



Environmental Management Plan

Introduction

This Environmental Management Plan (EMP) has been prepared for SEF Energy Co. Ltd. for the purpose of providing a stand-alone plan for managing the potential environmental and social impacts of upstream oil and gas operation activities within Ghana. This EMP is based on the assessments and findings of the Environmental Impact Statement (EIS).

Environmental Management Objectives

SEF energy is committed to using existing proven, industry and best practice strategies to minimize impacts, and to integrating environmental management and this EMP into the Project design, construction and operation. The overall objectives for environmental management throughout the Project are provided below.

1. Propose practical measures to avoid, reduce, restore or compensate for identified adverse impacts.
2. Conserve highly significant aspects of the biophysical, cultural and social environments.
3. Protect human health and safety.
4. Inform an environmentally sound and sustainable engineering design process.
5. Propose a plan to monitor and manage Project implementation, such that the Project is environmentally sustainable and optimizes resource use.

Structure, Implementation and Review

Structure

This EMP has been developed based on a number of individual specialist studies and reports prepared for the EIS. The specialist studies assessed the environmental values and the potential for impacts to these from the proposed Project. Risk assessments were undertaken to determine the significance of each potential impact based on a consequence

and probability matrix, producing a low, medium or high significance level for each impact. Management measures have been proposed with the aim of reducing these risk levels. For each environmental and social element, the following is described within this EMP:

- Summary of environmental values (from the EIS)
- Summary of potential impacts (from the EIS)
- Management objectives – main outcomes to be achieved overall by management measures, based on impacts assessed as having potentially high significance
- Management strategies (in table format), including for each potential impact:
 - facility – areas and facilities relevant to the impact (mine areas, haulage including ore handling and transportation, port areas and marine operations, general infrastructure)
 - stage – stage of works relevant to the impact (construction including design and pre- construction, operation including decommissioning and rehabilitation)

Implementation

Criteria – performance standards to meet that are measurable or quantifiable wherever possible

Management actions – individual tasks and on-site actions that can be undertaken at the relevant facility and stage

Monitoring – continuing assessment of performance of management actions

Auditing, corrective action and reporting – procedures for reviewing and auditing management activities, remediating or amending after impacts or non-conformity occurs, responding to incidents, and keeping appropriate records. A mitigation hierarchy was used within each specialist study and is best practice guidance for understanding the scope of mitigation measures. The mitigation hierarchy emphasizes the principle of preventing environmental impacts from happening in the first instance and if this is not possible then limiting the impacts to an acceptable level (ICMM 2006).

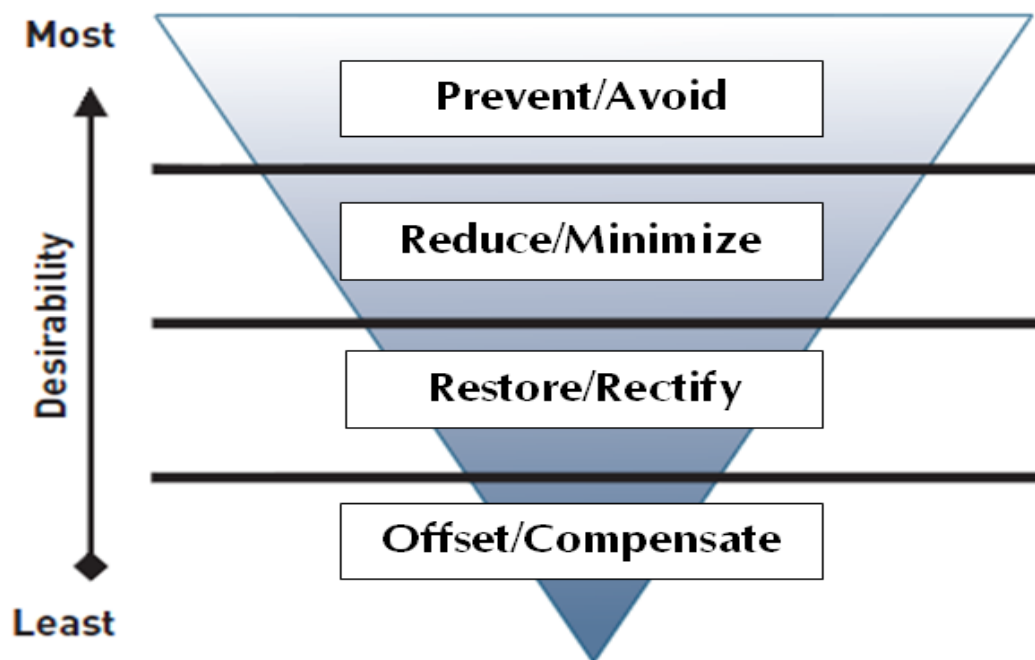


Figure 1-1 The Mitigation Hierarchy



Based on the EMP implementation guide within the Environmental Impact Assessment for Developing Countries in Africa (Lorain et al. 1997), this EMP is planned to be implemented as follows:

1. Final detailed design will incorporate specifications and plans for meeting the approved EIS.
2. Construction contract specifications will include all required mitigation measures.
3. Construction contractors' performance will be internally monitored and audited against the EMP and relevant plans and drawings, including daily and weekly inspections, and monthly internal reporting of environmental incidents and corrective actions taken.
4. Implementation and auditing of the monitoring program throughout the construction and operation stages, including actions recommended improving ongoing environmental management.
5. Reporting and evidence of the above steps during the various Project stages.

Project activities will be undertaken within an Environmental Management System, which will be established at the commencement of the Project. This EMP will form the basis of a Construction EMP and an Operations EMP to be developed following detailed design.

The review and sign-off of the EMP will be a Hold Point for the Project execution stage (i.e. no construction stage works shall commence before these plans are approved by the Environmental Manager and Construction/Project Manager).

All staff will be inducted to the Project and their relevant work sites prior to commencing any work. The induction will instruct staff on the health, safety and environmental awareness and management obligations for the Project and the EMP for the duration of the Project. Inductions will include (as a minimum) explanation of:



The Environmental Policy duty of care and reporting responsibilities for all persons key environmental values and their management key health and safety issues cultural sensitivity hazard assessment, management and reporting processes emergency procedures.

Review, Audit and Updating

The EMP documentation will be reviewed prior to implementation to ensure management actions are adequate for the site and activities. This review will consider any further approval conditions, documentation or studies that are relevant and available.

The review and sign-off of the EMP and associated specific plans will be a Hold Point for the Project construction stage (i.e. no construction stage works shall commence before these plans are approved by the Environmental Manager and Construction/Project Manager).

A half-yearly internal audit of the EMP implementation will be undertaken, including a review of records, data and other documentation and on-site management current on the day of the audit inspection.

Where considered necessary, the EMP will be updated or revised to incorporate issues identified through emergencies, incidents, inspections, monitoring or audits.

An annual review of the EMP will be undertaken to assess the appropriateness to current and proposed activities, monitoring data or studies, approvals, standards and legislation.

Roles and Responsibilities

Project HSE Manager

The Construction Manager and Project Manager will be responsible for the following:

- Ensuring compliance with the EMP and relevant approvals.
- Report significant environmental incidents or emergencies to the local relevant authority to ensure remediation applied are appropriate and acceptable.
- Maintain general communications with stakeholders and authorities to inform them of planned activities where relevant.
- Certify additional management plans to be attached to and incorporated into the EMP.
- Commission additional studies if considered necessary following monitoring results, significant events or incidents (for example).

Site Supervisors

The Site Supervisors will be responsible for the following in their area of works:

Ensure the measures detailed in the Construction or Operations EMPs and associated plans and specifications are implemented correctly, on schedule, and are effective and appropriate for the site and activities.

Sign-off on additional plans and drawings prior to construction or implementation, such as the Hold Point for erosion and sediment control measures to be in place prior to clearing and earthworks commencing for a mine area.

Daily inspections of activities including mitigation measures as well as corrective actions would be taken. This be recorded and made available where necessary, or other resolutions made and their justification.



Ensure periodic collection of data from weather station and any data loggers is occurring.

Report environmental incidents to the Construction/Project Manager and Environmental Manager/Officer immediately after becoming aware of them.

Ensure all personnel have the relevant qualifications and training to carry out their relevant tasks and roles.

Hold daily pre-start toolbox meetings with personnel to discuss the current Project activities and the health, safety and environmental issues associated with these.

Take corrective action or otherwise respond to management needs following SMM Solomon on- site inspections and EMP audits.

Environmental Team

The Environmental Team is likely to consist of an Environmental Manager, Environmental Officers and Community Liaison Officer, who will be responsible for the following:

- Review of EMP following detailed design in order to verify that the proposed measures are adequate for the site and activities, detailed design and specifications have been incorporated, and documentation is present (e.g. daily and weekly inspection checklists, emergency/incident response form, and complaint response form).
- Provide input to site inductions for all personnel in terms of environmental values, potential impacts from the project, management measures, and reporting of incidents and emergencies.
- Weekly inspections of environmental mitigation measures implemented on-site to check functioning and effectiveness.
- Undertake or coordinate the various monitoring activities, such as water quality data collection.
- Lead investigations into any significant environmental incidents and monitor the closeout of these incidents.

- Monthly internal reporting to the Construction/Project Manager on environmental incidents and corrective actions taken (or other resolutions made) and results of ongoing monitoring activities.
- Half-yearly internal audits of EMP implementation (of both documentation/records and on-site controls).
- Annual internal review and subsequent update of the EMP.
- Liaison with environmental authorities, conservation groups, stakeholders, and provincial or local agencies.

All Personnel

All project personnel will have a general duty of care to take reasonable and practicable actions to not cause environmental harm.

All staff will have a responsibility to report potentially harmful activities (environmental or otherwise) to their Site Supervisor.

All staff involved in the construction, operation and decommissioning activities will be appropriately qualified and trained to undertake their project roles and tasks.

All staff will be inducted to the project and their relevant work sites prior to commencing any work. All site staff must attend the toolbox meeting prior to work commencing each day.

Personnel in charge of vehicles or machinery will undertake daily pre-start checks to ensure equipment is in good working condition, does not need any repairs or maintenance, does not have excess dirt or material, and contains all necessary equipment within it (e.g. spill kits, fire extinguishers). A checklist will be kept in each vehicle to record daily pre-start checks.

Internal Monitoring, Incident Response and Reporting

Monitoring

All monitoring data and results will be recorded, compiled and retained for five years (minimum). Specific monitoring programs are described in the management strategies tables for each environmental element within this EMP.

Monitoring programs will be undertaken in accordance with recognized standards, codes and guidelines in order to establish and maintain appropriate and consistent sampling protocols, analysis and quality assurance. Qualified and trained staff will undertake monitoring tasks. NATA accredited laboratories will undertake laboratory analysis.

All monitoring records, raw data and resultant reporting will be kept in Project documentation on-site and be made available to relevant authorities upon request.

Inspections

The Site Supervisor throughout the course of their daily activities will undertake daily inspections of work areas. The issues to be checked during daily inspections include:

- Condition and function of existing erosion and sediment controls
- Need for additional erosion and sediment controls, taking into consideration (and recording) current or forecast weather
- Flora and fauna protection measures (particularly during clearing activities)
- Weed or pest problems
- Slope drainage and diversion measures
- Access and haul road conditions
- Presence of litter or inappropriately disposed waste
- Any spills (e.g. fuel or hydraulic hose leaks). Weekly environmental inspections of work areas and implemented management measures will be undertaken by the Environmental Officer, and will include the above environmental elements and any other management issues observed.



The Weekly Environmental Inspection Template attached as Appendix A can be used to record relevant information and to prompt the user to identify issues during site inspections.

Monthly internal environmental reporting will include issues that are recurring on inspection records.

All inspection records will be kept in Project documentation on-site and be made available to relevant authorities upon request.

Incidents and Emergencies

Any events that are considered incidents or emergencies will be addressed, recorded and reported. Incidents and emergencies may include:

- A contaminant spill (to land, air or water)
- Injury or death to native wildlife
- A disturbance to a protected area, exclusion zone or area outside of the designated Project area
- Significant non-conformance or non-compliance with an approval or with specific criteria in the EMP (e.g. water quality trigger values)
- Action or event that causes or has the potential to cause significant environmental harm

- An environmental event endangering personnel or broader community health or safety (i.e. near miss or actual incident), such as a bushfire or contaminant spill.

Staff will notify the Site Supervisor immediately upon becoming aware of an incident or emergency, who will then notify the Project Manager and Environmental Officer, where relevant. The authority will be notified as soon as possible after becoming aware of any emergency, incident or action that has or could potentially result in environmental harm. This will be followed by written advice to the authority that will describe the nature of the emergency or incident, the actions taken at the time of the event, any additional monitoring of the situation and impacts, and the proposed actions to prevent a similar occurrence in the future.

The Incident Response Form Template attached as Appendix B can be used to record the required information for notification, corrective action, and reporting purposes. An Emergency Response Form will be included in the Emergency Response Plan to be developed. Monthly internal environmental reporting will include information about any incidents or emergencies and responses and actions taken as a result. All incident and emergency records will be kept in Project documentation on-site and be made available to relevant authorities upon request.

Complaints/Grievance Procedure

More information on the complaints or grievance process is provided in the Grievance Procedure for the Project. Any complaints/grievances received that relate to this Project's activities require at least the following to be recorded:

- Time and date of complaint
- Form of complaint (e.g. written, in person)
- Name and address of complainant
- Nature of complaint



- Name of person responding to complaint
- Response, investigation and corrective actions resulting from complaint. The Complaint Response Form Template attached at the end of Appendix C can be used to record this information. Monthly internal environmental reporting will include information about any complaints received and responses and actions taken as a result. All complaint records will be kept in Project documentation on-site and be made available to relevant authorities upon request.

Legislation and Standards

Table 5-1 below provides the environmental management and legislation and standards that are considered to be applicable to the upstream oil and gas industry, including overarching as well as issue-specific documents. The legislation and guidelines that apply to the structure and content of EMPs are described further in the following section

Overview of Environmental Legislation and Standards

Issue	Legislation, Standards, Agreements and Guidelines
General Environmental and Upstream Management	<ul style="list-style-type: none"> • Ghana Labor Act, 2003: Ghana Petroleum Exploration and Production Law, 1984 (PNDCL 84); Petroleum Commission Act, 2011; Acts 821; and Factories, Office and Shops Act of 1970; Offshore Petroleum Health and Safety Act 2010 (Draft bill) • International Standards: International Council on Gas and Oil Environmental Standards and Good Practice Guidance for Oil and Gas; International Finance Corporation (IFC) Performance Standards on Social and Environmental Sustainability; World Bank Group (WBG)/IFC Environmental, Health and Safety General and Mining Guidelines; • International Agreements: The Equator Principles Financial Institutions (EPFI); United Nations (UN) Global Compact; Global Reporting Initiative • Guidelines: Environmental Impact Assessment Guidelines; Environmental Impact Assessment for Developing Countries in Asia & Africa; Department of Environment and Resource Management (DERM) Queensland Environmental Protection Act 1994
Geology and soils	<ul style="list-style-type: none"> • International Standards: International Organization for Standardization (ISO) soil quality sampling
Nature conservation	<ul style="list-style-type: none"> • Ghana Petroleum Exploration and Production Law, 1984 (PNDCL 84); Petroleum Commission Act, 2011; Acts 821 • International Agreements: International Union for the Conservation of Nature (IUCN) and the Red List of Threatened Species; Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Business and Biodiversity Offsets Program (BBOP); Convention on Biological Diversity • Guidelines: Australian Government Environmental Offsets Policy under the Environment Protection and Biodiversity Conservation Act 1999 (draft 2011); Queensland Government Environmental Offsets Policy (2008)
Air and noise	<ul style="list-style-type: none"> • International Standards: WBG/IFC Environmental, Health and Safety Guidelines for Oil and Gas, Environmental, Air Emissions and Ambient Air Quality, and Noise Management; US EPA National Ambient Air Quality Standards; WHO Guidelines for Air Quality, Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulphur dioxide – global update 2005, and Guidelines for Community Noise; ISO 1996-2:2007 – Acoustics • Guidelines: DERM Queensland Environmental Protection (Air) Policy 2008; Office of Environment and Heritage (OEH) Approved Methods for the

	Modeling and Assessment of Air Pollutants in New South Wales; Australian Standard (AS) 4156.6:2000 for air monitoring and ISO for air and noise monitoring
Social, transport and land use	<ul style="list-style-type: none"> · International Standards: WBG/IFC Environmental, Health and Safety General Guidelines; · International Agreements: Prevention of Pollution from Ships 1973; London Convention; Waigani Convention; Protocol 1 Dumping; Protocol 2 Emergencies; Liability for Oil Pollution Damage · Guidelines: International Ship and Port Facility Security (ISPS) Code; International Maritime Dangerous Goods (IMDG) Code; International Maritime Solid Bulk Cargoes Code (IMSBC)
Waste	<ul style="list-style-type: none"> · International Standards: WBG/IFC Environmental, Health and Safety Guidelines for Waste Management, Hazardous Materials Management, Construction and Decommissioning, Community Health and Safety, Upstream and Downstream Oil and Gas, Mining, Ports Harbors and Terminals, and Waste Management Facilities; · International Agreements: Prevention of Pollution from Ships 1973; London Convention; Stockholm Convention; Waigani Convention; Noumea Convention; Protocol 1 Dumping; Protocol 2 Emergencies; UN Convention on the Law of the Sea (UNCLOS III)