list-style-type: none"> a. Location of existing and planned aquaculture farms; b. Results of environmental monitoring in the reporting period; c. Any other relevant aspects. 	At least biannual	Record of stakeholder communication
Complaints register	(11) Maintain and disclose a complaints / comments register. The register must record: <ul style="list-style-type: none"> a. Name and contact details of person complaining / commenting; b. Date submission was lodged; c. Person who initially received the submission; d. Nature of the submission; e. Operator that is subject to the submission; 	Duration of operations	Keep records of all complaints

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	<ul style="list-style-type: none"> f. Actions taken to investigate a complaint and outcome of the investigation; g. Action taken to remedy the situation; and h. Date on which feedback was provided to the complainant. 		
Response to environmental incidents	(12) Contingency plans in the event of accidental spills must be prepared and immediately implemented in the event of a spill.	Prior to construction.	Contingency plans must be in place
	(13) Record all environmental incidents related to aquaculture farm construction / expansion, including: <ul style="list-style-type: none"> a. Loose / drifting equipment; b. Accidents (collisions) with other water users; c. Entanglement of marine animals; d. Spill of pollutants; and e. Waste in the marine environment. f. Underwater Maritime Heritage Resources are disturbed during maintenance 	In the event of an incident	Maintain register of incidents and response Following resumption of activities, frequently inspect area to ensure issue was properly addressed
	(14) Coordinate a response to environmental incidents related to aquaculture operations, if necessary.	In the event of an incident	Time taken to address the incident
	(15) Initiate the emergency response protocol to respond to an environmental incident if it cannot be dealt with at farm level.	In the event of an incident	Time taken to address the incident
Sector development	(16) <i>Liaise with relevant authorities to encourage the development of South African spat and fingerling hatcheries to reduce the reliance on import, and associated risk of non-intentional introduction of associated alien species and diseases.</i>	As early as possible	
	(17) <i>Encourage the municipality, in cooperation with aquaculture operators and the AMC, to initiate a study to identify industries or projects that could benefit from the direct and indirect opportunities generated by the ADZ, and mechanisms to promote or establish such industries or projects.</i>	As early as possible	
	(18) <i>Encourage the municipality, in cooperation with aquaculture operators and the AMC, to encourage and support projects and / or networks that provide training and support for small and medium enterprises in the Nelson Mandela Bay Municipality to benefit from the opportunities generated by the ADZ.</i>	As early as possible	

Table 17 Farm – level management and mitigation measures that must be implemented during the Operation Phase of the Algoa Bay ADZ by individual operators.

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
Environmental awareness training	(1) Provide environmental awareness training to all personnel on the farm at the start of their employment. Training should include discussion of: <ol style="list-style-type: none"> a. Potential impact of waste and construction activities on the environment. b. Suitable disposal of waste. Suitable handling and disposal protocols must be clearly explained and sign boarded and the 'Reduce, reuse, recycle' hierarchy should be implemented. c. Key measures in the EMPr relevant to worker's activities. d. How incidences and suggestions for improvement can be reported. e. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names. 	Before employment.	Training attendance register. Observe whether activities are executed in line with EMPr requirements
Complaints register	(2) Forward all public submissions received by operators to the DAFF/AMC	Within one week of receiving the submission	Keep record of all complaints
	(3) Provide a response to the submission, where required.	Within one week of receiving the submission	Keep record of all complaints
Management of domestic waste	(4) Do not discard any waste overboard vessels. (5) Minimise waste through reducing and re-using material (e.g. packaging). (6) Collect recyclables separately and deliver these to suitable facilities or arrange for collection. (7) Collect all waste in bins and/or skips. Prevent littering by staff at work sites by providing bins or waste bags in sufficient locations. (8) Ensure no debris and waste material used at the operations enters the marine environment (particularly plastics), to minimise the risk of attraction, harming and entanglement by seabirds, marine mammals and large predators. (9) In the event of equipment, litter and debris entering the sea, remove these as soon as possible. (10) Investigate alternative uses for wastes prior to disposing to landfill.	Throughout operation	Visual inspection and waste management protocol in place.
Storage of hazardous material	(11) Provide separate bins for hazardous / polluting materials and mark these clearly. (12) All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	Throughout operation.	Visual
Day to Day Biological Waste Management	(13) Do not discard fouling organisms removed from farming structures, oysters or mussels into the marine environment (molluscs may have alien fouling organisms growing on their shells). Dispose biological waste at a registered Waste Management Facility.	Throughout operation.	Waste monitoring programme and visual inspections.

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	<p>(14) Do not discard fouling organisms removed from netting taken onshore for maintenance back into the marine environment.</p> <p>(15) Do not discard sick or dead organisms into the marine environment.</p> <p>(16) Provide fish mortality to fishmeal farms in the area, where possible (only if biosecurity measures are met).</p> <p>(17) Where mortalities are sent for disposal to a fish meal processing facility, the farm shall receive documented proof that the facility is treating the material in an approved manner such that no transfer of pathogens may occur in the marine/aquaculture sector via the end use of the fishmeal or the disposal of any condemned material. This shall be ensured through either the treatment process method or the end product use (not being an aquaculture feed additive).</p> <p>(18) Condemned material (waste/fish infected with confirmed OIE or controlled disease as opposed to normal mortalities, as confirmed and directed by the State Veterinarian), will be incinerated or disposed of at a licensed landfill site per the requirements of the Meat Safety Act (Act No 40 of 2000).</p>		
Emergency Biological Waste Management	(19) In the case of mass mortality of farm organisms, dispose of dead organisms at a licensed waste management facility. <i>Alternatively where possible and if biosecurity measures are met provide mortalities to fish meal farms in the area.</i>	In emergency situations	Confirmation with the licenced Waste Management Facility that biological waste was received.
Response to environmental pollution and incidents	<p>(20) Contingency plans in the event of accidental spills of hazardous materials must be prepared and immediately implemented in the event of a spill.</p> <p>(21) In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.</p> <p>(22) Initiate steps to contain the environmental incident at a farm level.</p> <p>(23) Only resume activity once the problem has been stopped, the equipment has been repaired and/or the pollutant can be captured without reaching the marine environment.</p> <p>(24) Report all environmental incidents related to aquaculture farm operation to the DAFF, including (but not limited to):</p> <ol style="list-style-type: none"> Hydrocarbon spills; Accidents (e.g. collision with other water users); Collisions of fauna with vehicles; Entanglement of marine animals; Loss of stock; Disease outbreak or algal bloom; 	<p>Prior to commencement of the operational phase.</p> <p>In the event of an incident</p>	<p>Contingency plans must be in place</p> <p>Maintain register of incidents and responses following resumption of activities, frequently inspect area to ensure issue was properly addressed.</p>

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	g. Spill of pollutants; and h. Waste in the marine environment;		
	(25) Repair faulty equipment as soon as possible.	In the event of an incident	Visual inspection, record the amount of time taken to address the issue.
	(26) Request assistance with environmental incidents from the DAFF / AMC if the incident cannot be dealt with at farm level.	In the event of an incident	Time taken to address an incident.
	(27) Rectify activities that elicit noise or odour complaints.	In the event of an incident	Record of rectification
Incident logging	(28) Maintain an incident register in which all events caused by farming activities or farm infrastructure, such as escape events or the dislodging of infrastructure, which may have environmental risks, are recorded.	Throughout operation	Incident register on file
	(29) Report all non-routine events that may have an environmental impact to the DAFF / AMC.	Throughout operation	Appropriate communication Farm Monitoring Report
Mussel Farm management	(30) Seed ropes with specimens present in the area and do not introduce mussels from other areas.	Throughout operation	Farm Monitoring Report
	(31) Do not dispose of mussels in the Bay during red tides (no biological material should be discarded into the marine environment).	Throughout operation	Visual inspection Reports of non-compliance
	(32) Avoid high density culture (overcrowding). The recommended density is:	Throughout operation	Visual inspection
	(33) One raft of 800 droppers per ha; or		Farm Monitoring Report
	(34) 11 longlines of 832 droppers per ha.		
Oyster farm management	(35) Use only spat sourced from biosecure certified hatcheries and/or quarantine facilities.	Throughout operation	Certificate
	(36) Inspect imported spat for other species before introduction into the Bay. Destroy any other species associated with oyster spat and report the incident to the DAFF.	Throughout operation	Visual inspection Farm Monitoring Report
	(37) Avoid high density culture (overcrowding). The recommended density is 11 longlines of 176 oyster stacks per ha.	Throughout operation	Visual inspection Farm Monitoring Report
	(38) Do not discard fouling organisms removed from cultured stock taken onshore for maintenance back into the marine environment.	Throughout operation	Records of non-compliance, disposal record
Finfish farm management	(39) Ensure that finfish cages do not occupy more than 30% of the total area allocated for finfish farming at any one time, both within individual licence areas and overall within the portions	Throughout operation	Visual inspection Farm Monitoring Report

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
Farm layout and density	of the ADZ identified for finfish culture.		Approved layout
	(40) Rotate cages within a production area to allow recovery of benthos.	Throughout operation	Visual inspection
	(41) Destock, or fallow, a site after a growing cycle to allow seabed recovery prior to restocking.		Farm Monitoring Report
Maintenance of aquaculture infrastructure	(42) Keep cage netting clean, free of algal growth and free of any damage that could lead to the escape of farmed organisms or the penetration of predators.	Throughout operation	Visual inspection Maintenance records
	(43) Keep nets well maintained (e.g. repair holes immediately)		
	(44) Maintain all project infrastructure in good working order.	Throughout operation	Visual inspection Maintenance records Farm Monitoring Report
	(45) Regularly clean cages, rafts etc and inspect for alien species.	Throughout operation	Visual inspection Maintenance records
	(46) Regularly inspect aquaculture infrastructure for integrity of the structure, anchorage and general wear and tear.	Throughout operation	Visual inspection Maintenance records
	(47) Keep all lines taught through regular inspections and maintenance.	Throughout operation	Visual inspection
	(48) Leave mooring anchors or blocks in place when undertaking cage or raft maintenance or fallowing sites to avoid repetitive impacts on the seabed.	Throughout operation	Visual inspection
	(49) Keep marine structures clean and free of unnecessary equipment.	Throughout operation	Visual inspection
Vessel operation	(50) Maintain service barges and boats to withstand local weather conditions and fit them with the necessary safety equipment to provide a safe working environment.	Throughout operation	Visual inspection Maintenance records
	(51) Implement maritime safety protocols while working on vessels and at sea.	Throughout operation	Visual inspection
Safety	(52) Minimise noise and air emissions from vessels.	Throughout operation	Visual inspection
	(53) Clearly mark cages and other offshore infrastructure with clear warning markers, bells and radar reflectors to ensure visibility to marine traffic.	Throughout operation	Visual inspection
Human consumption	(54) Keep necessary safety equipment (e.g. life rings) on platforms in an accessible position.		
	(55) Ensure that products intended for human consumption are of an acceptable quality and comply with health standards for seafood as prescribed by the relevant authorities such as the South African Bureau of Standards (SABS) and DAFF.	Throughout operation	Compliance with prescribed health standards
Feed	(56) Purchase only registered aquaculture feeds from recognised feed companies that produce high quality feeds of which the ingredients, composition and manufacturing methods are	Throughout operation	Certificates, order records

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	known. (57) Use high digestibility, high energy and low phosphorus feeds, species and system-specific feeds and maximize food conversion ratios (and minimize waste).]		
	(58) Use palatable feeds of the correct pellet or grain size to ensure low levels of feed loss.	Throughout operation	Farm monitoring report
	(59) Use feeding regimes that minimise direct feed wastage and excessive faecal and metabolite releases from fish.		
	(60) Record feed types and feeding rates daily so that conversion efficiency can be calculated and monitored.		
	(61) Monitor and manage feeding regimes to minimise feed wastage and chemical usage.		
	(62) Store and use feed on a “first-in-first-out” basis to prevent unnecessary aging and deterioration in quality.	Throughout operation	Visual inspection of feed quality
	(63) Ensure that feed storage areas are well ventilated, cool, dry and free of vermin that can damage, contaminate and consume feeds.	Throughout operation	Visual inspection of feed storage areas
Environmental and farm monitoring	(64) Comply with all management programmes required by DAFF (e.g. health management programme) including the reporting requirements of these programmes.	Throughout operation	
Bio-fouling	(65) Undertake routine surveillance for indications of non-native fouling species on and around marine farm structures and associated vessels and infrastructure.	At least monthly throughout operations	Visual inspection
	(66) Maintain effective antifouling coatings and monitor for fouling.	Throughout operation	Visual inspection
	(67) Clean structures and hulls regularly to ensure eradication of pests before they become established.	Throughout operation	Visual inspection
	(68) Avoid using chemicals for the cleaning of cage nets. It is recommended that high pressure water hoses and drying or sunning be used to clean cage nets of algae and debris.	Throughout operation	Record of materials used
	(69) Minimise the impact of bio-fouling organisms by using smooth, plastic coated, knotless mesh on nets, or copper-alloy mesh.	Throughout operation	Visual inspection
	(70) If antifouling products are used on infrastructure, ensure that they are not based on heavy metals and limit use of veterinary chemicals and antifoulants to the minimum necessary. .	Throughout operation	Records of materials used
	(71) Use only prescribed veterinary chemicals and antifoulants.	Throughout operation	Records of materials used, prescription
	(72) Establish and adhere to guidelines around the use of anti-fouling products in the mariculture industry.	Throughout operation	Records of materials used

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	(73) Do not apply antifoulants on site and use environmentally friendly alternatives where effective.	Throughout operation	Records of materials and methods used
	(74) Ensure that veterinarian protocols to eliminate any pests, parasites and diseases are strictly adhered to.	Throughout operation	Record of implementation
	(75) Obtain health certificates for any new batches of fry / finfish introduced into the bay (finfish and oysters).	Throughout operation	Health certificates
	(76) Do not discard fouling organisms removed from structures back into the sea.	Throughout operation.	Reports of non-compliance Disposal record.
Biosecurity	(77) Ensure that a high level of biosecurity management and planning is in place to limit the introduction of pests and diseases and to be able to respond quickly and effectively should biosecurity risks be identified. Comply with procedures prescribed by the DAFF Aquatic Animal Health Plans. Key components to biosecurity management include: <ul style="list-style-type: none"> a. Prevention of incursions, focussing on the management of: <ul style="list-style-type: none"> i. High-risk pathways (including international source regions); ii. New pathways; and iii. Regional sources known to be infected by recognised high-risk pests. b. Surveillance (detection), focussing on: <ul style="list-style-type: none"> i. Passive surveillance (screening at airports and ports); ii. Routine surveillance; iii. Targeted surveillance of high-risk areas. c. Control of populations and outbreaks through coordination with, and support from: <ul style="list-style-type: none"> i. All marine stakeholders whose activities can spread unwanted organisms; and ii. Agencies at local, regional and national scales. <p>Eradication measures and/or application of therapeutants (pharmaceutical products, or 'medicines') are only advised if the risk of re-invasion can be managed and pests can be detected before they become widespread.</p>	Throughout operation.	Biosecurity plan is in place Record of implementation, Farm Monitoring Report
Disease management	(78) Maintain strict bio-security measures within hatchery, holding tanks and sea cages.	Throughout operation.	Visual inspection
	(79) In the case of a suspected disease outbreak: <ul style="list-style-type: none"> a. The introduction of fingerlings onto the project site and the harvesting of fish and 		

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	<p>transport off the site must be temporarily suspended, in the case where a listed/notifiable disease is found (per RSA legislation/OIE guidelines) or an unexplained mass mortality occurs (>25% of farm population over a 14 day period), until the site has been declared suitable again by a veterinarian registered with the SAVC. Note that mass mortality events from environmental causes such as algal blooms (and associated toxins) and jelly fish swarm are precluded.</p> <p>b. Arrange immediately for a SAVC registered veterinarian to visit the site, sample, analyse and confirm diagnosis of the disease.</p> <p>c. Stop all inter-cage transfers of fish or equipment.</p> <p>d. Treat adjacent finfish cages simultaneously even if infections have not yet been detected.</p>		
	<p>(80) Upon detection of a disease outbreak:</p> <p>a. Implement the recommendations of the SAVC registered veterinarian including measures to minimise further spread of the disease, treat the diseased population or apply preventative measures to minimise the reoccurrence of the disease;</p> <p>b. Any suspected or identified disease listed as a controlled disease under the Animal Diseases Act (No 35 of 1984) must be reported to the State Veterinary Authority.</p> <p>c. If an OIE (World Organisation for Animal Health) listed disease is diagnosed, the State Vet Services shall be contacted immediately and their instructions followed.</p> <p>d. Humanely euthanize production animals to prevent suffering (in line with OIE Aquatic code (7.4) and detailed in farm Standard Operating Procedure).</p>	Throughout operation.	Farm Monitoring Report
	<p>(81) All organisms obtained from other hatcheries must be sourced only from certified disease, pathogen and parasite free sources.</p> <p>(82) Ensure all fry undergoes a health examination prior to stocking</p> <p>(83) All organisms introduced to the facility should be isolated in a quarantine system for a period of six weeks and subject to regular health inspections to monitor for disease.</p>	Throughout operation.	Veterinary records
	<p>(84) Take necessary action to eliminate pathogens through the use of therapeutic chemicals or improved farm management as per veterinary identification and prescriptions.</p>		Farm Monitoring Report
	<p>(85) Regularly inspect stock for disease and/parasites as part of a formalised stock health monitoring programme approved by DAFF.</p>		Veterinary records, Farm Monitoring Report

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	(86) Maintain comprehensive records of all pathogens and parasites detected as well as logs detailing the efficacy of treatments applied. These records should be made publically available to facilitate rapid responses by other operators to future outbreaks.		Veterinary records Farm Monitoring Report
	(87) Implement good house-keeping practices at all times, i.e. keep nets clean and allow sufficient fallowing time on sites to ensure low environmental levels of intermediates hosts and or pathogens.		Visual inspection Farm Monitoring Report Sampling records
	(88) Quarantine new juveniles or new broodstock when introduced to identify and treat potential diseases and parasites under the supervision of a veterinary professional; OR Ensure all newly introduced organisms undergo a health exam by a suitably qualified veterinarian and are certified as disease free.		Veterinary records, Farm Monitoring Report
	(89) Humanely euthanize production animals that are injured or diseased to a point that causes excessive suffering.		Farm Monitoring Report
	(90) Remove and dispose of dead organisms daily (weather permitting) and dispose of in a responsible manner (refer to biological waste disposal requirements in this EMPr).		Disposal record, Farm Monitoring Report
	(91) Clean and sanitise equipment used for disposing of dead organisms.		
	(92) Appoint an aquaculture veterinarian to conduct a health assessment at least annually.		Veterinary records Farm Monitoring Report
	(93) Take the following actions in the event of a disease breakout: <ul style="list-style-type: none"> a. Notify the DAFF immediately; b. Isolate the affected individuals / cages; c. Identify the disease; d. Consult a veterinarian for treatment advice; e. Apply treatment recommended by veterinarian; and f. Monitor the efficacy of the treatment. 	As required	Appropriate communication and records.
	(94) Locate cages stocked with different cohorts of the same species as far apart as possible (no less than 100 m), if possible stock different species in cages successively.		
	(95) Treat adjacent finfish cages simultaneously even if infections have not yet been detected if prescribed by veterinarian.		
Chemical therapeutants	(96) Seek assistance of an aquaculture veterinarian in the use of therapeutics and treatments, where required.	Throughout operation	Veterinary records Farm Monitoring Report

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
			Record of treatments
	(97) Use only recognised and registered chemicals as treatments, medicines, herbicides, insecticides, pesticides and for other purposes.	Throughout operation	Veterinary records Record of treatments
	(98) Avoid using excessive amounts of medication, antibiotics, hormones and pesticides.	Throughout operation	Veterinary records Record of treatments
	(99) The use of chemicals in disease management is discouraged due to negative impacts on the aquatic environment, consumer reluctance, and because the frequent use of traditional therapeutics may trigger the emergence of disease-resistant strains of pathogens.	Throughout operation	Veterinary records Record of treatments
	(100) Reduce levels of nutritional therapeutants and trace contaminants in feed, using only the lowest effective doses.	Throughout operation	N/A
	(101) Use the most efficient drug delivery mechanisms that minimise the concentrations of biologically active ingredients entering the environment.	Throughout operation	Veterinary records Record of treatments
	(102) Malachite Green as a bactericide or fungicide is prohibited.	Throughout operation	Veterinary records Record of treatments
	(103) Reduce reliance on therapeutic chemicals through the use of sound husbandry practices aimed at disease and stress prevention.	Throughout operation	N/A
	(104) Antibiotics use as a prophylactic or preventative measure is prohibited.	Throughout operation	N/A
	(105) Record dosages, application methods and the resultant outcome of all treatments in a treatment register.	Throughout operation	Veterinary records Record of treatments
	(106) Use bait type pesticides with care to prevent poisoning of non-target species.	Throughout operation	Veterinary records Record of treatments
	(107) File Material Safety Data Sheets (MSDS) or medicine datasheets and reference during use, storage and disposal.	Throughout operation	MSDS available for inspection
Genetic impacts (indigenous finfish species only)	(108) Implement suitable management and planning measures to limit the possibility of genetic interactions.	Throughout operation	Farm Monitoring Report
	(109) Adhere to DAFF genetic management guidelines.	Throughout operation	Certificate
	(110) Maintain genetic compatibility (similar levels of variation) between wild and cultured stock by implementing the “Genetic Best Practice Management Guidelines for Marine Finfish Hatcheries” developed by DAFF and ensure adequate genetic monitoring of brood stock	Throughout operation	Appropriate records

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	rotation		
	(111) Use appropriate spawning regimes in the hatchery to maintain genetic diversity in the offspring.	Throughout operation	Appropriate records
	(112) Implement annual genetic monitoring between wild caught and farmed fish to monitor for any significant differences	Throughout operation	Monitoring results
	(113) Reduce the number of escapees by maintaining cage integrity through regular maintenance and replacement and training of staff (see measures preventing escape of finfish).	Throughout operation	Maintenance records, visual inspection
	(114) Develop and implement recovery procedures should escapes occur (see measures preventing escape of finfish).	Throughout operation	Recovery procedure in place, staff is trained to implement the procedure
	(115) Develop the technology to create sterile fry for stocking (all female stocks can still interbreed with wild populations should escapes occur)	N/A	N/A
Escape of farmed finfish species	(116) Ensure good physical and biological containment to limit the effects of escaped stocks.	Throughout operation	Visual inspection
	(117) Use robust, well-maintained containment systems.	Throughout operation	Visual inspection
	(118) Maintain cage integrity through regular maintenance and replacement.	Throughout operation	Visual inspection Maintenance records Farm Monitoring Report
	(119) Develop a biosecurity management plan which provides mitigation measures to reduce the likelihood of escape occurring and recovery procedures should escapes occur.	Throughout operation	Biosecurity programme in place Farm Monitoring Report
	(120) Staff should be comprehensively trained to reduce human error which could lead to escapes and unsuccessful recovery in the event of escapes.	Throughout operation	Staff training completed. Teaching material, record of attendance.
	(121) Develop the technology to create sterile fry for stocking (all female stocks can still interbreed with wild populations should escapes occur)	Throughout operation.	Records of stock.
Alien and invasive fouling organisms	(122) Measures specific to <i>Crassostrea gigas</i> spat as a vector for the introduction of alien species: <ul style="list-style-type: none"> a. Produce oysters from own stock as far as possible and minimise importing of spat. b. If spat is imported, spat should be the smallest size category, which is less than 5 mm c. Spat must undergo a freshwater dip prior to transfer into quarantine tanks 	Throughout operation.	Records of spat imports, visual inspection, records of alien species removed from grow out tanks.

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	<ul style="list-style-type: none"> d. Spat must be quarantined prior to release e. Spat must be accompanied by a health and veterinary certificates and guarantees from the supplier country's delegated authority. (this mitigation measure is primarily important for release of alien pathogens and parasites, not marine species) f. Any excess debris produced during the cleaning of oyster shells must be disposed of at a registered waste management facility. Any effluent that is produced as a result of cleaning of oyster shells must be disinfected with e-oxide to kill any remaining pathogens or biofilm. g. Environmental monitoring should include the screening for the presence of visible larger alien species such as <i>Tetrapygyus niger</i> or <i>Ostrea edulis</i> (excluding authorised culture species). Any visible alien organism other than authorized culture species must be removed and disposed of regularly. Species identification should be confirmed by a qualified taxonomist or marine biologist. 		
Predators	(123) Remove any injured or dead fish from cages promptly.	Throughout operation	Visual inspection. Farm monitoring report
	(124) Do not release any blood and/or offal (organic waste) from finfish into the bay.	Throughout operation	Visual inspection.
	(125) Use predator exclusion nets. Enclose nets at the bottom to minimise entanglement, keep nets taut, use mesh sizes of < 6 cm and keep nets well maintained (e.g. repairing holes).	Throughout operation	Visual inspection.
	(126) Monitor whether predators are attracted to cages, e.g. through the presence of wildfish close to the cages.	Throughout operation	Visual inspection, farm monitoring report
Reduce seabird predation and at the aquaculture facility	(127) Use exclusion devices to prevent killing of stock by predatory birds and prevent predatory bird entanglement.	Throughout operation	Visual inspection.
Entanglement	(128) Ensure that exclusion nets are clearly visible under and above water.	Throughout operation	Visual inspection
	(129) Keep all lines and nets tight through regular inspections and maintenance.	Throughout operation	Visual inspection
	(130) <i>Ensure all mooring lines and rafts are highly visible (use thick lines and bright antifouling coatings). This mitigation measure has to be weight against bright infrastructure required to minimise entanglement.</i>	Throughout operation	Visual inspection
	(131) Implement the relevant AMC protocol in case of entanglement.	Throughout operation	Farm Monitoring Report
	(132) Request assistance with entanglement incidents from the DAFF/AMC if the incident cannot	Throughout operation	Appropriate communication,

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
	be dealt with at farm level.		record of incidents
	(133) Contact experts from the NSRI in the event of large marine mammals becoming entangled in cage systems.	Throughout operation	Record of contact with NSRI
	(134) Keep record of all incidents of entanglement and the outcome of these incidents.	Throughout operation	Record of entanglements
Socio-economic impacts	(135) Procure goods and services from local, provincial or South African suppliers as far as possible, giving preference to Black Economic Empowerment (BEE) suppliers.	Throughout operation	B-BBEE Programme records. Staff records.
	(136) Procure ancillary services for goods purchased overseas, such as installation, customisation and maintenance, from South African companies as far as possible.	Throughout operation	Procurement records.
	(137) Preferentially use local and regional labour	Throughout operation	Staff records, training programmes, farm monitoring report
	(138) Preferentially employ previously disadvantaged individuals.	Throughout operation	Staff records
	(139) Implement a local recruitment policy to discourage an uncoordinated influx of outside workers.	Throughout operation	N/A
	(140) Collect data on staff numbers, composition and origin and report these to DAFF.	Throughout operation	Farm monitoring report
Visual impacts	(141) Use grey based hues for all project components (rafts, cages, barrels, buoys/flotation devices) visible above the surface of the water as far as possible. This mitigation measure has to be weight against bright infrastructure required to minimise entanglement.	Throughout operation	Visual inspection
	(142) Ensure project components are of a similar style and scale to promote visual cohesiveness.	Throughout operation	Visual inspection
	(143) Utilise the minimum number of safety / warning buoys as far as possible. Only demarcate the corner points of each precinct and the minimum interval distance along the precinct boundary to meet Ports Authority (Transnet) safety requirements.	Throughout operation	Visual inspection
	(144) Maintain all project infrastructure in good working order	Throughout operation	Visual inspection, maintenance records
	(145) Lights at night should be safety dependent.	Throughout operation	Visual inspection
Product certification	(146) <i>Consider eco-labelling and certification schemes for fish safety and quality, to improve legality, transparency and sustainability.</i>	Operational phase	None required. Voluntary.
Protection of heritage	(147) Should any heritage resources material, be accidentally encountered during maintenance of the aquaculture operations in any of the proposed areas, work must cease in that area until	During installation of farm	Record of diver surveys

Aspect	Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
resources	the project archaeologist and SAHRA have been notified, the find has been assessed by the archaeologist, and agreement has been reached on how to deal with it.		
	(148) Provide the location and nature of any identified maritime and underwater cultural heritage resources to a maritime archaeologist and to SAHRA for inclusion on their shipwreck database.	During installation if required	Appropriate communication
	(149) Obtain a permit from SAHRA prior to continuing with activities that have disturbed a wreck site or part thereof, including objects or artefacts.	During installation if required	Appropriate communication
	(150) Submit a detailed anchor / mooring distribution plan to the Maritime and Underwater Cultural Heritage Unit at the South African Heritage Resources Agency (SAHRA).	Before installation commences	Record of diver surveys, placement of farms

8 MEASURES APPLICABLE TO THE DECOMMISSIONING PHASE

The DAFF facility does not have a specified life span. Partial or full decommissioning of individual farms may or may not occur. The decommissioning phase would also be applicable in case that the ADZ as a whole is decommissioned.

8.1 Roles and Responsibilities

The key role players during the decommissioning phase of the project are anticipated as follows:

- AMC (with DAFF primarily responsible);
- Aquaculture operators; and
- Contractors responsible for decommissioning / removal of infrastructure.

Individual operators retain the final responsibility with regards to the compliance of aquaculture operations with the EMPr and EA. All instructions relating to the EMPr will be given to contractors via the respective aquaculture operators. Contractors will report issues of concern to the aquaculture operator, who in turn will report on progress to the DAFF.

Key roles and responsibilities during the decommissioning phase with respect to the implementation of the EMPr are outlined below.

Roles and responsibilities relating to environmental monitoring are laid out in Section 9.1.

AMC (with DAFF primarily responsible)

The AMC has oversight over environmental management at the ADZ. In terms of environmental management, the AMC will:

- Ensure that environmental monitoring is undertaken in line with the monitoring plan until decommissioning is complete;
- Make decisions based on the outcomes of environmental monitoring, which could lead to the recommendations about the decommissioning process;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents related to aquaculture operations during decommissioning;
- Provide updated information to the public (e.g. notification when aquaculture operations cease); and
- Record and if necessary, respond to, environmental aquaculture-related incidents.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of decommissioning activities and the implementation of the EMPr. Operators are required to:

- Ensure that contractors are aware of and comply with the conditions of the EMPr;
- Ensure that staff are aware of and comply with the conditions of the EMPr;
- Ensure that aquaculture infrastructure is secure during decommissioning and removed completely;
- Report any incidents and initiate the emergency protocol if required.
- Report to the DAFF/AMC when decommissioning is complete.

Contractors:

All contractors will be required to:

- Ensure that all employees are aware of and comply with the EMPr;
- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Immediately notify the aquaculture operator of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the DAFF/AMC.

8.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the decommissioning phase, as well as timelines for the implementation of these measures and monitoring thereof, are detailed in Table 18 for farm-level measures to be implemented by individual operators.

Environmental monitoring requirements during the decommissioning phase are addressed in Chapter 9.

Table 18 Farm-level management and mitigation measures that must be implemented during decommissioning by individual operators (adopted from du Toit and Reuther 2017).

Aspect	Mitigation measure/procedure	Implementation timeframe	Monitoring methods
Determine requirements	(1) Initiate consultation with the AMC before decommissioning to discuss potential decommissioning options, methods and requirements.	While preparing decommissioning	Records of consultation with AMC
	(2) Determine other potential uses for equipment and infrastructure to be decommissioned (i.e. aim to reuse or recycle decommissioned items).		
	(3) Identify and assess any potential environmental and societal risks associated with the preferred method of decommissioning and implement mitigation to minimise risks.	While preparing decommissioning	Record of notification of AMC
	(4) Notify the DAFF/AMC before decommissioning activities commence.		
Environmental awareness training	(5) Provide environmental awareness training to all contractors. Training should include discussion of: <ul style="list-style-type: none"> a. Potential impact of waste and decommissioning activities on the environment. b. Suitable disposal of waste. Suitable handling and disposal protocols must be clearly explained and sign boarded and the 'Reduce, reuse, recycle' hierarchy should be implemented. c. Key measures in the EMPr relevant to worker's activities. d. How incidences and suggestions for improvement can be reported. e. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names. 	Before employment.	Training attendance register. Observe whether activities are executed in line with EMPr requirements
Removal of infrastructure	(6) Remove all infrastructure and equipment and dispose of it appropriately.	Upon decommissioning	Visual inspection, Reports of non-compliance.
	(7) Do not dispose or leave behind infrastructure in the coastal and marine environment.		
	(8) Ensure that no litter and debris reaches the marine environment during the removal of infrastructure, cleaning of infrastructure and general decommissioning activities.		
	(9) In the event of equipment, litter and debris entering the sea, remove these as soon as possible.		
	(10) Collect recyclables separately and deliver these to suitable facilities or arrange for collection.		Disposal records.
	(11) Do not allow any burning or burying of waste on site.		Visual inspection
	(12) Aim to reuse or recycle decommissioned items.		Visual inspection

9 ENVIRONMENTAL MANAGEMENT AND MONITORING

Management plans and protocols will provide guidance in responding to environmental incidents and complaints, in providing environmental awareness, and to environmentally responsible decommissioning. Environmental monitoring is essential for the ADZ and will inform the phasing of aquaculture expansion in Algoa Bay, maximum production that can sustainably be achieved in the ADZ and an adaptive management strategy to environmental management of the ADZ.

It is important to note that the drafting and implementation of all required management and monitoring plans and protocols detailed in this chapter will contribute significantly to achieving compliance with the EMPr. However, some of the mitigation measures detailed in Chapters 5-8 will not be covered by these plans/protocols and compliance with individual environmental management measures must be ensured on ADZ and operator level.

Management and monitoring will be undertaken at two levels:

- ADZ-level monitoring, implemented / coordinated by the DAFF / AMC, includes monitoring for wider spatial and cumulative impacts of farms, including monitoring further afield and at control sites, to determine the ADZ footprint and inform expansion of aquaculture within the approved limits / boundaries. In addition, monitoring for the ADZ EMPr would include studies of disease and parasites and genetic variability within wild stocks, and status of ecosystem indicators further afield (e.g. bird nesting success on islands, cetacean use of important feeding and breeding habitats, habitat use by fish, cetaceans and sharks via telemetry studies).

Many of these programmes will need to and should be undertaken in collaboration with existing studies and monitoring programmes in Algoa Bay. (Partial) funding for environmental monitoring may be sought from individual farm operators; and

- Farm-level monitoring must be implemented by individual operators and is specific to monitoring and record keeping of animal husbandry, stock health and feeding programmes, as well as water quality sampling within and adjacent to farms and, in the case of finfish farms, plans to deal with escapees and predators.

This monitoring programmes and management plans/protocols apply to:

- All phases of the ADZ (which are likely to overlap throughout lifetime of the ADZ); and
- All farms under design, construction, operation or decommissioning within the Algoa Bay ADZ.

Additional monitoring data may be collected outside of this EMPr framework:

- As part of other authorisations;
- In compliance with some form of code of practice;
- By regulatory authorities as part of enforcement; and
- By regulatory authorities as part of monitoring in the wider environment.

9.1 Roles and Responsibilities

The key role players involved in environmental management and monitoring are anticipated as follows:

- AMC (with DAFF primarily responsible);
- Aquaculture operators; and
- Specialists appointed to draft environmental monitoring plans and to undertake environmental sampling and monitoring.

The DAFF retains the final responsibility with regards to the compliance of aquaculture operations with the EMPr and EA. Some of the responsibility will be transferred to individual operators through permit and right conditions, where applicable. Individual operators also retain responsibility for undertaking any monitoring required at farm level and in terms of other authorisations.

All instructions relating to the service providers appointed to conduct sampling and monitoring on behalf of the AMC will only be given by the DAFF / AMC, and service providers will report directly to the DAFF / AMC.

Key roles and responsibilities relating to sampling and monitoring are outlined below.

AMC (with DAFF primarily responsible)

The AMC has oversight over environmental management at the ADZ. In terms of environmental management, the AMC will:

- Ensure that environmental monitoring is undertaken in line with the sampling/monitoring plans
- Monitor ADZ aquaculture operators' compliance with the EMPr and EA conditions; and
- Monitor production volumes in the ADZ.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of decommissioning activities and the implementation of the EMPr. Operators are required to:

- Undertake all necessary farm-level monitoring required in terms of authorisations and/or for the sustainable operation of the farm;
- Record and monitor farm-related aspects as per this EMPr;
- Provide service provider(s) appointed by the AMC with access to farm areas and requested information.

Specialists:

Specialists appointed by the DAFF and approved by the AMC to conduct environmental sampling and monitoring will be required to:

- Draft monitoring plans and protocols
- Conduct all sampling and monitoring in line with the requirements in the EMPr and specific plans;

9.2 List of environmental monitoring programmes and management plans/protocols/guidelines

DAFF and individual operators must appoint suitably qualified specialists to compile and/or approve environmental monitoring programmes and environmental management plans/protocols/guidelines appropriate for the type, size and impact significance of the proposed project for the following aspects within the time-frames specified in Table 19.

All management and monitoring instruments must be compiled in accordance with international and national best practice guidelines where available. The DAFF/AMC holds the responsibility to approve all monitoring and management instruments.

The time frames for approval and implementation differ for new farms and those already in operation at the time when the ADZ is established.

Table 19 Aquaculture Development Zone – level management and monitoring plans/protocols. The DAFF/AMC holds the responsibility to approve all monitoring and management instruments.

Type of programme/plan/protocol /guidelines	EMPr management measures to be included in the plan	Timeframe for approval	Timeframe for implementation	Responsibility: Drafting	Responsibility: Implementation
Design, maintenance and operational guidelines for the Algoa Bay ADZ	Consider all requirements listed in the EMPr to a level of detail appropriate for the plan.	Within 2 months of the ADZ establishment	Commencement of design phase for new farms Within 6 months for existing farms Throughout project cycle	DAFF	Individual operators
Farm establishment proposal template	Requirements for the design phase in Chapter 5.	At least 6 month before the first new farms establish	With the establishment of the first new farms	DAFF	Individual operators
Emergency response protocol	Requirements for the Construction phase : <ul style="list-style-type: none"> Table 14: #3-6 Table 15: #14-19 Requirements for Operation phase: <ul style="list-style-type: none"> Table 16:#12-15 Table 17:#17-25 	At least 6 month before the first new farms establish	Upon installation of new farm Within 2 months for existing farms Throughout project cycle	DAFF	Individual operators and AMC
Complaints register	Requirements for the Construction phase : <ul style="list-style-type: none"> Table 14: #2 Table 15: #2-3 Requirements for Operation phase: <ul style="list-style-type: none"> Table 16:#11 Table 17:#2-3 	Upon declaration of the ADZ	Upon declaration of ADZ. Throughout project cycle	DAFF	AMC
Environmental monitoring programme (baseline and impact monitoring)	To be completed in final version of the EMPr	Prior to declaration of ADZ	Upon declaration of ADZ Throughout project cycle	Specialist appointed by DAFF	Specialist appointed by DAFF; and If required appointed by operator
Socio-economic monitoring programme	To be completed in final version of the EMPr	Prior to declaration of ADZ	Upon declaration of ADZ Throughout project cycle	Appointed specialist	Specialist appointed by DAFF; and

Type of programme/plan/protocol /guidelines	EMPr management measures to be included in the plan	Timeframe for approval	Timeframe for implementation	Responsibility: Drafting	Responsibility: Implementation
					If required appointed by operator
Operator specific EMPr	To be completed in final version of the EMPr	During design of farm. Within 3 months for existing farms.	During design of farm. Within 6 months for existing farms. Throughout project cycle	Specialist appointed by operator	Operator
Decommissioning plan	Consider all requirements in Chapter 8.	During design of farm. Within 3 months of EA for existing farms.	During design of farm. Within 6 months of EA for existing farms. Decommissioning phase	Operator	Operator
Environmental awareness training plan	To be completed in final version of the EMPr	Three months prior to installation of the new farm Within 2 months for existing farms.	Prior to installation of new farm Within 3 months for existing farms. Throughout project cycle	ECO appointed by operator	ECO appointed by Operator
Farm-specific waste management plan	To be completed in final version of the EMPr	Three months prior to installation of the farm Within 2 months for existing farms	Upon installation of new farm Within 3 months for existing farms Throughout the project cycle.	ECO appointed by operator	Operator
Farm-specific hazardous substances handling and storage procedures	To be completed in final version of the EMPr	Three months prior to installation of the farm Within 2 months for existing farms	Upon installation of new farm Within 3 months for existing farms Throughout the project cycle.	ECO appointed by operator	Operator
Farm monitoring plan (based on design, maintenance and operational guidelines)	To be completed in final version of the EMPr	Three months prior to installation of the farm Within 2 months for existing farms	Upon installation of new farm Within 3 months for existing farms Throughout the project cycle.	Specialist appointed by operator	Operator

9.3 Monitoring measures

The monitoring measures that must be implemented for the ADZ, as well as timelines for the implementation of these measures, are laid out below:

- Table 20 - specifies ADZ-level measures that must be implemented by the DAFF / AMC; and
- Table 21 - specifies farm-level measures that must be implemented by individual operators.

A timeline for initial ADZ monitoring and sampling steps is provided in Figure 4 (du Toit and Reuther 2017).

Table 20 ADZ-level monitoring requirements that must be implemented by the Department of Agriculture, Forestry and Fisheries (DAFF)/ Aquaculture Development Zone Management Committee (AMC) (adopted from du Toit and Reuther 2017).

Mitigation measure/procedure	Implementation Timeframe	Monitoring Methods
(1) Ensure that the aquaculture industry association in Algoa Bay designates an individual to monitor the shoreline of the Bay weekly for any aquaculture equipment washed ashore. The frequency of monitoring can be reduced after 6 months with the approval of the AMC if incidents of equipment washing ashore are very limited.	Within 1 months of establishment of the ADZ	Appointment and Terms of Reference
(2) Ensure that the shoreline of the bay is monitored for any aquaculture equipment washed ashore.	Weekly monitoring Frequency can be amended by the AMC after 6 months.	Any debris is quickly removed, and owner is notified.
(3) Appoint / nominate a suitably qualified specialist to compile a comprehensive Sampling Plan for the ADZ and present the Sampling Plan to the AMC and consultative forum for review (Note that the sampling plan is not approved by the CF, however).	Within 6 months of establishment of the ADZ Sampling Plan to be compiled within 2 months of appointment of service provider.	Appointment and Terms of Reference Sampling Plan includes appropriate parameters and is (cost) effective and efficient
(4) Ensure that a suitably qualified specialist conducts sampling and sample analysis in line with the Sampling Plan.	Initiate sampling within 2 month of completion and approval of the Sampling Plan	Good understanding of aquaculture impact on bay, to inform phased implementation of aquaculture
(5) Appoint a suitably qualified specialist to monitor / audit compliance of aquaculture operators with specifications in the EMPr.	Within 6 months of establishment of the ADZ	Appointment and Terms of Reference
(6) Support existing and ongoing monitoring in Algoa Bay and aim to include parameters that are also relevant to monitoring potential impacts of aquaculture and respective baselines.	Audits to be undertaken at least quarterly initially. Frequency can be amended by the AMC after 1 year.	Compliance of aquaculture activities with EMPr
(7) Review and interpret results of environmental monitoring in Algoa Bay and make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits.	Throughout the lifespan of the ADZ	Complementary monitoring and reporting
(8) Review and interpret results of socio-economic monitoring in Algoa Bay and make decisions based on the outcomes of socio-economic monitoring, which could lead to the amendment of operations within the authorised limits.	At least quarterly Throughout the lifespan of the ADZ	Expansion / phasing in of activities does not compromise marine ecology of the bay
(9) Develop effective protocols to report on stocking densities, mortalities, graded and ungraded production, biofouling discards.	Throughout the lifespan of the ADZ	Data to be used in ADZ management

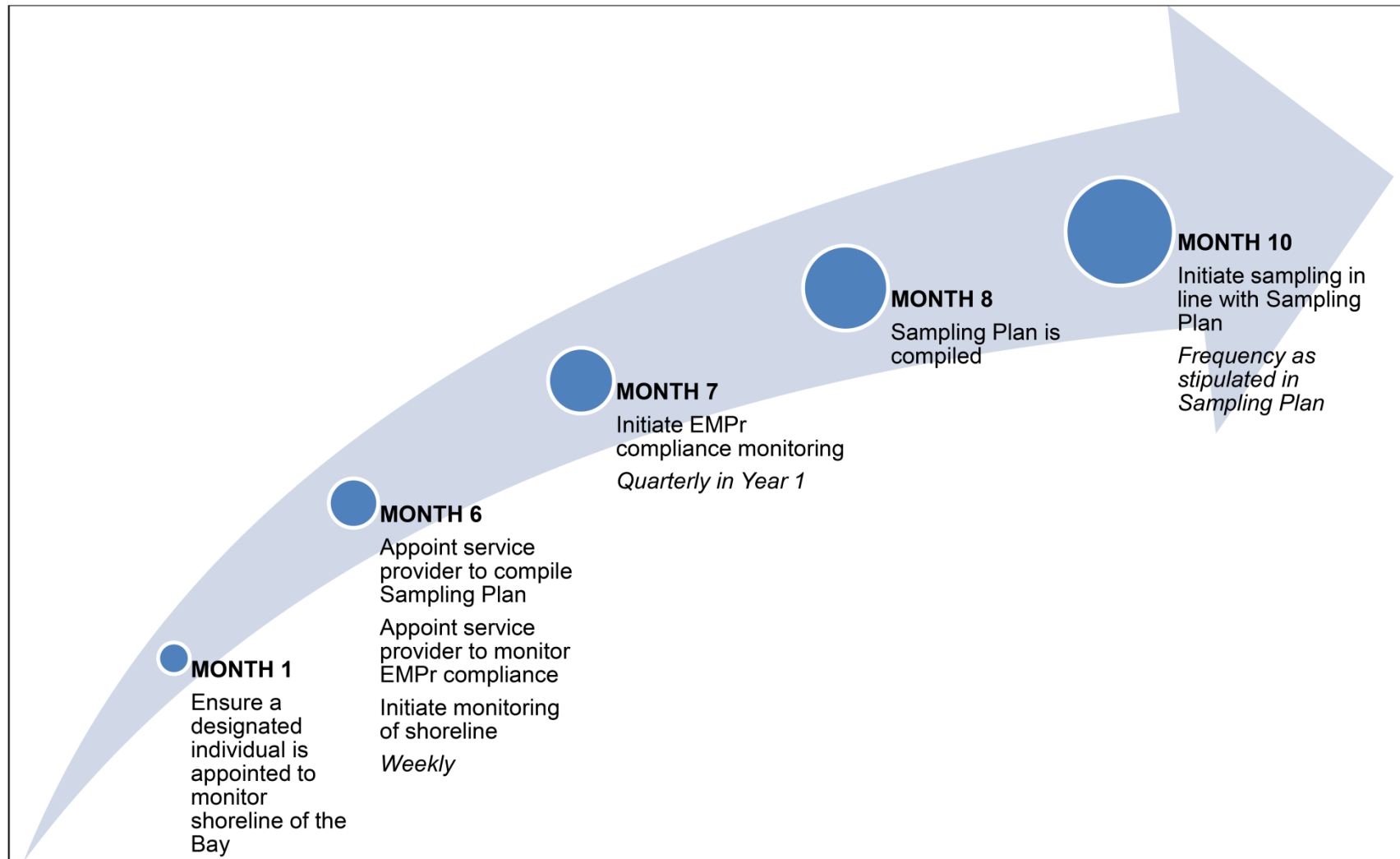


Figure 4 Timeline for initial implementation of monitoring at the Algoa Bay sea-based Aquaculture Development Zone (adopted from du Toit and Reuther 2017).

Table 21 Farm-level monitoring requirements that must be implemented by individual operators (adopted from du Toit and Reuther 2017).

Aspect	Mitigation measure/procedure	Frequency	Standard/target
Equipment	(1) Establish an effective monitoring protocol to ensure that longline / raft / net integrity and supporting infrastructure are maintained. Ensure that: <ol style="list-style-type: none"> Primary longline / raft / net is secured appropriately so that it is kept taut and rigid at all times. Nets of fish cages should be weighted; Ropes and anchor lines are taut, especially after rough seas; Ropes are routinely inspected for wear, especially after rough conditions, and replaced as and when required; and There is adequate separation between rafts and longlines, even during strong currents and rough seas; or There is adequate separation between the primary and secondary nets of fish cages, even during strong currents and rough seas. 	Surface infrastructure: Daily Subsurface infrastructure: Weekly and after storm events	Zero system failure resulting in loss of farm structure integrity. Fewer than 10 entanglements of any species per year and zero mortalities.
	(2) Maintain a comprehensive and detailed register of the quantities of chemicals, antibiotics, antifoulants and hormones etc. that are utilised.	Throughout operations	All substances are accounted for
Water quality	(3) Monitor water quality and sediment quality as required for operations and/or by other authorisations.	Throughout operations	Produce is suitable for human consumption.
Biosecurity	(4) Establish a traceability protocol of the cultured finfish / shellfish and its products.	Continuous as required by marine compliance officers, at processing, distribution and retail outlets.	100% traceability of cultured fish product
	(5) Develop and implement a stock health monitoring programme, including regularly inspecting stock for disease and parasites, in collaboration with DAFF.	Throughout operation	Stock is free of disease and parasites
	(6) Ensure that facilities are inspected by an aquaculture veterinarian to allow for monitoring of the health status of cultured stock.	Every two years	Overall health of stock should be of a suitable quality to promote and ensure efficient growth rates of particular species being cultured
Fish farming	(7) Monitor culture-fish mortalities to ensure dead fish are quickly removed, to minimise contamination and fluxes in waste production.	Daily	Zero mortalities left in cages for a period exceeding 24 hours.
	(8) Monitoring feed input and uptake to ensure feed waste is limited (i.e. prevent overfeeding by maximising the feed conversion ratio of cultured fish).	Daily	Achieve acceptable Food Conversion Ratio for the fish species farmed.

Aspect	Mitigation measure/procedure	Frequency	Standard/target
	(9) Develop and implement a protocol to monitor escapes from finfish farms.	Daily	Target = Zero escapees. AMC to decide on standard.
	(10) Adopt the MOM management system (or similar) for monitoring.	Throughout operation	
	(11) Ensure adequate genetic monitoring of brood stock rotation.	Throughout operation	No inbreeding / genetic interference
Marine animals	(12) Keep a log of all cetaceans, seabirds and predators recorded in the vicinity of fish farms, including behavioural observations. These data should be periodically compiled and analysed by experts.	Daily	Behaviour is not significantly altered to the detriment of the species.
	(13) If predator deterrents are used, closely monitor cetacean, seal, shark and seabird behaviour.	Daily	Zero predation of cultured stock. Zero cases of physical harm to any predator caused by deterrents.
	(14) Record all marine vertebrate mortalities resulting either directly or indirectly from aquaculture operations. Where appropriate modify equipment and/or implement other measures to reduce mortalities.	Daily	Target = zero mortalities. Acceptable level to be determined by EMPr advisory committee

10 REPORTING AND CORRECTIVE ACTION

Monitoring results must be compiled into various reports at specified frequency as detailed in Table 22. The minimum content of such reports is prescribed in Sections 10.1-10.5.

Table 22 Monitoring reports required throughout the lifespan of the Algoa Bay Aquaculture Development Zone.

Report	Frequency	From	To
Aquaculture Farm Monitoring Report	Monthly	Operator	DAFF/AMC
Environmental Sampling Reports	Quarterly	Appointed service provider	DAFF/AMC
Socio-economic monitoring reports	Quarterly	Appointed social engagement co-ordinator	DAFF/AMC
EMPr Compliance Report	Quarterly	Appointed service provider	DAFF/AMC
EA and EMPr Compliance Audit	As indicated in the EA	Independent person	DEA

*Note that all reports should also be made available to the Consultative Forum.

10.1 Aquaculture Farm Monitoring Report

Individual aquaculture operators must prepare a monthly Farm Monitoring Report, which includes as a minimum the following information:

- Species farmed;
- Stocking densities and weight;
- Information related to the type and amount of feed used;
- Issues encountered (e.g. disease, pollution events, red tide events, damage to infrastructure, health and safety related issues);
- Maintenance activities required;
- Staff information (number, staff turnover, skill level, B-BBEE compliance);

10.2 Environmental Sampling Report

Suitably qualified specialists must submit quarterly Environmental Sampling Reports to DAFF. The frequency of report submissions can be amended after one year. Reports must include at a minimum the following information:

- Sampling/monitoring activities undertaken in the reporting period;
- Sampling/monitoring results;
- Key trends;
- Items of concern; and
- Recommendations for additional/change in management practices.

10.3 Socio-economic monitoring report

Suitably qualified social engagement co-ordinator must submit quarterly socio-economic monitoring reports to the AMC. The frequency of report submissions can be amended after one year. Each report shall provide the following information:

- A summary of outputs and activities undertaken;
- Specification of achievements compared to targets; variance reporting and assessment of deviations, and
- An assessment of the efficiency of the process and the underlying impact on the community.

10.4 EMPr Compliance Report

A suitably qualified specialist must submit quarterly EMPr Compliance Reports to DAFF. The frequency of report submission can be amended after one year. Reports must include at a minimum the following information:

- Monitoring/audit activities undertaken in reporting period;
- Overall compliance with the EMPr;
- Key aspects of non-compliance; and

10.5 EA and EMPr Compliance Audit Report

In accordance with Section 34 of the EIA Regulations, 2014 (as amended in 2017), compliance with the conditions of the EA and the EMPr must be audited by an independent person at intervals indicated in the EA. Audit reports must be submitted to the relevant competent authority. Environmental audit reports must comply with the specifications in Section 34 and Appendix 7 of the EIA Regulations, 2014 (as amended in 2017).

10.6 Corrective Action

Corrective action is a critical component of the implementation–review–corrective action–implementation cycle and it is through corrective action that continued improvement can be achieved. Where repeated non-compliance is recorded, procedures may need to be altered accordingly to avoid the need for repeated corrective action.

If environmental compliance monitoring indicates non-conformance with the EMPr, the DAFF will formally notify the operator through a Corrective Action Request. The Corrective Action Request documents:

- The nature of the non-conformance / environmental damage;
- The actions or outcomes required to correct the situation; and
- The date by which each corrective or preventive action must be completed.

Upon receipt of the Corrective Action Request, the aquaculture operator will be required to report in the Farm Monitoring Report how the required actions were implemented and success or failure of the corrective action.

Should proposed standards or targets be regularly exceeded, an independent committee or service provider should investigate and objectively assess the effectiveness of mitigation measures. If effective mitigation cannot be implemented, stocked biomass should be reduced until targets are consistently achieved.

11 REFERENCES

- Mackay and van Zyl 2012. Algoa Bay Sea-based Marine Aquaculture Development Zones –Basic Assessment Report: Appendix G Environmental Management Programme. Supporting documentation for the Basic Assessment process conducted in terms of the National Environmental Management Act (No. 107 of 1998). Report prepared for the Department of Agriculture, Forestry and Fisheries by CapeEAPrac, Report Reference: NMM101/18 Version 30 July 2012.
- du Toit J and Reuther S. 2017. Proposed Sea-Based Aquaculture Development Zone in Saldanha Bay. Environmental Management Programme. Report prepared by SRK Consulting for the Department of Agriculture, Forestry and Fisheries. Report Number 499020/6. August 2017.



agriculture, forestry & fisheries

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA



ANCHOR
research & monitoring