Table 7.3: Impact Management and Monitoring Plan – Mobilization Phase

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
Site preparation (Land clearing, excavation)	Loss of flora and fauna	Site clearing shall commence from developed (e.g. roads) to undeveloped areas to provide escape routes for wildlife	Site clearing inspection records	Daily	Weekly	TEPNG
		Hunting by the workforce shall be prohibited	Compliance records	Weekly	Monthly	TEPNG
		TEPNG shall educate construction workers and host communities on the sensitive nature of the biodiversity of the area and the need for conservation	Records of HSE meetings and community enlightenment sessions	Weekly	Monthly	TEPNG
	Loss of habitat	TEPNG shall limit cleared area to what is required	Site clearing inspection records	Daily	Weekly	TEPNG
		TEPNG shall encourage the re-vegetation of land cleared for temporary use where feasible	Implementation records	One month after site clearance	Three monthlies	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
	Community unrest	TEPNG shall ensure that all host communities are represented in the employment of locals during land clearing and excavation to avert any conflict that could arise from perceptions of unfairness	Employment records for locals	Weekly	Monthly	TEPNG
		TEPNG shall ensure that land clearing and excavation jobs are reserved exclusively for the host communities	Employment records for locals	Weekly	Monthly	TEPNG
		TEPNG shall abide by all MoUs entered understandings the host communities	Records of compliance with Agreement items	Monthly	Quarterly	TEPNG
	Stress on existing security structures	TEPNG shall ensure that both contractor and TEPNG personnel develop a high level of security consciousness both within and outside the work area	Statistics of security breaches	Weekly	Monthly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
		If required, special security force shall be established and deployed for the project. This shall include deploying some of TEPNG police to strengthen security in the area	Number of special security personnel on site	Weekly	Monthly	TEPNG
		TEPNG shall ensure that a liaison to foster partnership with the community so as to guarantee security for the project is established and sustained	TEPNG- community meetings	Monthly	Monthly	TEPNG
		In order to beef up security for the project, TEPNG shall contact government authorities to improve the strength of the police force and shall consider providing assistance, to ensure improved security	Deployment of police personnel and records of security equipment.	Monthly	Annually	TEPNG
		TEPNG shall ensure that safety workshops to identify, evaluate and recommend contingency plans for all security risks are regularly organized	Records of security workshops	Monthly	Quarterly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
	Increase in dust and noise	TEPNG shall ensure that nose masks and earmuffs are worn by site workers during excavation	SPM, records of respiratory diseases and noise levels	Monthly	Monthly	TEPNG
		Water shall be sprayed on construction sites to reduce dust levels especially during dry season	Records on compliance, SPM at selected sites within 500m band	Weekly	Monthly	TEPNG
	Potential increase in erosion	TEPNG shall re-vegetate areas not needed for construction as soon as possible.	Records of re-vegetation exercise	Monthly	Quarterly	TEPNG
	Threat to health of workers (snake bites, insect stings, injuries etc)	TEPNG shall provide and ensure usage of PPE by field workers	Compliance records	Weekly	Monthly	TEPNG
		TEPNG shall ensure that an adequate number of trained first aiders are available at work sites	First aid training records and statistics	Monthly	Quarterly	TEPNG
		TEPNG shall ensure that anti-venom/anti-histamine is provided on site to mitigate snake bites and insect stings	Records of anti-venom/anti-histamine at site clinic	Monthly	Quarterly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
		TEPNG shall ensure that awareness is created among site workers on the likelihood of exposure to poisonous wildlife and plants	Awareness records	Monthly	Monthly	TEPNG
Influx of labour and followers (dependents, bounty seekers)	Changes in local population	Prior to commencement of the construction phase, TEPNG shall advertise construction jobs that will be available. This will hopefully discourage unqualified personnel from moving into the project area, thus reducing the rate at which population will grow	Records of applications at employment office and copy of advertisement	Weekly	Monthly	TEPNG
		TEPNG will look into the development of off-site job recruitment to discourage influx of people.	Documentary evidence of implementation	3-months	6-monthly	TEPNG
		Movement of unauthorized persons into camps shall be strictly restricted	Records of access control	monthly	Quarterly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
	Increase in morbidity (including STIs and mortality)	Health awareness on the mode of transmission of STIs (including HIV/AIDS)	Statistics of health awareness lectures	Intensive phase one to two months prior to mobilization and quarterly there after	Quarterly	TEPNG SD and Occupational Health teams
		As much as possible, psychological support shall be provided to persons living with the HIV virus	Records of HIV support programs	Quarterly	6-monthly	TEPNG SD and Occupational Health teams
		Immunization of workforce as appropriate	Records and statistics of immunization	During mobilization	Quarterly	TEPNG
		TEPNG shall enforce malaria policy	Compliance	Monthly	Annually	TEPNG
		Vector control to reduce incidence of malaria (such as regular spraying of camp and provision of insecticide treated nets) (ITN)	Records and statistics of ITN distribution	Monthly	Quarterly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
		Awareness campaign shall be carried out to enlighten the communities/field workers on the common communicable diseases and the health implications of drug and alcohol abuse, unprotected sex, prostitution and the need to sustain cultural values	Statistics of health awareness lectures	Monthly	Quarterly	TEPNG
		Alcohol and drug policy shall be implemented to encourage healthy lifestyle for workers	Records of violations	Monthly	6-monthly	TEPNG
		TEPNG shall support the activities of the state action committee on STIs/HIV/AIDS within the local communities	Records of supportive action	Monthly	Quarterly	TEPNG Occupational Health team
		TEPNG shall provide site clinic to take care of minor illnesses for all workers	Statistics of attendance, morbidity and mortality	Weekly	Monthly	TEPNG
		TEPNG shall provide contraceptives for construction workers	Condoms availability to workers	Monthly	Quarterly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
	Increase in social vices	Intensive enlightenment campaign and health education for the abatement of abuse of drugs, alcohol in the communities and among workers throughout the life of the project	Enlightenment campaign/health education statistics; records of cases of abuse in the workforce	At least 3 months before commencement of construction activities then 6-monthly thereafter	Annually	TEPNG
		TEPNG shall ensure that contractor enforces the alcohol and drug policy for staff	Records of violation	6-monthly	Annually	TEPNG
		TEPNG shall support sporting activities	Number of sporting activities	6-monthly	Annually	TEPNG team
		TEPNG shall support public health lectures with emphasis on common communicable diseases such as malaria, TB, STIs including HIV/AIDS	Statistics of health awareness lectures	1 to 3 months before mobilization and then quarterly thereafter	Quarterly	TEPNG
		TEPNG shall support local security systems	Record of TEPNG support	Quarterly	6-monthly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
		TEPNG shall provide contraceptives for construction workers	Number of condoms provided and distributed	Monthly	Quarterly	TEPNG
		TEPNG shall ensure that contractor implements social and health awareness programs for all workers at induction and on a continuous basis throughout the life of the project	Statistics of social and health awareness programmes	At induction and quarterly thereafter	Annually	TEPNG
	Increase in inflation level	TEPNG shall support skill development and enhancement of the local communities through training	Number of beneficiaries of skill acquisition	6-monthly	Annually	TEPNG team

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
	Changes in culture, lifestyle and habits	TEPNG shall carry out enlightenment campaigns to encourage positive influences on cultural values and healthy lifestyles (e.g. breast-feeding habits, alcohol and drug use, exercise, monogamy, high moral values with regard to sexuality etc) and discourage adverse influences (e.g. prostitution, drug abuse, alcoholism etc)	Records of enlightenment sessions	6-monthly	Annually	TEPNG
Waste generation and disposal	Increase in breeding ground for disease vectors and other agents of diseases	TEPNG waste management policy shall be enforced	Compliance	Weekly	Monthly	TEPNG
	Pressure on existing waste management system	TEPNG shall explore ways to assist the communities in managing wastes	Records of supportive action	Quarterly	Annually	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
	Increase in noise and vibration levels	TEPNG shall alert communities in advance of the activities that are likely to increase noise and vibration levels	Records of information/consultation sessions	1 month before Work	2 weeks before commencement of Work	TEPNG team
	Contamination of the environment by Work wastes	TEPNG shall ensure regular collection and disposal of wastes in accordance with the TEPNGs waste management plan	Compliance	Weekly	Monthly	TEPNG
		TEPNG shall ensure that disposal of Work wastes is in line with regulatory standards	Compliance	Weekly	Monthly	TEPNG
Construction	Reduction in air quality (emissions)	TEPNG shall ensure that all stationary sources are properly maintained	Maintenance records	Monthly	Quarterly	TEPNG
	Changes in aesthetic quality of the environment	TEPNG shall alert communities on anticipated visual environmental changes during the activities	Records of consultation/information	1 month before the commencement of activities	Once during activity	TEPNG SCD team
		TEPNG shall ensure that the site restoration certificate process is completed	Compliance	3 months after	6 months after	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
				construction works	construction works	
		TEPNG shall re-vegetate areas that are not required for operation and maintenance of the well head cellar	Compliance	3 months after construction works	6 months after construction works	TEPNG
	Contamination of the environment by chemicals	TEPNG shall ensure that chemicals are stored in lined bunded areas in sealed containers with rain protection	Compliance	Weekly	Monthly	TEPNG
		TEPNG shall ensure that SHOC cards/MSDS are available at site to provide advice on clean-up in the event of spills and leaks	Compliance	Weekly	Monthly	TEPNG
	Contamination of the environment by domestic wastes	TEPNG shall ensure regular collection and disposal of wastes in accordance with the project waste management plan	Compliance	Weekly	Monthly	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
	Soil degradation from spills and leaks	TEPNG shall ensure that all maintenance and repair of equipment and vehicles are done in a secure location with clean-up materials etc) are readily available	Compliance	Monthly	Quarterly	TEPNG
	Change in topography	TEPNG shall ensure that the original topography is maintained as far as practically possible	Site inspection reports	Weekly	Monthly	TEPNG
	Exposure to radiation materials	TEPNG shall ensure that adequate safety measures (appropriate PPE and engineering techniques) are put in place to avoid exposure to radioactive materials	Site inspection reports	Daily	Weekly	TEPNG
	Potential for inhalation of welding fumes	TEPNG shall ensure that adequate safety measures (appropriate PPE) are put in place to avoid inhalation of welding fumes	Compliance	Weekly	Monthly	TEPNG
	Potential for conflicts arising from labour issues	TEPNG shall ensure that it abides by agreements reached with the welder's union before their engagement	Compliance with MOUs; Records of complaints and conflicts	Monthly	Quarterly	TEPNG

Table 7.4: Impact Management and Monitoring Plan – Operation and Maintenance Phase

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspection/Monitoring	Frequency of Formal reporting	Action Party
Operation and Maintenance of facility	Increase in noise levels	TEPNG shall encourage Community members Not to settle near the facility	Visual monitoring of the level of encroachment	6-monthly	Annually	TEPNG
		TEPNG shall place warning signs including noise maps at strategic locations within the facility	Display of warning signs and locations	6-monthly	Annualy	TEPNG
		TEPNG shall protect Hearing of Workers through the Enforcement of the Recommendations of Job Hazard Analysis (JHA)	Compliance	6-monthly	Annualy	TEPNG
	Reduction in air quality	TEPNG shall ensure that appropriate maintenance programs are in place for all equipment	Maintenance Records	6-monthly	Annually	TEPNG
	Degradation of soil and surface water from spills and leaks	TEPNG shall provide containment for chemicals and liquid discharges	Compliance	6-monthly	Annually	TEPNG
		TEPNG shall ensure that chemicals are stored in lined bunded areas in sealed containers with rain protection	Compliance	6-monthly	Annualy	TEPNG

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter for Monitoring	Frequency of Inspection/Monitoring	Frequency of Formal reporting	Action Party
		TEPNG shall ensure that SHOC cards/MSDS are available at site to provide advice on clean-up in the event of spills and leaks	Compliance	Quarterly	Annually	TEPNG
		TEPNG waste management policy shall be enforced	Compliance (waste consignment notes)	Quarterly	Annually	TEPNG
		TEPNG shall ensure that a controlled fuelling, maintenance and servicing protocol for operation machinery at worksite is established and followed to minimise leaks and spills	Compliance	6-montly	Annually	TEPNG
	Relative drop in economic activities	TEPNG shall support skill development and enhancement of the local communities through training as agreed in the Stakeholders Plan (SP) and Social Action Plan (SAP)	Compliance with SP and SAP	6-montly	Annually	TEPNG SCD team

Table 7.5: Impact Management and Monitoring Plan – Commissioning phase

Project Activity	Impact (positive or negative	Mitigation/Enhancement	Parameter For Monitoring	Frequency of Inspectional/ Monitoring	Frequency of Formal reporting	Action Party
Commissioning	Threat to health of workers	TEPNG shall ensure that fully equipped first aid facility and trained first aiders are available on site at all times and valve stations	Records of first aid box inventory and health statistics from Retainership clinics	Weekly	Monthly	TEPNG
		TEPNG shall enforce appropriate use of Personal Protection Equipment (PPE)	Compliance	Weekly	Monthly	TEPNG
		TEPNG shall ensure the training of first aiders at least 1:50	Records of first aid training	Monthly	Quarterly	TEPNG
		TEPNG shall ensure that anti-venom/anti-histamine is provided on-site to mitigate snake bites and insect stings	Records and adequacy of anti-venom/anti-histamine	Monthly	Quarterly	TEPNG
	Contamination of the environment by Work wastes	TEPNG shall ensure regular collection and disposal of wastes in accordance with the TEPNGs waste management plan	Compliance	Weekly	Monthly	TEPNG
		TEPNG shall ensure that disposal of Work wastes is in line with regulatory standards	Compliance	Weekly	Monthly	TEPNG

7.7 EMP BUDGETING

To effectively execute this Environmental Impact Assessment (EIA) and ensure comprehensive environmental monitoring, it is essential to develop a detailed and realistic budget for the Environmental Monitoring Plan (EMP). Below is a recommendation for budgeting for the EMP activities at the Ubeta FDP site.

1. Personnel Costs

Funds shall be allocated for staffing needs, which include personnel to conduct in-situ measurements, field assessments, and taxonomic studies, as well as those involved in stakeholder consultations and dialogue.

2. Sampling and Field Equipment Costs

Estimate shall be made to budget for air, water, soil, and sediment quality measurement equipment, including monitors, meters, and reagents for ASTM and APHA standards.

3. Laboratory Analysis Costs

Costs shall be provided for external laboratory analysis services, if the company does not possess in-house facilities for all required tests.

4. Transportation and Logistics

A budget estimate shall be allocated for the associated transportation of personnel to and from the site and the safe transport of samples to laboratories or storage facilities.

5. Data Management and Reporting

A budget estimate shall be provided for the preparation and dissemination of compliance reports to regulatory bodies such as FMEnv, RSMEnv, NUPRC, and for maintaining in-house records.

6. Consultation and Stakeholder Engagement Costs

Budget estimates shall be provided for expenses related to stakeholder engagement, in the course of monitoring.

7. Contingency Funds

A contingency fund shall be incorporated to manage unforeseen costs and ensure flexibility in the EMP execution. This fund shall address unplanned expenses arising from regulatory changes, unexpected environmental impacts, or modifications in monitoring protocols.

8. Budget Formulation

To estimate monitoring costs, all expenses must be categorised by frequency and duration.

7.8 CONTINGENCY PLANNING

Despite all care and diligence exercised in project execution, accidents still do occur. Accidents could occur from equipment failure or third-party error or sabotage, all to the detriment of the environment. Consequently, Gas Contingency Plans are usually made to handle such accidental emissions. Although serious incidents are considered unlikely in this project, TEPNG has in place a Contingency Plan that has been activated, regularly updated through regular and periodic checks conducted by the Nigeria Upstream Petroleum Regulatory Commission (NUPRC). Appendix 7.1

7.9 EMERGENCY RESPONSE PLAN

Detailed emergency response plan for the project is presented in Appendix 7.2

7.10 WASTE MANAGEMENT

7.10.1 Introduction

Waste management is a key aspect of the Health, Safety and Environmental Management System (HSE-MS) in TEPNG. The HSE-MS in place for TEPNG operations are certified to ISO 14001 in line with corporate standards and in compliance with regulatory requirements. The key principles governing waste management in TEPNG are based on waste minimization, recycling, recovery, re-use and/or recovery. Waste will be managed and disposed in line with corporate standards (ISO 14001) and in compliance with regulatory requirement (as outlined in the EGASPIN 2018).

7.10.2 Waste Composition

Site clearing and excavation will result in the generation of large quantity of solid waste, essentially biodegradable vegetation, wood debris and soil. Civil engineering works will generate volume of wastes which will include wood and iron rod cuttings. Mechanical engineering works will generate pipe cutting wastes, welding wastes, x-ray photographic waste, radiation materials container wastes, Electrical works will generate waste cartons, cable cutting etc. Drilling will generate drilling fluids and drill cuttings. Administration wastes are mainly paper from site construction offices and from the Central Processing Facility during operations. Sewage generated during construction will be handled via mobile toilets which shall be placed at specific locations on the pipeline right of way and emptied by sewage trucks. Sewage generated in the construction camps shall be handled by used of sewage treatment plants.

7.10.3 Waste Management

Waste generated throughout all stages of this project shall as a matter of deliberate commitment be managed from cradle to grave. The Proponents of this project will:

- Take all practical and cost-effective measures to minimize the generation of wastes, by implementing the four R's (reduce, reuse, recycle, recover) of waste management through process optimizations, efficient procedure and good housekeeping;

- Minimizing the hazards presented by all wastes and ensuring that all wastes shall be managed and disposed of in an environmentally acceptable manner. This policy implies that:
- All activities planning must, at inception, address waste management, and shall not be approved without this being seen to have been done;
- The management of waste is a line responsibility and key/front -line staff shall be actively involved in controlling the wastes generated by their activities.

7.10.3.1 Construction Phase

The following procedures shall be adopted in handling wastes emanating from the construction stage:

All waste generated shall be classified and registered.

- Waste shall be segregated at site into the following categories:
- vegetation debris (leaves, cut grass, tree branches)
- Construction debris
- Scrap metals and welding off-cuts
- Cable cutting
- Drums
- Spent lube oil
- Oil and fuel filters
- Hazardous wastes e.g. – solvents, drilling fluids and drill cuttings.
- Glass
- Biodegradable domestic wastes
- Office and stationery wastes (toner cartridges, diskettes, etc.)

All wastes shall be quantified, and the inventory data recorded. The details of the waste category and their volume is provided in Appendix 7.3.

- **Table 7.6: Waste and Management options**

Vegetation debris (leaves, cut grasses, tree branches)	Approved Dumpsite/incinerator
Construction debris	Approved Dumpsite/incinerator
Scrap metals	Recycling
Cable cuttings	Recycling
Drums	Recycling
Spent lube oil	Recycling
Oil and fuel filters (Hazardous)	Approved Incinerator
Hazardous waste; e.g. solvent, thinners (Hazardous)	Approved Facility
Radiation waste (cartridge or radiation source container)	Approved Facility
Glass	Recycling
Biodegradable domestic wastes	Approved Incinerator
Office/stationary wastes (toner cartridge, diskettes, etc.)	Recycling

The cradle to grave waste management strategy will be managed with the use of waste transfer notes.

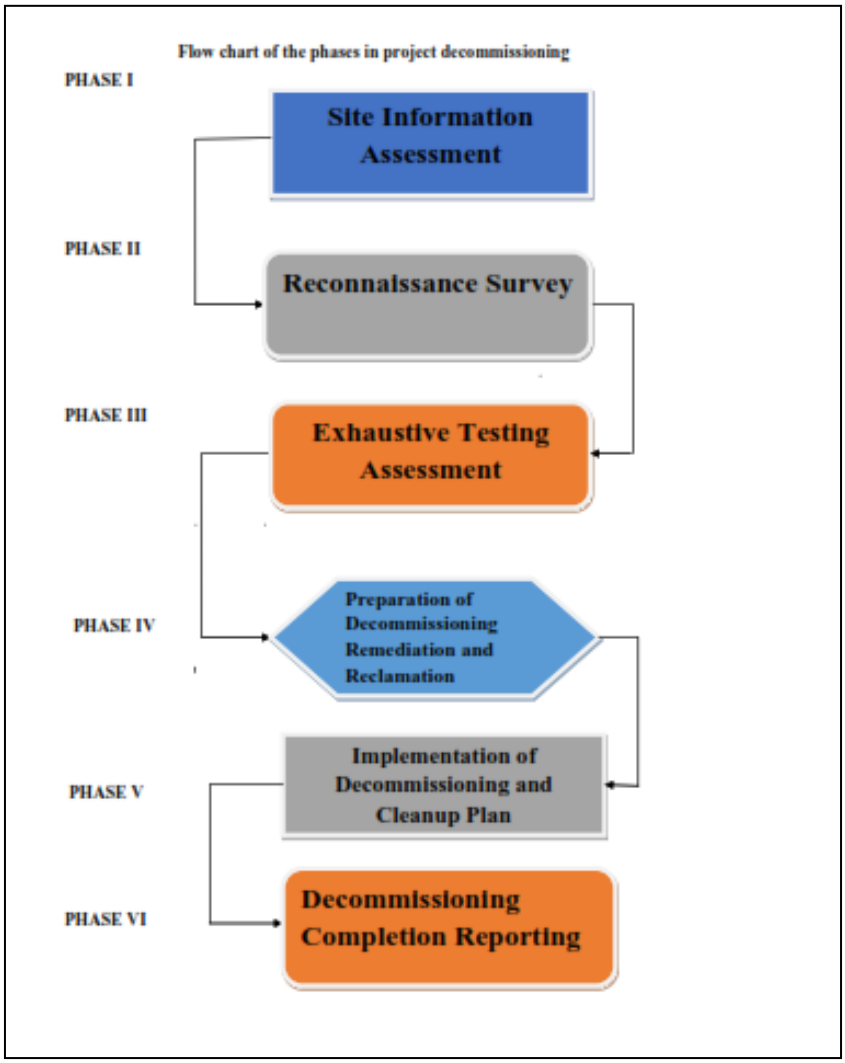
7.11 DECOMMISSIONING AND REMEDIATION PLAN

The decommissioning and abandonment plan will follow the decommissioning/abandonment phases as illustrated by FMEnv (Figure 7.2.) Before abandonment, TEPNG will develop decommissioning plans for:

- Environmental aspects of the decommissioning activity.
- Methods for facility re-use, recycling, disposal, removal or abandonment.
- Proper consultation with all stakeholders (communities, other land users and regulators).
- Efforts to mitigate negative environmental impacts and appropriately rehabilitate the site.
- Programs for restoring the environment in accordance with national (FMEnv and NUPRC) and international best-practices and regulatory requirements.
- Scope of work to assess possible residual impacts of the facility on the environment; specifically, any future restrictions on other activities.

The content of the plan will take into consideration the extent of the decommissioning (temporary or permanent, partial or complete shutdown), plans for future use of the site, and the condition of the site and environment at the time of decommissioning. A detailed post operational study of the impact of the project on the environment will be conducted to determine appropriate restoration and remedial measures.

At this stage, only preliminary plans exist for decommissioning and abandonment. Additional details will be developed as the project progresses. In general, however, decommissioning activities will be conducted in compliance with applicable regulations and guidelines, including FMEnv guidelines and NUPRC EGASPIN, Section VIII-G "Decommissioning of Oil and Gas Facilities", or any other regulations that are in force at the time of decommissioning. The plans will also include regulations and a risk and cost analysis of the various options. The abandonment plan will consider all facilities associated with the Project.



- **Figure 7.2 Decommissioning Phases** (Source: Federal Ministry of Environment)

- **7.11.1 Remediation**

This will entail:

a) A survey of the decommissioned site for contamination;
b) Initial conclusions on the hydrology and geology;

c) Preparation of a Site Assessment Action Process Flow Sheet to be approved by FMEnv and also NUPRC as provided in Fig. VIII-F1 in EGASPIN; and
d) Interim action or remediation designed to confirm applicability and feasibility of one or more potential remedial options: such as application of dispersants or biological treatment using petroleum degrading bacteria or by aeration process.

Finally, the site shall be monitored for compliance and performance to confirm effectiveness to remedial measures. At the end of the site abandonment, the following useful documentations shall be reviewed:

a) The initial abandonment plan
b) The abandonment operations conducted in the project area, along with changes to plan necessitated by field conditions.
c) Toxicity test report carried out on all decommissioned items.

- **7.11.2 Reporting**

As required by regulations, a post decommissioning report (PDR) will be prepared and submitted to the FMEnv and NUPRC. The report will provide the following details:

- Overview of decommissioned facilities.
- Details of methods used for decommissioning.
- Nature of decommissioning (partial or whole).
- Record of consultation meetings.
- Details of recyclable/reusable materials/facility components.
- Decontaminated facilities.
- Decommissioning Schedule.
- State of the surrounding environment.
- Waste Management Plan.
- Plans for restoration/remediation where necessary

Chapter 8

CONCLUSION

A multidisciplinary team of experts has carefully developed and assessed the status and sensitivity of the many ecological and socioeconomic components of the project environment by literature study, field sampling, measurements, and testing within the planned project region.

To identify, characterize, and evaluate the potential and associated impacts, other source references were employed in conjunction with the interactions of the various ecological and socioeconomic components of the existing environment with the known activities of the proposed project.

Mitigation measures were subsequently developed for adverse impacts based on industry best practice, available technology and HSE considerations.

Throughout the project's lifecycle, consultations will be held with the host communities, regulatory bodies, and other stakeholders. The impact analysis of the proposed project, shows that it would have a favorable impact on the socioeconomic well-being of the populace by creating semi-skilled and unskilled jobs and providing social services

Increased gas production which will improve gas supply to satisfy the needs of Bonny Nigeria Liquefied Natural Gas (NLNG) plant and the domestic market will boost the economy of Nigeria and boost revenue generation in the country. It will also

The proposed project will also contribute to significant socio-economic development within the host communities and result in long term economic empowerment for the indigenes, residents and other professionals.

The identified adverse impacts were generally short-term and can be prevented, reduced, ameliorated, or controlled if the recommended mitigation measures are implemented. Further, an Environmental Management Plan (EMP) has been developed to ensure that the identified potential impacts can be reduced to “as low as reasonably practical” (ALARP). The EMP should therefore form the basis for the actual project implementation and future monitoring of environmental components.

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DOCUMENT CONTROL

This report ***"UBETA FIELD DEVELOPMENT PROJECT ENVIRONMENTAL IMPACT ASSESSMENT"*** was prepared by Delta Systematics Limited for TotalEnergies Exploration and Production Nigeria Limited (TEPNG). All confidentialities are maintained.

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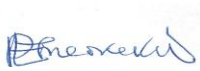
Reviewed by	Nnaemeka Okeke		Project Manager
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Revision: Version 2

Date: 30th April, 2024

COMPANY MANAGEMENT SYSTEM

LEVEL 2 DOCUMENT

JV ASSET OIL SPILL CONTINGENCY PLAN - STRATEGY PLAN

Approval

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03	01/23	DMD, JV Asset	Alignment to IMS and OSRL service update
02	05/16	DMD, PHC District	Review in Line with new Organization/Rex on 12” OBG-RUM Export Line spill
01	06/13	DMD, PHC District	Review in line with new district organisation
0		DMD, PHC District	First Issue
Rev.	**Date**	**Authorised by**	**Brief comments**

Contents

1. Purpose

The Oil Spill Contingency Plan (OSCP) is part of TEPNG emergency management documentation. It is designed to assist personnel in providing a response to an accidental hydrocarbon spill that may occur on water (sea or inland waters) or on land during TEPNG-JV Asset activities. The OSCP framework is made of Asset OSCP and site specific OSCPs.

The purpose of the District OSCP is to specifically provide the TEPNG-JV Asset Incident Management Team (IMT) and Crisis Management Cell (CMC) the main procedures to be implemented and the information required during an oil spill response.

The General OSCP consists of 3 volumes:

Volume 1 – Action Plan

Volume 2 – Response Handbook

Volume 3 – Strategy Plan (Non-operational document)

Note that the oil spill emergency contact numbers are contained within the Emergency Response Directory.

The purpose of this volume is to specifically give an overview of the oil spill risks that result from TEPNG-JV Asset oil handling operations and to justify the oil spill response capabilities that have been established.

2. Scope

The Strategy Plan is a non-operational document containing relevant data and information that is not useful during the emergency for the teams on sites but is essential to understand basis of how the OSCP has been developed and response capabilities built. This approach also ensures that the Action Plan and the Response Handbook are concise and succinct.

3. Related documents

3.1. Internal to TotalEnergies Upstream Companies in Nigeria (CMS)

Reference	Title
HLP-HSE/GEN-M01-011	TUCN Health Safety Environment and Quality Policies
HLP - COM - COM - 22	Communication and Media Policy
PRD-COM-COM-10	Issuance of Press Releases Statements Procedure
PLN-HSE/GEN-M07-021	TUCN Crisis Management Plan
PLN - DCD - DCD - 05	JV Asset BOCP Part I Blow Out Contingency Plan
CHA-HSE/GEN-M01-041	TUCN Health Safety and Environment Charter
PLN - HSE/ENV-M05-02	TUCN Waste Management Plan
PRD- HSE/GEN- M03-62	Responsible for Safety and Environment on Site (RSES) Procedure
PRD-HSE/GEN-M02-25	Internal and External HSEQ Communication Procedure
PLN-HSE/GEN-M07-022	JV Asset Emergency Response Plan
PLN-HSE/GEN-M07-025	Affiliate Medical Evacuation Procedure
PRD-HSE/GEN-M08-011	Reporting and management of HSE events and anomalies
PLN-SEC-SEC-50	JV Asset Security Plan
GM-HSE/GEN-M04-38	Principles and Practices of HSE Risk Management in Operations
PLN-HSE/GEN-M07-24	DW OSCP - Vol.1A - Action Plan
PLN-HSE/GEN-M07-25	DW OSCP - Vol.1A – General Context
PLN-HSE/GEN-M07-26	DW OSCP - Vol.1A – Response Handbook

3.2. TotalEnergies Group/E&P documents

Reference	Title
Directive DIR-EP-00	Management of the E&P Standards applicable to Exploration and Production Segment
DIR GR-HSE 001	One-MASESTRO HSE Principles

CR GR-HSE 001	One-MAESTRO HSE Expectations
CR EP FP 270	Blow out Contingency plan
CR EP GIN 301	Geographic Information in Exploration & Production: Organization and Management
CR EP HSE 094	Oil spill preparedness and response policy in Exploration & Production
CR EP HSE 031	HSE risk management in operations
CR EP HSE 035	Site Hygiene Safety and Environment Manager (RSES)
CR EP HSE 041	Technological Risk Management
CR EP HSE 060	Industrial Hygiene and health at work
CR EP HSE 081	HSE Training of Exploration and Production Personnel
CR EP HSE 082	HSE Training for personnel holding job in HSE domain
CR EP HSE 091	Managing emergencies/crisis in affilliates
CR EP HSE 092	Information, notification and communications between affiliates and E&P in case of emergency/crisis
CR EP HSE 093	Large-Scale Exercises (LSE's)
CR EP HSE 501	GIS Deliverables for HSE
CR EP HSE 102	Anomalies, incidents, and occupational illnesses. Definitions, reporting and recording
CR EP HSE 411	Environmental Management and Protection in Operations
GS EP ENV 120	Environmental Impact assessment of E&P activities
CR EP HSE 094	Oil spill preparedness and response policy in Exploration & Production
GM EP HSE 091	Guidelines for Affiliate Emergency Response Plan
GM EP HSE 093	Guidelines for Site Contingency Plan
GM EP ENV 071	Implementation Guide - HSE Management of contractors

3.3. External documents

Reference	Title
NCP, 2000	National Contingency Plan by National Emergency Management Agency (NEMA)
NDRP, 2001	National Disaster Response Plan by National Emergency Management Agency (NEMA)
EGASPIN, 2002	Environmental Guidelines and Standards for the Petroleum Industry in Nigeria by National Upstream Petroleum Regulatory Commission (NUPRC/ NMDPRA)
NOSCP, 2011	National Oil Spill Contingency Plan by National Oil Spill Detection and Response Agency (NOSDRA)
NOSDRA, 2011	S.I. No. 25 Oil Spill Recovery, Clean-up, Remediation and Damage Assessment Regulations
NOSDRA, 2011	S.I. No. 26 Oil Spill and Oily Waste Management Regulations

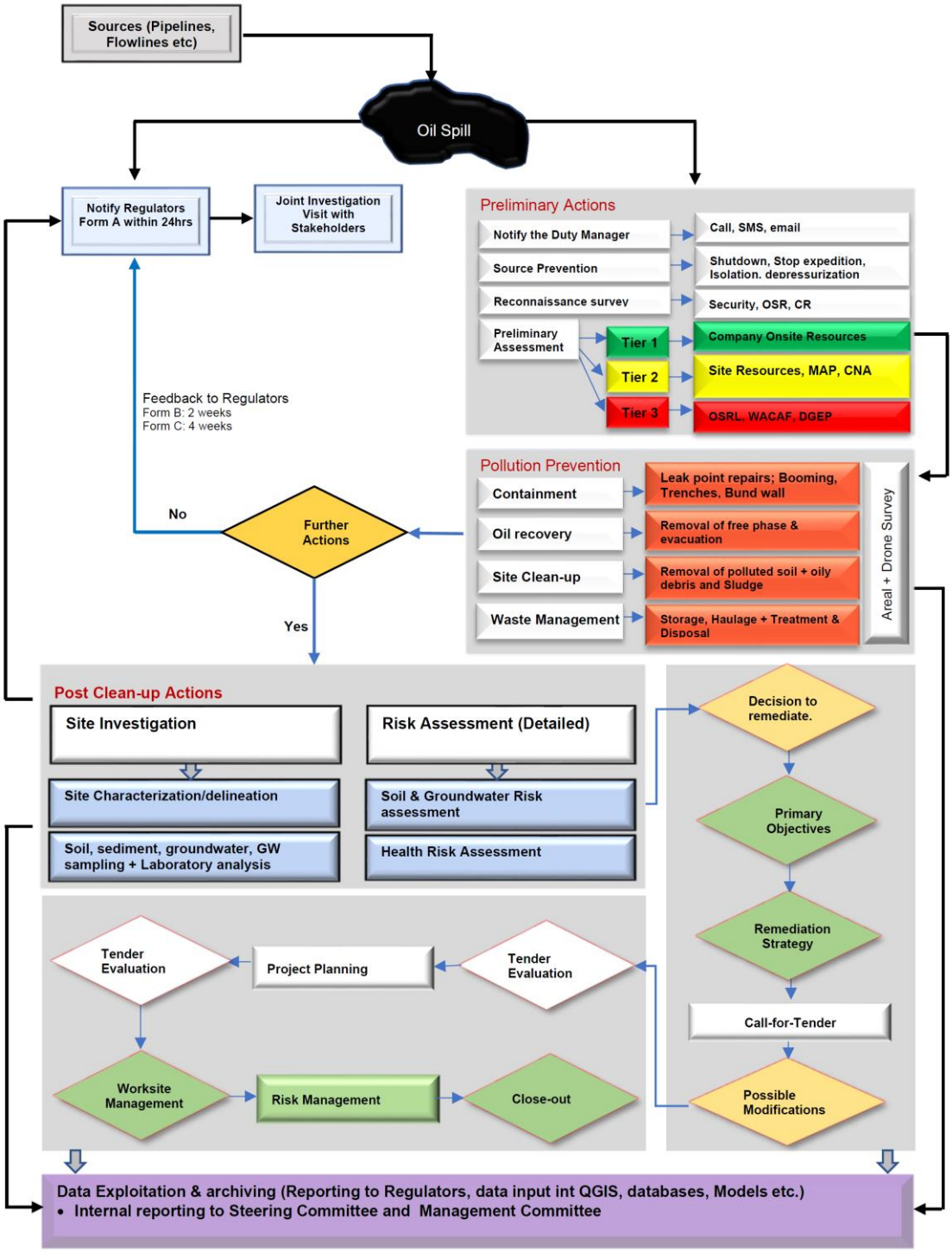
4. Definitions / abbreviations

CEDRE	Centre of Documentation, Research and Experimentation on Accidental Water Pollution
CMC	Crisis Management Cell of the TotalEnergies Group who would be mobilised in a major (Tier 3) oil spill.
CMT	Crisis Management Team who will handled the “strategic” and “media” aspects of an emergency.
CNA	Clean Nigeria Associates who are a Tier 2 provider.
CORAPOL	Coordination of pollution response resources; TotalEnergies Group committee in charge of co-ordinating and improving resources intended to mitigate accidental water pollution.
DGEP	Direction Générale Exploration and Production.
NUPRC	Nigerian Upstream Petroleum Regulatory Commission who regulate the oil and gas industry in Nigeria.
NMDPRA	Nigerian Midstream and Downstream Petroleum Regulatory Agency who regulate the oil and gas industry in Nigeria.
IMT	Incident Management Team who will handle the “technical” aspects of an emergency.
ERIT	Emergency Response Interventional Team, based at an operational site.
FOST	Fast Oil Spill Team; a TotalEnergies specific Tier 3 provider.
MAP	Mutual Assistance Plan where the oil industry in Nigeria have made their Tier 1 resources available to each other.
NOSDRA	National Oil Spill Detection and Response Agency who are responsible for overseeing oil spill response in Nigeria.

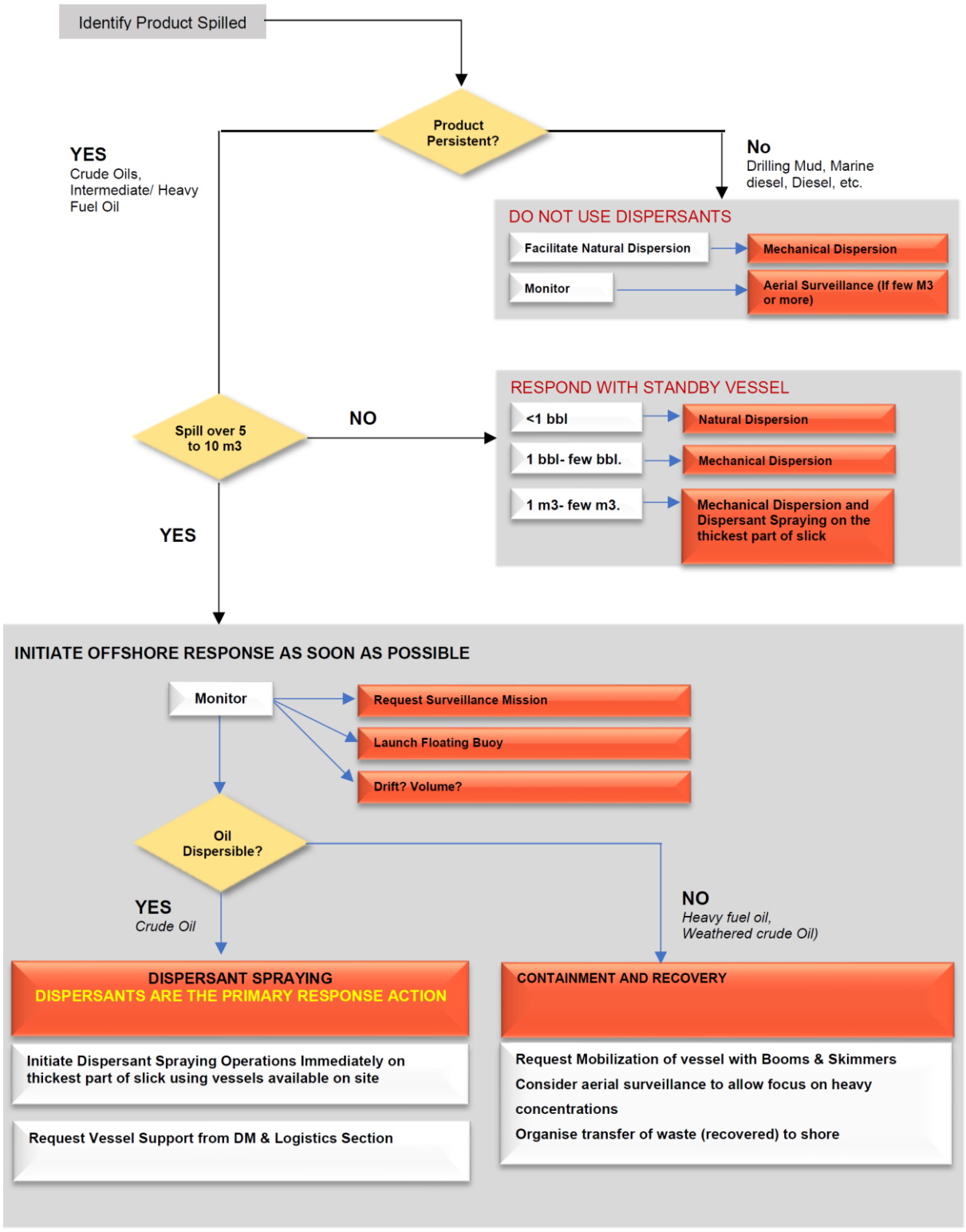
Oil Spill Response Limited	Oil Spill Response Limited (ex OSRL/EARL); a Tier 3 provider.
PARAPOL	Plan to Assist with mobilising Resources for Pollution Response; TotalEnergies Group crisis procedures.
RSES	Responsible for Safety and Environment on Site; the person responsible for emergency response at an operational site.
TEPNG	**"TEPNG",** "**TotalEnergies Upstream Companies in Nigeria"** or **"The Affiliate"**: designates all of the TotalEnergies Upstream Companies registered in Nigeria.
WASP	West Africa Surveillance Platform for Aerial Surveillance Service operated by Oil Spill Response; a Tier 2 service.

5. Flowchart

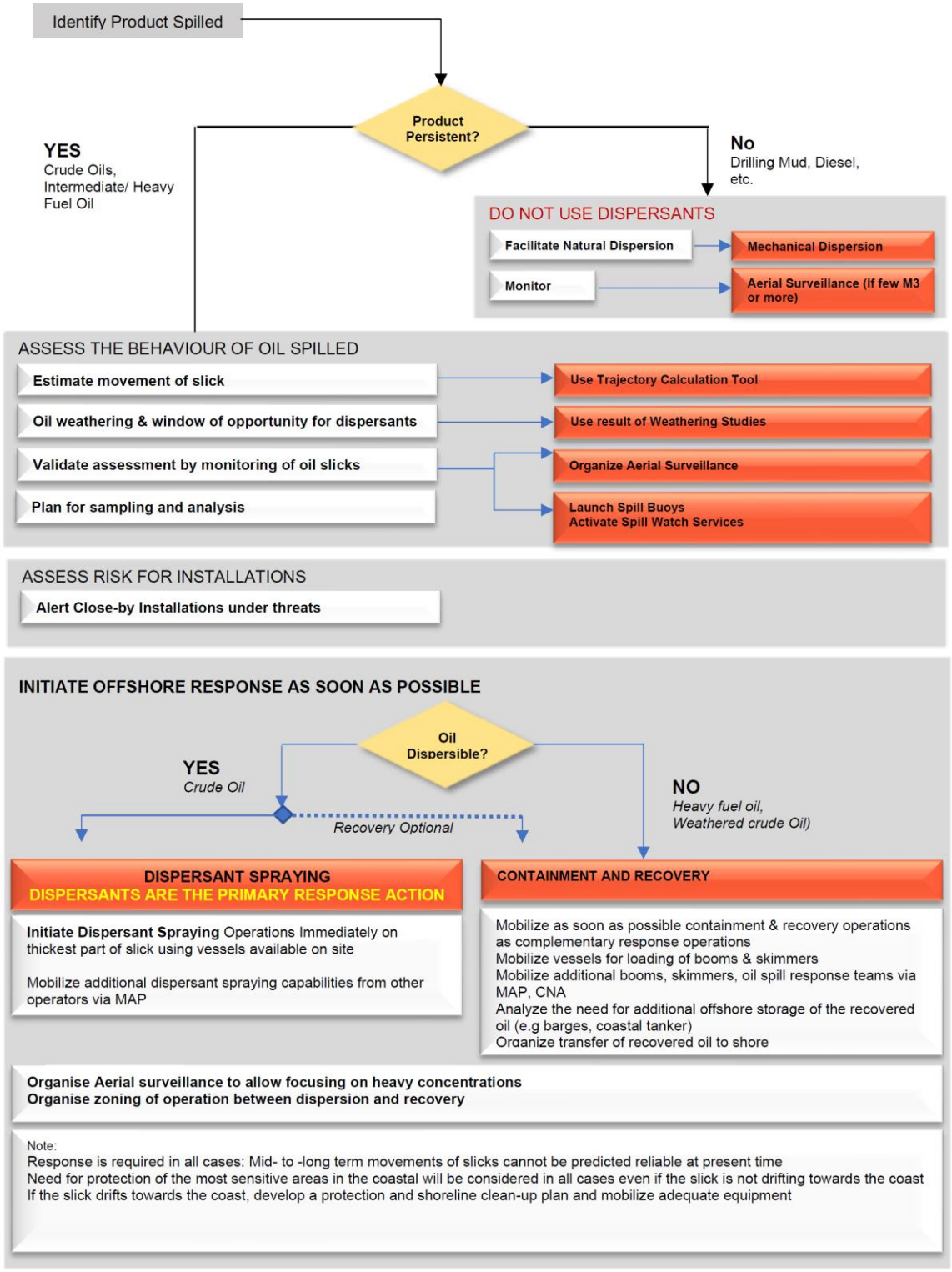
5.1. Onshore Oil Spill Management Guide



5.2. Tier1 Offshore Oil Spill Response Guide



5.3. Tier 2 Offshore Oil Spill Response Guide



Field/Station	Specific Gravity @15°C	Density @ @15°C	API @15°C	Pour Point (°C)
OML100-EDD (Edikan)	0.8902	0.8897	27.5	>4
OML100-IMD (IME)	0.9233	0.9228	21.8	>2
OML100-ODD (Odudu)	0.8808	0.8803	29.3	>2

Summary of Condensate Properties

Field/Station	Specific Gravity @15°C	Density @ @15°C	API @15°C	Pour Point (°C)
OML99-AMP (Amenam)	0.9092	0.808	43.4	22

The Amenam condensate is relatively heavy, with a high pour point which will be due to a high wax content. The light ends will evaporate within the first few hours when spilled at sea, most likely leaving a waxy persistent residue which will probably not be amenable to dispersant

6.9. Sensitivities to Oil spills

6.9.1. Onshore

OML58 is located in seasonal rain forest swamp of the Niger Delta and drained by the Sombreiro and Orashi Rivers, creeks and streams. During the wet season, the rain forest becomes a swamp / wetland characterised by surface water. Any mobile surface water will eventually flow into the Sombreiro River or the Elele Alimini River. The export pipeline from Obagi to the Rumuekpe Metering Station crosses the Sombreiro River near Ahoada, and the pipeline from Olo to the tie-in crosses the upper swampy reaches of Elele Alimini River. The area where TEPNG has assets (wells, flowlines, pipelines, facilities, etc) is typically tropical rain forest with fringes and patches of fresh water swamps along the rivers and creeks. There are several towns in the area, and the land-use activities of the communities inhabiting the area consist mainly of subsistence farming and some fishing.

Vegetation

The vegetation of OML58 is classified as moist lowland forest or tropical rain forest. Based on vegetation type, OML58 can be divided into five distinct areas:

Area	Description
Dry land mature rainforest	consist primarily of evergreens with leafy crowns of the mature forest trees arranged in layers or storeys typifying the primary forest. These layers include the upper storey and the lower storey with layers of shrubs layer as well as herbs.
Galloping swamp forests	dense fresh water swamp forest with raffia plants as the dominant plant species. They are also part of the aquatic ecosystem and in some areas, the ground is irregular with frequent patches of water pond
The aquatic ecosystem	consists of freshwater ponds with stagnant and running waters, especially during the rainy season with water lettuce and water lily floating on the pond surface, bank side vegetation
Farmlands	mainly smallholdings of cassava-based farms with maize and other crops e.g. yams, cocoyams, melon, pepper, pumpkins, bananas, plantains and okra
Bush fallow lands	fallow lands containing plant species at varying stages of succession and this constitutes the light bush / secondary forest. This is the dominant vegetation type of OML58 and constitute above 70% of the Total vegetation type

Wildlife

There are nearly a 100 vertebrate wildlife species resident in the area around OML58, including;

- 26 mammalian species from 15 families.
- 39 avian species from 18 families.
- 22 reptilian species from 12 families.
- 5 amphibian species from 3 families.

The mammalian fauna within OML58 is dominated by thryonomids viz (a cane rat), followed by the bovids (duikers and antelopes) and Suids (bush-pigs). The thryonomids are widely distributed in cultivated farmland where they devour cassava tubers at night. The bovids keep to the bushes and secondary forest batches in the neighbourhood of the farmlands from where they also make nocturnal incursions into the farms.

OML58 has a diverse assemblage of avifauna which frequently visits cultivated farmlands and pipelines routes for insects, fruits and seeds, and forest for resting, perching and cover during a rain. The most abundant and ubiquitous species included the Allied Hornbill, Pied Crow, Swifts, Hawks, Kites, and the passerine forms.

Lizards of the family Agamidae and Skinks family Scincidae are found in abundance in OML58. They readily colonised such habitats as cassava peel dumps, timber piles, oil palm fruit heaps, garbage dumps, buildings, operational sites etc., where plentiful insects for food are present. Snakes are also present, most of which are poisonous. Species include the cobra, mamba, viper and python.

Several breeding grounds for amphibians are present in the vicinity of the operational sites in OML58. Amphibians are abundant in stagnant water swamps, streams, pools, and wet grasses in the area. The commonest of the amphibian fauna is the African toad.

Most animals are likely to avoid an oiled area, especially when a response is active and causing a commotion. Animals that rely on water are most at risk of being oiled, with birds being particularly vulnerable with oiled plumage resulting in possible drowning and ingestion during preening resulting in potential lethal results. Mammals that enter an oiled area may end up with oiled fur which will reduce thermal properties. Ingestion during subsequent self-cleaning may result in the animal being poisoned.

Socioeconomic Sensitivities

Within OML58 there are various villages and communities that could be impacted if there was oil spill, both economically and socially. Any oil spill event is likely to strain relations with local communities and careful negotiations will be required to open access for a response. Economic activities of local communities may be potentially impacted as a result of a spill. Such activities that occur in OML58 are influenced to a large extent by the lands and land resources. The Egi and Elele Alimini areas are predominantly dry land and are used for farming and hunting. Fishing activity is relatively small in OML58, especially compared to farming which is the traditional and dominant occupation of the area. Though a vast area of the land mass is used for farming, there are still large areas of forests and bush fallows, which yield raw materials for craftsmanship. The women engage themselves in weaving mats and baskets that are commonly sold to fishermen in the neighbouring communities of Usomini.

6.9.2. Offshore

Environmental Sensitivity Index (ESI) mapping has been conducted for the Nigeria coastline commissioned by TEPNG, with a summary presented in this subsection (see Volume 2 – Response Handbook for the actual ESI maps). The fundamental basis of ESI is related to the vulnerability of particular environments to spilled oil, based on their geomorphology, exposure and biological productivity. Distinct shoreline segments are colour coded and ranked on a scale of 1-10 in order of increasing sensitivity to spilled oil, and in the context of Nigeria this equates to:

ESI 1 – Manmade structures

ESI 2 – Eroding mud beach

ESI 3 – Fine sand beach

ESI 4 – Medium to coarse sand beach

ESI 5 – Mixed sediment beach

ESI 6 – Saline flats

ESI 7 – Grassland

ESI 8 – Degraded freshwater wetland

ESI 9 – Sheltered tidal flats / vegetated low banks

ESI 10 – Mangroves

A summary of the ESI for each coastal region is presented below:

Coastal Region	Coastline	ESI
Badagry – Lagos	Medium to coarse sand beach Exposed rip-rap / sea wall	4 1
Lekki Lagoon – Mahin (Atijere)	Mangrove Barrier sand	10 3
Mahin – Forcados River	Mangrove Barrier sand	10 3
Ramos River – Kulama	Mixed sediment beach Fine sand beach Eroding mud beach Exposed sea wall / rip-rap	5 3 2 1
Fishtown River – Bartholomew River	Mangrove Barrier sand	10 3
Sombreiro River – Imo River	Mangrove Barrier sand	10 3
Imo River – Cross River / Rio del Rey	Fine sand beach Exposed rip-rap / sea wall Fine sand beach Exposed sand beach	3 1 3 3

Summary of the ESI for each Coastal Region of Nigeria

The main features of each region are detailed below:

- **Badagry – Lagos Area:** This is the westernmost part of the barrier beach-lagoon complex, and comprises sandy barrier beaches backed by a network of creeks and beach ridges. Topographically, a continuous, wave-beaten barrier beach broken only at the entrance to the Lagos Harbour, fronts the zone. The barrier beach widens eastwards, and at the eastern extremity of the area, the Lekki Peninsula, it is approximately 5km wide. Various crops are grown on the 110km stretch of sandy barrier beach, including, coconut palm, bananas, cassava and cocoyams. West of

the Lagos, there are extensive areas along the seashore covered with coconut palms and also areas of natural vegetation.

- **Lekki Lagoon – Mahin (Atijere) Area:** The geomorphology of this region is similar to that of the Badagry - Lagos region, except at the eastern edge. The barrier beach here is wider, ranging from 22km at the western edge (Ikosi - Iwerekun axis) to 10km at the boundary with the Mud coast. It is narrower (2km) south of Lekki Lagoon. The Mud coast lacks an active barrier beach. Spring high tides result in the coastbelt being frequently inundated. The vegetation sequence here is similar to that in Badagry – Lagos area. Large lagoon systems are still present and the largest ones are the Ikosi and Lekki Lagoon. North of Lekki and outside of the coastbelt is the Omo Biosphere Reserve while further east of the area is the Eba Island Forest Reserve, located in a freshwater swamp forest. All throughout the area, freshwater swamp forest borders the beach sands with mangroves. The freshwater swamp is narrower in the western than in the east. On the extreme eastern tip of the region, peaty mud flats are present that are bordered by mangrove.
- **Mahin Area - Forcados River:** This area is commonly termed the `Transgressive Mud Coast' due to the regular sea incursion into and inundation of the area. The coastline consists mostly a peaty mud. Elevations are low, especially in the region of the adjacent towns of Awoye and Molume, and are lower than the highest tides. Landward, is a 2km wide band of saline alluvial soils that extend southeastward, terminating at the north bank of the Benin River estuary. There are extensive freshwater swamps north of the Benin River estuary, but the whole of the southern side, landward of the barrier island bounded by the Benin and Escravos Rivers is a low-lying tidal saline swamp. As in the Badagry - Lagos area, the backshore of the barrier beach has silty soil, is subject to impeded drainage and is covered by freshwater swamps. This backshore grades into the mangrove in the more low-lying areas subject to tidal inundation. The rivers and creeks have elevated mud banks, which constitute levees. The presence of the levees worsens the drainage condition within the inter-levee areas.
- **Ramos River – Kulama:** This is the Niger Delta section where the coast trends south-southeast towards the tip of the delta. The Ramos River in the north and the Dodo River in the south bound the region. The region is bounded seaward by two barrier islands: Ramos - Dodo and Dodo-Penington. The longest of the barrier islands, at 35km is the Ramos-Dodo Island. The widest is the Forcados-Ramos Island which is 10km wide. As on the other barrier islands and beach ridges, the shoreline consists of beach sands backed by ridges. The backshore slopes more gently toward the mangrove, and is usually waterlogged during the long rainy season on account of silty soils and impeded drainage. Freshwater swamps gradually supersede the mangrove further inland with the rise in the elevation of the land. These latter areas also have impeded drainage due to levee formation by the numerous creeks and rivers of the area, and are subject to flooding by rainfall or high water levels. Tidal incursion over distances in excess of 50km occurs along the Forcados River up to Warri.
- **Fishtown River – San Bartholomew River:** This area consists of many barrier islands containing ‘active’ and ‘abandoned’ beach ridges but with most of the latter located in the backshore, and significantly eroded by tidal currents operating through the network of tidal channels landward of the barrier islands. The beach ridges decrease in size eastwards from Bengatoro River towards Fishtown River. In this area, the beach ridges are almost completely eroded. The beach ridges widen again from the Fishtown River towards the Brass River – Nicholas River area with widths in excess of 3km. The narrow barrier islands have elevations of about 3m above mean sea levels. There is a vast mangrove swamp beyond the backshore of the beach ridge-barrier islands. These swamps are invariably bounded by levees. Towards the west, the mangrove grades into freshwater swamps and high forest at 15km away from the coast, but eastward, the mangrove band is wider and is in excess of 25km.
  - **Sombreiro River – Imo River:** This is the most easterly section of the Niger Delta and is bordered in the east by creeks connecting the Bonny River, Andoni River and Imo River. There are numerous barrier islands with sand beaches in the area, with the greatest concentration being around the estuary of the new Calabar River – Bonny River. Here the barrier islands are narrow

and appear to be remnant beach ridges, which have been subjected to significant tidal erosion especially through the many short creeks in the backshore of the beach ridges. Thus, the area of freshwater vegetation fronting the sea is limited in this region, and may continue to decrease, being succeeded by saline mangrove species.

- **Kwa River – Cross River / Rio del Rey:** This area consists of narrow (<1.5km), gently sloping barrier beach. The barrier beach is narrower (<1km) west of River Kwa Ibo and terminates landward at an extensive creek that virtually connects River Kwa with River Imo. In this area, three small estuaries of the creek break the barrier beach. To the east of River Kwa, the barrier beach extends unbroken for approximately 25km to the estuary of Cross River. The barrier is slightly wider here (approx. 1.5km). As in the Niger Delta, tidal creeks have penetrated the backshore of the barrier beach to cause erosion and a succession from freshwater to mangrove swamps. This is very evident landward of the Ibeno-Okposo beach ridge (River Kwa – River Cross). Here, the Stubbs and Widenham Creeks are associated with a low-lying large expanse of degraded mangrove and nipa swamp. Around the River Cross estuary, the mangroves are full-grown pure stands. The mangroves in the strand coast zone are however not as extensive as in the Niger Delta.

Wildlife

Various marine animals and birds are at risk in the event of a major oil spill. The main animals at risk are cetaceans, manatees, turtles and birds. Cetaceans, manatees and turtles are unlikely to be adversely impacted by spilled oil as they are likely to avoid the area and are generally not frequently seen. Impact may occur should an individual surface to breath in a spill. Turtle nesting sites, for example on Bioko Island, are at most risk in the event of a spill. There are a number of coastal bird species that could become oiled in a spill. Birds are particularly vulnerable to oil pollution with oiled plumage resulting in birds drowning and ingestion during preening resulting in potential lethal results.

In general, the most important factors that will affect the vulnerability of animals to oil spills are:

- Conservation status of any of the species.
- Migratory patterns - are the animals actually using the site?
- Relative size of individual animal groups and how close they are to shoreline.
- Feeding behaviour - do they have much direct contact with water?
- The quantity, type and weathering of the oil - Light oil products can be more toxic and heavier oils may be less easy for the animal to remove.

Socioeconomic Sensitivities

Along the Nigerian coast and in the Delta there are various villages and communities that could be impacted if there was oil spill, both economically and socially. Any oil spill event is likely to strain relations with local communities and careful negotiations will be required to open access for a response. Economic activities of local communities may be potentially impacted as a result of a spill, particularly fishing. Nigerian waters are noted to be rich in fish and shrimps due to the upwelling resulting from the influence of the Benguela currents and Equatorial counter currents on the Guinea currents. According to Nigerian Institute for Oceanography and Marine Research (1986), the total animal value of these commercial species is estimated at $233.57m - $531.64m. There are more than 700 species of fish in the maritime and salt waters of Nigeria, and among these species, there are commercially important pelagic species consisting mainly of sardine, tuna and anchovies. The predominant living marine resources exploited for food in the Nigeria waters are the fin and shell fisheries, which can either be pelagic, eurybathic or demersal.

Fish and shellfish populations are at greatest risk from oil spills when the water depth is very shallow or they live in the intertidal zone (e.g. mud crabs, oysters, clams etc.). Deeper than 10m, in open waters, it is very unlikely that fish will be affected. In shallow or enclosed waters, however, high concentrations of fresh

dispersed oil can kill some fish and have sub-lethal effects on others. Juvenile fish in nursery areas are at greatest risk. The oil can also taint the flesh with an oily taste and make it unpalatable. This tainting is the main cause of damage to fisheries after an oil spill, because they may need to be closed for a period until the taste of oil is lost, 'depuration'. This process happens naturally once the oil concentrations have dropped to background levels. The depletion time depends on the fish species, but can range from a few days to many weeks. Even if there is no actual impact of an oil spill on the fish or shellfish themselves, it is still possible for the fishery to be affected by the adverse publicity created by the spill. It is possible for the market to be affected for long periods, with both commercial and social impacts. Fishing gear and boats are also at direct risk from oil slicks on the water surface.

6.10. Risk Assessment

6.10.1. Risk Assessment Methodology

Evaluating Oil Spill Risks

One of the most important initial steps in the contingency planning process is the risk assessment. Evaluating oil spill risks requires considerations of two factors, namely the probability of an oil spill occurring, and the consequence. Once the oil spills scenarios have been identified, the likely fate and behaviour can be assessed along with the environmental sensitivities and potential effects in order to determine appropriate spill response strategies. This process will be developed throughout this Strategy Plan.

Probabilities of an oil spill occurring can be inferred from TEPNG and industry historical data. Since this information is based on averaging statistics over a period of time it can be misleading. This is due to the following factors not always being taken into account, which may increase or decrease the risk of oil spills:

- Developments in technology, which would normally decrease the risk of spills.
- Types of preventative measures in place.
- Variables which are unique to a particular field and operating environment (e.g. offshore deep water E&P operations have different associated risks than those in shallower water).
- For a given spill with a risk of occurring only once in 100 years, that risk, however small, still does exists and could happen at any time.

As such, the specific details of each operation in question have been considered that may reduce, eliminate or add new risk factors to the historical data.

Historical Spills from Industry

In addition to using historical TEPNG oil spill data for ranking scenarios in terms of probability, the use of wider industry data can be also be utilised. There are no Nigerian or global oil spill databases for exploration and production activities, however the United Kingdom Government has compiled comprehensive statistics on the drilling and production operations for the North Sea over a 25 year period. This data provides a useful indication on the types of spills and spill volumes that may occur during drilling and production operations. It shows that if the number of oil spills is normalised against the number of fields, the frequency of spills is seen to level off to approximately 1.5 spills per field per year. The data also indicates that the quantity of oil spilled has decreased greatly during the 1990s, with the most common spill size being between 0.1 tonnes and 1 tonne, and large spills being very uncommon, with there being no major North Sea oil spills in the past 20 years.

ITOPF manages a global database for oil spills associated with tankers, combined carrier and barge operations. This database contains information on over 10,000 spills, 85% of which were less than 7 tonnes. Approximately 34% of the spills in category 7 to 700 tonnes occurred during routine operations, with 27% occurring during loading or discharging. For larger incidents, groundings and collisions account for over 63% of the incidents over 700 tonnes.

The Macondo incident of 2010 from drilling operation was unprecedented in the industry as much as the response. It opened a new horizon in oil spill response and well capping operations. Though specifically for deepwater operations, the JV Asset has learnt from this incident.

6.10.2. Oil Spill Scenarios

Oil spill scenarios have been identified for each TEPNG operational site. A scenario is a sequence of events leading to a potential accidental oil spill incident. A range of spill scenarios has been identified to reflect spills that occur in TEPNG's operations onshore and offshore. Scenarios are subdivided on the basis of location:

Onshore Operations	**Offshore Operations**
Infield Obagi Flow Station Obite Gas Plant Ibewa Well Cluster Olo Flow Station (Production Stopped and oil evacuated from crude oil storage tanks to Obagi Flowstation)	Onne Site OML99 OML102 OML100 *FSO Unity* and CALM Buoy At-sea

Onshore – Infield

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
1.	Drilling / producing production wells.	Blowout.	Sabotage, equipment malfunction, well kick during drilling, unexpected reservoir conditions.	Crude or condensate. Percentage of produced water significantly varies between wells.	Depends on well characteristics, for example some wells producing around 440m^3 of oil per day and others <5m^3 of oil per day. There are around 70 functional wells.	Wetland, swamp, river, on land. Community impact possible. Sombriero River system could be impacted.	Greater chance of a blowout during drilling as opposed to normal production operations.
2.	Infield flowlines.	Rupture.	Sabotage, corrosion, civil engineering earthworks, structural failure, over-pressurisation.	Crude or condensate. Percentage of produced water significantly varies.	Taking 6" diameter, for a 500m line, loss could be ~9.1m^3 and for a 10km line ~182.5m^3. Volume for a 6" average flowline would be ~220m^3. Amount released would be controlled by flowline topography.	Wetland, swamp, river, on land. Community impact possible. Sombriero River system could be impacted.	Length of lines range from 500m to 10km with an average being ~3km and diameters being 4" or 6". ESDV would initiate instantaneously at either end. Taking 6" diameter, for a 500m line loss could be ~9.1m^3 and for a 10km line ~182.5m^3. Volume for a 6" average flowline would be ~220m^3. Loss of entire volume extremely unlikely; almost impossible for longer routes due to topography.
3.	Infield flow lines.	Minor loss.	Sabotage, corrosion, civil engineering earthworks, structural failure, over-pressurisation.	Crude or condensate. Percentage of produced water significantly varies.	Less than 5m^3, but to 10s of m^3 possible in lager events.	Wetland, swamp, river, on land. Community impact possible. Sombriero River system unlikely to be impacted.	Records of previous oil spills provide an indication of the amount released.
4.	Diesel road tanker.	Tanker rollover.	Road accident, human error, sabotage / attack.	Diesel.	Up to 45m^3.	Roadside; on land, ditches, vegetated areas. Community impact possible.	Maximum volume of road tankers in the region is 45m^3.
5.	Drilling localities.	Loss of oil based mud transport.	Road accident, human error, sabotage / attack.	Oil based mud containing up to 60% base oil (EDC 99-DW).	Up to 45m^3.	Roadside; on land, ditches, vegetated areas. Community impact possible.	Oil based muds are transported from the Ibewa Mud Plant to the drill site by road tanker with a maximum volume of around 45 m^3.

Onshore – Obagi Flow Station

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
6.	Anywhere within the Flow Station.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, etc.	Crude, condensate, lube oil, hydraulic oil or diesel.	Less than $1m^3$.	Within confines of Obagi Flow Station, possibly in a bunded area.	Likely occur during routine operations for example maintenance, pigging, handling oils, diesel import, etc. Volumes will be small, certainly no more than a $1m^3$ and more likely to be less than 1bbl.
7.	Drum store.	Damage / loss of oil drum.	Human error, poor storage, rusted drums.	Lube oil and hydraulic oil.	Less than 1 barrel.	Within the bunded confines of the drum store.	Volume of lube oil spilled will vary depending on scale of incident. Unlikely more than 1 barrel would be damaged unless part of a wider emergency.
8.	Process line.	Minor loss from a process unit.	Equipment failure, human error, process malfunction, corrosion.	Crude.	Loss likely to be $1m^3$.	Within Obagi Flow Station in a bunded area or directly onto the ground.	Daily site inspections will indentify potential causes.
9.	Process line.	Major loss from a process unit.	Equipment failure, human error, process malfunction, corrosion, wider emergency such as an explosion or an attack.	Crude.	Volumes could be in the range of a few m^3 to 10s of m^3 of crude.	Within Obagi Flow Station in a bunded area or directly onto the ground. Spill may enter closed drain system.	Exact loss likely to vary depending on source, incident and time to shut down.
10.	Process unit.	Loss of inventory.	Equipment failure, human error, process malfunction, corrosion, wider emergency such as an explosion or an attack.	Crude.	Loss of entire volume would represent worse case. Smallest unit is $42m^3$ and largest is $116.4m^3$.	Within Obagi Flow Station in a bunded area or directly onto the ground. Spill may enter closed drain system.	Separators and gas boot range in size. Depending on the incident, more than one vessel may be lost.
11.	Storage tank.	Loss of inventory.	Catastrophic failure, human error, corrosion, wider emergency, such as an explosion or an attack.	Crude.	Single tank volume is $5,000m^3$.	Any spill should be contained within bunded area, however in the event of a wider emergency the bund may fail or in the event of tank structural failure oil may overtop.	There are 4 tanks, 2 of which are used as production tanks (Tanks 2 and 4) which are filled to capacity prior to export. When one inventory is being exported the second will be filled – i.e. under normal operations both tanks

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
							are not at maximum capacity simultaneously. Other tanks used for allowing water to settle out (Tank 3) and receiving produced water (Tank 1) for reinjection.
12.	API separator pit.	Overflow / pit failure.	May result from human error, structural failure of process systems malfunction.	Oily water.	Volume of oily water up to $10m^3$.	Contamination of surrounding ground. Spill may enter closed drain system.	Maximum volume of pit $10m^3$. Highly unlikely entire volume would be lost.
13.	Diesel storage tank.	Loss of inventory.	Catastrophic failure, human error, corrosion, wider emergency, such as an explosion or an attack.	Diesel.	Tank volume is $40m^3$.	Spill contained within the bund.	In the event of a wider emergency the bund may fail or in the event of tank structural failure oil may overtop.
14.	Closed drain system.	Overflow of sump tank.	Excessive rain fall and failure to regularly empty tank.	Oily water.	Likely to be no more than $1m^3$.	Contamination of surrounding water courses possible.	Volumes likely to depend on quantity of oil washed into drains. If a scenario such as #11 has occurred with the bund failing, impact may be significant with community relations impacted.
15.	Flare lake.	Flare carry over.	Process malfunction.	Crude as a sheen.	Volume not likely to be greater than $1m^3$.	Spill contained in flare pit lake.	Pollution of surrounding water courses unlikely.
16.	Obagi-Rumuekpe Export Line	Full rupture.	Sabotage, corrosion, civil engineering earthworks, structural failure, over-pressurisation.	Crude.	Amount released would be controlled by pipeline topography and time till detection. Previous spill indicate a spill of $>40m^3$ worse case.	Wetland, swamp, river, on land. Community impact possible. Sombriero River system could be impacted.	Pipeline has a 12" diameter and is 30km long. Static volume is approximately $2,200m^3$. Amount that would be released depends on shut down time and pipeline topography. There are no remote or ESDVs.

Onshore – Obite Gas Plant

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
17.	Anywhere within the Gas Plant.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, etc.	Condensate, lube oil, hydraulic oil or diesel.	Less than $1m^3$.	Within confines of Obite Gas Plant, possibly in a bunded area.	Likely occur during routine operations for example maintenance, pigging, handling oils, diesel import, etc. Volumes will be small, certainly no more than a $1m^3$ and more likely to be less than 1bbl.
18.	Process line.	Minor loss from a process unit.	Equipment failure, human error, process malfunction, corrosion.	Condensate.	Loss likely to be $1m^3$.	Within Obite Gas Plant in a bunded area or directly onto the ground.	Daily site inspections will identify potential causes.
19.	Process line.	Major loss from a process unit.	Equipment failure, human error, process malfunction, corrosion, wider emergency such as an explosion or an attack.	Condensate.	Volumes could be in the range of a few m^3 to 10s of m^3 of crude.	Within Obite Gas Plant in a bunded area or directly onto the ground. Spill may enter closed drain system.	Exact loss likely to vary depending on source, incident and time to shut down.
20.	Process unit.	Loss of inventory.	Equipment failure, human error, process malfunction, corrosion, wider emergency such as an explosion or an attack.	Condensate.	Loss of entire volume would represent worse case. Smallest unit is $21.8m^3$ and largest is $65.54m^3$.	Within Obite Gas Plant in a bunded area or directly onto the ground. Spill may enter closed drain system.	Separators range in size. Depending on the incident, more than one vessel may be lost.
21.	Diesel storage tank.	Loss of inventory.	Catastrophic failure, human error, corrosion, wider emergency, such as an explosion or an attack.	Diesel.	Tank volume is $69.38m^3$.	Spill contained within the bund.	In the event of a wider emergency the bund may fail or in the event of tank structural failure oil may overtop.
22.	Closed drain system.	Overflow of sump tank.	Excessive rain fall and failure to regularly empty tank.	Oily water.	Likely to be no more than $1m^3$.	Contamination of surrounding water courses possible.	Volumes likely to depend on quantity of oil washed into drains.
23.	Flare stack.	Flare carry over.	Process malfunction.	Condensate showering.	Volume not likely to be greater than $1m^3$.	Release likely to be a fine mist.	No water courses would be impacted.

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
24.	Obite – Obagi Pipeline	Full rupture.	Sabotage, corrosion, civil engineering earthworks, structural failure, over-pressurisation.	Condensate.	Static volume 194m^3. Amount released would be controlled by pipeline topography.	Wetland, swamp, on land. Community impact inevitable.	ESDVs at Obite and Obagi would close instantaneously. 8" diameter pipeline, 6km long. Loss of entire volume extremely unlikely if not impossible due to topography.

Onshore – Ibewa Well Cluster

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
25.	Anywhere within the facility.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, etc.	Condensate, lube oil, hydraulic oil or diesel.	Less than 1m^3.	Within confines of facility, possibly in a bunded area.	Likely to occur during routine operations for example maintenance, pigging, handling oils, diesel import, etc. Volumes will be small, certainly no more than a 1m^3 and more likely to be less than 1bbl.
26.	Drilling / producing production wells.	Blowout.	Sabotage, equipment malfunction, well kick during drilling, unexpected reservoir conditions.	Crude or condensate. Percentage of produced water significantly varies between wells.	Depends on well characteristics. Worse case producing well is 5,500bbl dry condensate per day.	Ibewa Well Cluster would be impacted. Drain systems potentially overwhelmed.	Greater chance of a blowout during drilling as opposed to normal production operations.
27.	Process line.	Minor loss from a process unit.	Equipment failure, human error, process malfunction, corrosion.	Condensate.	Loss likely to be 1m^3.	Within facility in a bunded area or directly onto the ground.	Daily site inspections will indentify potential causes.
28.	Process line.	Major loss from a process unit.	Equipment failure, human error, process malfunction, corrosion, wider emergency such as an explosion or an	Condensate.	Volumes could be in the range of a few m^3 to 10s of m^3 of crude.	Within facility in a bunded area or directly onto the ground. Spill may enter closed drain system.	Exact loss likely to vary depending on source, incident and time to shut down.

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
			attack.				
29.	Process unit.	Loss of inventory.	Equipment failure, human error, process malfunction, corrosion, wider emergency such as an explosion or an attack.	Condensate.	Loss of entire volume would represent worse case. Test separator is the only significant volume; 12.6m^3.	Within facility in a bunded area or directly onto the ground.	Spill may enter closed drain system.
30.	Mud plant.	Loss of inventory.	Catastrophic failure, human error, corrosion, wider emergency, such as an explosion or an attack.	Base oil (EDC 99-DW) or oil based mud containing up to 60% base oil.	Largest storage tank is 83.6m^3.	Within facility in a bunded area or directly onto the ground. Spill may enter closed drain system.	There are 8 tanks in the mud plant that may contain base oil / oil based mud mix. The smallest is 71.5m^3 and the largest 83.6m^3.
31.	Closed drain system.	Overflow of sump tank.	Excessive rain fall and failure to regularly empty tank.	Oily water.	Likely to be no more than 1m3.	Contamination of surrounding water courses possible.	Volumes likely to depend on quantity of oil washed into drains. In the event of a major spill (such as a blowout) the drain system would be overwhelmed.
32.	Ibewa – Obite Pipeline	Full rupture.	Sabotage, corrosion, civil engineering earthworks, structural failure, over-pressurisation.	Condensate.	Static volume 146m^3. Amount released would be controlled by pipeline topography.	Wetland, swamp, on land. Community impact inevitable.	ESDVs at Obite and Obagi would close instantaneously. 12” diameter pipeline, 2km long. Loss of entire volume extremely unlikely if not impossible due to topography.

Offshore – Onne Site

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
33.	Onne Logistics Base / Mud Plant.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, damage to oil storage etc.	Diesel, utility oil, hydraulic oil, base oil (EDC 99-DW) or oil based mud containing up to 60% base oil.	Volumes will be small, <1m^3.	In an inspection shed, lube oil store, warehouse, pipe yard, bunded area or quayside. Possible release into dock.	Likely to occur during routine operations for example maintenance, handling oils, handling drums, transferring oil, loading operations etc. Retention pits / closed drain systems will contain any spill.

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
34.	Mud Plant.	Loss of a storage tank.	Catastrophic failure, human error, corrosion, wider emergency, such as an explosion.	Oil based mud containing up to 60% base oil (EDC 99-DW) or neat base oil.	Maximum tank volume is 340m^3.	Within the mud plant, in a bunded area. If bund damaged as part of the emergency, spill will enter drain system, with worse case being released into the dock.	Largest single base oil inventory on site is 340m^3. The two mixing tanks are ~60m^3.
35.	Mud Plant.	Loss during transfer.	Flange failure, human error, hose being run over and ruptured, lack of maintenance.	Oil based mud containing up to 60% base oil (EDC 99-DW).	<1m^3 assuming loading operation stopped almost instantly.	Quayside, with oil based mud reaching the water.	Hoses are laid on quayside to vessel, thus at risk of being run over / damaged. Hose is approximately 120m long and 4" diameter. Static volume 1m^3, shut down is manual but should be almost instantaneous as operators constantly visually monitor line.

Offshore – OML99

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
36.	Any platform.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, damage to oil storage etc.	Condensate, diesel, utility oil or hydraulic oil.	Volumes will be small, <1m^3.	Likely to occur on deck and contained, for example in a skid. Unlikely to reach the sea.	Likely to occur during routine operations for example maintenance, handling oils, pigging, etc.
37.	Drilling platform; AMD1 or AMD2.	Blowout.	Equipment malfunction, well kick during drilling, unexpected reservoir conditions.	Condensate.	As an indication of possible release rates, the well for each drilling platform with the maximum liquid delivery potential is; AMD2 15,000bpd and AMD1 8,000bpd.	Subsea. Possible shoreline impact may result.	Greater chance of a blowout during drilling as opposed to normal production operations. Length of release depends on success of shut-down systems.
38.	Bridge between	Full rupture of pipeline.	Large scale vessel collision, process	Condensate.	Static volume of largest pipeline (high pressure	Any point along the 162m bridge. Release to the sea inevitable.	High pressure separator pipeline from AMD2 to AMD1 is 82m long and 16"

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
	AMP1, AMD1 and AMD2.		malfunction, corrosion, lack of maintenance wider emergency such as an explosion or blowout.		separator) is 10.6m^3. Medium pressure pipeline 23m^3 and test separator pipeline 23m^3.		diameter, and from AMD1 to AMP1 is 80m at 24". ESDVs would initiate instantaneously.
39.	Any platform.	Minor release from a flowline / process unit.	Corrosion, lack of maintenance, operating error, valve failure.	Condensate and water (worse case; 100% condensate).	Loss likely to be less than 1m^3.	Likely to be caught in a skid, or on deck. May be released to sea.	If undetected, chronic pollution may occur.
40.	Any platform.	Major release from a flowline / process unit.	Process failure, human error, wider emergency, large scale vessel collision.	Condensate and water (worse case; 100% condensate).	Largest volume of a single unit is the separator on AMP1; 167m^3	Release to the sea.	Depending on the exact release source, volume of crude will vary. Shut down would initiate instantaneously.
41.	AMP1	Produced water malfunction.	Process failure.	Condensate sheen.	Minor release most likely, no more than 1m^3.	Release to the sea.	Oil lost with produced water discharge.
42.	AMT2	Flare carry over.	Process malfunction.	Condensate sheen.	No more than 1m^3.	Release to the sea.	
43.	AMP1 or AMQ	Loss of diesel storage tank.	Human error, corrosion, lack of maintenance wider emergency.	Diesel.	Diesel storage tank on AMP1 toal is 408m^3. AMQ diesel tank is 22m^3.	Release to the sea.	Worse case would be loss of inventory to sea.
44.	Subsea pipeline to ODP1 (OML100)	Rupture.	Full rupture as a result of anchor dragging, over pressure, corrosion or sea bed movement.	Condensate.	Static volume of pipeline 4,500m^3.	Subsea, with plume eventually reaching the sea surface.	Shut down valves present at AMP1 and ODP1 (OML100) that would initiate instantaneously. Loss of entire volume extremely unlikely due to pressure of seawater. Pipeline is 35km long, 16" diameter.

Offshore – OML102

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
45.	Any platform.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, damage to oil storage etc	Crude, diesel, utility oil or hydraulic oil.	Volumes will be small, <1m^3.	Likely to occur on deck and contained, for example in a skid. Unlikely to reach the sea.	Likely to occur during routine operations for example maintenance, handling oils, pigging, etc.
46.	Drilling platform; OFD1 or OFD2.	Blowout.	Equipment malfunction, well kick during drilling, unexpected reservoir conditions.	Crude.	As an indication of possible release rates, the well for each drilling platform with the maximum liquid delivery potential is; OFD1 4,314bpd and OFD2 3,521bpd.	Subsea. Possible shoreline impact may result.	Greater chance of a blowout during drilling as opposed to normal production operations. Length of release depends on success of shut-down systems.
47.	Bridge between OFD1 and OFP1.	Full rupture of pipeline.	Larger scale vessel collision, process malfunction, corrosion, lack of maintenance wider emergency such as an explosion or blowout.	Crude.	Static volume of pipeline is 7.8m^3.	Any point along the bridge. Release to the sea inevitable.	Bridge oil pipeline is 16” diameter, 60m long. ESDVs would initiate instantaneously.
48.	Subsea pipeline between OFD2 and OFP1.	Full rupture of pipeline.	Full rupture as a result of anchor dragging, over pressure, corrosion or sea bed movement. Highly unlikely.	Crude.	Entire static volume of pipeline could be lost; 254m^3 however extremely unlikely due to pressure of seawater.	Subsea, with oil surfacing in the vicinity.	Shut down valves present at OFD2 and OFP1 that would initiate instantaneously. 5km long, 10” diameter.
49.	Any platform.	Minor release from a flowline / process unit.	Corrosion, lack of maintenance, operating error, valve failure.	Crude and water (worse case; 100% crude).	Loss likely to be less than 1m^3.	Likely to be caught in a skid, or on deck. May be released to sea.	If undetected, chronic pollution may occur.
50.	Any	Major	Process failure, human	Crude and water	Largest volume of a single	Release to the sea.	Depending on the exact release

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
	platform.	release from a flowline / process unit.	error, wider emergency, large scale vessel collision.	(worse case; 100% crude).	unit is the separator on OFP1; 46.9m^3		source, volume of crude will vary. Shut down would initiate instantaneously.
51.	OFP1.	Flare carry over.	Process malfunction.	Crude sheen.	No more than 1m^3.	Release to the sea.	
52.	OFP1.	Loss of diesel storage tank.	Human error, corrosion, lack of maintenance wider emergency.	Diesel.	Diesel storage tank on OFP1 is 50m^3.	Release to the sea.	Worse case would be loss of inventory to sea.
53.	Subsea pipeline between OFP1 and ODP1 (OML100).	Rupture.	Full rupture as a result of anchor dragging, over pressure, corrosion or sea bed movement.	Crude.	Static volume of pipeline 2993m^3.	Subsea, with plume eventually reaching the sea surface.	Shut down valves present at OFP1 and ODP1 (OML100) that would initiate instantaneously. Loss of entire volume extremely unlikely due to pressure of seawater. Pipeline is 41km long, 12” diameter.

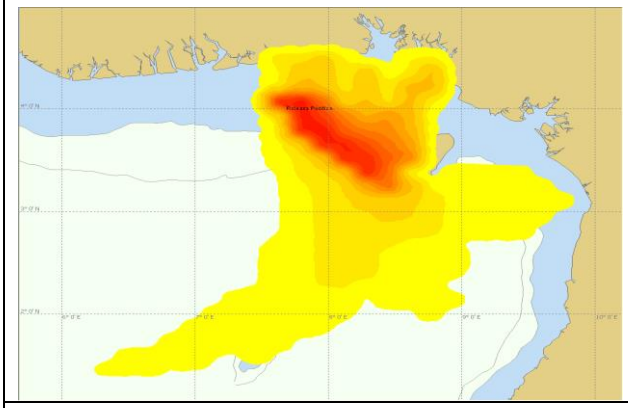
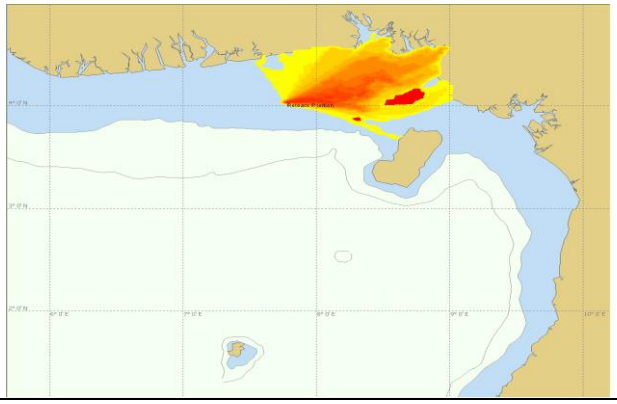
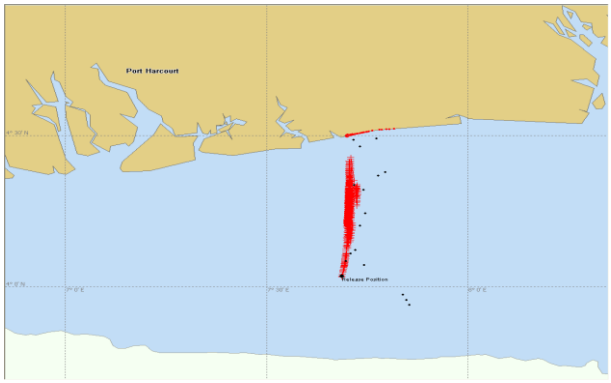
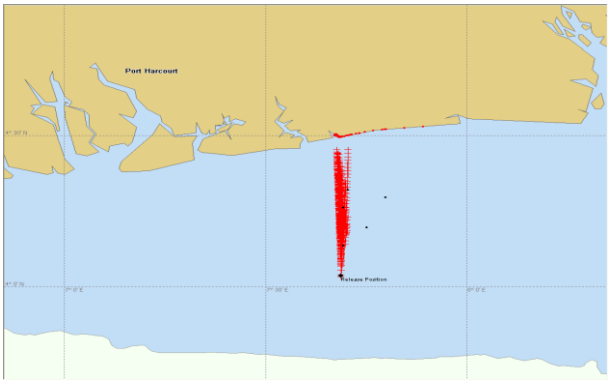
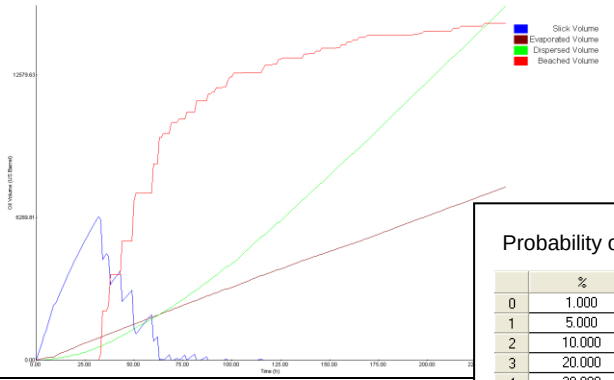
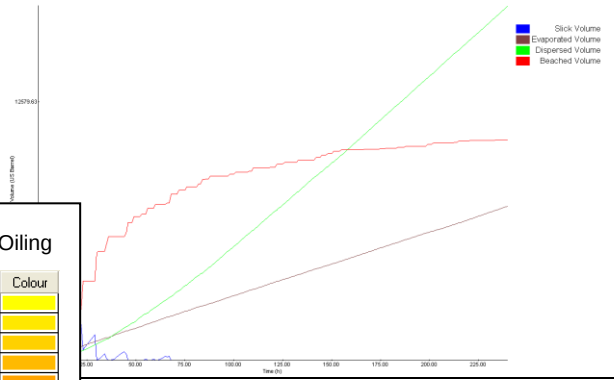
Offshore – OML100

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
54.	Any platform.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, damage to oil storage etc.	Crude, diesel, utility oil or hydraulic oil.	Volumes will be small, <1m^3.	Likely to occur on deck and contained, for example in a skid. Unlikely to reach the sea.	Likely to occur during routine operations for example maintenance, handling oils, pigging, etc.
55.	Drilling platform; ODD1, AFD1, IMD1, EDD1.	Blowout.	Equipment malfunction, well kick during drilling, unexpected reservoir conditions.	Crude.	As an indication of possible release rates, the well for each drilling platform with the maximum liquid delivery potential is; ODD1 1,500bpd; EDD1 4,400bpd; AFD1 4,240bpd and IMD1 3,850bpd.	Subsea. Possible shoreline impact may result.	Greater chance of a blowout during drilling as opposed to normal production operations. Length of release depends on success of shut-down systems.
56.	Subsea pipelines between ODP1 and either EDD1, AFD1 or IMD1.	Full rupture of pipeline.	Full rupture as a result of anchor dragging, over pressure, corrosion or sea bed movement. Highly unlikely.	Crude.	Entire static volume of pipeline could be lost, however extremely unlikely due to pressure of seawater: ODP1 to EDD1 – 295m^3; ODP1 to AFD1 – 116m^3; ODP1 to IMD1 – 118m^3.	Subsea, with oil surfacing in the vicinity.	Shut down valves present at ODP1 manifolds and respective drilling platforms that would initiate instantaneously.
57.	Bridge pipeline between ODP1 and ODD1.	Full rupture of pipeline.	Larger scale vessel collision, process malfunction, corrosion, lack of maintenance wider emergency such as an explosion or blowout.	Crude.	Static volume of pipeline is 1.1m^3.	Any point along the bridge. Release to the sea inevitable.	Bridge oil pipeline is 8” diameter, 35m long. ESDVs would initiate instantaneously.
58.	Any platform.	Minor release	Corrosion, lack of maintenance, operating	Crude and water (worse case; 100%	Loss likely to be less than 1m^3.	Likely to be caught in a skid, or on deck. May be released to sea.	If undetected, chronic pollution may occur.

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
		from a flowline / process unit.	error, valve failure.	crude).			
59.	Any platform.	Major release from a flowline / process unit.	Process failure, human error, wider emergency, large scale vessel collision.	Crude and water (worse case; 100% crude).	Largest volume of a single unit is the separator on ODP1; 66m^3.	Release to the sea.	Depending on the exact release source, volume of crude will vary. Shut down would initiate instantaneously.
60.	AFD1, IMD1, EDD1 and ODP1	Flare carry over.	Process malfunction.	Crude sheen.	No more than 1m^3.	Release to the sea.	
61.	ODP1	Loss of diesel storage tank.	Human error, corrosion, lack of maintenance wider emergency.	Diesel.	Diesel storage tank on ODP1 is 20m^3.	Release to the sea.	Worse case would be loss of inventory to sea.
62.	Subsea pipeline between ODP1 and *FSO Unity*.	Rupture.	Full rupture as a result of anchor dragging, over pressure, corrosion or sea bed movement.	Crude.	Static volume of pipeline 788m^3.	Subsea, with plume eventually reaching the sea surface.	Shut down valves present at ODP1 and *FSO Unity* turret that would initiate instantaneously. Loss of entire volume extremely unlikely due to pressure of seawater. Pipeline is 2.7km long, 24" diameter.

Offshore – *FSO Unity* and CALM Buoy

#	Facility / Activity	Scenario	Possible Causes	Oil Type	Volume	Location of Release	Comments
63.	*FSO Unity* or CALM Buoy.	Minor operational spill.	Causes likely to include human error, incorrect use of equipment, equipment failing, damage to oil storage etc.	Crude, diesel, utility oil or hydraulic oil.	Volumes will be small, <1m^3.	Likely to occur on deck and contained, for example in a skid. Unlikely to reach the sea.	Likely to occur during routine operations for example maintenance, handling oils, pigging, etc.
64.	Any platform.	Minor release from a flowline / process unit.	Corrosion, lack of maintenance, operating error, valve failure.	Crude and water (worse case; 100% crude).	Loss likely to be less than 1m^3.	Likely to be caught in a skid, or on deck. May be released to sea.	If undetected, chronic pollution may occur.
65.	*FSO Unity.*	Major release from a flowline / process unit.	Process failure, human error, wider emergency, large scale vessel collision.	Crude and water (worse case; 100% crude).	Less than 10m^3.	Release to the sea.	Depending on the exact release source, volume of crude will vary. Shut down would initiate instantaneously.
66.	*FSO Unity.*	Produced water malfunction.	Process failure.	Condensate sheen.	Minor release most likely, no more than 1m^3.	Release to the sea.	Oil lost with produced water discharge.
67.	*FSO Unity.*	Tanker collision.	Engine room failure, human error, terrorism.	Diesel.	Loss of one of the *FSO Unity* forward diesel storage tanks. The tank with the largest capacity is 2,581.4m^3.	Release to the sea.	Tanker could be a passing vessel or one that is to be loaded.
68.	*FSO Unity.*	Tanker collision.	Engine room failure, human error, terrorism.	Crude.	Loss of a crude wing tank. Tanks either of a capacity of 20,587.7m^3 or 29,409.8m^3.	Release to the sea.	Tanker could be a passing vessel or one that is to be loaded. Loss of cargo or bunkers from the tanker could also occur. Tankers are usually 2,000,000bbl dead weight.

DRY	WET
Stochastic Result	Stochastic Result
	
Trajectory Result	Trajectory Result
	
Evaporated volume: 7,651bbl / 1,216.43m^3 Dispersed volume: 15,628bbl / 2,484.74m^3 Time till beaching: 33 hours Volume beached: 14,872bbl / 2,364.49m^3	Evaporated volume: 7,500bbl / 1,192.44m^3 Dispersed volume: 17,248bbl / 2,742.35m^3 Time till beaching: 16 hours Volume beached: 10,720bbl / 1,704.41m^3
Trajectory Mass Balance	Trajectory Mass Balance
	

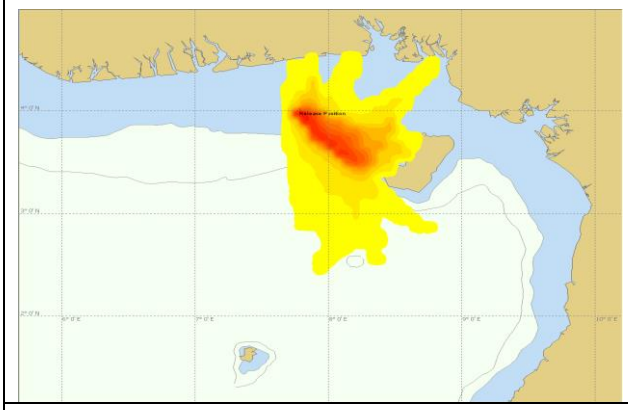
Probability of Oiling

	%	Colour
0	1.000	
1	5.000	
2	10.000	
3	20.000	
4	30.000	
5	40.000	
6	50.000	
7	60.000	
8	70.000	
9	80.000	
10	90.000	
11	100.000	

Modelling Results # 54 – OMI100, *FSO Unity* – Loss of *FSO Unity*

DRY

Stochastic Result



Trajectory Result

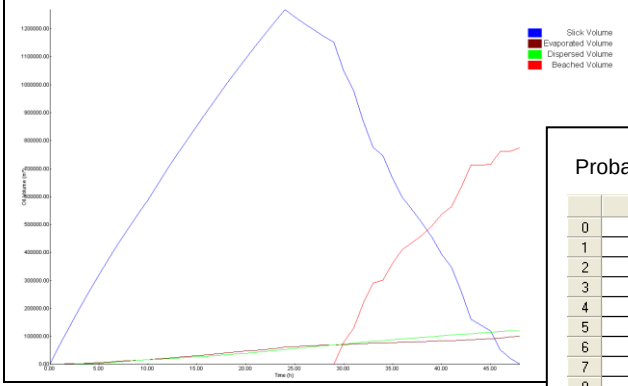
Evaporated volume: 626,624.6bbl / 99,625m^3

Dispersed volume: 755,010bbl /120,037m^3

Time till beaching: 30 hours

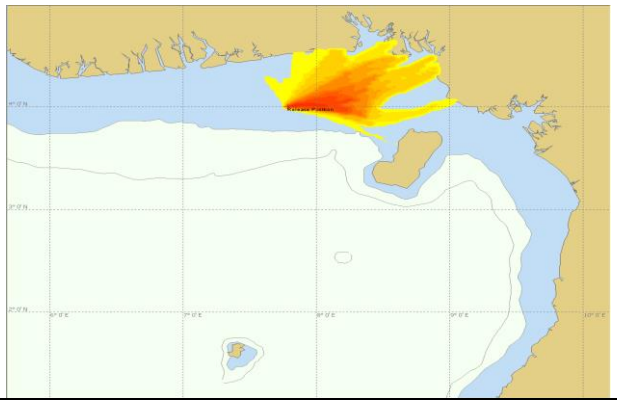
Volume beached: 4,867,505bbl / 773,387m^3

Trajectory Mass Balance

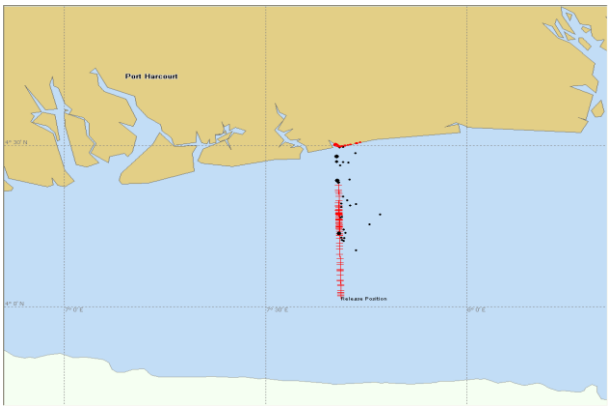


WET

Stochastic Result



Trajectory Result



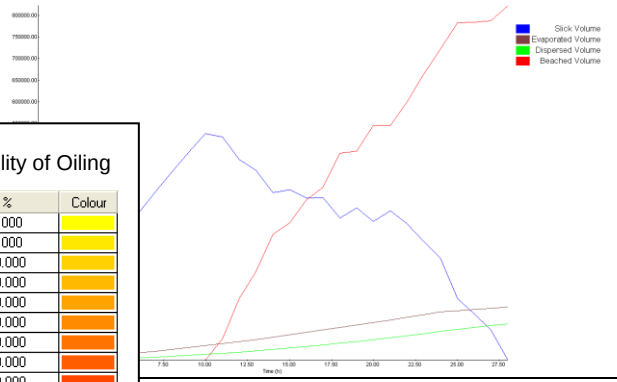
Evaporated volume: 783,438.9bbl / 124,556m^3

Dispersed volume: 533,447.8bbl / 84,811m^3

Time till beaching: 11 hours

Volume beached: 5,171,488bbl / 822,200m^3

Trajectory Mass Balance



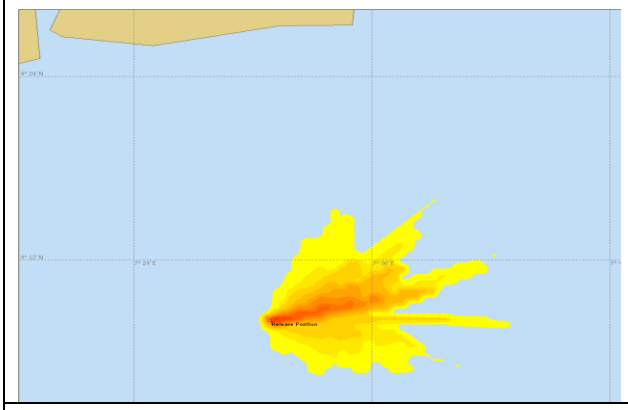
Probability of Oiling

	%	Colour
0	1.000	
1	5.000	
2	10.000	
3	20.000	
4	30.000	
5	40.000	
6	50.000	
7	60.000	
8	70.000	
9	80.000	
10	90.000	
11	100.000	

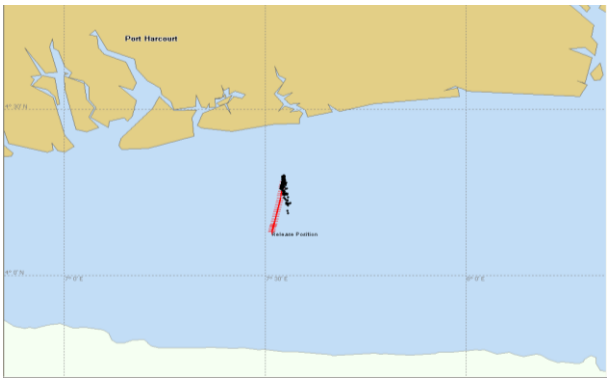
Modelling Results # 12 – OML99, AMP1 – Loss of Diesel Storage Tank

DRY

Stochastic Result



Trajectory Result



Evaporated volume: 1,036.78bbl / 164m^3

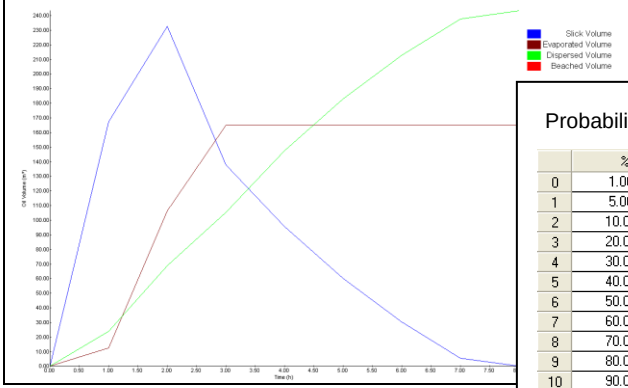
Dispersed volume: 1,529.46bbl / 243m^3

Time till beaching: no beaching

Time till natural dissipation: 8 hours

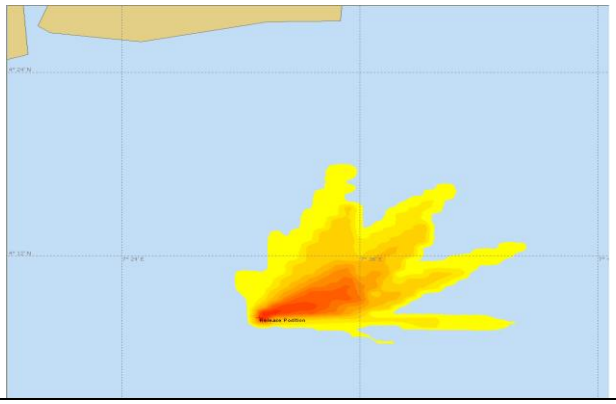
Slick travelled 19km

Trajectory Mass Balance

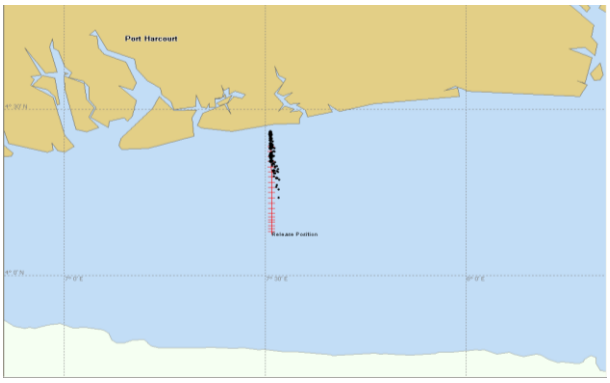


WET

Stochastic Result



Trajectory Result



Evaporated volume: 1,081.03bbl / 171m^3

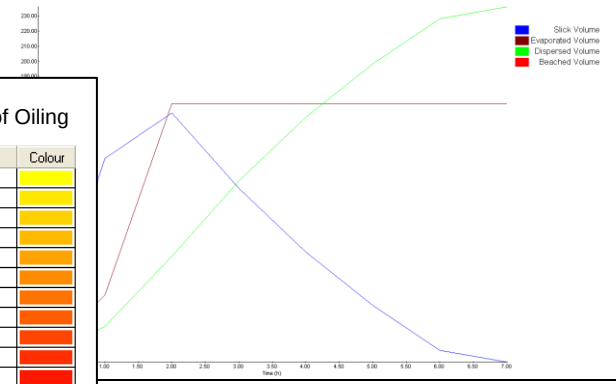
Dispersed volume: 1,485.21bbl / 236m^3

Time till beaching: no beaching

Time till natural dissipation: 7 hours

Slick travelled 35km

Trajectory Mass Balance



Probability of Oiling

	%	Colour
0	1.000	
1	5.000	
2	10.000	
3	20.000	
4	30.000	
5	40.000	
6	50.000	
7	60.000	
8	70.000	
9	80.000	
10	90.000	
11	100.000	

The stochastic oil spill modelling provides a useful indication of which areas are at risk of oiling in the event of a spill, based on environmental data and oil properties. There is a marked difference between seasons, with the eastern Niger Delta, west Cameroon and the Equatorial Guinea islands of Bioko and Principe being at risk in the dry season, whereas in the wet season Equatorial Guinea is not predicted to be impacted but Nigeria and Cameroon still are. For all dry season crude scenarios there is a clear dominant direction of oil movement to the south east. In contrast, the dominant direction of oil movement in the wet season is to the north east. This corresponds to the wet season wind data showing a greater dominance of strong southwesterlies compared to the dry season.

The crude oil trajectory results show that beaching may occur quicker in the wet season than the dry season. In the dry season, under worse case conditions, shoreline impact may occur within 20 – 35 hours depending on the exact scenario. In the wet season, under worse case conditions, shoreline impact may occur within 10 – 20 hours. These figures are estimated under the assumption that there is a constant worse case wind for the model duration and that no intervention occurs.

The diesel scenario modelling results demonstrates that shoreline impact would not be anticipated, even under worse case conditions. This is due to the properties of diesel where it will naturally dissipate rapidly.

6.11.Response Strategies

6.11.1. Contingency Planning Guiding Principles

TotalEnergies Energies oil spill response strategy has been developed with consideration to the following aspects in line with the reference documents listed in section 3.1 and 3.2 of this document;

- Net Environmental Benefit Analysis
- Tiered preparedness and response framework
- Specific parameters related to TEPNG operations (type of oil produced, local sea and weather conditions & drift prediction, location of operations, presence of environmentally sensitive areas and socio-economic activities) – Sees sections 6.5 to 6.9

Net Environmental Benefit Analysis (NEBA)

The NEBA methodology provides a qualitative approach to determine response strategies which has been used as a standard in the oil and gas industry worldwide*, recognizing that “The aims of oil spill response are to minimize damage to environmental and socioeconomic resources, and to reduce the time for recovery of affected resources by achieving an acceptable standard of cleanliness.” (IPIECA Technical guidelines – Volume 10).

The aim of NEBA is to assist response planners and incident commanders in the selection of a response strategy which has been informed by a systematic assessment and evaluation of multiple factors, with input from a number of stakeholders (IPIECA-IOGP 2015). NEBA may be used during pre-spill planning as well as during response operations:

- NEBA has been used for the development of TEPNG OSCP in order to ensure that response strategies for planning scenarios have been well informed.
- During a response, the NEBA process will be to ensure that evolving conditions are taken into consideration, so that the Incident Action Plan (IAP) can be adjusted as necessary to manage individual response actions and end points.

6.11.2. Oil Spill Response Techniques

The following response techniques have been investigated for TEPNG to predict their effectiveness and relative impact modification potential in the context of TEPNG activities and installations.

Onshore response techniques

TECHNIQUES (TE)	CORRESPONDING ACTIONS
#1- ASSESSMENT OF THE OIL SPILL INCIDENT TO	- Ascertain the extent of the spill - Confirm the nature of the oil spilled - Identify the risk of impact of sensitive areas - Use of the Shoreline Clean-up assessment technique (SCAT)
#2- PROTECTION OF SENSITIVE AREAS AT RISK THROUGH APPROPRIATE TECHNIQUE	- Use of booms to stop the flow of oil into river mouths, Swamps, lagoon, etc.
#3- JOINT INVESTIGATION VISIT (JIV)	This visit must be implemented within 24hrs of spill incident with all relevant stakeholders to - Jointly determine cause of incident - Volume of oil spilled and nature of impact

#4- CLEAN-UP OPERATIONS	- Concentration of oil to areas suitable for oil recovery operations using
	  - booms to concentrate oil slicks floating at river mouths and on the shoreline
	  - booms to divert the oil towards areas where recovery of the oil can be organized
	  - trenches dug in the beach to divert oil into for easier recovery
	- Recovery of bulk accumulations of oil
	  - Use of pumps, skimmers, sorbent materials, etc. on water
	  - Use of earth moving equipment and / or manual techniques on land and on the beaches
	  - Use of low-pressure flushing techniques

#5- TEMPORARY STORAGE OF WASTE ON SITE	- Use of temporary storage tanks (Fastanks)
	  - On riverbanks, at suitable identified sites and at the top of the beach
	  - As buffer close to main tracks, before evacuation to main storage site
	- Use of pre-identified storage areas located in the vicinity of accesses to the shoreline in the case of beach clean-up
	- Use of trenches, protected by a lining on land and at top of beaches

#6- TRANSPORT AND DISPOSAL OF WASTE	- Use of trucks and vacuum trucks for transportation of oily wastes - The final storage of collected oily wastes must be a licensed waste management facility.
#7- SITE RESTORATION	- Depending on the nature of the oil spill, long term restoration measures might have to be implemented

Offshore response techniques

TECHNIQUES (TE)	CORRESPONDING ACTIONS
#1- MONITORING AND EVALUATION OF SPILL	Whether moving in an offshore or an onshore direction, all oil slick(s) should be monitored (using vessel and or more preferably helicopter as more efficient) until it can be safely assumed that the oil no longer poses any threat to sensitive areas or offshore installations. Monitoring can be the only response needed in the following cases: - Oil slicks are not threatening any offshore installations or any sensitive areas, in particular in the case of small volumes of oil (a few barrels) being spilled and/or oil slicks drifting in an offshore direction. - The product spilled will evaporate within few hours. - The product spilled can constitute a fire/explosion hazard and will disperse rapidly. In such a case, any work in the hazardous zone must be prevented and, in particular, concentration of the product must be avoided. - ***Note**: The monitoring only option is a valid strategy as per the provisions of the National Oil Spill Contingency Plan.*
#2- TRACKING AND DRIFT PREDICTION	- In order to anticipate threatened resources, drift prediction can be carried-out by using specific software. As required by HSE/EP, Spill watch service shall be mobilized for Tier II spill incident - Tracking can also be performed by using specific devices transmitting a GPS signal - The movement of the slick can also be assessed a posteriori using Radar satellite imagery
#3- PROTECTION OF ASSETS AND/OR SENSITIVE AREAS	This strategy aims at protecting assets and/or sensitive areas which could suffer from impact of oil. It consists of: - Deflecting the spill using water guns (e.g. FiFi equipment). - Deploying floating booms to protect coastal sensitive areas. - Using sorbent materials (sorbent booms or loose sorbent in conjunction with floating booms).
#4- MECHANICAL DISPERSION	The principle of the strategy is to break the slick to facilitate its spreading and per consequence the evaporation and natural dispersion. This technique can be only applied on fresh oil (not on an emulsified oil). - This technique is relevant for low volume < 5 m3 and for diesel spill.
#5- USE OF DISPERSANTS	This technique consists of: - Using vessels and/or aircraft (helicopter or airplane) to spray dispersants on the slicks in order to enhance the natural dispersion of oil, therefore setting up conditions for a quicker biodegradation of the oil into the marine environment. - Monitoring the effectiveness of the dispersion operation.
#6- CONTAINMENT & RECOVERY	Containment and recovery of the oil involves: - The containment and concentration of oil using floating booms. - The recovery of oil using skimmers (and/or sorbent when appropriate, e.g. small patches of oil). - The temporary storage of the recovered oil at sea, before its evacuation for final disposal, using storage capacities available from tanks on board vessels /or floating storage tanks which can be mobilized from Company or other operators in Nigeria through the MAP agreement.

- The transportation of the recovered oil towards a final storage or a disposal site

6.11.3. Overall Oil Spill Response Strategies

During an oil spill the final strategy proposed will be based on the PEARL methodology which aims to assess the impact on People – Environment – Assets & Activities – Reputation – Liability in order to define objectives, strategies, and adapted response operation with relevant resources.

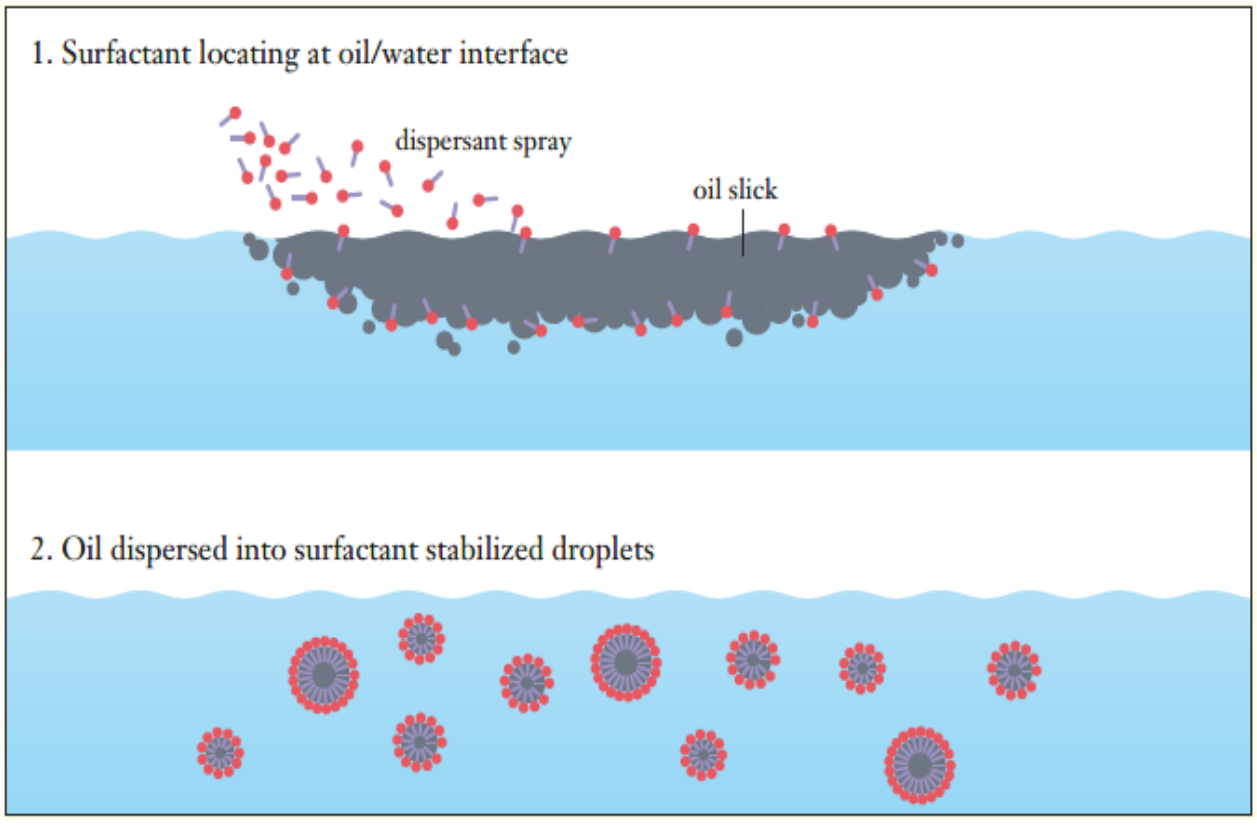
The overall oil spill response strategy for Tier 1, 2 and 3 (incidents offshore or onshore) which could occur as the result of incidents at the offshore & Onshore installations operated by TEPNG or of third-party spills to which TEPNG could be requested to respond is outlined in the table below:

Strategy	Applicable Techniques
Monitoring of the movement of oil slicks	In cases where the **oil is not threatening** any installations or sensitive areas (and/ or in case of very small volume spilled): - **Monitoring of the movements of the oil slicks** and the behavior of the oil spilled until such time that the oil has degraded on the sea surface and/or that it can safely be assumed that no installations or sensitive areas are at risk any longer.
Monitoring of the movements of the oil slicks; drift prediction and tracking	In cases where the **oil poses a threat to** installations or sensitive areas, the oil spill response strategy consists of :
Limiting/ avoiding impact of sensitive areas, by responding at sea as soon as possible	- **Offshore response strategy is based on chemical dispersants as the primary response option for crude oil (see section 6.11.1)**. Dispersion operations should start as soon as possible for spill upper then 5 to 10m3: time opportunity for dispersion is limited in the best cases (calm weather) and decreases rapidly with the increase of viscosity caused by the increase of the speed of the wind - Given the various spill scenarios identified during the risk analysis and the limited time opportunity, **containment and recovery (see section 6.11.2)** operations might be needed to replace and/ or to complement the spraying of dispersants. - Mechanical dispersion is efficient for very low volume of oil spilled (< 5m3) and on light products such as marine diesel oil.
protection of coastal sensitive areas	- Initiating the protection of coastal sensitive areas which could be affected by the oil slicks, as soon as it is assessed that an impact could occur. - Special attention should be given to sensitive natural areas, fisheries and fishing villages. Coastal sensitivity maps approved National Oil Spill Detection and Response Agency will be used as support for decision making
Mobilizing resources for shoreline clean-up	- Initiate mobilization for shoreline clean-up when the assessment leads to a possible impact of the coastal area.

Containment & Recovery	▯ This shall be implemented using booms and skimmers ▯ Use less sensitive sandy beaches as “sacrificial” areas to contain and recover the oil

6.11.1. The Use of Dispersants

Spraying dispersant on the oil enhances its natural dispersion in micro-droplets by the wave actions. They retard the re-coalescence of droplets into slicks because they contain surfactants (surface active agents) which reduce interfacial tension between oil and water. The dispersed micro-droplets can then be biodegraded more easily and more rapidly by naturally occurring marine micro-organisms and bacteria in the sea water.



From Operational point of view, dispersants have the following advantages

- ▯ Provided that a sufficient amount of dispersant, properly equipped vessels and adequate spraying equipment are available on site, a large amount of oil can be treated rapidly.
- ▯ Dispersant application is more efficient for sea response than containment and recovery operations. Experience has shown that, due to various limitations (weather conditions, logistics, etc.), it is usually not possible to recover more than 10% of the amount of oil initially spilled.
- ▯ Dispersant application by boat can be done (even in mediocre weather conditions). Dispersion should therefore be possible under the Block 17 prevailing MetOcean conditions.

- Dispersed oil is removed from the wind action. This can avoid slicks to land on the shore in case of onshore winds (depending on the strength and direction of the current).
- Dispersant application saves having to manage oily wastes at sea.

Nigeria Context for the use of dispersant

The use of dispersants is authorized in Nigeria in offshore water zone >5km from the shoreline therefore all TEPNG facilities offshore is located within a zone considered safe for chemical dispersion.

However, authorization must be obtained from NUPRC, NMDPRA and NOSDRA before use of dispersants in the event of an oil spill incident.

TUCN owns a stock of INIPOL 90, Corexit and Dispolene 36S tested successfully on TEPNG Crude oil (Source: weathering study performed by Cedre):

- In case of a Tier 2 oil spill, it might be necessary to supplement the Company stock by calling assistance from other Nigerian operators available through MAP agreement.
- In case of Tier 3, additional dispersant will be shipped from abroad.

6.11.2. TEPNG Oil Spill Capabilities

TEPNG follows international best practice regarding oil spill response and adheres to the three-tiered approach to Tiered Preparedness and Response as defined by the International Petroleum Industry Environmental Conservation Association (IPIECA). Tier 1 resources, people and equipment, are in place both onshore and offshore and if these capabilities become overwhelmed TEPNG has arrangements in place for additional support at the Tier 2 and Tier 3 levels, as described below.

Onshore Capabilities

Strategy	Tier 1	Tier 2	Tier 3
Monitor and Evaluate movements of the soil slicks	Monitoring shall be done with Pedestrian	Use of Bristow helicopters	Use of Bristow helicopters
Containment and Recovery of Oil on Permeable / Impermeable Ground	Use of sorbents / manual recovery or use of the vacuum truck, and use of local contractors to supply vacuum trucks / earth work machinery.	CNA and use of local contractors to supply vacuum trucks / earth work machinery.	Use of all Tier 2 resources and Oil Spill Response / FOST.
Containment and Recovery in Ditches / Streams	Using various locally available materials. Skimmer systems held at Obagi and the vacuum truck offer a range of options.	CNA / MAP.	Oil Spill Response or FOST managing, using various locally available materials.

Containment and Recovery in Rivers	Booms held at Obagi may be suitable for smaller / slower rivers. Skimmer systems held at Obagi and the vacuum truck offer a range of options.	CNA / MAP.	Use of all Tier 2 resources and Oil Spill Response / FOST.
Containment and Recovery in Swamps	Booms held at Obagi suitable. Skimmer systems held at Obagi and the vacuum truck offer a range of options.	CNA / MAP.	Use of all Tier 2 resources and Oil Spill Response / FOST.

Offshore Capabilities

Strategy	Tier 1	Tier 2	Tier 3
Monitor and Evaluate	From a platform / vessel / use of Bristow helicopters.	From a vessel / use of Bristow helicopters / WASP/Satellite surveillance.	Use of all Tier 2 resources and Oil Spill Response / FOST.
Containment and Recovery	Resources held on *FSO Unity.*	CNA / MAP.	Use of all Tier 2 resources and Oil Spill Response / FOST.
Dispersant Application	Resources held on *FSO Unity* / on support vessels.	CNA / MAP.	Use of all Tier 2 resources and Oil Spill Response / FOST.
Aerial Surveillance / Dispersant Application	Helibucket at Port Harcourt (currently not operational).	WASP.	Oil Spill Response.
Shoreline Protection	Not applicable.	CNA / MAP.	Use of all Tier 2 resources and Oil Spill Response / FOST.
Shoreline Clean-up	Not applicable.	CNA / MAP.	Use of all Tier 2 resources and Oil Spill Response / FOST.
In Situ Burning	In situ burning would use fire booms to contain oil on the water surface, which would then be ignited and allowed to burn. This strategy is presently outlawed in Nigeria.		
Subsea Injection	Capability is not available locally in Nigeria OSRC can provide support, though not necessary for PHCD because we use Jack- up Rigs.		

6.11.3. Justification of Main Onshore Strategies

TEPNG have the capability to employ a number of oil spill response strategies for an oil spill event of any severity. The main strategies available to TEPNG are listed below.

Location	Main Strategies Available to TEPNG
Impermeable Ground	Manual recovery and cleaning oiled areas
Permeable Ground	Manual recovery, mechanical recovery and recovering oil from groundwater
Ditches / Streams	Damming and oil recovery
Rivers	Booming and oil recovery

Swamps	Damming, booming and oil recovery

The use of such strategies are well documented in the oil spill response industry, for example:

- "A Field Guide to Inland Oil Spill Clean-up Techniques", Concawe 1991.

The limitations of each strategy have been extensively researched by the industry. For TEPNG the main limitations are firstly gaining access from the local community to the affected site, mobilising equipment to remote areas and ensuring there are no security concerns. The main limitations centre on booming oil on flowing water. In currents over 2.5 knots the length of boom required to take account of current usually becomes unmanageable, and oil will escape from a boom laid perpendicular to the flow if the relative current strength is above 0.6 knots.

6.11.4. Justification of Main Offshore Strategies

TEPNG have the capability to employ a number of oil spill response strategies for an oil spill event of any severity. The main strategies available to TEPNG are listed below.

Location	Main Strategies Available to TEPNG
Offshore	Monitor and Evaluate and Aerial Surveillance
	Containment and Recovery
	Dispersant Application
Coastal	Shoreline Protection
Coastal	• Shoreline Cleanup: • Manmade Structures (ESI 1) – mainly pressure washing • Sedimentary Shores (ESI 2 – 6) – mainly manual and mechanical recovery, and possibly natural recovery or low pressure washing • Vegetated Shores (ESI 7 – 9) – mainly natural recovery with monitoring and low pressure washing • Tidal Flats (ESI 9) – mainly natural recovery with monitoring and low pressure washing • Mangroves (ESI 10) – mainly natural recovery with monitoring and low pressure washing

The use of such strategies are well documented in the oil spill response industry, for example:

- "A Filed Guide to Coastal Oil Spill Control and Clean-up Techniques", Concawe 1982
- "A Field Guide to the Application of Dispersant to Oil Spills", Concawe 1988
- "Manual on Oil Pollution", International Maritime Organization 2005
- "Technical Information Papers Series", International Tanker Owners Pollution Federation Limited 1981 – 2008

Each offshore strategy has various limitations. For all strategies the weather and sea state have a direct control on what is actually possible to safely undertake. It is well documented that containment and recovery is only likely to recover 10 – 20%, because of the logistical difficulties in encountering oil that is fragmenting and spreading thinly over an increasingly wide area. For this reason TEPNG also have a dispersant application capability, but this too has limitations. The main one is the "window of opportunity" which is the time period after initial release that the oil is amenable to dispersant. Beyond this, the effect of dispersant will be reduced. Coastal strategies are mainly limited by the weather conditions and sea state. In addition, access in regards to mobilising equipment to remote sites, personnel safety, security and community approval, are major limitations.

6.11.5. Justification of Tier 1 Capability – Onshore

The sites in OML58 are surrounded by dense jungle which in the wet season generally becomes a wetland with streams and pools of water. As such oil spill response equipment in the Tier 1 stockpile consists of booms and skimmers specifically designed for such an operating environment. Access to contaminated infield sites is an issue, for example limited road access, and as such the Tier 1 equipment is small enough so that it can be safely transported manually. The size of the stockpile has been designed around there being enough personnel for two Tier 1 sites to be safely managed simultaneously. In addition, basic, non-specialised resources are also available, for example damming materials, PPE and manual cleanup tools. Such equipment is ideal for inland spill scenarios where oiled soil and vegetation may need to be removed. A 8m^3 capacity vacuum truck is also available. Full details of the Tier 1 equipment are given in the Anti Pollution Equipment Stockpile COR-PLA-HSE/ENV/21.

The Tier 1 spill volume for inland scenarios depends on the locality. For incidents on land it is 50bbl (7.95m^3) and for incidents on inland waters, the volume definition is 25bbl (3.975m^3). The vacuum truck can hold 8m^3 and each of the two Fastanks can hold ~7m^3. Assuming ideal conditions and trained operators, the recovery rate of the skimming main units, Komara 12 and Komara 20, are said to be 12 tonnes/hour (approximately 12m^3/hour)and 20 tonnes/hour (approximately 20m^3/hour) respectively.

6.11.6. Justification of Tier 1 Capability – Offshore

The main offshore oil spill response resources are held on *FSO Unity* in OML100. Containment and recovery is the primary response option. Refer to the Anti Pollution Equipment Stockpile COR-PLA-HSE/ENV/21 for the full equipment listing and specifications. In the event of a spill in OML99 or OML102, infield vessels in OML100 will be loaded with response equipment and will sail to the incident location. Sailing time from OML100 to OML102 is 2 hours, and for OML100 to OML99 is 1hr 35 minutes. The spill risk in OML99 and OML102 is lower than OML100, as the main oil spill risk is associated with the exporting of oil from *FSO Unity*. Hence, the equipment is stockpiled in OML100.

The Tier 1 spill volume definition is 50bbl (7.95m^3) and TEPNG has more than sufficient resources to meet this assuming it is still within the operational limits of the Tier 1 capability. The containment and recovery equipment consists of 500m of boom and an offshore skimmer that in ideal conditions and being operated by trained personnel, can recover 50 tonnes/hour (approximately 50m^3/hour). The offshore recovered oil storage consists of the 100m^3 floating storage tank and the onboard storage on the tug *Bourbon Rhodes* which is 116m^3. Both storage volumes exceed the TEPNG Tier 1 definition.

Should containment and recovery not be suitable or sufficient, TEPNG have two infield vessel dispersant application systems with a stock of dispersant held on the *FSO Unity*. The 9,800 litres (9.8m^3) of dispersant available can treat the following amount of oil assuming conditions are optimal, operatives are trained and oil is fresh:

- Assuming a ratio of 1:20 is sufficient, around 160m^3 (1,006.4bbl) of oil could possibly be dispersed.

If the original NUPRC/ NMDPRA Tier 1 definition is considered, <250bbl (39.75 m^3) which is not as strict for reporting, then the TEPNG Tier 1 resources are still more than adequate to handle such an incident assuming it is still within the operational limits of the Tier 1 capability.

TEPNG can respond to more than one offshore incident at a time. The limitation is the number of vessels. The *Bourbon Rhodes* would be required in containment and recovery operations, along with a surfer or the *Lamnalco Eagle* tug. The Viksospray system could be installed on another surfer or the *Lamnalco Eagle* tug if available for simultaneous dispersant spraying.

6.12. End of oil spill response operations

The oil spill response operations can be stopped when an acceptable level of clean-up (particularly for the shoreline clean-up operations and on land) has been achieved.

At the end of the operations, a visit of the clean-up work sites should be organized by TEPNG with representatives of the Nigerian authorities who will have the authority to validate the termination of the clean-up operations.

6.13.Waste management and site restoration

6.12.1 Storage of waste on site

During oil spill response operations, a great amount of oil and oily waste can be recovered. Sufficient temporary storage on site must be provided to ensure that recovered waste can be temporarily stored, before evacuation is organized

For onshore sites, temporary storage on site (using free standing flexible storage tanks, Plastic Tanks or drum) is used to store oil directly recovered with skimmers, pumped from the trenches or collected manually.

Intermediate storage tanks or Jute bags can be used to centralize the waste from the temporary storage before evacuation

For offshore, the storage tanks onboard the vessels and floating storage tanks, will be used for the temporary storage of the waste as well as for the evacuation of the waste through a vessel to Onne port or any other designated location.

6.12.2 Transport and disposal of wastes

In case of a major clean-up operation, the number of oily wastes generated by clean-up operations can rapidly become very large and the entire disposal chain must be organized as soon as possible from the transportation of the oily wastes to a treatment storage site and final disposal in line with regulatory requirements.

Note. It is recommended to segregate the different types of contaminated wastes (e.g. soil, vegetation, oily sediments, liquid wastes, etc.) to allow for different solutions for the disposal of these wastes.

6.12.3 Site restoration & Post monitoring

Following an onshore spill and depending on the type of oil and ground conditions, and the outcome of post clean-up inspection assessment, site remediation strategy might have to be implemented.

A post-incident environmental monitoring can also be implemented to assess the ecological impact of the incident, ecological impact of oil spill response techniques on the environment and degree of rehabilitation of the ecosystems affected by the spill.

TotalEnergies EP Nig Ltd.	UBETA	TotalEnergies

UBETA PROJECT

UBETA EMERGENCY RESPONSE PLAN

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01	AFU	17 March 2024	Approved For use	A. TOBIN	H. IKPA	L. EKE
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Table of Contents

1. GENERAL

1.2 INTRODUCTION

The Emergency Response Plan is an operational document drawn up in anticipation, identifying the key points for response to a major event on sites such as an event affecting the health and safety of personnel, a security event resulting from harmful actions committed by third parties and events that may affect the environment.

The purpose of this Emergency Response Plan is to provide an action-oriented plan to effectively control and manage emergencies while executing activities related to Ubeta project. The emergency response plan is applicable to all locations (Contractor yard, Site and Company).

Specific objectives are to:

- Describe the project Emergency Response Organization
- Define the roles and responsibilities of the Emergency Response members.
- Define the Emergency Scenarios.
- Describe the Emergency Response measures established for alert, muster, evacuation and rescue.
- Describe the emergency response communications organization.
- Describe measures established to bring emergency situations under control and post event recovery.
- Provide a basis for the training of personnel to ensure that competent personnel are able to undertake their assigned duties during an emergency.

This plan is based on principles and methods of emergency response management as one of the methods applicable to the recovery phase of hazards and effects management process in HSE management system.

It describes the process, roles and responsibilities of entities response to emergency involving assets, personnel, visitors, sub-contractors, and support services involved in the execution of the project in an efficient and professional manner that effects on personnel, assets and environment are prevented or minimized.

It applies to all offices, worksites and sites that will be utilized throughout various stages of the life of the project and for personnel in transit from site to site travelling on behalf of the project. Sites are further categorized as follows:

- TotalEnergies Operated Sites (Nigeria)
- Contractor Operated Sites (Nigeria)

This plan defines:

- The response organization for incidents on TOTALENERGIES operated sites, including offices in Lagos.
- The response arrangements for 3rd party incidents affecting Project personnel and sites.
- References and interfaces with other plans and documentation, including contractor site plans.

1.3 FIELD OF APPLICATION

This Plan applies to all emergency situations (Safety, Medical or Security related) at the Project offices, worksites, sites and transit of personnel between offices, worksites and sites.

1.3.1 TOTALENERGIES Sites

All Ubeta emergency activities will be managed by the UBETA resident emergency team and escalated through the PMT and OML 58 management organization.

Project personnel based in TUCN authorized offices or sites in Nigeria, will be covered by the relevant site emergency response plans.

If any of the sites/office emergency response plan is activated for an incident in which Ubeta Project personnel are affected, then this plan will be activated in support.

1.3.2 Contractor Sites

All main contractor sites where Project personnel will be stationed must have an Emergency Response Plan in place verted and approved by PMT.

The Ubeta Project Package Manager will be responsible for ensuring that contractor's plan is fit for purpose.

A bridging plan must be developed to bridge the contractor plans with this plan. The responsibility for the development of these bridging plans lies with the Ubeta Project Package Manager.

These plans should be kept simple and be of flowchart design and contain.

- Key contact details in case of emergencies.
- Method of activation and response.
- Local interface between project and contractor emergency organization.

A copy of the contractor site emergency response plans, or equivalent document, and any other relevant emergency related plans, i.e., medical, crisis management, security and evacuation, must be provided to PMT for inclusion.

The Ubeta HSEQ Manager is responsible for ensuring that a duty person is always available to liaise directly with Contractor and notification to the District's Duty Manager in the event of emergencies.

If the contractor emergency plans are activated for an incident in which Ubeta Project personnel are affected, then this plan will be activated in support.

1.3.3 Project Personnel in Transit

The originating Project Package must track staff, contractors, and visitors, travelling on behalf of the project. Basic journey management protocols must be applied for all personnel where procedures are not already in existence, i.e., itinerary, destination arrival confirmation, contact details, etc. In the

event of travel related incidents where a threat to safety of the traveler/s exists, or relevant corporate and / or contractor emergency plans are activated, then this plan will be activated in support.

1.4 RESOURCES

To ensure comprehensive emergency management at both TotalEnergies Site and Contractor Yard locations, a range of essential resources must be in place to address any unforeseen situations promptly and effectively. These resources include, but are not limited to:

- Clearly Defined and Prominently Marked Muster Points:
- Trained and Proficient Emergency Response Team:
- Robust Communication Infrastructure:
- Comprehensive Emergency Plans with scenario based reflex card
- Arrangement with retainer clinics
- Adequate perimeter security and response plan

2. REFERENCE DOCUMENTS

Unless otherwise stipulated, the applicable version of the reference documents listed below, including the relevant appendices and supplements, is the latest revision published.

E&P Referential

Reference	Title
HSE Charter	Exploration and Production HSE Organization Charter
CR EP HSE 001	Rules for Implementation of the DGEP HSE Policy: MAESTRO
CR GR HSE 100	HSE Reporting
CR EP HSE 091	Affiliate Emergency Response Plan
GM EP HSE 091	Guideline for Affiliate Emergency Response Plan
CR EP HSE 092	Notification and Liaisons DGEP - Affiliates in Case of Emergency
GM EP HSE 006	Directeur de Permanence DGEP
CR EP HSE 101	Investigation of major accidents
GS EP MED 061	Medical Support for E&P Sites

TUCN (TEPNG & TUPNI)

Reference	Title
PLN-HSE/GEN-M07-022-Rev03	PHC District Emergency Response Plan

PLN-HSE/GEN-M07-021-Rev 3	TUCN Crisis Management Plan
HSE-GENERAL MAESTRO 07	Affiliate Medical Evacuation Procedure
PLN-HSE/ENV-M05-04	General Oil Spill Contingency Plan
PLN-HSE/ENV-M05-014-Rev 3	JV Asset Oil Spill Contingency Plan – Action Plan
PLN-HSE/ENV-M05-16-Rev 3	JV Asset Oil Spill Contingency Plan - Strategy Plan
GS EP PJC 401	Health, Safety and Environment on construction and installation
NG-UBM-00-UBSE-00014	Contractor HSE Assessment and Implementation Plan
PRD-HSE/GEN-M01-25-Rev 0	HSEQ Awareness and Communication Procedure
INT-PLN-58-HSE-037 Rev06	OML58 OIL SPILL CONTINGENCY PLAN-1 Action Plan
INT-PLN-58-HSE-037 Rev06	OML58 OIL SPILL CONTINGENCY PLAN-2 Response

Ubeta Project

Reference	**Title**
NG-UBM-00-UBSE-00002	Project HSE Plan
NG-UBM-00-UBSC-00001	Project Security Plan

3. DEFINITIONS

Company (CPY)	Means TotalEnergies Upstream Nigeria Limited.
Contractor (CTR)	An awardee of an EPC contract
Alarm	Sound or visual device meant to warn of existing or imminent danger
Alert	Verbal information made to a person or an entity that takes part to the response process
Crisis	Any incident, series of events, or set of circumstances that threatens to fundamentally affect or alter the way the district chooses to do business
Emergency	An unforeseen combination of circumstances that disrupts normal operating conditions and poses an actual or potential threat to human life, health, property or the environment if not controlled, contained, or eliminated immediately.
Incident	An event, series of events or set of circumstances that interrupts normal operating procedures and has the potential to precipitate an emergency or crisis
Notification	Information made to a person or an entity that needs to know about.