1.0 Introduction

Base Depot and Tank Farms Facilities as used in this procedural guideline shall refer to an area used for the storage of oil and/or petrochemical products in large tanks either above ground or underground. These farms are traditionally installed close to oil refineries or in locations where marine tankers can discharge their products. Some oil depots have facilities to draw petroleum products through pipelines and are fed by rail, barge and road tankers. A tank farms normally consist of:

- Tankage, either above ground or underground
- Gantries for the discharge of products into road tankers or other vehicles (such as barges) or pipelines.

2.0 Project Justification

The Proponent shall provide necessary and adequate information on justification for the project. Proponent shall thoroughly elucidate the comparative advantages of the proposed project to its intended end users and its overriding advantages over the anticipated negative impacts on the society and the environment. Justification shall be provided for the choice of proposed project over available alternative projects which shall justify the selection with consideration on project sustainability.

3.0 Project Description

The Proponent shall provide detailed description of the proposed project including associated and potential impacts (positive or negative, significant or negligible, beneficial or non-beneficial) in terms of raw materials, processes, equipment, work force, products, among others. Concise information should be provided on the technical, economic, and environmental features essential to the project as well as development objectives targets and indicators, and the proposed schedule for project.

The project description should be supplemented by process flow charts and diagrams, land use maps showing the general location, specific siting and project layout of the proposed development. Each flow diagram should indicate all material

input, waste loads, discharges and management for the process, type, frequency and duration of each developmental phases of the project.

The EIA study should report a description of the development in relation to the local environment as follows:

- Description of development type with physical characteristics, scale and design.
- An estimate of quantities and types of materials needed during construction and operation phase of the project.
- A description of indication of the physical presence and appearance of completed development within the receiving environment.
- The nature of the production processes intended to be employed and expected production rate.
- The land area taken by the development with its location clearly defined on a map.
- The uses to which the land will be put should be described.
- The estimated duration of the construction phase, operational phase and where appropriate, decommission phase should be given.
- The numbers of workers and/or visitors entering the site during construction and operation should be estimated. The access to the site and likely means of transport should be given.
- The means of transporting raw materials and products to and from the site and the approximate quantities involved should be described.
- An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from operation of the proposed project.

Emphasis should however be given to those components with the most potential for significant short and long term environmental impacts.

4.0 Description of the Environment/Baseline Data

The area and location of the environment likely to be affected by the development should be described in the EIA Report. The environmental component expected to be affected by the project should be presented with a suitable map. Description of the existing environment should include the natural (physical and biological

environment) and human (cultural, socio-economic) systems and their inter-relationships.

The baseline conditions —a description of the affected environment as it is currently, and as it could be expected to develop if the project were not to proceed, should be presented. The important components of the affected environments should be identified and described. The methods and investigations undertaken for this purpose should be disclosed and be appropriate to the size and magnitude of the project. Secondary data of significance can be sourced for useful utilization including local plans.

4.1 Biophysical Component

(a) Climate and Air Quality: Precipitation patterns (amount, frequency, trend), wind patterns (direction, speed, frequency), temperature, climatic zone and air quality measurements.
(b) Topography: Drainage patterns, elevations and slopes, prominent features
(c) Soils and Geology: Regional geology and geomorphology, seismic history, and soil type, characteristics and profile, land use map.
(d) Hydrogeology: Regional hydrogeology, site hydrogeology
(e) Water resources (ground and surface): Quality (organic and inorganic composition), depth and thickness of aquifers, hydraulic recharge, quantity, seasonal variations, flow rates, ecological characteristics, and uses.
(f) Ecology: Vegetation type, type and distribution of intrinsic flora and fauna

4.2 Human Component

This includes, but not limited to, health impact assessment and the social, cultural, economic component of the environment. The issues following issues should be considered in the EIA report;

(a) Communities likely to be affected: Location, access, population (number, demographic and social characteristics); economy (employment rate, income distribution); services (types, capacity, adequacy) and housing; concern in the ability to (i) provide work force, (ii) service new development and (iii) absorbs and adjust to growth (worker/family in-migration): waste management and disposal, energy sources/services

(b) Land Use: Intensive and casual, full time and seasonal, actual and projected, specially designated areas (parks, refuges, reservoirs, and wilderness), man-made features (structures, roads, and utilities), land rights, organizations (NGOs).

(c) Areas of ecological interest including unique ecosystem and reserves for endangered species

(d) Culture and Tradition: Historic sites, native religious sites.

(e) Health: Healthcare statistics, disease vectors, psychological challenges, epidemics, nutritional status, public health/safety, waste management

(f) Infrastructure: Healthcare facilities, roads, water infrastructures, electricity, telecommunication.

5.0 Associated and Potential Environmental Impacts

The Project Proponent shall name all sources of impacts from the aspect of the various phases of the project e.g. vegetation clearing, oil slippage, water pollution, construction jobs, using appropriate medium.

Potential impacts shall be exhaustively described in order of impacts; and impacts according to levels - impacts due to location, Impacts due to construction, impacts due to project operations.

5.1 Impacts due to project location/siting

The location and site preparation of a project involve activities with potentially significant environmental impacts. Common environmental impacts linked with the location/siting of Oil and Gas Base Depot and Tank Farms which should always be considered include, among other things:

(a) Damage to cultural and historical resources

(b) Displacement of inhabitant/indigenous people from host community

(c) Land-use conflict and encroachment into other valuable lands

(d) Interference/Destruction ecological sensitive areas zones (breeding/nesting ground, habitat fragmentation)

(e) Interference with drainage pattern and erosion hazard

(f) Water pollution from leakages, accidental spills and washouts

5.2 Impacts due to construction

Construction related activities which include, but not limited to; clearing, land/sand filling, dredging, material transport, spoils deposition, etc. produces significant environmental impacts which should be considered in the EIA report during evaluation of impacts. Some key potential environmental impacts associated with construction and which should be considered include:

(a) Damage of cultural and historical resources (historic and anthropogenic sites)
(b) Damage to sensitive ecosystems
(c) Limit of other land uses of the area
(d) Nuisances of noise, dust, fumes, fires, explosions, vibrations etc.
(e) Soil erosion and flooding hazards due to construction impediments to natural drainage
(f) Air pollution from dust particulate, and vehicular traffic, wind erosion from unpaved roads, and cleared areas
(g) Alteration of surface and ground water quality/quantity

5.3 Impacts relating to project operation

The major impacts which should be considered in relation to the project operation phase in the EIA include:

(a) Surface and ground water pollution from leaks, spills and washouts
(b) Damage of ecological resources and environmental degradation by oil spills from storage tanks, pipes, and pits.
(c) Sanitary and domestic wastes
(d) Problems of hazardous wastes, additives, radioactive materials, batteries, etc.
(e) Air pollution from unwanted gases, burning of oil wastes and sludge pits
(f) Noise and vibration from pump operations, truck traffic, and other heavy equipment
(g) Road damages, accidents and traffic delays from increased truck traffic on local roads
(h) Injury/loss of life from work place hazards, and accidents
(i) Subsidence of land surface due to heavy loads
(j) Company-community conflicts such as vandalisation, kidnapping etc.

6.0 Mitigation Measures/ Alternatives

The proponent shall ensure possible preventive and remedial measures for each potential adverse impact associated with the proposed project. The detailed report shall identify fully the proposed measures that shall be implemented to address the identified adverse effects. Similarly, the effectiveness of these measures towards achieving desired objectives shall be assessed. A wide range of realistic and sustainable options should be proposed to prevent, reduce, or remediate for the various adverse impacts.

The EIA should describe the types and magnitude of residual impacts should the proposal be implemented and what steps will be taken to minimise environmental damages. It should also consider and quantify cumulative impacts, and describe strategies for waste reduction through best practices and best available technology, waste recycling and waste reuse.

6.1 Mitigation Alternatives

Prior to selecting mitigation plans it is appropriate to study the alternatives for cost-effectiveness, technical and social feasibility. Such mitigation measures include:

(a) avoiding environmental sensitive areas (ESAs)
(b) adjusting work schedules to minimize disturbance
(c) engineered structures such as berms and noise attenuation barriers
(d) pollution control devices such as scrubbers and electrostatic precipitators
(e) changes in fuel feed, manufacturing, process, technology use, or waste management practices, such as substituting a hazardous chemical with a non-hazardous one, or the re-cycling or re-use of waste materials, etc.

7.0 Environmental Management Plan (EMP)

The Project Proponent shall develop an Environmental Management Plan (EMP) which shall be integrated into the EIA process. The EMP shall outline the mitigation, monitoring and institutional measures to be taken during project implementation and operation to avoid or control adverse environmental impacts, and the actions needed to implement the measures. The EMP shall be designed to provide the means for continuous self-assessment of the predictive accuracy of the impacts and the management effectiveness of project implementation and

operation. A properly designed monitoring programme shall discuss the following elements:

(a) Scope of monitoring (e.g. well-articulated waste management plan)
(b) How the monitoring programme will be implemented
(c) Selection of parameters to be monitored in the environment (land, air, water)
(d) Selection of sampling locations
(e) Sampling procedures and frequency of sampling
(f) Monitoring schedule/frequency
(g) Post-commissioning environmental audit

8.0 Remediation Plans after Decommissioning

Project proponent shall provide the best remediation plans that will be implemented for the Oil and Gas Base Depot or Tank Farm facility in the event that the base depot needs to be decommissioned or closed (temporarily or permanently). The Decommissioning and Remediation Plans should provide a framework for the implementation of decommissioning and rehabilitation activities in the closure phase of the Project. The plan should be in line with the FMEnv guidelines for decommissioning and best international practices. A remediation plan should be drawn by the proponent and approved by all concerned (regulators and stakeholders) before execution. Both beneficial and adverse environmental effects of the decommissioning or closure should be scrupulously stated. Mitigation measures should be prescribed to ensure health of workers and environmental safeguards and to minimize the risk of possible incidental events during decommissioning phase.

Mitigation measures shall be proffered for the adverse effects due to decommissioning or closure. Such measure should include the removal of contaminated soils, remediation of polluted water bodies, excavation and proper management of storage tank residue etc.

Project proponent shall also design means of restoring the project location back to its original status at the same time ensuring protection of the environment and humans before the project execution.

GUIDELINES FOR OIL AND GAS

(Terminal and Flow Station Facilities)

1.0 Introduction

Terminal and Flow Station Facilities as used in this procedural guideline shall refer to an area used for the collection, storage and transmission of oil directly from exploration site prior to refining. Terminal and Flow Station have facilities to draw crude oil from oil rigs through pipelines and send to local refineries or stored in cargos for shipping. A conventional Terminal/Flow Station has four functions:

- Berthing of tankers and unloading or reloading of cargoes,
- Storage of LNG in cryogenic tanks (-160°C),
- Regasification of LNG,
- Send-out of this gas into the transmission grid.

2.0 Project Justification

A proponent shall provide necessary and adequate information on the justification for the project. This shall include a summary of the report of the Project's feasibility study; the need, value and sustainability (social, cultural and economic) of the Project. Such justification shall expressly define the benefits of the project to its intended end-users and indicate the over-riding advantages or positive impact of the project over its anticipated environmental impacts. The justification may also include the rationale for selecting the project amongst various available options or alternatives and any socio-economic factor's justifying the project.

3.0 Project Description

The Proponent shall provide detailed description of the proposed project, the processes involved, required environmental and human resources as well as the all possible impacts (positive or negative, significant or negligible, beneficial or non-beneficial) of the proposed project. Concise information should be provided on the technical, economic, and environmental features essential to the project as well as development objectives targets and indicators, and the proposed schedule for project.

A well prepared project and description shall provide;

- A brief description of the activities during this period is required, including a plan if necessary.

- An estimate of quantities and types of materials needed during construction and operation phase of the project.
- A description of indication of the physical presence and appearance of completed development within the receiving environment.
- Direct employment during construction possible influx of labours and stress on public utilities and services
- Use of water and power and its source during construction, proposed earth moving, and dredging
- Proposed plan for transportation and storage of construction material.
- Detailed schedule of activity and resource requirements.
- Disposal of solid waste/dredged material.
- Facility residue disposal: description of the disposal method(s) giving tons disposed per day at full production for each type of residue.
- Transport: brief description of how the raw material and final products will be transported (to their point of sale inland or port of export) is required.

4.0 Description of The Environment/Baseline

Baseline data should be identified, collected and used to describe the status of the project site before any activity related to project implementation commences. The description of the environment/baseline should be categorized into three: social component, biophysical component and regulatory framework applicable to the proposed developmental facility.

4.1 Biophysical Component

(a) Climate and Air Quality: Precipitation patterns (amount, frequency, trend), wind patterns (direction, speed, frequency), temperature, climatic zone and air quality measurements.

(b) Topography: Drainage patterns, elevations and slopes, prominent features

(c) Soils and Geology: Regional geology and geomorphology, seismic history, and soil type, characteristics and profile, land use map.

(d) Hydrogeology: Regional hydrogeology, site hydrogeology

(e) Water resources (ground and surface): Quality (organic and inorganic composition), depth and thickness of aquifers, hydraulic recharge, quantity, seasonal variations, flow rates, ecological characteristics, and uses.

(f) Ecology: Vegetation type, type and distribution of intrinsic flora and fauna

4.2 Human Component

This includes, but not limited to, health impact assessment and the social, cultural, economic component of the environment. The issues following issues should be considered in the EIA report;

(a) Communities likely to be affected: Location, access, population (number, demographic and social characteristics); economy (employment rate, income distribution); services (types, capacity, adequacy) and housing; concern in the ability to (i) provide work force, (ii) service new development and (iii) absorbs and adjust to growth (worker/family in-migration): waste management and disposal, energy sources/services

(b) Land Use: Intensive and casual, full time and seasonal, actual and projected, specially designated areas (parks, refuges, reservoirs, and wilderness), man-made features (structures, roads, and utilities), land rights, organizations (NGOs).

(c) Areas of ecological interest including unique ecosystem and reserves for endangered species

(d) Culture and Tradition: Historic sites, native religious sites.

(e) Health: Healthcare statistics, disease vectors, psychological challenges, epidemics, nutritional status, public health/safety, waste management

(f) Infrastructure: Healthcare facilities, roads, water infrastructures, electricity, telecommunication.

5.0 Associated and Potential Environmental Impacts

The identification, prediction and evaluation of potential impacts of the project on the environment should be investigated and described. The impacts should be broadly defined to cover all potential effects on the environment. Also;

(a) A description of direct impact and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative impact of the project should be addressed.

(b) The types of impact in (1) above should be described with regards to human beings, flora and fauna, soil, water, air, climate, land, cultural and interactions amongst them.

(c) Impacts during construction and operation phases should be considered including impacts that might arise from non-standard operating conditions, accidents e.t.c.

(d) Predicted impacts should be derived from baseline conditions as to prevail as a consequence of the project.

(e) Identification of impacts should be by a systematic methodology such as project specific checklists, matrices, overlays, Ad-hoc, networks, geographic information system (GIS), expert opinion, Delphi technique e.t.c.

(f) A brief description of the impact identification method should be described and the rational for using it.

(g) The significance of impacts should be assessed, taking into account appropriate national and international standards where available. consideration should also be made for magnitude, location and duration of the impacts. The choice of significance assessment should be justified and any contrary opinion elaborated upon.

(h) The EIA study should also consider the cumulative impacts that could arise from a combination of the impacts due to other projects with those of other existing or planned projects in the surrounding area and including residual impacts.

6.0 Mitigation Measures / Alternatives

(a) For ensuring a thorough site selection process, alternative sites should have been considered where practicable with primary advantages and disadvantages and reasons for the final choice detailed. Including alternative processes, designs, and operating conditions.

(b) Mitigations of all significant adverse impacts for the project type should be considered. Any residual or unmitigated impacts should be justified.

(c) The extent of effectiveness of mitigations measures when implemented should be described.

(d) Mitigation methods considered should include modification of project, compensation and the provision of alternative facilities as well as pollution control.

(e) Details of how the mitigation measures will be implemented and function over the time span for which they are necessary should be highlighted.

(f) Mitigation measure should be described with respect to the impact of significances to which it relates and the conditions under which it is required (for example, continuously or in the event of contingencies). These should also be cross-

referenced to the project design and operating procedures which elaborate on the technical aspects of implementing the various measures.

6.1 Mitigation Alternatives

Prior to selecting mitigation plans it is appropriate to study the alternatives for cost-effectiveness, technical and social feasibility. Such mitigation measures include:

(a) avoiding environmental sensitive areas (ESAs)
(b) adjusting work schedules to minimize disturbance
(c) engineered structures such as berms and noise attenuation barriers
(d) pollution control devices such as scrubbers and electrostatic precipitators
(e) changes in fuel feed, manufacturing, process, technology use, or waste management practices, such as substituting a hazardous chemical with a non-hazardous one, or the re-cycling or re-use of waste materials, etc.

Figure 1 below gives an indication of the mitigation procedure.

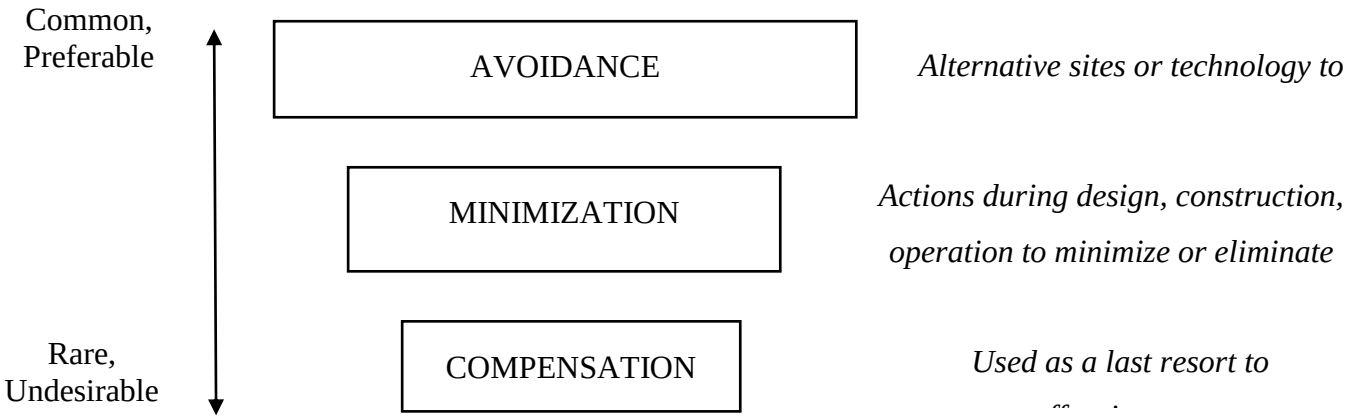

Figure 1: Hierarchy of elements of mitigation plan

7.0 Environmental Management Plan (EMP)

The Proponent shall design an Environmental Management Plant (EMP) which shall provide a framework for managing or mitigating environmental impacts throughout the life of the project. The EMP shall outline the mitigation, monitoring and institutional measures to be taken during project implementation and operation to avoid or control adverse environmental impacts, and the actions needed to

implement the measures. The EMP shall be designed to provide the means for continuous self-assessment of the predictive accuracy of the impacts and the management effectiveness of project implementation and operation. The EMP shall also make provision for monitoring/auditing the effectiveness of the proposed environmental protection measures and procedures.

A well prepared EMP shall have the following:

(a) Summary of the project activities and the associated impacts
(b) Outline of legal requirements and best practices that apply to the project
(c) Plan for mitigation management
(d) Identified monitoring and auditing requirements
(e) Roles and responsibilities of the project proponent and its contractors
(f) A plan for environmental monitoring, auditing and reporting
(g) Prescribed mechanism through which public consultation will continue during the project
(h) Programme for training of project crew on the implementation of the EMP.

8.0 Remediation Plans after Decommissioning

Project proponent shall provide the best remediation plans that will be adopted where the Oil and Gas Terminal or Flow Station Facility needs to be decommissioned or closed (temporarily or permanently). The Decommissioning and Remediation Plans should provide a framework for the implementation of decommissioning and rehabilitation activities in the closure phase of the Project. The plan should be in line with the FMEnv guidelines for decommissioning and best international practices. A remediation plan should be drawn by the proponent and approved by all concerned (regulators and stakeholders) before execution. Both beneficial and adverse environmental effects of the decommissioning or closure should be painstakingly stated. Mitigation measures should be prescribed to ensure health of workers and environmental safeguards and to minimize the risk of possible incidental events during decommissioning phase.

Mitigation measures shall be proffered for the adverse effects due to decommissioning or closure. Such measure should include the removal of contaminated soils, remediation of polluted water bodies, excavation and proper management of storage tank residue etc.

Project proponent shall also design means of restoring the project location back to its original status at the same time ensuring protection of the environment and humans before the project execution.