

**PROPOSED CONSTRUCTION AND OPERATION OF A WAVE ENERGY
CONVERTER ADJACENT TO THE ABAGOLD FARMS, HERMANUS**

BASIC ASSESSMENT REPORT

**APPENDIX F: ENVIRONMENTAL MANAGEMENT
PROGRAMME**

Prepared for:

Department of Environmental Affairs

On behalf of:

Abagold

Prepared by:

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INTRODUCTION

Section 24N of the National Environmental Management Act requires that an Environmental Management Programme (EMP) be submitted as part of the application for an environmental authorisation where an EIA has been identified as the instrument to be used to inform an application. An EMP is an important tool for ensuring that the management measures identified during the environmental impact assessment process are clearly defined and implemented throughout all phases of the project life-cycle.

This document is the draft EMP for the proposed development and operation of a wave energy converter by Abagold in Hermanus. This EMP specifies management actions to protect the natural, social and socio-economic environment and is based on the principles of the National Environmental Management Act (Act No. 107 of 1998) (NEMA). These principles include:

- To avoid, minimize, or correct pollution and degradation of the environment;
- To avoid or minimize waste and to re-use or re-cycle waste where possible;
- To dispose of waste in an acceptable manner;
- To apply a risk averse and cautious approach; and
- To anticipate and prevent negative impacts on the environment (physical, biological, social, economic, and cultural). Where these impacts cannot be prevented, such impacts must be minimized, mitigated or remedied.

This EMP comprises six sections. The first section provides a brief account of the project description and a summary of the identified impacts of the activity. A review of applicable legislation is provided in Section 2. Section 3 identifies the persons responsible for carrying out specific duties in terms of the EMP while Section 4 outlines the required management measures to be taken. Monitoring and reporting mechanisms, and educational and awareness measures are provided in Section 5 and 6 respectively.

The intention of this draft is to provide an over-arching framework which clearly indicates the requirements for environmental management. It is envisaged that this EMP will be revised and finalised once a detailed construction plan has been prepared. A finalised EMP must be included in all contract documentation and include a system of fines to be deducted directly from the contractor, as this person/persons shall at all times be responsible for the actions of the employees in his employ, as well as guests, invitees or delivery vehicles bringing materials to site. This is necessary to emphasize and enforce legal compliance as well as to reduce the risk of potential negative impact to the receiving environment. The EMP shall form part of the tender specifications issued to prospective contractors, so that the Contractor is aware of his/her environmental responsibilities and the associated costs during construction activities. Prospective contractors shall incorporate the requirements of the EMP into their submissions/tenders.

The contents of this EMP are to be conveyed to all Contractors, sub-Contractors, employees on site (permanent or casual), visitors, guests and invitees. Copies of all employee identity documents must be kept on site as well as written proof of their awareness training and agreement to abide by these rules,

at all times. The EMP provides specifications that Contractors shall adhere to, in order to minimize adverse environmental impacts and optimize opportunities associated with the activity.

The following pre-conditions shall be applicable prior to any construction activities taking place;

- The construction area is to be fenced/screened so as to prevent public access and with the necessary signage.
- The construction site, service routes, work boundaries and no-go areas must be demarcated.
- There needs to be a written methodology for removal of topsoil, sub-soil and storage of building materials.
- Adequate ablution facilities must be made available (portable toilets).
- Adequate refuse bins and skips which are weather and wind proof with proper lids.
- Adequate serviced and functional fire fighting equipment must be on site.
- The Contractor must ensure that there is a copy of the signed and approved building plan, as well as the Environmental Authorization available on site for inspection at all times.
- One tap on a fixed stand pipe needs to be on site. No leaking taps are to be tolerated.

1 PROPOSED ACTIVITY

1.1 PROJECT DESCRIPTION

The project covered by this EMP involves the construction and operation of a wave energy converter (WEC), pump assistance pond and effluent pipe turbine. The proposed development is an alternative energy project that aims to decrease Abagold's energy bill and by so doing ensure the sustainability of the company. Three alternative development scenarios were proposed by Abagold Ltd in 2011. Anchor Environmental Consultants (Anchor) assessed the environmental impacts of all three scenarios in a Basic Assessment Report (BAR) submitted as part of the application for environmental authorisation to the Department of Environmental Affairs in 2012. A detailed description of the project is provided in the BAR. This EMP was designed based on the construction plans provided by Abagold and assessed by Anchor in the BAR. Should any aspect of the construction design or method change this EMP must be revised.

The first two alternatives comprise two WEC dams and a pump assistance pond, each dam and the pond with a slot-slope wall on the seaward edge. Each WEC dam is to be fitted with turbines to produce electricity. In addition a turbine is to be fitted to the existing Abagold effluent pipe. The difference between these alternatives is that the first alternative (preferred) will have a phased construction approach allowing for the development and testing of a pilot WEC prior to a second, larger WEC being constructed, whereas the second alternative will have no pilot phase. The total construction period estimated for the preferred phased alternative is 41 months while that for alternative 2 (non-phased) is 36 months. The footprint of the preferred alternative and Alternative 2 is 20 900 square metres. The

third scenario comprises the development of one large WEC dam covering an area of 35 000 square metres.

The proposed area for the construction of the buffer dams is the intertidal rocky shore area and subtidal area adjacent to the Abagold farm. Abagold's farm is situated to the south west of the Hermanus New Harbour. There are currently two access routes to the site. The one access route is a gravel road leading through the Abagold farm down to the existing pump house. The second is a tarred and cement road to the north east of the Abagold farm around the Harbour Rocks restaurant. The rocky platform can be accessed by vehicles off this access road. No additional access routes will be constructed. Both water and electricity will be supplied by the municipality during construction. Following construction Abagold intends to be less reliant on the national grid.

1.2 SUMMARY OF IMPACTS ASSOCIATED WITH THE PROPOSED ACTIVITY

Impacts to the marine biota, neighbouring users and residents, and the wider community were considered in the basic assessment report. During the project design phase some of the impacts were anticipated and much consideration was given to reducing or eliminating these impacts through the use of innovative construction methods. The construction planning and design took into account the sensitivity of surrounding aquaculture facilities to alterations to water quality in the near shore environment from which they extract water. The principle concerns regarding water quality include potential chemical pollution from the casting of concrete directly in the water as well as the increase in suspended solids following blasting. As such no concrete will be poured directly into the marine environment and instead all casting of concrete will be done within plastic canvas bags enclosed by a metal frame with shuttering secured to rocks. Blasting will be conducted using a rock breaking technology known as NoneX. The NoneX rock breaking process produces a much coarser fragmentation when compared to the smaller particles produced by explosives and is thus expected to reduce the impacts of increased suspended solids in the water column.

In addition to design specifications and methods, specific management measures were identified to reduce or mitigate impacts. Table 1 and 2 provide a summary of all the potential impacts, their significance, assuming the implementation of mitigation measures, and the type of mitigation required; either a management measure or a specific construction design or method.

TABLE 1: SUMMARY OF THE POTENTIAL IMPACTS AND THE SIGNIFICANCE THEREOF TO THE MARINE ENVIRONMENT LIKELY TO OCCUR DURING THE CONSTRUCTION OF THE PROPOSED WECS. THOSE MARKED WITH AN * ARE ADDRESSED IN THIS EMP.

Potential Impact (Construction)	Mitigation	Alternative 1	Alternative 2	Alternative 3
Potential impacts to marine biota: habitat disturbance *	Management measures	Low	Low	Low
Potential impacts to marine biota: barotrauma from blasting *	Management measures Construction design	Low	Low	Low
Potential impacts to marine biota: noise from blasting and drilling *	Management measures Construction design	Medium	Medium	Medium
Potential impacts to marine biota: water quality	Construction design	Very low	Very low	Very low
Potential impacts to marine biota: litter and pollution *	Management measures	Low	Low	Low
Potential socio-economic impacts: job creation *		Low	Low	Low
Potential impacts to neighbouring users: water quality *	Management measures Construction design	Low	Low	Low
Potential impacts to neighbouring users: noise impacts *	Management measures	Very low	Very low	Very low
Potential impacts to neighbouring users: dust impacts *	Management measures	Insignificant	Insignificant	Insignificant
Potential impacts to neighbouring users: visual impacts	Construction design	Low	Low	Medium - Low

TABLE 2: SUMMARY OF THE POTENTIAL IMPACTS AND THE SIGNIFICANCE THEREOF TO THE MARINE ENVIRONMENT LIKELY TO OCCUR DURING THE OPERATION OF THE PROPOSED WECS. THOSE MARKED WITH AN * ARE ADDRESSED IN THIS EMP.

Potential Impact (Operation)	Mitigation measures	Alternative 1	Alternative 2	Alternative 3
Potential impacts to marine biota: fish kills in turbines	Construction design	Very low	Very low	Very low
Potential impacts to marine ecology: heat and noise generated by turbines	Construction design	Very low	Very low	Very low
Potential impacts to neighbouring users: wave and current regime changes	Construction design	Low	Low	Low
Potential impacts to neighbouring users: visual impacts	Construction design	Medium - Low	Medium - Low	Medium - Low
Potential socio-economic impacts: job creation and security *	Management measures	High	High	High

2 APPLICABLE LEGISLATION

The Contractor/s shall ensure that all pertinent legislation concerning the protection of the natural environmental and prevention of pollution is strictly enforced. The most commonly applicable legislation relevant to environmental management is listed below.

The Constitution of the Republic of South Africa, Act No. 108 of 1996 sets the legal context in which environmental law in South Africa occurs and was formulated. All environmental aspects should be interpreted within the context of the Constitution and the National Environmental Management Act 107 of 1998.

The Constitution has enhanced the status of the environment by virtue of the fact that an environmental right has been established (Section 24) and because other rights created in the Bill of Rights may impact on environmental management through, for example, access to health care, food and water and social security (Section 27). An objective of local government is to provide a safe and healthy environment (Section 152) and public administration must be accountable, transparent and encourage participation (Section 195(1) (e) to (g)).

The National Environmental Management Act, Act No. 107 of 1998 (NEMA) is the framework environmental legislation in South Africa. Chapter 1 of the Act establishes a number of principles related to the environment in South Africa. These principles are designed to provide a general framework for environmental planning and guidelines for the interpretation, administration and implementation of the Act.

The principles include a number of internationally recognized environmental law principles, i.e. the:

- Preventive principle
- Precautionary principle
- Polluter pays principle

Central to these principles is the notion of sustainable development which requires that environmental, socio-economic and cultural interests be considered in decision making so to ensure that the needs of present generations can be met without compromising the ability of future generations to meet their needs. Sustainable development requires the consideration of all relevant factors including the following:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, minimised and remedied
- Pollution and degradation of the environment are avoided, or, minimised and remedied
- Disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or, minimised and remedied
- Waste is avoided, or, reduced re-used or recycled where possible and otherwise disposed of in a responsible manner
- Use and exploitation of non-renewable natural resources is responsible and equitable

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- The development, use and exploitation of renewable resources and the ecosystem of which they are part of do not exceed the level beyond which their integrity is jeopardised
 - A risk-averse and cautious approach is applied
 - Negative impacts on the environment and on the people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

Chapter 5 of NEMA deals with integrated environmental management and provides Environmental Impacts Assessment (EIA) as a management tool. The purpose of integrated environmental management is to ensure that the fundamental principles of environmental management are integrated in all decision making which may significantly impact the environment. EIA refers to processes in which the biophysical and social impacts of a proposed activity are identified, predicted and evaluated and the appropriate mitigation measures are specified, prior to any decision being taken regarding the authorization of the activity.

The competent authority for this application is the National Department of Environmental Affairs (DEA) given that the activity involves the generation of electricity. A Scoping and Environmental Impact Assessment Report (S&EIR) are required for the proposed project as part of the application for environmental authorization in terms of NEMA. However, the potential impacts of the proposals on the environment (including all other beneficial uses of the sea in this area), both in respect of the construction and operational phases, are likely to be easy to identify and quantify, and are likely to be of low significance. Hence the competent authority would be able to reach a decision on the basis of information provided in a basic assessment report only without requiring a full scoping and Environmental Impact Reporting. As such, permission was granted by DEA to apply Basic Assessment instead of the required Scoping and EIA

The National Environmental Management: Integrated Coastal Management Act, Act No. 24 of 2008 (ICMA) was promulgated so to establish a system of integrated coastal and estuarine management in order to promote the conservation of the coastal environment, maintain the natural attributes of coastal landscapes and seascapes and to ensure that development and the use of natural resources within the coastal zone is socially and economically sustainable. Section 63 of ICMA requires that the competent authority take into account relevant factors, listed as part of this section, when considering an application for an environmental authorisation in terms of Chapter 5 of NEMA where the proposed activity is to take place within the coastal zone.

ICMA defines the coastal zone and incorporates the notion of "coastal public property" thereby placing the ownership of such property in the hands of all citizens of South Africa. The purpose of designating coastal public property is to prevent the exclusive use of the coast by facilitating access to the coast and the sustainable use of coastal resources. Section 65 requires that any development in the coastal public property be conducted under the authority of a coastal lease.

Section 3 of **the Sea Shore Act, Act No. 21 of 1935** provides for the letting of the sea-shore and the sea for several purposes. These administrative powers were delegated to the coastal provinces

(Proclamation R27 in GG 16346 of 7 April 1995). Since this delegation of powers, the Sea-shore Act has been repealed in its entirety by the ICMA except for those sections that were assigned to provinces. Thus the administrative power of the various provincial authorities to let the sea-shore still prevails despite the Sea-shore Act being repealed. A lease will need to be acquired for the sea shore area prior to commencing any construction activity in the coastal public property.

The Marine Living Resources Act, Act No. 18 of 1998 provides for the conservation and management of the marine ecosystem, the long-term sustainable utilisation of marine living resources and equitable access to exploitation, utilisation and protection of certain marine living resources. Section 43 provides for the declaration of marine protected areas (MPAs). Walker Bay was declared a MPA in 2001. The purpose of the MPA is to provide a sanctuary for whales between the 1 of July and the 15th of December. Section 43 (2) (e) prohibits anyone from carrying out an activity which may adversely impact the ecosystems of the MPA. While the proposed activities fall outside of the boundaries of the Walker Bay MPA there is a potential that they will impact marine life within the MPA if not managed correctly.

The National Heritage Resource Act, Act No. 25 of 1999 was introduced to ensure protection of South Africa's important heritage features. The act covers the following areas of heritage value:

- Archaeology
- Palaeontology
- Meteorites.

All the above mentioned materials that are discovered are property of the state. Tools used to conserve and manage these resources are the formal regulated EIA processes as well as permits issued by the South African Heritage and Resources Agency (SAHRA) to restrict and/or regulate development within a heritage environment.

The Cape Land Use Planning Ordinance, No. 15 of 1985 regulates land use planning and development through the use of zoning schemes. The current zoning of the project area is listed as "Authority use" and as coastal public property in terms of ICMA. No re-zoning is required for the proposed project if consent is gained from authorities and a lease is acquired in terms of the Sea Shore Act.

Spatial land use planning processes in the Western Cape are undertaken in terms of the **Municipal Systems Act, Act No. 32 of 2000**, and the **Western Cape Planning and Development Act, Act No. 7 of 1999**. The Integrated Development Plan and the accompanying Spatial Development Framework of the Overberg District Municipality was prepared in accordance with these Acts and were consulted during the EIA.

In addition the **Municipal Systems Act, Act No. 32 of 2000** requires that the local municipalities adopt by-laws to give effect to its tariff policy for municipal services. The proposed project falls within the jurisdiction of the Overstrand Municipality. Of relevance to this development are the following by-laws:

- By-law relating to Electricity Supply (2008)
- By-law relating to Stormwater Management (2009)
- Solid Waste Management By-law (2007)

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- Water Supply and Sanitation Services By-law (2009)

The Occupational Health & Safety Act, Act No. 85 of 1993 was promulgated to provide for the health and safety of persons at work; the protection of persons other than the persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work.

3 RESPONSIBLE PERSONS FOR ENVIRONMENTAL MANAGEMENT MEASURES

Each party involved in the proposed implementation of this EMP must have clearly defined roles and responsibilities for the environmental management measures which they are assigned. This will increase accountability during the construction phase and ensure that environmental management measures are accurately handled.

3.1 PROJECT ENGINEER

The Project Engineer, (PE) is required to:

1. Be familiar with the contents of the EMP.
2. Communicate to the Contractor the advice of the ECO and the contents of the ECO reports and issue site instructions giving effect to the ECO requirements where applicable.
3. Review and approve construction method statements.
4. Provide the ECO with monthly activity schedules indicating dates for actions which may have a negative impact on the environment.
5. Designate all working areas.
6. Communicate to the ECO any infringements of the Environmental Management Measures and accompany the ECO during site inspections.
7. Discuss with the ECO the application of any penalties and other possible enforcement measures when necessary.
8. Provide and discuss monthly plans for all construction activities with neighbouring abalone farms.
9. Notify the ECO and neighbouring abalone farms regarding any casting, blasting or drilling activities to undertaken in the marine environment in each subsequent week, and at least four hours prior to commencing with such activities on the day (to be conducted in accordance with the method described in the BAR).

3.2 ENVIRONMENTAL CONTROL OFFICER

An Environmental Control Officer (ECO) shall be appointed at commencement of the construction phase. The ECO shall implement and monitor the implementation of the EMP. The function of the ECO must be fulfilled by an individual with experience in environmental management. The ECO shall have the following responsibilities:

1. To advise the Project Engineer on the interpretation and enforcement of the Environmental Management Measures.
2. To supply environmental information to the Contractor and site staff.

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3. To prepare and ensure all staff undergo an induction training course for which documented proof must be retained to enforce accountability.
 4. To be present on site during all blasting and cement casting activities conducted below the high water mark.
 5. To undertake weekly inspections and submit reports on the Contractor's compliance with the Environmental Management Measures; these reports shall be copied to the Project Manager and Project Engineer.
 6. To compile a monthly report showing levels of compliance as a percentage which will be submitted to the Provincial authorities.
 7. To provide on-site environmental guidance.
 8. Take appropriate action if the specifications contained in the EMP are not followed.
 9. Order the removal of person(s) and/or equipment in contravention of the specifications of the EMP.
 10. Report any incidents and emergencies and the remedial measures applied.
 11. Maintain a record of environmental incidents (spills, impacts, legal transgressions, etc) as well as corrective and preventative actions taken, for submission to the client and the PE.
 12. Maintain a public complaints register in which all complaints are recorded, as well as action taken, for submission to the client and the PE.
 13. Advise and assist the PE in determining and imposing penalties for the infringement of the Environmental Management Measures. (All employees on site should be bound contractually to a system of fines for non compliance and potential removal from site of sub- contractors or employees.)

3.3 THE CONTRACTOR OR SUB-CONTRACTOR

The Contractors, (C) and sub-Contractors, (SC) have the responsibility to:

1. Comply with the Environmental Management Measures contained in this document.
2. Be familiar with the EMP and the Environmental Authorisation.
3. Familiarise themselves and their staff with the "No-Go" areas (where relevant) and associated restrictions pertaining to the project.
4. Notify the ECO and PE immediately in the event of any accidental infringements of the Environmental Specifications to enable appropriate remedial action to be taken swiftly.
5. Undertake rehabilitation of all areas affected by construction activities to restore them to their original states, as determined by the ECO.
6. Undertake the required works, only within the designated working areas.

3.4 COMMUNICATION CHANNELS

The importance of open communication between all parties mentioned above is emphasized, as the attainment of environmental quality requires a joint effort. With open communication the role of the ECO should be a positive one - aimed at being proactive in preventing problems - rather than a negative "policing" role when negative impacts have already occurred.

Internal communication shall involve interaction between the client, the Project Engineers, the Environmental Control Officer and the Contractor. A weekly site meeting is recommended.

Monthly meetings shall be arranged between the PE, ECO and nominated representatives from the neighbouring aquaculture facilities to discuss the coming month's construction activities and schedule. Notification regarding any casting, blasting or drilling activities to be undertaken in the marine environment in each subsequent week to be provided to neighbouring aquaculture facilities in advance and at least 4 hours prior to commencement of such activities. No changes to the construction schedules may be effected without prior consultation with agreement of the neighbouring aquaculture facilities.

Other external communication shall include discussions with the relevant government authorities, if required. Interaction with Interested and Affected parties is encouraged and should be made available telephonically as well as a complaints register on site. Local media could also be utilized at the beginning and end of construction activities.

4 ENVIRONMENTAL MANAGEMENT MEASURES

4.1 PLANNING AND DESIGN

The BAR and this EMP are based upon specific construction methods and design criteria outlined by Abagold. Any further construction planning should not deviate from these methods. At the very least plans must conform to the following:

- no casting of concrete directly in the water column of the intertidal or subtidal coastal area; and
- no explosives other than Nonex to be used seaward of the high water mark.

Furthermore a lease will need to be acquired for the sea shore area prior to commencing any construction activity in the coastal public property (see section 2).

To mitigate the potential impacts of altered wave and current patterns a detailed study must be conducted prior to the commencement of construction activities to inform the design of a rock slope to mitigate the reflections of waves and storm surge during severe storms towards the existing Aquafarm infrastructure adjacent to the proposed development.

4.2 CONSTRUCTION

All contracts shall be conducted in accordance with the principles of Integrated Environmental Management (IEM) in an environmentally and socially responsible manner. **Environmental Management Measures**, provided in sections 4.2.1 to 4.2.20 below, detail the controls and procedures necessary to achieve this goal. The Contractor shall be required to comply with the Environmental Management Measures contained in this section. Should any conflict arise between other specifications and the Environmental Management Measures, the Environmental Management Measures shall prevail.

The contractor is required to provide detailed monthly **Method Statements** to the ECO outlining procedures for dealing with / or ensuring compliance with the Environmental Management Measures detailed in this section. The format shall clearly indicate the following;

- What - A concise, description of the task/work to be undertaken;
- How - A detailed description of the process of work, methods, material and mitigation strategies;
- Where- A description/sketch map of the locality of work (if applicable); and
- When - The sequencing of actions with estimated commencement and completion dates.

It is important to note that no casting or blasting activities may take place over weekends and public holidays except by prior arrangement with the neighbouring abalone farms. A normal working day is accepted as being 8am to 6 pm.

Based on the engineering specifications, the following Method Statements are therefore required at minimum:

- Site clearing, establishment of site and ablution facilities;
- Site access and traffic control;
- Hazardous substances storage;
- The relocation of marine biota;
- Proposed blasting programme (dates in monthly method statement and times in weekly method statement);
- Concrete batching;
- Concrete casting (dates in monthly method statement and weekly notifications);
- Waste management;
- Hazardous waste management;
- Dust control;
- Noise control.

The method statements shall form part of the EMP as appropriate.

The Contractor shall not commence the activity for which a method statement is required until the PE and/or ECO has approved the relevant method statement. Method statements must be submitted 5 working days prior to the date on which approval is required (i.e. start of the activity). The activities may not commence until the method statements have been approved by the PE and the ECO.

The Contractor shall plan his work in such a way that compliance with the Environmental Management Measures is facilitated timeously.

4.2.1 Working areas

4.2.1.1 Establishment of site

The following mitigation measures pertaining to the establishment of the site must be implemented:

- a. The Contractor shall produce a site plan showing the positions of all buildings (e.g. site office and workshops), wash areas, fuel storage areas, material stockpile areas, and other infrastructure for the approval of the Engineer prior to the establishment of the site. The site plan must be attached to this EMP and be made available to the authorities upon request.
- b. The site office shall be located on a surfaced area that is level and must be positioned in a site that is readily accessible.
- c. Material stockpile areas, fuels, chemical storage areas, concrete batching areas, and areas for vehicular access shall be located away from environmentally sensitive areas and protected from storm water runoff, fire, and access by unauthorised persons.

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- d. The Contractor and Project Engineer (PE) shall ensure that lighting on site does not interfere with road traffic or cause a reasonably avoidable disturbance to the surrounding community or other users of the area.
 - e. No uncontrolled cooking facilities are permitted in the working area.
 - f. No fires are permitted in the working area.
 - g. Appropriate fire suppression equipment and trained personnel shall be available on-site during construction.
 - h. Locate and clearly indicate convenient access routes, temporary loading and packing areas, and turning circles so that vehicle movement can be confined to these areas.
 - i. Access roads for earthmoving-equipment must be clearly designated and be positioned as close as possible to the proposed development site. No driving off of the marked roads may be allowed and designated parking areas must be identified.
 - j. Locate temporary waste bins and skips such that they are easily accessible for removal and wind-proofed, (Covered with netting).
 - k. Demarcation of the limits of all working areas shall be carried out before the Contractor shall be permitted to undertake any excavation or construction on site.

4.2.1.2 Working Areas and no-go areas

- a. The Construction Site shall be divided into working areas and 'no-go' areas and shall be marked on appropriate plans for reference. The working areas are to be fenced with shade cloth and uprights to support it.
- b. Working areas are those areas required by the Contractor to construct the works and as approved by the PE.
- c. 'No-go' areas are generally those areas outside the designated working areas, and may include, but not be limited to:
 - Existing services and infrastructure;
 - Privately owned land
 - Watercourses outside of the designated working area;
 - Any heritage sites that receive the protection from Heritage Western Cape.
 - The sea shore and coastline. (Unless in relation to the work being done.)
- d. The Contractor shall ensure that all "no go" areas are demarcated and that no unauthorised entry, stockpiling, dumping or storage of equipment or materials shall be allowed within the demarcated "no go" areas.
- e. Once construction within an area has been completed and the area has been rehabilitated, it shall be considered a "no go" area.
- f. In the event that any damage is caused to the "no-go" areas, the Contractor will be required to repair, restore, reinstate and/or rehabilitate these areas to a standard required by the ECO and at the Contractor's cost.

4.2.1.3 Ablution Facilities

- a. The Contractor must provide ablution facilities for the construction staff. The following shall be taken into consideration for the location and management of ablution facilities:
- b. Ablution facilities provided shall include shelter, toilets, and washing facilities.
- c. Toilets shall be provided at the preferred ratio of 1 toilet per 15 workers, but not less than 1 toilet per 30 workers.
- d. Sanitation facilities shall be located within a maximum of 50 m of any point of work.
- e. All temporary / portable toilets shall be secured to the ground to prevent them toppling due to wind or any other cause.
- f. Entrances to toilets shall be adequately screened from public view.
- g. Ablution facilities provided shall be maintained in a hygienic state and serviced regularly to ensure proper operation.
- h. No spillage shall be allowed when the toilets are cleaned or serviced. Any spillages shall be promptly cleaned and the area sanitised by the sub-contractor.
- i. The contents of chemical toilets shall be removed to an approved disposal site – no discharge into the environment or burying of sewage shall be allowed.
- j. The toilets shall be serviced and cleaned on the last construction day before a weekend, public holiday or builder's holiday.
- k. Wash areas shall be placed and constructed in such a manner so as to ensure that no pollution occurs, including groundwater pollution.

4.2.1.4 Eating areas

- a. The contractor shall, in conjunction with the ECO, designate restricted eating areas for eating during normal working hours. The contractor shall provide adequate refuse bins that must be cleaned on a daily basis. No form of recreational activity may take place in the area during such meal times.

4.2.2 Site access and traffic flow

1. Vehicular Site access is to be restricted to a single entry and a single exit point to alleviate traffic congestion in the area.
2. Heavy vehicles are to be restricted to operating on the proposed site.
3. A single entry point is to be established for pedestrian entry in close proximity to the Site Office which must be clearly signposted.
4. All access points are to be monitored and a security presence will need to be on site 24/7.
5. Only fully roadworthy vehicles are allowed on site.
6. No vehicles with oil leaks must be allowed to access the site.

4.2.3 Storage of fuels and oils

Temporary fuel storage tanks not exceeding 1 000 m³ in volume may be used for construction purposes without the required environmental authorization. The following mitigation measures shall apply:

1. Fuel storage tanks shall be erected on an impervious surface that is bunded and able to contain at least 110% of the volume of the tanks.
2. Fuel storage tanks shall be located in a portion of the construction site where they do not pose a high risk in terms of water pollution (i.e. they must be located away from water courses / resources).
3. Vehicles and equipment shall undergo regular maintenance to identify and remedy fuel and oil leaks, as well as remove any combustible material.
4. Collection containers (e.g. drip trays) shall be placed under all dispensing mechanisms for hydrocarbons or hazardous liquid substances to ensure that contamination from any leaks is reduced.
5. Bulk fuel storage tanks shall be placed so that they are out of the way of traffic, so that the risk of the tanks being ruptured or damaged by vehicles is minimised.
6. The contractor shall keep the necessary materials and equipment on site to deal with spills of fuels and oils should an event occur.
7. The contractor shall set up a procedure for dealing with spills, which will include notifying the ECO and the relevant authorities prior to commencing with construction. These procedures must be developed in consultation with and approved by the appointed ECO.
8. A record must be kept of all spills and the corrective action taken.
9. The contractor must minimize the quantities of fuel, paints and other hazardous material kept at the construction site.
10. Safeguarding of hazardous substances from being stolen, vandalised, catching fire or spilling on open ground or into the ocean. (Hazardous Substance store.)

4.2.4 Marine biota relocation

1. The footprint of the site extending seaward of the high water mark shall be demarcated with buoys.
2. Kelp collection and fauna relocation shall take place prior to any drilling or blasting activities.
3. All kelp is to be removed from the demarcated footprint of the site. The fronds of the kelp are to be used as feed by Abagold and the remainder of the kelp is to be removed by the existing kelp concession holders.
4. Urchins, giant periwinkles, abalone and crayfish are to be collected and relocated to suitable habitat outside of the development footprint.

4.2.5 Blasting and drilling

1. All blasting must be conducted using a rock breaking technology known as NoneX (www.nonex.co.za). This is not an explosive technology but rather a propellant compound encased in a cartridge which reacts very quickly to produce high volumes of harmless gas (nitrogen, carbon dioxide and steam). The cartridge is sealed inside a drilled hole and ignited. High pressure gas is released and enters into the fractures caused by drilling and natural fractures or planes of weakness in the rock. The gas pressure causes the fractures to expand and the rock to split apart. The cartridges do produce a high pressure over a short time frame and so will produce noise.
2. Monthly (specifying the days) work schedules and weekly and notifications regarding blasting activities are to be prepared and distributed to neighbouring aquaculture facilities in advance. Some flexibility will be required as blasting will be dependent on weather and the absence of marine mammals from the area.
3. All neighbouring aquaculture facilities are to be notified at least 4 hours prior to blasting.
4. No blasting or drilling in the sea must be conducted during the period between June 30 and December 31 as southern right whales are likely to be in the vicinity of Walker Bay.
5. Observers with binoculars must be sited on key vantage points immediately before all intended blasts. Blasting should only commence when cetaceans are not seen to be diving or resting on the sea surface within two kilometres of the blast site.

4.2.6 Stockpiling of excavated material

1. Rock emanating from blasting activities shall be used as backfill for the project.
2. Topsoil shall be excavated from the following areas no longer than five days before the start of construction:
 - Areas for the storage of fuels.
 - Areas to be used for batching / mixing of concrete.
 - Areas for stockpiling of construction materials.
3. Topsoil shall be excavated to approximately 150-mm and stockpiled for later use in the area designated by the PE.
4. Topsoil shall be placed uncompacted in stockpiles not exceeding 2.5 metres in height.
5. Topsoil shall not be mixed with any other material (construction rubble, subsoil's etc) and erosion of the topsoil stockpiles shall be prevented.
6. Soil contaminated by hazardous substances must be disposed of at a registered landfill site.
7. Stockpiled topsoil is to be covered with shade cloth and kept dampened so that dust is suppressed.

4.2.7 Concrete batching

1. The batching site must be bunded with earth berms or sandbags to prevent runoff escaping into the ocean. Contaminated water shall be drained to a waterproof lined pond. The contaminated water shall be disposed of at a site approved by the PE.
2. Any waste concrete and cement sludge shall be scraped off the site and disposed of in an approved landfill site.
3. After closure of the batching plant or any area where concrete was mixed, all waste concrete/cement sludge shall be removed together with contaminated soil. The surface shall then be ripped to a depth of 150 mm and the topsoil replaced evenly over the site and watered.
4. No batching of concrete is to take place directly on exposed soil. Any contaminated area must be removed from the site for safe disposal.

4.2.8 Concrete casting

1. Concrete casting in the sea must take place using the method described below:

The construction of the base of the wall will be conducted in a modular fashion using a large reusable metal frame (12 m x 3.6 m) with four adjustable legs. The frame will be positioned on the sea floor using a crane and levelled using the four adjustable legs. Holes will be drilled into the bedrock and bolts will be inserted into the holes to secure the frame in position. In some cases it may be necessary to insert a two part epoxy gel into the drilled holes to improve the integrity of the anchors. There is no risk of contamination from the epoxy as it is inserted into the drilled hole in a glass tube immediately before the anchor rods are inserted.

A series of metal shuttering beams will be lowered through the frame circumference onto the rocks to form a “cage” on the uneven seafloor. This will serve as a mould for the underwater concrete casting. A plastic canvas-bag will be inserted into the mould and filled with water to ensure proper positioning as well as to ensure that it is water tight thus ensuring total enclosure of the wet concrete casting. The bag will be protected by the shuttering of the cage and will not take any pressure. The bag will be filled with concrete through a water tight sleeve at the top while a second sleeve will ensure the escape of air as well as provide access for vibratory equipment to settle the concrete properly. The top surface will be levelled using a removable top shutter board. The top of the base will be at mean sea level (MSL). Once the concrete is set the metal frame and shuttering will be removed and used for the next casting and the plastic bag will be cut away from the top of the block as well as all exposed surfaces. Once the base is complete the pre-cast units of the slot-slope wall can be stacked securely on top.

2. Monthly (specifying the days) and weekly (specifying the times) concrete casting schedules are to be prepared and distributed to neighbouring aquaculture facilities in advance.

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3. Mitigation measures must be put in place in case of cement spillage.
 4. Casting of the base of the Pilot WEC slot slope wall must commence on the Eastern side, furthest away from the Aquafarm sump.
 5. Aquafarm must be given full access to the site during casting in order to verify the effects of the casting method for themselves.

4.2.9 Erosion control

The Contractor shall take all reasonable measures to prevent soil erosion resulting from works on site, restriction or increase in the flow of storm water caused by the presence of temporary / permanent works, operations and activities. Erosion prevention measures must be implemented to the satisfaction of the PE and ECO.

Areas affected by construction-related activities must be monitored regularly (at least weekly) for evidence of erosion. Areas particularly susceptible to erosion are: areas stripped of topsoil, topsoil stockpiles and steep slopes (gradients > 6 %); where evidence of erosion appears the construction of contour berms, cut-off drains or planting of grass sods may be necessary. In the event of soil erosion, the Contractor shall reinstate such areas and areas damaged by the erosion, at his own cost and to the satisfaction of the PE and ECO.

4.2.10 Waste management

Pollution could result from the release of chemicals, oils, fuels, sewage, wastewater, solid waste and litter, etc. The Contractor shall ensure that pollution of the ground or ocean does not occur as a result of any activities on site. The site of the works shall be clean and presentable at all times and the Contractor shall take care to minimize any negative visual impacts of construction.

1. No litter or Contractors' waste shall be left lying about the site at any time.
2. The site shall be kept clean, neat and tidy to the satisfaction of the PE and ECO. The Contractor shall provide bins at the work site and shall be responsible for disposal of refuse and waste generated by his staff on a daily basis.
3. No burning or burying of waste shall be permitted on site. Waste shall be removed to an approved waste disposal facility.
4. Sufficient closed containers must be on the construction site to handle the amount of litter, waste, debris and builders waste generated on the site.
5. All solid and chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site. (Receipts must be kept.)
6. A skip, with a wind proof cover, must be used to contain refuse from site bins.

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7. A skip, with a wind proof cover must be used to contain rubble and other construction material.
 8. Ready-mix chutes to be cleaned at dedicated site for this purpose as discussed above.
 9. Waste water from batching operations or ready mix trucks shall be discharged into a lined waterproof sump for this purpose and the cement residue removed from site at a later stage. No discharge of cement-laden water onto open ground or into any water course, (e.g. streams and drainage areas or the sea) shall be permitted. Cement laden water and all waste concrete shall be removed to an approved registered landfill.

4.2.11 Hazardous waste

1. Used oil, lubricants, and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and sent back to the supplier.
2. Water and oil shall be separated in an oil trap. Oils collected in this manner shall be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit shall be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company.
3. All used filter materials shall be stored in a secure bin for disposal off site.
4. All hazardous material shall be disposed of at a registered landfill.

4.2.12 Dust control

Dust is regarded as a nuisance when it reduces visibility, soils private property and is aesthetically displeasing.

1. The Contractor shall be responsible for the control of dust arising from his operations and activities. Control measures could include regular spraying of working / bare areas with water, at an application rate that shall not result in soil erosion.
2. Excavated material, (Spoil.) is to be removed from site on the same day by means of a truck to a registered disposal site. This would include the sections of road which are to be used to enter and exit the site by means of sweeping.
3. All vehicles transporting material that can be blown off (e.g. soil, rubble etc.) must be covered with a tarpaulin or another suitable material (that provide the same purpose).
4. Local residents should not be exposed to any inconvenience due to dust. Excessive dust conditions shall be reported to / by the ECO and severe fines issued.

4.2.13 Noise control

1. The Contractor shall take reasonable measures to limit noise levels during construction. If necessary the Contractor shall familiarize himself with the legislation pertinent to noise generation, as part of the environmental awareness training exercise (See Section 6).
2. Noise levels shall be kept within reasonable norms at all times. Vehicles shall be driven at moderate speeds. All vehicles and machinery shall be fitted with silencers that shall be properly maintained.
3. Work hours during the construction phase shall be strictly enforced unless express permission is given, which permission shall not be granted without consultation with the local residents. Noise reduction is essential and Contractors shall limit unnecessary noise, especially loud talking, shouting or whistling, radios, sirens or hooters, revving of motors, etc.
4. When the blasting activities are to take place, the drilled holes containing the charges are to be covered with sections of conveyor belt.

4.2.14 Fire prevention

1. No fires are to be tolerated on site. The Contractor shall take all the necessary precautions to ensure that fires are not started as a consequence of his activities on site.
2. The Contractor, sub-contractors and all employees are expected to be conscious of fire risks. The Contractor shall hold fire prevention talks with staff to create an awareness of the risks of fire (See Section 7 on environmental awareness training). Regular reminders to his staff on this issue are required. Smoking areas are to be designated and receptacles provided for cigarette butts.
3. The Contractor shall ensure that there is adequate fire-fighting equipment on site and that the necessary emergency numbers are displayed at each phased site and the Site Office.
4. The Contractor shall be liable for any expenses incurred by any organizations called to assist with fighting fires and for costs involved in rehabilitation of burnt areas/property/persons, should the fire be the result of the Contractor's activities on site.

4.2.15 Socio-economic Impacts

This project provides job creation potential in the short, medium and long term and opportunities for educational and research programmes.

1. Job creation - The contractor shall, where possible, employ labor from local communities.
2. Education - As this is the first time this type of technology is to be used, it is strongly recommended that a graphic display of an informative nature be erected for the general public

to understand the process. This site has good educational potential as well, showcasing a source of alternative energy production.

4.2.16 Impacts to neighbouring users

HIK Abalone Farm extract water from the sea for operations on their farm via a pumphouse situated on the Abagold site. In order to ensure HIK Abalone Farm's operations are not negatively disturbed access to the pumphouse must be granted to HIK Abalone Farm throughout the construction period. It must be realized that the town of Hermanus is a tourist based destination and any adverse environmental affects emanating from this construction site may impact on tourist generated income, thus negatively impacting the local economy. Apart from being fined, criminal and / or civil charges are a potential reality.

All complaints received must be recorded in a complaints register and must be acted upon by the PE and ECO.

4.2.17 Existing services and infrastructure

The Contractor shall ensure that existing services (roads, pipelines, power lines and telephone services) are not disrupted or damaged, unless required by the contract and with the permission of the PE and relevant authorities.

4.2.18 Work stoppage

The PE or the ECO shall have the right to order work to be stopped immediately, or to have personnel removed from site immediately, in the event of significant infringements, until the situation is rectified and in compliance with the specifications. In this event, the Contractor shall not be entitled to claim for delays or incurred expenses and may in fact be fined.

4.2.19 Heritage resources management

1. Construction personnel must be alert and must inform the ECO and PE should they come across any findings of terrestrial heritage or marine heritage resources.
2. Should any archaeological artefacts be exposed during excavation, on land or in the sea, work on the area where the artefacts were found, shall cease immediately and the Contractor shall inform the ECO and PE as soon as possible.

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3. Any archaeological sites exposed during demolition or construction activities may not be disturbed prior to authorization by the South African Heritage Resources Agency or the appropriate provincial heritage resource agency (Heritage Western Cape).

4.2.20 Post Construction Activities

The Contractor shall ensure that all temporary structures, equipment and materials used or generated on site during construction activities are removed when all construction work has been completed. The construction site must be cleaned and all litter removed. Fences, barriers and demarcations associated with the construction phase must be removed from the site unless stipulated otherwise by the PE or ECO.

All disturbed areas shall be repaired, revegetated and rehabilitated to the satisfaction of the ECO. The Contractor shall use only grasses and vegetation types which are endemic and indigenous if such is needed.

4.3 OPERATION

Abagold will be responsible for the operation of the wave energy converter. The following duties will need to be conducted or overseen by Abagold:

1. Kelp trapped within the WEC dams, slot-slope walls or pump assistance pond must be removed weekly to ensure that there is no build up of organic materials within the dams or pond.
2. Fouling organisms on pipes, slot-slope walls and mechanical and electrical installations are to be removed mechanically. No anti-fouling chemicals are to be used without authorisation.
3. All kelp and fouling material removed from the WECs to be disposed of in an appropriate landfill site. No debris to be dumped in the sea.
4. HIK must continue to be granted access to their sump.
5. A monitoring programme must be established to test the efficacy of the WEC.
6. Educational materials should be made available at the site. Access must be permitted to designated areas for educational, research and tourism purposes.

4.4 REHABILITATION/CLOSURE

The footprint of the site will undergo permanent change and not undergo any rehabilitation following construction. In addition closure of the site is not foreseen in the long-term.

5 MECHANISMS FOR MONITORING COMPLIANCE AND PERFORMANCE ASSESSMENT

5.1 COMPLIANCE MONITORING

The ECO shall monitor the Contractor's performance in relation to the Environmental Management Measures on a weekly basis. The ECO shall be assisted in monitoring by the PE.

The ECO is to submit monthly status reports that must contain any infringements of Environmental Management Measures. The reports must also indicate any problems with planned construction activities and so alert the Contractor to potential environmental risks and the appropriate action that should be taken. The PE shall make the content of these reports known to the Contractor.

The ECO must also inform the relevant parties (See Section 3.2) in writing of any major non-conformance with the Environmental Management Measures described in this EMP, or any legal non-compliance.

5.2 ENFORCEMENT OF ENVIRONMENTAL MANAGEMENT MEASURES

The ECO is responsible for reporting non-conformance with the Environmental Management Measures and legal obligations to the PE. The PE in consultation with the Client and the ECO (and any other relevant party) must, thereafter, undertake the following activities:

1. Investigate the cause of the non-conformance;
2. Implement suitable corrective action (such as, but not limited to training) as well as prevent recurrence of the problem;
3. Assign responsibility for corrective and preventive action; and
4. Impose appropriate fines on repeat offenders or decide that the required standards are not being met and that that person / persons no longer be allowed to work on site.

Where the Contractor inflicts non-repairable damage upon the environment or fails to comply with any of Environmental Management Measures, he shall be liable to pay a fine. Spot fines shall be imposed by the ECO in agreement with the PE on Contractors who are found to be infringing the EMP Environmental Management Measures and method statements. Spot fines shall be determined, depending upon the severity of the infringement and the actual or potential impact involved at the time of the offence. The decision on how much the fine will be shall be made by the ECO and PE and shall be final. Fines must be pre-determined so that all contractors and employees are aware of the consequences. A schedule of fines is to be listed and communicated to all employees on induction, i.e. litter = R 500.00, fire = R 20 000.00. The Contractor shall be advised in writing of the nature of the infringement and the amount of the spot fine. The Contractor shall determine how to recover the fine from the relevant employee and /or sub-contractor.

Any non-conformance with the agreed procedures of the EMP is a transgression of the various statutes and laws that define the manner by which the environment is managed; therefore any non-conformance, dependant on severity, shall be considered grounds for contact to be made with relevant provincial or national authorities. The Contractor is also advised that the imposition of spot fines does not replace any legal proceedings the Council, authorities, land owners and /or members of the public may institute against the Contractor who may well still be criminally liable.

In addition to the spot fine, the Contractor shall be required to make good any damage caused as a result of the infringement at his/her own expense.

A preliminary list for which spot fines shall be imposed is as follows:

- Conducting construction activities and other work outside the demarcated site boundaries and in the “no-go” areas;
- Entering a no-go area without authority;
- Littering of the site and surrounds;
- Urinating or defecating in areas other than the designated facility;
- Burying waste on site and surrounds;
- Smoking outside of the demarcated area;
- Creating or making fires;
- Causing excessive/significant dust;
- Defacement of any natural features, (Vegetation, rocks etc.)
- Spillage into the marine environment of oil, diesel, etc;
- Unnecessary or continued harassing or disturbance to local residents.
- Unnecessary hunting, trapping, fishing or interference with terrestrial or marine fauna or avifauna;
- Social disruption to surrounding businesses and landowners; and
- Additional activities as determined by the ECO.

Fines imposed shall be subtracted from payments due to the Contractor by the PE, and shall be recorded by the ECO.

The PE and ECO (in consultation with the Client may also order the Contractor to suspend part or all the works if the Contractor repeatedly causes damage to the environment by not adhering to the EMP (i.e. more than 3 infringements, and also depending on the significance of impacts associated with such infringements). The suspension shall be enforced until the offending actions, procedure or equipment is corrected. No extension of time shall be granted for such delays and all costs, direct or indirect, shall be borne by the Contractor.

The ECO must also inform the authorities in writing of any major non-conformance described in this EMP, or any legal non compliance.

6 ENVIRONMENTAL AWARENESS AND TRAINING

The main objectives of the environmental training and awareness programme will be to impart to labourers, contractors and sub-contractors an understanding of the environmental and social impacts associated with the development, the available mitigation measures and the reporting procedures. Each staff member, labourer, contractor and sub-contractor working on the proposed project shall receive an environmental induction before the commencement of construction activities. This may include (but should not be limited to):

- A site induction.
- An understanding of environmental impacts and the need for environmental protection/controls.
- Worker conduct on site.
- Organisational structure and official communications channels for the reporting of environmental incidents or problems.
- Corrective actions pertaining to non-conformance, where relevant.
- Emergency response training for environmental incidents.

These training sessions can take the form of formal presentations, informal meetings or handouts. The use of pictures and real examples is encouraged as these tend to be more easily remembered.

The environmental training shall be undertaken by the ECO.

Weekly “toolbox talks” shall be given by the contractors.

Every employee on site is to sign a document that they have received such training, understands it, agrees to abide by it and understands that there will be a system of fines in place. This document will include employee name and ID no. for reference.

7 CONCLUSION

If the EMP is effectively implemented and monitored, negative environmental impacts of the project will be reduced to an acceptable level and the benefits of the development will in all likelihood be well supported by the general public. This draft EMP must be revised to include financial requirements and feasibility, a system of fines, and construction scheduling once construction plans have been detailed. Although every effort has been made to produce a practical document, no liability can be accepted for possible potential losses which may or may not be incurred.