



FIRST SCHEDULE

Environmental Impact Assessment (EIA)

for

The Bayan Field Development Project (FDP) for Oil Production, Offshore Bintulu, Sarawak

Project Proponent



PETRONAS CARIGALI SDN BHD

Prepared by



CHEMSAIN

CHEMSAIN KONSULTANT SDN BHD

EXECUTIVE SUMMARY

Environmental Impact Assessment (EIA) for The Bayan Field Development Project (FDP) for Oil Production, Offshore Bintulu, Sarawak

Proponent and EIA Consultant

Proponent



PETRONAS Carigali Sdn. Bhd.
Suite 23-01 to 23-08, Level 23,
Gtower, 199 Jln tun Razak, 50400,
Wilayah Persekutuan Kuala
Lumpur



Contact Person

Mr. Faizal B Abdullah
Tel: 0197798345
E-Mail:
izal_abdullah@petronas.com.my

EIA Consultant



CHEMSAIN

Chemsain Konsultant Sdn. Bhd.
No. 172 Rock Road
93200 Kuching, Sarawak,
Malaysia



EIA Team Leader

Ir. Chong Sin Hian (Brian)
Tel: 082-548 366
Fax: 082-548 388/399
E-Mail: consult@chemsain.com



Legislative Requirement

Environmental Quality (Prescribed Activities)
(Environmental Impact Assessment) Order
2015

ITEM 9 Petroleum

Sub-item (a) Development of:-
(i) oil field

“

Statement of Need

To optimise recovery from bypassed and under-drained reservoirs, maintain reservoir pressure and extend the productive life of the Bayan Field using existing infrastructure.

”



- 1. Two existing oil producer to be converted to water injector. (BY-103 & BY-106)
- 2. Power tie-in requirement for PWIM pump from BYG-A & BYP-A.
- 3. New wellhead control panel (WHCP).

01

02

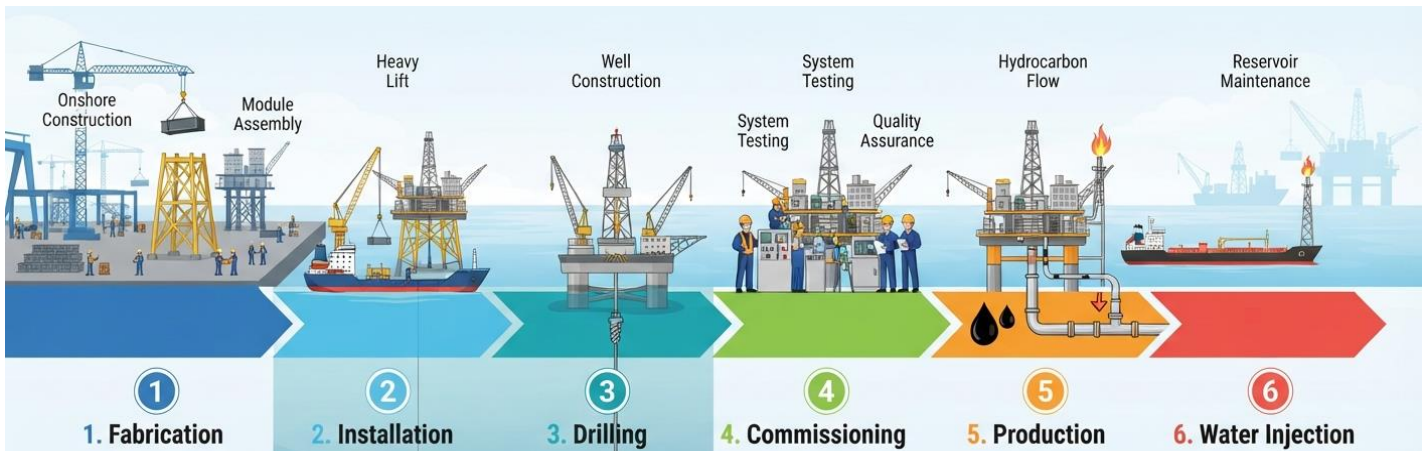
03

- Existing BYP-A, BYG-A, BYR-A and MOPU utilized
- Existing pipeline network utilized
- Existing oil and gas export systems utilized
- No new export pipelines

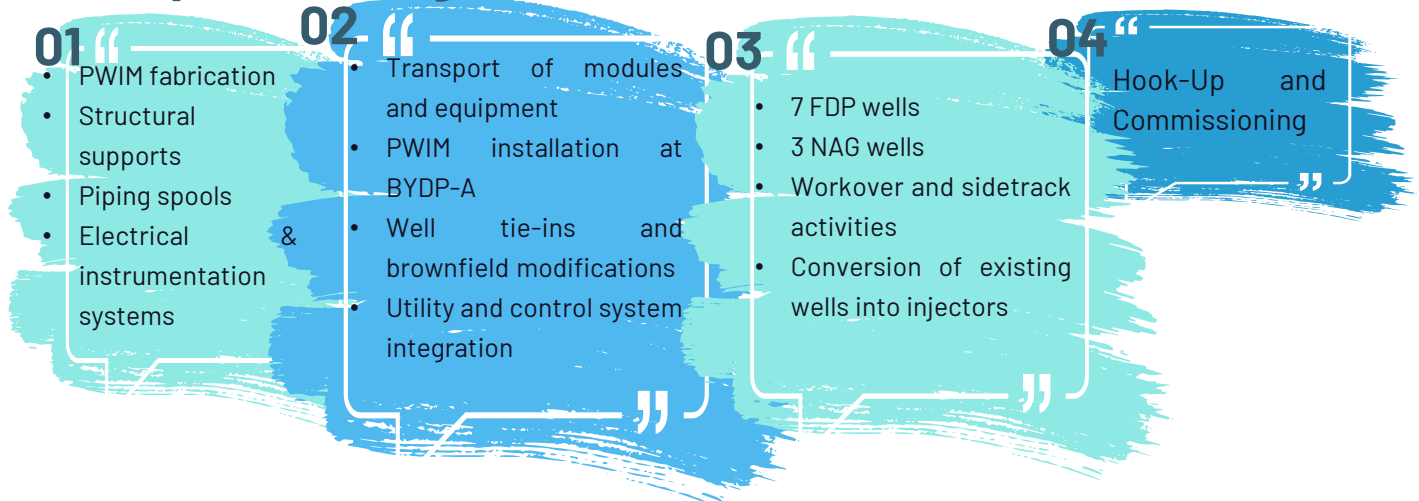
Project Description



Project Activities



Development Stage



OPERATION AND MAINTENANCE STAGE

- Oil and gas production through existing facilities
- Seawater treatment and injection
- Reservoir pressure maintenance
- Routine inspection and maintenance
- Existing export system utilisation

DECOMMISSIONING AND ABANDONMENT STAGE

- Plug and abandon wells
- Facility decommissioning
- Pipeline flushing and isolation
- Implementation of approved Decommissioning Plan

Project Schedule



Development Drilling Campaign: Sept 2026 – Oct 2027

PWIM Installation & Commissioning: 2026 – 2027

First Water Injection: Jun 2027

First Oil: October 2026



Existing Environment

Geology

- Located in the Balingian Province of the Sarawak Basin, characterized by a Tertiary-aged sedimentary basin.
- Fluvial to shallow marine sandstone reservoirs feature moderate-to-high porosity, with hydrocarbon migration occurring along fault lines.



Bathymetry & Seabed Conditions



- Generally flat seabed with water depths ranging between 28.4 m and 30.8 m below Mean Sea Level (MSL).
- The regional seabed gradient is negligible at less than 1°

Wind and Wave



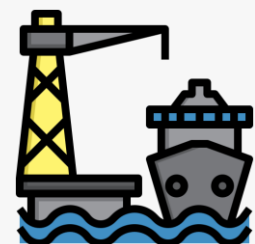
- Area influenced by the Northeast and Southwest Monsoons.
- Stronger winds typically occur during the Northeast Monsoon.
- Dominant wave directions:
 - Northward influence during year-end monsoon season.
 - Westerly influence during mid-year period

Currents and Tides

- Seasonal monsoon patterns govern current circulation.
- Diurnal tidal regime is characteristic of offshore Sarawak waters.

Human Environment Marine & Industrial Activities

- Existing producing platforms already operate within the project area.
- Bintulu Port is the nearest major port facility.
- Project lies outside major commercial shipping routes.





Existing Environment

Biological & Human Environment

Environmental Sensitive Areas

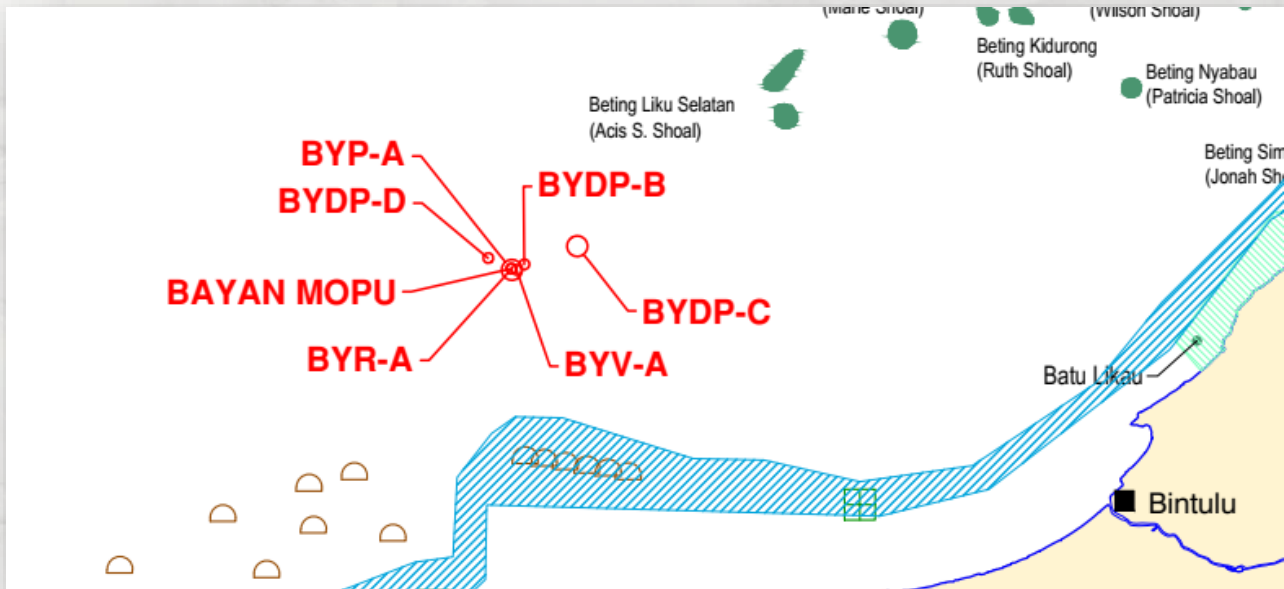
Marine Turtles

- Turtle nesting beaches at Similajau National Park (Golden Beach, Turtle Beach I & II).
- Nearest nesting habitat located more than 20 km from the project site.



Fisheries

- Project located within an existing offshore oil and gas development area.
- Not situated within recognized fishing grounds



Coral and Artificial Reefs

- Nearest natural coral reef: Acis S. Shoal, approximately 28 km from the project area.
- Artificial Reef Complex: The closest state turtle-conservation reef ball fields are located >20 km away.
- Luconia Shoals Marine National Park sits over 140 km northeast.



Environmental Baseline Sampling



Marine Water Quality

- Seventeen (17) marine water samples were collected from the survey area.
- 100% compliant with MMWQS Class 3 standards for commercial and industrial zones.
- Features high clarity (turbidity <1.0 NTU), low suspended solids (2–14 mg/L), and non-detectable levels of oil, grease, Total Petroleum Hydrocarbons (TPH), or PAHs. Elevated trace metals (Al, Cu) reflect natural regional background profiles.

Seabed Sediment Quality

- Seventeen (17) sediment samples were collected.
- Dominated by fine-grained silt (47.8%–56.2%) and sand (27.1%–36.5%).
- All heavy metal concentrations, Total Organic Carbon (2.89%–3.21%), and hydrocarbon fractions fall strictly below the NOAA Effect Range-Low (ERL) safety thresholds, indicating no baseline industrial pollution.



Biological Environmental

- Seventeen (17) monitoring stations established.

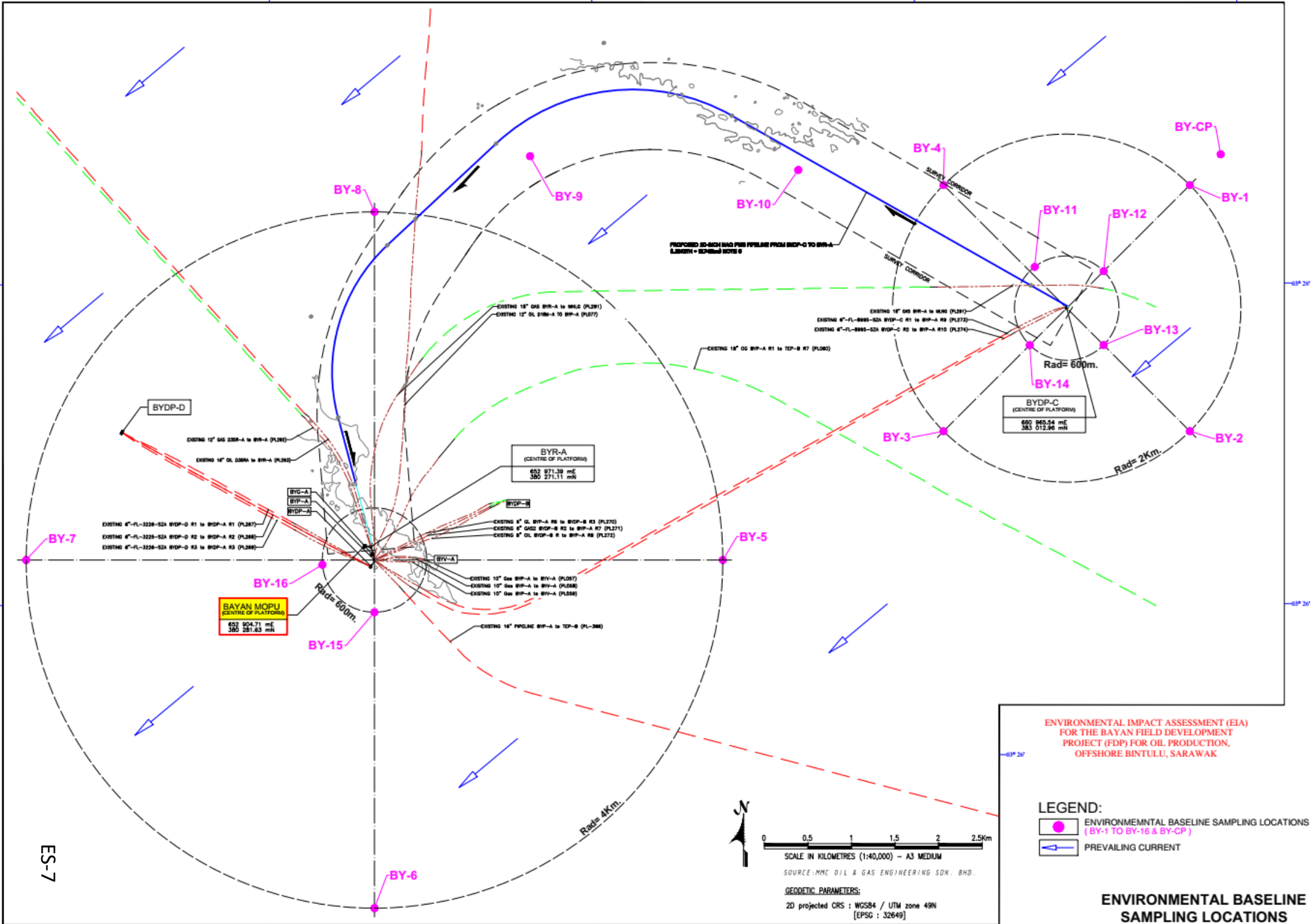
Macrobenthos

- Productive, well-balanced benthic ecosystem with overall densities ranging from 520 to 1,250 units/m². High Shannon diversity indices ($H' = 2.44$ – 2.85) and balanced evenness indicate stable soft-bottom habitats dominated by polychaetes, burrowing shrimps (*Callinassa*), and scaphopods (*Cadulus*). .

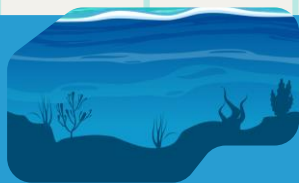
Planktonic Ecosystem

- Moderately productive phytoplankton community (40,600 to 155,500 cells) heavily dominated by centric diatoms (*Chaetoceros*, *Rhizosolenia*), supporting low-to-moderate zooplankton diversity ($H' = 0.96$ – 1.48) dominated by copepods and crustacean larvae. No signs of harmful algal blooms or eutrophication..





Impacts and Mitigation Measures



MARINE WATER *LOW*

MEDIUM (Accidental Event)

- Potential impacts to marine water quality due to vessel wastewater discharge, drill cuttings discharge, drilling fluids, cement returns, maintenance activities and support vessel operations. No routine produced water discharge is anticipated during normal operation.
- Potential deterioration of marine water quality may occur in the event of hydrocarbon spill, pipeline leakage or chemical release.

Mitigation Measures

Development Stage

- Ensure vessel discharges comply with MARPOL requirements.
- Use environmentally acceptable drilling fluids and chemicals.
- Implement waste management and good housekeeping practices.
- Minimise unnecessary discharges during drilling and support activities..

Operation and Maintenance Stage

- Route maintenance drainage and wash water to designated collection systems.
- Collect and manage pigging residues and maintenance wastes appropriately.
- Conduct routine inspection of drainage systems, pipelines and process equipment.

Accidental Event

- Maintain Oil Spill Contingency Plan and Emergency Response Plan.
- Conduct routine pipeline integrity monitoring and leak detection.
- Implement immediate containment and recovery measures in the event of a spill.



SEABED *LOW*

- Potential disturbance to seabed conditions due to drilling activities, drill cuttings deposition, anchoring activities and temporary seabed scarring.
- Impacts are expected to remain localised within the immediate vicinity of the drilling locations.

Mitigation Measures

Development Stage

- Optimise anchor placement and vessel positioning.
- Minimise seabed footprint during installation and drilling activities.
- Utilise environmentally acceptable drilling fluids.
- Implement drilling waste management procedures.

Decommissioning Stage

- Undertake removal activities in accordance with approved abandonment procedures.
- Restore disturbed areas where practicable.

Impacts and Mitigation Measures



MARINE ECOLOGY

LOW
MEDIUM (Accidental Event)

- Temporary increase in suspended solids and drill cuttings deposition may affect plankton, benthic communities, fish and other marine organisms.
- Mobile marine fauna are expected to avoid areas of disturbance and recolonise following completion of activities.
- Potential impacts may occur in the event of hydrocarbon spill or chemical release.

Mitigation Measures

Development Stage

- Optimise drilling programme to minimise seabed disturbance.
- Minimise anchor and vessel footprint.
- Restrict activities to designated work areas..

Operation and Maintenance Stage

- Maintain asset integrity.
- Conduct environmental monitoring where required.

Accidental Event

- Implement spill prevention measures.
- Maintain oil spill response capability and emergency preparedness.



AIR QUALITY

LOW

- Emissions generated from drilling rigs, support vessels, generators, maintenance vessels and ancillary equipment.
- Greenhouse gas emissions associated with fuel combustion and occasional flaring during startup, shutdown and emergency conditions.

Mitigation Measures

Development Stage

- Ensure marine vessels comply with MARPOL Annex VI requirements.
- Maintain engines and equipment in good working condition.

Operation and Maintenance Stage

- Minimise flaring and venting activities.
- Optimise vessel movements and fuel consumption.
- Maintain equipment efficiency through scheduled maintenance.



NOISE

LOW

- Increased underwater and airborne noise levels due to drilling activities, support vessels, helicopter movements, maintenance activities and PWIM operation.
- Primary impact is expected to be limited to personnel and marine fauna within the vicinity of the Project area.

Mitigation Measures

Development Stage

- Maintain noise-generating equipment in good condition.
- Optimise drilling and support vessel activities.

Operation and Maintenance Stage

- Install acoustic protection where required.
- Implement occupational noise management programme.
- Provide appropriate hearing protection to personnel exposed to elevated noise levels.

Impacts and Mitigation Measures



MARINE TRAFFIC

LOW

- Increased vessel traffic and temporary navigation restrictions due to drilling, installation and support vessel activities.
- Temporary restriction of fishing activities within safety exclusion zones.
- Operational vessel movements are expected to be infrequent and limited to maintenance activities.

Mitigation Measures

Development Stage

- Issue Notices to Mariners.
- Establish and clearly mark safety exclusion zones.
- Engage with relevant marine and fisheries authorities.

Operation and Maintenance Stage

- Coordinate maintenance vessel movements.
- Maintain navigational aids and communication systems.



WASTE

LOW

- Generation of domestic, operational, maintenance and scheduled wastes during development and operation activities.
- Improper handling or disposal may result in contamination of the marine environment and risks to personnel.

Mitigation Measures

Development Stage

- Segregate, store and dispose wastes in accordance with approved waste management procedures.
- Transport wastes to licensed onshore facilities.

Operation and Maintenance Stage

- Manage scheduled wastes in accordance with Environmental Quality (Scheduled Wastes) Regulations 2005.
- Manage pigging residues, spent chemicals and contaminated materials through approved disposal routes.
- Manage NORM, if encountered, in accordance with AELB requirements.



OCCUPATIONAL SAFETY AND HEALTH

MEDIUM (Development)

LOW (Operation) and Maintenance

- Potential injury or illness arising from drilling, lifting operations, vessel transfers, working at height, confined space entry, maintenance activities, pressurised systems and exposure to hazardous substances.

Mitigation Measures

- Implement Permit-to-Work system.
- Conduct Job Hazard Analysis prior to work activities.
- Ensure personnel are appropriately trained and competent.
- Provide suitable PPE.
- Maintain emergency response procedures and conduct periodic drills.
- Comply with PETRONAS HSE requirements and safe work practices.

Impacts and Mitigation Measures



Socio-Economic

LOW (*Fisheries Restriction*)

POSITIVE (*Employment and Economy*)

- Creation of employment opportunities, skills enhancement and business opportunities through procurement of goods and services.
- Temporary restrictions to fishing activities may occur within operational safety zones.

Mitigation Measures

- Prioritise qualified local participation where practicable.
- Communicate project activities to relevant stakeholders and marine users.
- Maintain engagement with fisheries and marine authorities.



DECOMMISSIONING AND ABANDONMENT

LOW

- Temporary impacts may arise from facility decommissioning, well plugging and abandonment, removal of offshore equipment, vessel operations, waste handling and seabed disturbance associated with decommissioning activities.
- Impacts are expected to be localised, short-term and reversible, with natural recovery of affected areas following completion of decommissioning activities.
- No significant long-term environmental impacts are anticipated provided decommissioning is undertaken in accordance with approved abandonment procedures.

Mitigation Measures

Pre-Decommissioning Stage

- Prepare and implement a Decommissioning and Abandonment Plan in accordance with PETRONAS requirements and relevant regulatory requirements.
- Notify relevant authorities at least six (6) months prior to commencement of decommissioning activities.

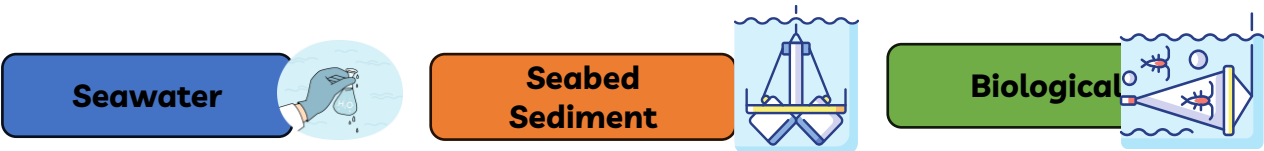
Decommissioning Stage

- Implement approved waste management procedures for handling, storage, transportation and disposal of wastes.
- Minimise seabed disturbance during removal of facilities and subsea infrastructure.
- Implement marine operations management and navigation safety measures during offshore removal activities.
- Ensure all decommissioning works are undertaken in accordance with approved environmental, safety and operational procedures.

Post-Decommissioning Stage

- Conduct post-decommissioning environmental surveys and monitoring, where required.
- Submit site closure and environmental monitoring reports to the relevant authorities.
- Verify that the site has been restored to an acceptable condition in accordance with approved abandonment requirements.

Proposed Monitoring Programme



Locations

17 Stations

17 Stations

17 Stations

Frequency

6-monthly

6-monthly

6-monthly

Compliance

Class 3 MMWQS

NOAA Guideline's ERL & ERM

Baseline Result Comparison

