

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT
PROPOSED DEVELOPMENT OF A NEW COMBINED CYCLE GAS TURBINE (CCGT) POWER PLANT WITH A CAPACITY OF 1,400 MW ON AN EXISTING BROWNFIELD SITE IN PORT DICKSON, NEGERI SEMBILAN, MALAYSIA

Project Proponent

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Overview

The Project involves the construction and operation of a **1,400 MW CCGT power plant** on the former Port Dickson Power Plant site, comprising two 700 MW units. It will use natural gas as the primary fuel, with distillate oil for backup. The Project aimed at meeting Malaysia's growing energy demand through an efficient, advanced and environmental-friendly CCGT system for power generation.

LEGAL REQUIREMENT

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

First Schedule

Activity 11: Power Generation and Transmission

b) Construction of combined cycle power stations, with or without transmission line.

OBJECTIVES

- To identify the potential environmental impacts associated with the implementation of the Project;
- To recommend appropriate mitigation measures to be integrated into the Project's design and operation phases;
- To determine any residual impacts that may persist despite the implementation of mitigation measures; and
- To outline the requirements for an Environmental Management Plan (EMP) to effectively manage and monitor these impacts.

Statement of Need

Conformance to Government Policies and Plans

The Project is in line with the following policies and plans at national, state and local levels:

- United Nations Sustainable Development Goals, Agenda 2030
- Thirteenth Malaysia Plan, 2026 – 2030
- National Energy Transition Roadmap 2050
- National Grid Code and Electricity Supply Act 1990
- Rancangan Tempatan Malaysia Vision Valley 2045
- National Energy Policy, 2022–2040
- Twelfth Malaysia Plan, 2021–2025
- Fourth National Physical Plan, 2021–2040
- Rancangan Struktur Negeri Sembilan 2045



Economic Benefits of the Project

- Lowers operational costs through high-efficiency CCGT technology.
- Enhances energy security by using domestic natural gas and reducing reliance on imports.



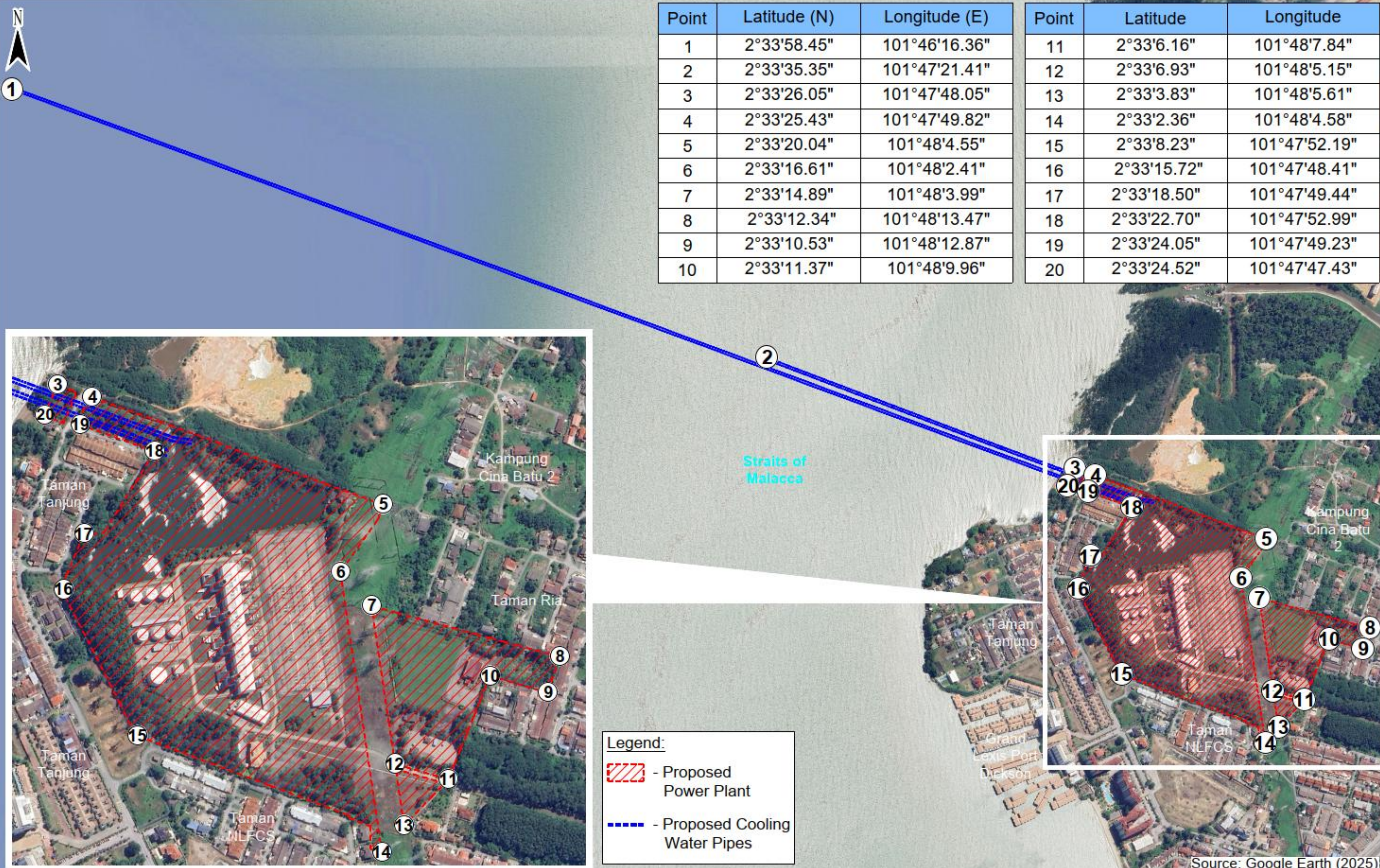
Social Benefits of the Project

- Creates jobs during construction, operation, and maintenance, supporting local employment and skills development.
- Provides reliable power supply to meet growing demand, enhancing quality of life for communities and industries.

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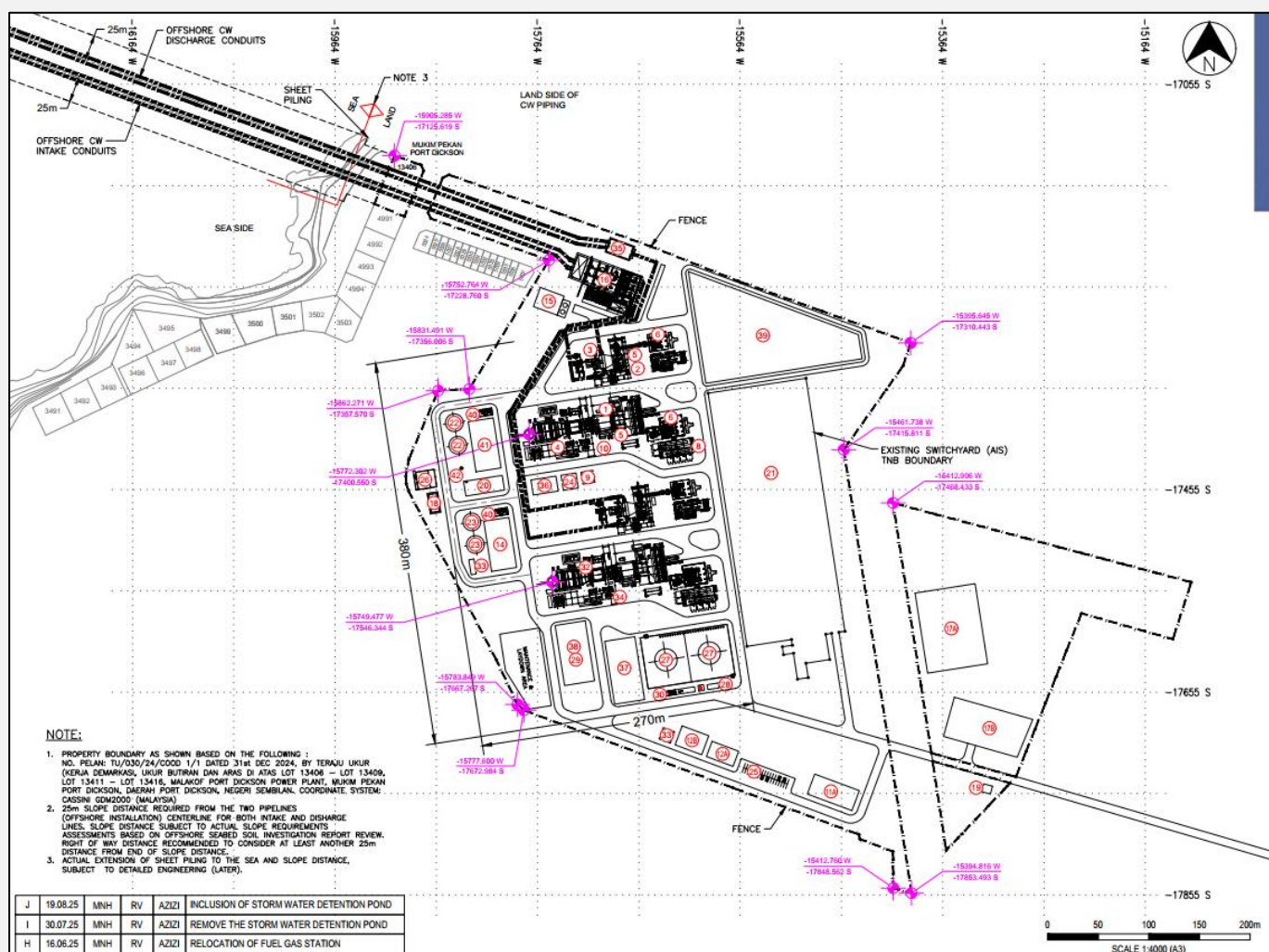
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Project Location



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Project Layout



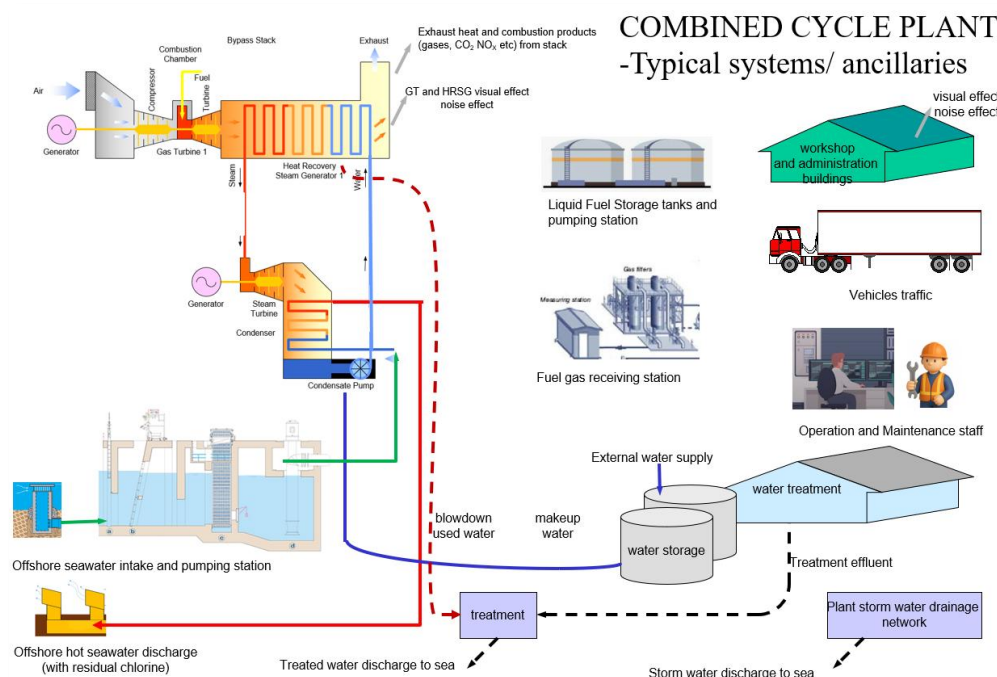
J	19.08.25	MNH	RV	AZIZI	INCLUSION OF STORM WATER DETENTION POND
I	30.07.25	MNH	RV	AZIZI	REMOVE THE STORM WATER DETENTION POND
H	16.06.25	MNH	RV	AZIZI	RELOCATION OF FUEL GAS STATION

LEGEND		SITE LOCATION SCALE: 1:100	
1	GAS TURBINE	19	ELECTRICAL AND CONTROL BUILDING
2	STEAM TURBINE	20	WORKSHOP & STORE BUILDING
3	CONDENSER	21	DANGEROUS GOODS STORE
4	HEAT RECOVERY STEAM GENERATOR(HRSG)	22	FUEL GAS CONDITIONING SKID
5	GENERATOR	23	WATER TREATMENT BUILDING
6	GENERATOR STEP UP TRANSFORMER (GSUT)	24	ELECTRO CHLORINATION BUILDING AND STORAGE TANK
7	SAMPLING RACK	25	COOLING WATER INTAKE PUMPS STATION
8	POWER CONTROL CENTER (PCC)	26	PLANT FUEL GAS CONDITIONING STATION
9	AUX. BOILER	27	PETRONAS FUEL GAS RECEIVING STATION
10	TURBINE BUILDING	28	ABNORMAL WASTEWATER STORAGE PIT(TEMPORARY PIT)
11	ADMINISTRATION	29	GUARD HOUSE
		30	FIRE FIGHTING PUMP HOUSE
		31	SWITCHYARD (INCLUDING INNER MAINTENANCE ROAD)
		32	TOWN WATER / FIRE WATER TANK
		33	DEMINERALISED WATER STORAGE TANK
		34	COMPRESSED AIR STATION
		35	CAR PARK SHED
		36	WASTE WATER POND
		37	FUEL OIL TANK
		38	FOAM STATION SHELTER
		39	BLACK START EMERGENCY DIESEL GENERATOR (BSDG)
		40	FUEL OIL & TRANSFER PUMP SHELTER
		41	UNIT AUX. TRANSFORMER (NOT SHOWN)
		42	CONTINUOUS EMISSION MONITORING SYSTEM
		43	SEWAGE TREATMENT SYSTEM
		44	CHEMICAL DOSING SKID SHELTER
		45	SEAL PIT
		46	GAS STORAGE SHELTER FOR N2, CO2, H2
		47	UNLOADING STATION AREA
		48	DIESEL TANK FOR BLACK START DIESEL GENERATOR (BSDG)
		49	STORM WATER POND
		50	CHEMICAL STORAGE TANK
		51	WASTE WATER TREATMENT AREA
		52	POTABLE WATER TANK

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Project Component



No.	Components	Description
1	Gas Turbine	Combusts natural gas to produce electricity.
2	HRSG	Captures heat to convert water into steam, then sent to the steam turbine.
3	Steam Turbine	Uses the steam to spin the turbine, converting mechanical energy into electricity.
4	Generator	Generates electricity through the spinning motion of the turbines
5	Cooling System	To condense steam and transfer the heat load to circulating cooling water
6	Gas Receiving Station	Regulates and compresses the natural gas for combustion in the gas turbine.
7	Condenser	Condenses the steam, converting it back into water for reuse.
8	Switchyard	Connects the power plant to the electrical grid
9	Power Control Center (PCC)	This system monitors and controls plant efficiency and operations.
10	Water Treatment Plant (Demineralization)	This system is designed to remove dissolved salts, minerals, and impurities from raw water, producing demineralized water
11	Wastewater Treatment Plant / OWS	Treat process effluent and complied with environmental regulations prior to discharge and reuse of water within the plant.
12	Chemical Storage Tanks	Stores chemicals used in water treatment and water steam cycle chemical dosing
13	Fuel Oil Tanks	Stores liquid fuel oil for emergency, and also for black start diesel generator
14	Gas Storage Tanks for N ₂ , CO ₂ , and H ₂	Stores N ₂ , CO ₂ , and H ₂ to prevent fire hazards, purging purpose and cool down generators
15	Electro-chlorination Plant	To generate sodium hypochlorite for biofouling
16	Water Tanks	House the storage tanks for potable water, service water consumption

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Existing Environment



Topography

- Generally flat: Highest in E & SE, and lowest in NW & Pond area.
- Elevation: 2 – 5 amsl



Bathymetry

Pond:

- 3.5 ha (ex-brick factory)
- Depth: banks (+3.0 mRL); outlet (–1.5 mRL)
- Planned backfilling for CCGT

Coastal:

- Survey area: 13.4 km²
- Nearshore depths: <0.5 m CD
- Offshore depths: up to 17 m CD (deepest south)



Climate & Meteorology

In-Land

- Equatorial-monsoon climate (NE: Nov–Mar; SW: May–Sep)
- Mean temperature: 26.6 °C
- Relative Humidity: 82.6%
- Rainfall: 1,804 mm/year; 162 rain days
- Winds: avg 1.2 m/s; prevailing NE & S (14.3%)

Offshore:

- Winds: dominant NW & SE (monsoon-driven), 1.0–3.5 m/s; occasional >4.5 m/s
- Waves: mainly NW (>50%); SE ~15% (SW Monsoon)



Soil

- **General:** Lateritic soils (from argillaceous sediments & metamorphic rocks)
- **Site condition:** Mix of sand, silt, clay, and gravel (onshore & marine boreholes)
- **Groundwater:** 2.4–12.0 m below ground; fully saturated in marine boreholes
- **Subsoil:** Five main layers identified (soft to firm soils overlying stronger strata)



Seismicity

- Site in seismically stable region (no local earthquakes)
- Influenced by nearby Sumatran fault systems
- Design basis: MW 5.0; PGA ~0.07g (GA 6–7%)



Hydrology

- Project within Sungai Lukut Kecil catchment (28.9 km²), draining to Straits of Malacca
- On-site pond receives runoff from 3 sub-catchments; discharges via culverts with flap gates
- Site is located outside flood-prone zones (low risk)



Coastal Hydraulics

- Reach 8W, mixed sandy beaches, mudflats & mangroves; generally low–moderate wave energy; south-easterly sediment transport
- Currents 0.03 –1.01 m/s, flowing NW–SE with tides; tidal range: 2.6–3.4 m CD



Geology

- Regional setting: Quaternary deposits (Early Pleistocene)
- Surface: Marine & coastal deposits (clay, silt & sand)
- Beneath: Sedimentary bedrock (shale, sandstone & mudstone)



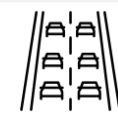
Terrestrial Ecology

- Pond ecology formed by spontaneous regrowth after clearing
- Common planted or colonizing flora species, no rare or threatened species recorded
- Primates, reptiles, and 16 bird species observed



Marine Ecology

- No algal blooms or pollution indicators.
- Common macrobenthos and fish; mangroves, coral reefs, and seagrass present; no marine mammals or turtle nesting observed.
- Marine Capture Fisheries: 295 licensed fishermen and 202 licensed vessels; with declining catch trend observed over the past 10 years (2014-2023)
- Aquaculture: 14 farmers (Prawns & fish), showing a similar declining trend (75%) over the same period.



Traffic

- Peak hours: 7–8 am & 5–6 pm.
- Federal Route 5 & Jalan Tanjung Gemuk operate at LOS B–C during peaks; existing lanes adequate for current demand.
- Key junctions (J1, J3, J4, J5) generally at LOS B–C, with longest queues at J1 (up to 12 vehicles).



Land Use

- Site is gazetted as *Infrastructure & Utilities* under RTMVV 2045
- Classified as High Polluting Industry (HPI); DOE recommends buffer of 300 m; not fully available at western boundary; mitigated by plant layout & engineering controls.
- Site not in ESA; CW pipeline crosses coastal ESA Rank 3; nearest forest reserves 11–21 km SE



Public Health

- Majority of community has satisfactory access to basic amenities.



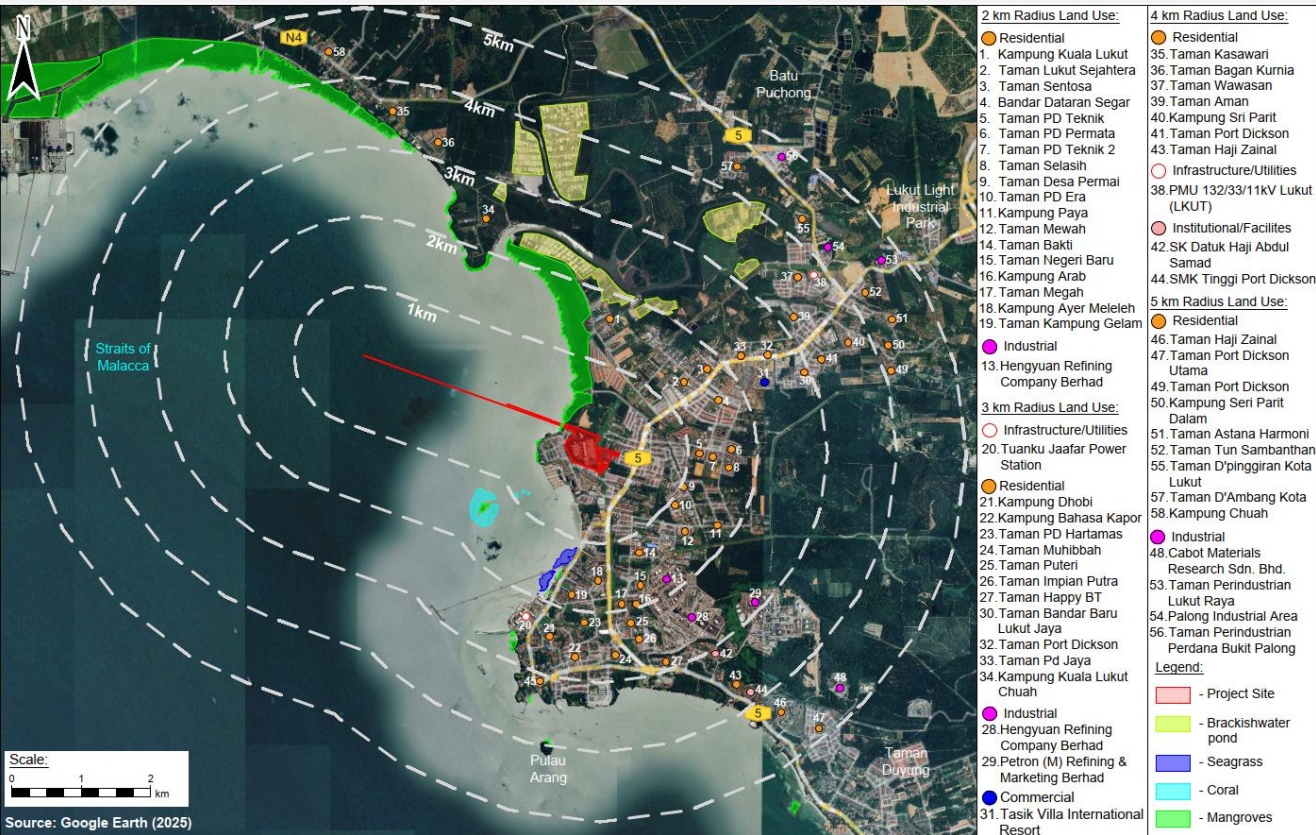
Socio-Economy

- **Engagement:** Perception surveys with residents, businesses, industries, and fishermen; FGDs with government agencies and Fishermen Board Committee.
- **Residential & Commercial:** Majority support (~63%); most see more advantages than disadvantages and report little direct impact.
- **Industrial:** Mixed views (~49% support, 37% unsure); nearly half report no direct impact.
- **Fishermen:** Largely opposed (~66% disagree), citing disadvantages and higher perceived impacts.

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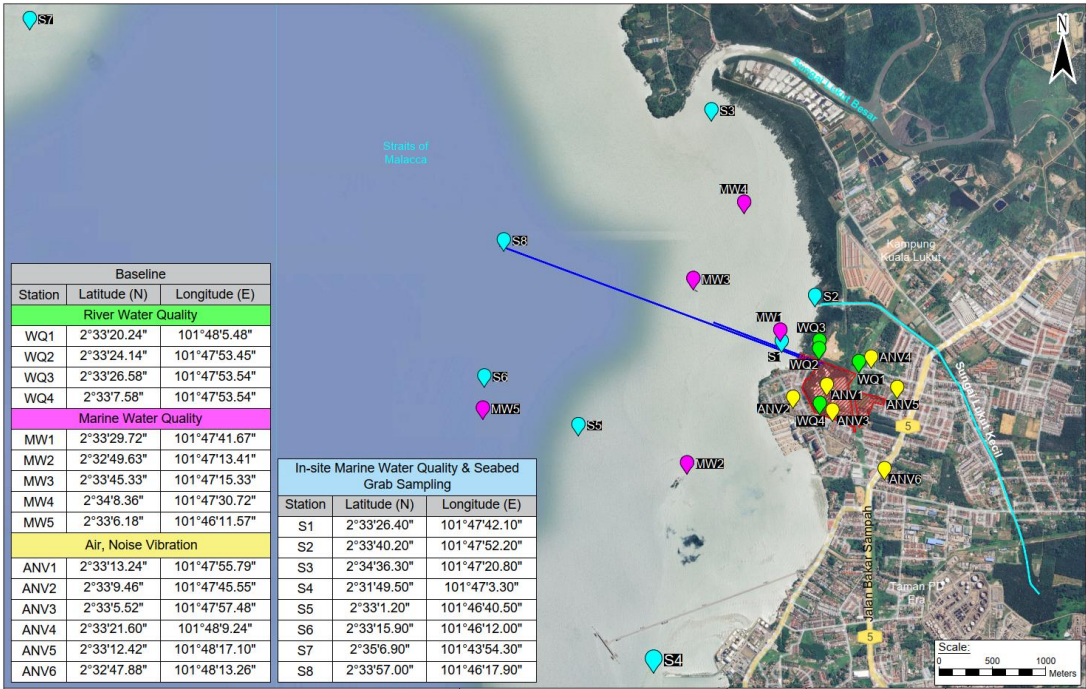
Existing Land Use



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Environmental Baseline Sampling



In-Situ Marine Water Quality

- Eight stations monitored (S1–S8) against Malaysian Marine Water Quality Standards (MMWQS).
- TSS frequently exceeded Class 1, Class 2, and Interim Class E1 limits; several samples also surpassed the Class 3 threshold (100 mg/L), with higher values during spring tide and at S8 (up to 187 mg/L).
- Chlorine concentrations were very low (≤ 0.08 mg/L) with only minor tidal influence.
- Temperature remained within limits; S8 values were consistent with baseline stations, indicating no significant thermal difference.

Seabed Sediments

- Eight stations sampled (S1–S8). Sediments predominantly sandy, with localized silt and clay fractions.
- Overall, seabed sediments exhibit a predominantly sandy profile with minor variability.

Ambient Air Quality

- Six (6) stations monitored (A1–A6) against New Malaysia Ambient Air Quality Standard 2020.
- PM₁₀ and PM_{2.5} within limits; SO₂, NO₂, O₃ not detected; CO only at trace level.
- All parameters complied with the standard.

Noise Level

- Six stations monitored (N1–N6) against Second Schedule: Recommended Permissible Sound Level (LAeq) for Existing Built-Up Areas (Suburban & Urban Residential, Mixed Development) in the Guidelines for Environmental Noise Limits and Control, Third Edition 2019 (Reprint 2021).
- Daytime LAeq at all stations complied with 65 dBA limit.
- Night-time: N1–N3 within 60 dBA limit; N4–N6 exceeded due to early-morning peaks (traffic, residential activity, rainfall).

Vibration Level

Six locations monitored (V1–V6) complied with Third and Ninth Schedules of the Guidelines for Environmental Vibration Limits and Control, 3rd Edition 2021 (RMS: 0.8–1.6 mm/s day, 0.4 mm/s night; PPV: 1.0 mm/s)

River Water Quality

- Four stations (WQ1–WQ4) against Class IIB limits.
- pH around 6–9; DO below limit at all sites except WQ1.
- BOD and COD exceeded only at WQ1; TSS complied at all stations.
- Ammoniacal nitrogen exceeded 0.3 mg/L at all sites.
- Turbidity below 50 NTU except at WQ1; colour within 150 TCU.
- TDS ranged 2,070–25,270 mg/L, higher at WQ2–WQ3.
- Faecal coliforms exceeded 400 CFU/100 mL at WQ1.

Marine Water Quality

- Five stations monitored (WM1–WM5) against Malaysian Marine Water Quality Standards (Class 2).
- DO exceeded 5.0 mg/L limit; TSS within 50 mg/L.
- Heavy metals (Cu, Zn, As³⁺, Al) detected at trace levels below limits; Cd, Cr⁶⁺, Pb not detected.
- Mercury exceeded at WM2–WM4 (0.050–0.055 μ g/L vs 0.04 μ g/L).
- Nutrients: phosphate exceeded at WM1 and WM4; nitrite exceeded at all stations; unionized ammonia complied.
- Faecal coliform counts (1–4 CFU/100 mL) well within 70 CFU/100 mL limit.
- Oil & grease, cyanide, total phenol, and PAHs were not detected.

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Impact Assessment



Soil Erosion & Sedimentation

Soil Erosion Modelling

- Assessment conducted using RUSLE under three (3) scenarios: Existing Condition, Worst-case (without mitigation), and With Mitigation Measures.
- Highest erosion risk observed during worst-case scenario: 77.60 t/ha/year (Critical)
- With mitigation, total soil loss reduced to 2.74 t/ha/year (Low Risk)

Sediment Yield

- Existing Condition: 116.45 tonnes
- Worst-case Scenario: 218.69 tonnes
- With mitigation measures: 17.22 tonnes



Hydrology

Hydrology

- Assessment was conducted for Pre-Project (Existing Pond), Post-Project (Pond Backfill) and Mitigation (proposed detention pond with pipe drainage outlet) scenarios
- For existing condition, maximum water levels at the pond and outlet remain below the bank. Meanwhile, the upstream incoming drain overflows by approximately 0.2 – 0.65 m above bank level, posing potential upstream flood risk.
- For Post Project, maximum water levels increase, with overtopping at the upstream incoming drain (0.2 – 1.2 m above bank level). The downstream outlet remains sufficient to discharge flows to the sea.
- After implemented mitigation measures, it reduces the upstream water levels relative to the post Project scenario 2, and prevent overtopping.



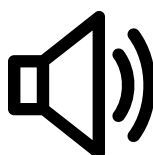
Air Quality

Construction Phase

- Wind-blown dust from exposed areas –periodic (dry and windy) and limited distance (6 -9 m)
- Fugitive dust emissions from transportation activities – limited distance (<200 m)
- Vehicle/ Equipment Exhaust Emission – (minor and intermittent/ transient)
- Nearest receptor >500 m — dust impact considered insignificant

Operation Phase

- Assessment was conducted for the stacks emission on two (2) scenarios: operations based on 100% natural gas and 100% distillate fuel oil
- The calculated Ground Level Concentrations (GLCs) for identified criteria air pollutants at the identified Air Sensitive Receptors (ASRs) at the surrounding of the Project site met the Malaysian Ambient Air Quality Standards (MAAQS) 2020, for both scenarios. The concentration of NO₂ using fuel oil is higher than using natural gas.
- The maximum average incremental concentrations (MAICs) for MAAQS 2020 criteria pollutants were within the calculated thresholds, all in full compliance with MAAQS 202 limit and 25% threshold limit set of MAAQS 2020.



Noise

Construction Phase

- Noise modelling conducted at six (6) identified NSRs of nearby residential areas.
- The predicted cumulative noise levels are within the recommended limits of 75 dB(A) and 90 dB(A).
- The anticipated community response to noise due to the Project was “none” to “little”.

Operation Phase

- Project Proponent is committed to installing equipment with the sound pressure level (SPL) controlled at 85 dB(A) at 1 m distance and within the building.
- The cumulative L_{Aeq} levels at all identified NSRs during daytime are below the recommended limit of 65 dB(A) during daytime and 60 dB(A) during night time, under Second Schedule.
- The anticipated community response to noise due to the Project was “none”

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Impact Assessment



Vibration

CONSTRUCTION PHASE

- Vibration impact assessed using FTA 2018 and DOE Guidelines 2021
- The typical vibration generating equipment (e.g. pile drivers, rollers) & the distance of impact is assessed
- Sensitive receptors are not within the ZOI of 15 mm/s and 10 mm/s
- Immediate proximity may experience perceived vibration level (<10 m/s) that can be tolerated

OPERATIONAL PHASE

- Traffic induced ground-borne vibrations only occur in very extreme circumstances
- No ground-borne vibration impacts anticipated.



Coastal Hydraulic and Water Quality

CONSTRUCTION PHASE

- In the absence of mitigation measures, the project could lead to significant short-term increases in TSS levels at marine receiving point. Otherwise, the TSS concentration can be effectively reduced to compliance limit.
- In general, the current speed, wave height, sediment transport experienced minimal changes
- Existing sediment conditions is under Class 3 while the total sediment concentration remains below the threshold throughout the trenching operations

OPERATIONAL PHASE

- Treated wastewater comprises <1% of total discharged water
- Temperature changes due to 40 °C heated cooling water discharge are complied to MWQS limit of +2 °C across all monsoon seasons at all identified ESRs
- The impact of chlorines on ESRs is insignificant and negligible due to its rapid degradation behaviour in warm, saline and organically active coastal water.



Terrestrial Ecology

CONSTRUCTION PHASE

- Overall impacts are anticipated to be low as most areas have been cleared
- Silver Leaf Langur is expected to migrate to mangroves located in close proximity

OPERATIONAL PHASE

- No disturbance is anticipated as the surrounding terrestrial ecology is expected to remain unaffected



Aquatic Ecology

CONSTRUCTION PHASE

- Sediment spillage, increase of water temperatures and decrease in DO concentrations
- Release of biogenic and chemogenic products, leading to rise of oxygen demand
- Elevated TSS concentration potentially retards the primary production (plankton), then reduce photosynthesis rate which later induce migratory of herbivorous organism
- Destruction of spawning areas, burial and smothering or suffocation of sessile organisms
- Light reduction and visual impairment in sea, reduced reproductive rate and migration of fish fauna to less disturbed areas
- Cause changes to the swim pattern and orientation of turtles
- Conflict between PP and local fishermen and aquaculture systems, as well as reduce in recreational activities
- No significant impact on the coral reefs, seagrass areas, nearby mangroves and marine mammals

OPERATIONAL PHASE

- Ecological Impact from the thermal discharge is expected to be insignificant
- Residual chlorine dispersion at most area has a negligible impact
- Potential risk for the turtle to be trapped at the gate or in the water intake pipeline

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Impact Assessment



Quantitative Risk Assessment

Individual Risk (IR) Contour

- IR contour of 1×10^{-5} /year remains within site boundary
- IR contour of 1×10^{-6} /year is beyond the proposed Project site and impacts residential areas surrounding the project area in the East, Northeast and Southeast.

Worst-Case Scenarios (WCS)

Rupture of Fuel Oil Storage Tanks

- Pool Fire Event: 37.5 kW/m² and 4 kW/m² hazard zone extends up to 47 m, and 103 m, respectively
- Jet Fire Event: 37.5 kW/m² and 4 kW/m² hazard zone extends up to 317 m, and 422 m, respectively

Rupture of Pipeline from Fuel Gas Receiving Station to Gas Turbine

- Explosion Event: 0.14 bar explosion overpressure hazard zone up to 295 m.



Waste

CONSTRUCTION PHASE

- Waste types: Biomass (1,424.25 tons/day), construction debris, domestic (440 kg/day) and scheduled wastes
- Improper waste management: elevated flood risk, soil, groundwater and odour pollution

OPERATIONAL PHASE

- Waste types: Domestic (32.65 kg/day), and scheduled wastes
- Improper waste management: elevated flood risk, proliferation of pests
- Soil, surface water and groundwater quality contamination



Health Impact

- Air pollutants and noise during construction and operational phase are negligible (HQ<1)
- Other health risk during construction includes potential mosquito breeding leading to dengue when monitoring and controls are not in place.
- Health impact related to air quality is insignificant.
- Potential risk of transmission disease such as COVID-19, tuberculosis, cholera, malaria.



Socio-Economy

CONSTRUCTION

- Positive: Increase in job and business opportunities
- Negative: Slight increase of traffic movement, damaged roads, negative perceptions among residents, influx of foreign workers and social issues, disturbance to the fishermen activities

OPERATIONAL PHASE

- Positive: Increase in electric supply in national level
- Negative: Insignificant traffic impact with mitigation measures implemented, insignificant noise disturbance, potential negative perceptions among residents



Traffic

CONSTRUCTION PHASE

- The main access road (Federal Route 5) is operating at LOS B and C and the junction is operation at LOS B and D during peak hour periods.
- Additional traffic is not anticipated to create significant impact and the impact on the junction is expected to be minimal.

OPERATIONAL PHASE

- The main access road is anticipated to operate at acceptable LOS during peak hour, at LOS B and C in the Year 2029 and LOS C and D in the year of 2039.
- The junctions are expected to operate at LOS C and D during peak hour periods, indicating sufficient to accommodate future traffic demand.

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Mitigation Measures

CONSTRUCTION PHASE

- The risk of soil erosion and sedimentation will be minimal with the implementation of Best Management Practice (BMP) as per ESCP/LD-P2M2 such as:
 - Use of construction markers and perimeter control
 - Installation of sediment basins and pocket silt traps and regular maintenance
 - Proper management of surface runoff and spoil as well as regular site inspection



Soil Erosion & Sedimentation

Mitigation (Detention Pond)

- 1.25 ha detention pond with 2.0 m depth
- RC incoming U-drain (1.5 m × 1.5 m) to convey stormwater into the detention pond
- 340 m RC pipe drainage ($\varnothing = 0.15$ m) connecting the pond to the sea
- Flap gate ($\varnothing = 0.9$ m) at the outlet to prevent tidal backflow during MHWS



Hydrology

Mitigation (Pond Backfill)

- Pond outlet replaced with RC U-drain (4.0 m width x 2.0 m depth)
- Maintained the existing twin pipe culvert ($\varnothing = 1.4$ m) and flapgate

CONSTRUCTION PHASE

- Air quality impacts will be minimized through BMPs for dust control
- All BMPs will comply with the CAR 2014 and DOE's guidance on fugitive emissions.

OPERATIONAL PHASE

- Emissions will be monitored per DOE's CAR 2014, guided by BATs and DOE technical documents.
- Stack height should be at least 3 meters above the highest structure within the vicinity
- Sampling port will be designed in accordance to the Malaysian Standard MS1596:2003
- Weather protection cowls will be designed in a way that do not obstruct the free flow of gases, fumes or dust



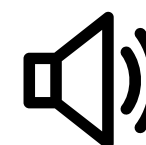
Air Quality and Odor Control

CONSTRUCTION PHASE

- Abide guidelines for Environmental Noise Limits and Control: Annex E: Guidance on Noise Control (GENLC) by DOE Malaysia
- Use of acoustic cover or screen for noisy machinery

OPERATIONAL PHASE

- Working area with high noise will be identified and working hours will be limited
- Adhere the permissible exposure limits set by DOSH's Occupational Safety and Health (Noise Exposure) Regulations 2019
- Use proper PPE when working with noisy machines



Noise

CONSTRUCTION PHASE

- Abide guidelines for Environmental Vibration Limits and Control (2021): Annex E, Management and Mitigation of Vibration in The Environment"
- Utilize the hierarchy of control to mitigate the vibration
- Use of suitable, low impact and environmental-friendly piling friendly piling methods

OPERATIONAL PHASE

- No source of potential vibration impact during operational phase



Vibration

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT PROPOSED DEVELOPMENT OF A NEW COMBINED CYCLE GAS TURBINE (CCGT) POWER PLANT WITH A CAPACITY OF 1,400 MW ON AN EXISTING BROWNFIELD SITE IN PORT DICKSON, NEGERI SEMBILAN, MALAYSIA

Mitigation Measures

CONSTRUCTION PHASE

- Implement ESC as per LD-P2M2, proper on-site chemical and waste handling, and worker training and management at Project site
- At pipeline installation, double layer silt curtain will be utilized and marine water quality monitoring will be implemented

OPERATIONAL PHASE

- Install online monitoring system for temperature and total chlorine at the cooling water pipe
- Regular monitoring the effluent and marine water quality
- Initiate a Shoreline Monitoring Program (SMP) every 3 months during pipeline construction and bi-annually after the completion of pipeline construction



Coastal
Hydraulic
and Water
Quality

CONSTRUCTION PHASE

- Retain a particular strip of vegetation at the northern boundary as a buffer zone for the use of the langurs and other primates
- Monitoring of the Silver Leaf monkeys is proposed if they still use the green strip

OPERATIONAL PHASE

- No ecological mitigation measures required.



Terrestrial
Ecology

CONSTRUCTION PHASE

- Installation silt curtain, regular maintenance of barge, dredger and machinery
- Periodic marine biological and water quality monitoring
- For turtle protection, modified propeller will be modified to reduce the underwater noise level, proper waste management will be implemented, avoid of construction during nesting season and presence of marine turtles will be monitored regularly.
- Maintain active communication between PP and fishermen and aquaculture.

OPERATIONAL PHASE

- Periodical marine biological and water quality monitoring
- Installation of suitable screen at cooling water intake
- Relocation of *Kelong Pozi*



Aquatic
Ecology

CONSTRUCTION PHASE

- Reuse of biomass waste as mulch
- Proper management of construction and domestic waste
- Scheduled waste management will be carried out in accordance to the "Guidelines for Packaging, Labelling, and Storage of Scheduled Wastes in Malaysia"

OPERATIONAL PHASE

- Domestic wastes will be managed through the regular provision and maintenance of waste bins within the site
- All scheduled wastes will be managed by a Competent Person as required under the requirements of the Guidelines



Waste

- Provision of adequate, safe water supply and sanitary
- Practice good housekeeping
- Provide management of worker communities on-site
- Foreign workers to undergo a proper pre-employment health assessment through FOMENA
- Health screening will be done whenever there is any outbreak of diseases



Health Impact

EXECUTIVE SUMMARY

FIRST SCHEDULE ENVIRONMENTAL IMPACT ASSESSMENT
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Mitigation Measures

CONSTRUCTION PHASE

- Close liaison with the neighbouring community, fishermen communities and take immediate action to resolve any conflict
- Maintain strong collaboration between the PP, local communities and local authorities/ relevant agencies
- Conduct risk assessment for the safety and health of workers, contractors and visitors

OPERATIONAL PHASE

- Develop and implement Corporate Social Responsibility (CSR) programmes



Socio-Economy

CONSTRUCTION PHASE

- Provide sufficient of warning signs and flagmen at all workstations to facilitate traffic control
- Trucks will be restricted to off-peak periods (10 am to 4 pm, 8 pm to 6 am, at permissible work zones)
- Place adequate safety and warning signs
- Adequate tow trucks and emergency response teams will be provided with a maximum response time of 15 minutes

OPERATIONAL PHASE

- Provide safe and comfortable avenue for the pedestrian movement
- Provide better planning and control in the movement of pedestrian



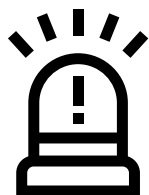
Traffic

Proposed Environmental Monitoring Program



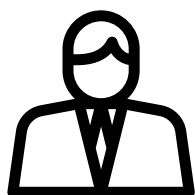
COMPLIANCE MONITORING (CM)

- Ensures EIA conditions of approval are complied with by the Project Proponent
- Carried out by Accredited Laboratory



PERFORMANCE MONITORING (PM)

- Ensures effectiveness of pollution control systems and mitigation measures
- EO to carry out PM on site



IMPACT MONITORING (IM)

- Ensures effectiveness of pollution control systems and mitigation measures
- EO to carry out PM on site

ENVIRONMENTAL COMPLIANCE AUDIT

- Environmental Audit by a registered environmental auditor
- Possess Certified Erosion, Sediment and Storm Water Inspector (CESSWI) or Malaysian Certified Inspector of Sediment and Erosion Control (MY-CISEC) Qualifications
- Best Management Practices (BMPs) will be adopted

BASELINE MONITORING

General indication of the baseline environmental conditions at the time of reporting

ENVIRONMENTAL MONITORING PROGRAM

- Provides database of environmental impacts
- Early indicator of environmental impacts

SELF-REGULATORY MONITORING

- Ensures effectiveness of mitigating measures and compliance towards environmental regulations
 - Carried out by EO

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Proposed Environmental Monitoring Program

MONITORING		FREQUENCY	
Performance Monitoring			
As per LD-P2M2		- Weekly - After heavy rainfall (>12.5 mm as measured by rain gauge)	
Compliance Monitoring			
Discharge points of sediment basin		Monthly	
Impact Monitoring			
- Water quality (2 stations) - Ambient Air, Noise & Vibration (5 stations each) - Marine Water Quality (6 stations) - Marine Ecology Monitoring		- Monthly - Quarterly - Bi-annually	
Operational Phase			
- Air Emission Quality (2 Stacks) - Water quality (2 stations) - Wastewater effluent (1 station – seal pit) - Ambient Air and Odor, Noise & Vibration (5 stations each) - Marine Ecology Monitoring		- CEMS and Quarterly Monitoring - Online and Monthly Monitoring - Annually	

ENVIRONMENTAL MONITORING PROGRAMME DURING CONSTRUCTION PHASE

ENVIRONMENTAL MONITORING PROGRAMME DURING OPERATIONAL PHASE

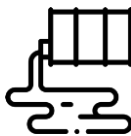
Emergency Response Plan

EMERGENCY RESPONSE TEAM

- A team of qualified individuals with specific roles and responsibilities to carry out during an emergency.
- Responsible for executing the following procedures:



FIRE EMERGENCY RESPONSE
Coordinating workers movement and communication with fire department



SPILLAGE PROCEDURES
Mitigation methods and reporting process



ESCP FAILURE RESPONSE
Control and maintenance methods

Conclusion

The Project poses low environmental risk. All expected impacts can comply with stipulated limits, and can be effectively mitigated. plays a critical role in supporting the power supply to the nation, and will help to alleviate the risk of potential power shortages in Malaysia in the near future.

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN LOJI JANAKUASA TURBIN GAS KITAR PADU (CCGT) BERKAPASITI 1,400 MW DI MUKIM PORT DICKSON, DAERAH PORT DICKSON, NEGERI SEMBILAN

Penggerak Projek

PDP GEN TWO Sdn. Bhd

Alamat : Level 11, Block 4, Plaza
Sentral Jalan Stesen Sentral
5, 50470 Kuala Lumpur
No. Telefon : 03-2263 3388
Wakil : Lionel Fok
Emel : lionel.fok@malakoff.com.my

Perunding EIA



AGV Environment Sdn. Bhd.

Alamat : Level 3A, Tower B,
ATWATER Corporate Office,
Jalan Prof Diraja Ungku Aziz,
46300 Petaling Jaya, Selangor
No. Tel : 03-7931 1455
Wakil : Ms. Tan Kim Fong
Emel : kimfong.tan@agvenvironment.com

Gambaran Keseluruhan

Cadangan Projek melibatkan pembangunan dan operasi loji janakuasa turbin gas padu (CCGT) berkapasiti **1,400 MW** diatas bekas loji janakuasa Port Dickson (PDPP) yang merangkumi dua unit berkapasiti 700 MW. Gas asli digunakan sebagai bahan api utama manakala minyak distilat sebagai sokongan. Projek ini bertujuan memenuhi permintaan tenaga yang semakin meningkat di Malaysia melalui sistem CCGT yang cekap, maju dan mesra alam untuk penjanaan kuasa.

KEPERLUAN UNDANG-UNDANG

Kualiti Alam Sekeliling (Aktiviti Yang
Ditetapkan) (Penilaian Kesan Kepada Alam
Sekeliling)
Perintah 2015

Jadual Pertama:

Aktiviti 11: Penjanaan dan Pemancaran Kuasa

b) Pembinaan stesen janakuasa kitar padu, dengan
atau tanpa talian pemancar

OBJEKTIF

- Mengenal pasti potensi impak alam sekitar yang berkaitan dengan pelaksanaan Projek
- Mencadangkan langkah mitigasi yang sesuai untuk dimasukkan ke dalam fasa reka bentuk dan operasi Projek
- Menentukan sebarang impak residu yang mungkin berterusan walaupun langkah mitigasi telah dilaksanakan
- Menyatakan keperluan Pelan Pengurusan Alam Sekitar (EMP) untuk mengurus dan memantau impak-impak ini dengan berkesan

Pematuhan Polisi dan Pelan Kerajaan

Projek ini selaras dengan dasar dan rancangan berikut di peringkat kebangsaan, negeri dan tempatan:

- United Nations Sustainable Development Goals, Agenda 2030
- Thirteenth Malaysia Plan, 2026 – 2030
- National Energy Transition Roadmap 2050
- National Grid Code and Electricity Supply Act 1990
- Rancangan Tempatan Malaysia Vision Valley 2045
- National Energy Policy, 2022–2040
- Twelfth Malaysia Plan, 2021–2025
- Fourth National Physical Plan, 2021–2040
- Rancangan Struktur Negeri Sembilan 2045

Kenyataan Keperluan

Manfaat Ekonomi Projek

- Mengurangkan kos operasi melalui teknologi CCGT berkecekapan tinggi.
- Meningkatkan penjanaan tenaga dengan menggunakan gas asli domestik dan mengurangkan kebergantungan import.



Manfaat Sosial Projek

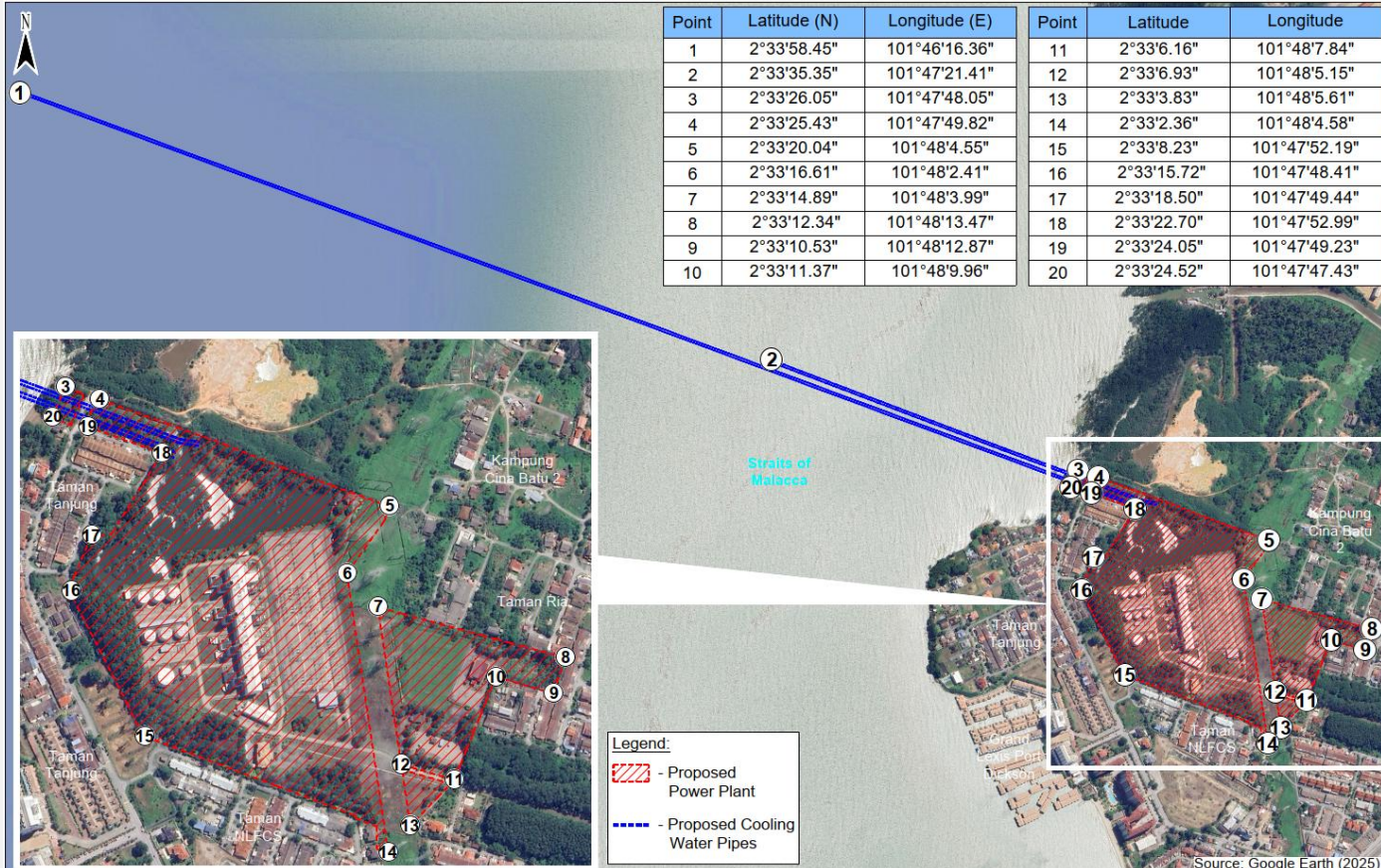
- Menjana peluang pekerjaan semasa pembinaan, operasi, dan penyelenggaraan, sekaligus menyokong peluang pekerjaan tempatan serta pembangunan kemahiran.
- Menyediakan bekalan kuasa yang dipercayai boleh memenuhi permintaan yang semakin meningkat, seterusnya meningkatkan kualiti hidup bagi komuniti dan industri.



RINGKASAN EKSEKUTIF

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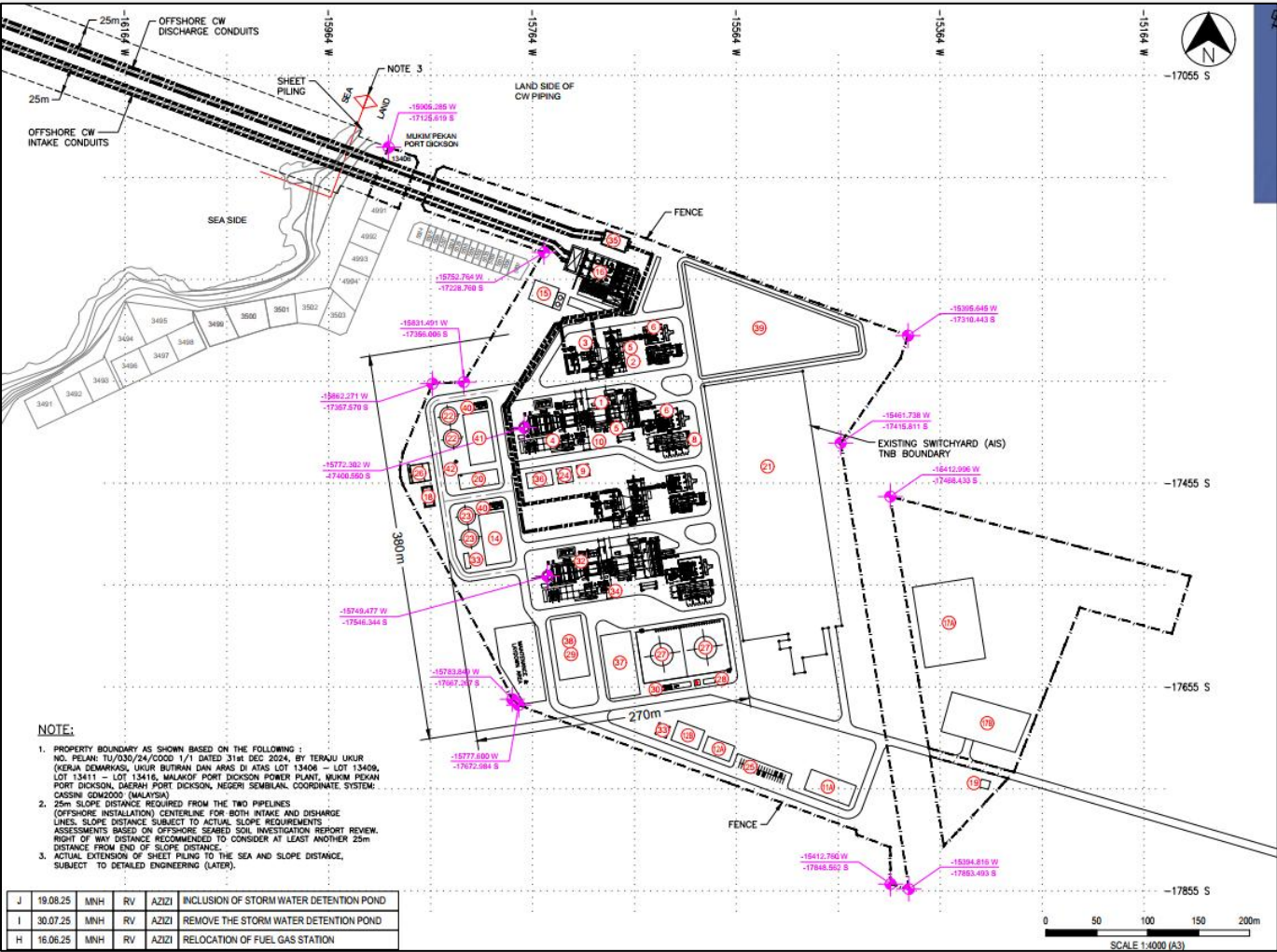
Lokasi Projek



RINGKASAN EKSEKUTIF

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Pelan Susun Atur Projek

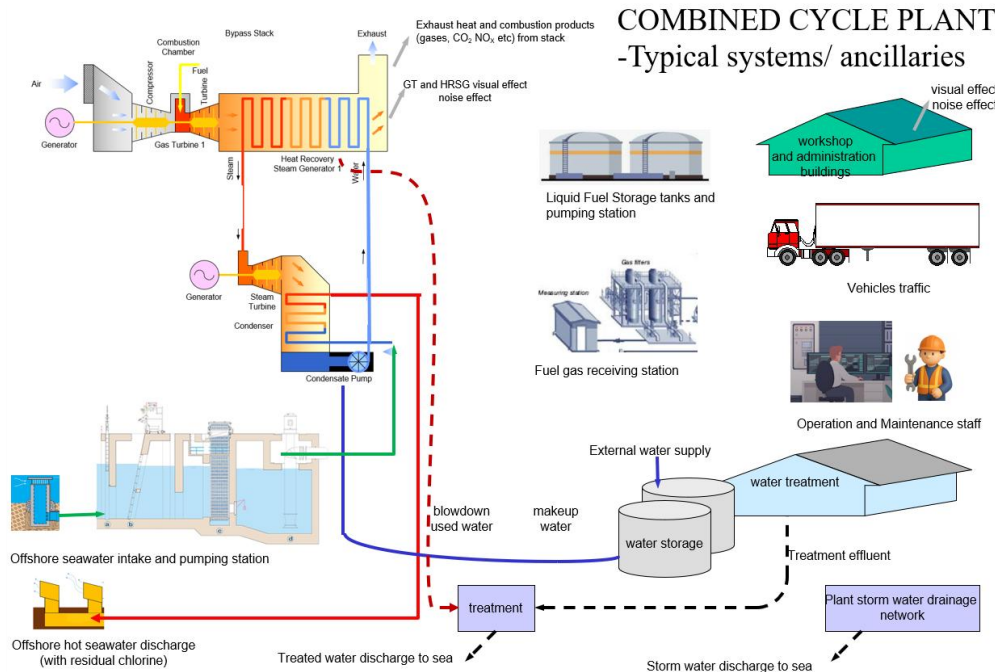


LEGEND	SITE LOCATION SCALE: 1:NTS	
1 GAS TURBINE	13 ELECTRICAL AND CONTROL BUILDING	22 CONTINUOUS EMISSION MONITORING SYSTEM
2 STEAM TURBINE	14 WORKSHOP & STORE BUILDING	23 SEWAGE TREATMENT SYSTEM
3 CONDENSER	15 DANGEROUS GOODS STORE	24 CHEMICAL DOSING SKID SHELTER
4 HEAT RECOVERY STEAM GENERATOR(HRSG)	16 FUEL GAS CONDITIONING SKID	25 DEMINERALISED WATER STORAGE TANK
5 GENERATOR	17 WATER TREATMENT BUILDING	26 COMPRESSED AIR STATION
6 GENERATOR STEP UP TRANSFORMER (GSUT)	18 ELECTRO CHLORINATION BUILDING AND STORAGE TANK	27 CAR PARK SHED
7 SAMPLING RACK	19 COOLING WATER INTAKE PUMPS STATION	28 WASTE WATER POND
8 POWER CONTROL CENTER (PCC)	20 PLANT FUEL GAS CONDITIONING STATION	29 FUEL OIL TANK
9 AUX. BOILER	21 PETRONAS FUEL GAS RECEIVING STATION	30 FOAM STATION SHELTER
10 TURBINE BUILDING	22 ABNORMAL WASTEWATER STORAGE PIT(TEMPORARY PIT)	31 BLACK START EMERGENCY DIESEL GENERATOR (BSDG)
11 ADMINISTRATION	23 GUARD HOUSE	32 FUEL OIL & TRANSFER PUMP SHED
		33 UNIT AUX. TRANSFORMER (NOT SHOWN)

RINGKASAN EKSEKUTIF

**PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL
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Komponen Projek



No.	Components	Description
1	Turbin Gas	Membakar gas asli digunakan untuk penjanaan elektrik
2	HRSG	Mengumpul haba untuk menukar air ke wap, kemudian dihantar ke turbin wap
3	Turbin Wap	Menggunakan wap untuk memutar turbin, seterusnya menjana elektrik
4	Penjana	Menjana elektrik melalui pergerakan putaran turbin
5	Sistem Penyejukan	Memeluwapkan wap dan menyalurkan haba kepada air penyejuk
6	Stesen Penerimaan Bekalan Gas	Mengawal dan memampatkan gas asli untuk pembakaran dalam turbin gas
7	Pemeluwap	Memeluwapkan wap, menukarkan ke air dan digunakan semula
8	Switchyard	Menyambungkan loji janakuasa ke rangkaian elektrik
9	Pusat Kawalan Kuasa (PCC)	Memantau dan mengawal kecekapan serta operasi loji
10	Loji Rawatan Air (<i>Demineralization</i>)	Menapiskan garam, mineral dan bendasing daripada air mentah, menghasilkan air tanpa mineral
11	Loji Rawatan Air Sisa/ Pemisah Minyak-Air	Merawat effluent ke tahap yang ditetapkan dalam peraturan alam sekitar sebelum dilepaskan dan digunakan semula di dalam loji
12	Tangki Kimia	Menyimpan bahan kimia yang digunakan dalam rawatan air.
13	Tangki Minyak	Menyimpan minyak <i>diesel</i> untuk kecemasan dan penjana <i>diesel Black Start</i>
14	Tangki Simpanan Gas N ₂ , CO ₂ , and H ₂	Menyimpan N ₂ , CO ₂ , and H ₂ untuk mengelakkan <i>hazard</i> kebakaran, pembersihan dan penyejukan penjana
15	Loji Elektro-Klorinasi	Menjana <i>Sodium Hypochlorite</i> bagi biofouling
16	Tangki Air	Menyimpan air minuman dan air perkhidmatan

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Persekitaran Sedia Ada



Topografi

- Umumnya rata: Tertinggi di Timur & Tenggara, dan terendah di Barat Laut & kawasan Kolam.
- Ketinggian: 2 – 5 m dari aras laut



Batimetri

- Kolam:**
- 3.5 ha (bekas kilang batu-bata)
 - Kedalaman: tebing (+3.0 mRL); saluran keluar (–1.5 mRL)
 - Dirancang untuk penambakan semula bagi CCGT

- Pesisir Pantai:**
- Kawasan tinjauan: 13.4 km²
 - Kedalaman pesisir: <0.5 m CD; luar pesisir: 17 m CD (bahagian selatan terdalam)



Iklim & Meteorologi

- Dalaman:**
- Suhu purata: 26.6 °C
 - Kelembapan relatif: 82.6%
 - Hujan: 1,804 mm/tahun; 162 hari hujan
 - Angin: purata 1.2 m/s; utama dari NE & S (14.3%)

- Laut Lepas:**
- Angin: dominan NW & SE (dipacu monsun), 1.0–3.5 m/s; kadang-kadang >4.5 m/s
 - Ombak: terutamanya NW (>50%); SE ~15% (Monsun Barat Daya)



Tanah

- Tanah laterit (daripada sedimen argilaseus & batuan metamorf)
- Keadaan tapak: Campuran pasir, kelodak, tanah liat, dan kerikil (lubang gerudi darat & marin)
- Air bawah tanah: 2.4–12.0 m di bawah tanah; tepu sepenuhnya dalam lubang gerudi marin
- Tanah bawah: Lima lapisan utama dikenal pasti (tanah lembut hingga pejal di atas strata yang lebih kuat)



Kegempaan

- Tapak berada di kawasan seismik yang stabil (tiada gempa bumi tempatan)
- Dipengaruhi oleh sistem sesar Sumatera berdekatan
- Asas reka bentuk: MW 5.0; PGA ~0.07g (GA 6–7%)



Hydrologi

- Projek terletak dalam tadahan Sungai Lukut Kecil (28.9 km²), mengalir ke Selat Melaka
- Tapak berada di luar zon mudah banjir (risiko rendah)



Hidraulik Persisir

- Jajaran 8W, pantai berpasir bercampur, dataran lumpur & paya bakau; tenaga ombak umumnya rendah–sederhana; pengangkutan sedimen ke tenggara
- Arus: 0.03 – 1.01 m/s, mengalir NW–SE mengikut pasang surut; julat pasang surut: 2.6 – 3.4 m CD



Geologi

- Kawasan serantau: Endapan Kuarternar (Pleistosen Awal)
- Permukaan: Endapan marin & pesisir pantai (tanah liat, kelodak & pasir; paling muda)
- Lapisan bawah: Batuan dasar sedimen (syal, batu pasir & batu lumpur; lebih tua)



Ekologi Daratan

- Ekologi Kolam: Terbentuk melalui pertumbuhan semula spontan selepas pembersihan
- Flora: Spesies biasa yang ditanam atau menjajah, tiada spesies jarang atau terancam direkodkan
- Fauna: Primat, reptilia, dan 16 spesies burung



Ekologi Marin

- Tiada pembungaan alga atau penunjuk pencemaran.
- Makrobentos dan ikan biasa; terdapat bakau, terumbu karang, dan rumpai laut; tiada mamalia marin atau pendaratan penyu diperhatikan.
- Perikanan Tangkap Marin: 295 nelayan berlesen dan 202 vesel berlesen; trend penurunan hasil tangkapan direkodkan dalam tempoh 10 tahun lepas (2014–2023).
- Akuakultur: 14 penternak (udang & ikan), menunjukkan trend penurunan yang sama (75%) sepanjang tempoh yang sama.



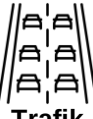
Profil Komuniti

- Majoriti komuniti mempunyai akses yang memuaskan kepada kemudahan asas



Guna Tanah

- Tapak diwartakan sebagai Infrastruktur & Utiliti di bawah RTMVV 2045
- Diklasifikasikan sebagai Industri Pencemar Tinggi (HPI); DOE mencadangkan zon penampakan 300 m; tidak sepenuhnya ada di sempadan barat; dikawal melalui reka letak loji & kawalan kejuruteraan
- Tapak tidak berada dalam ESA; paip CW merentasi ESA pesisir Rank 3; hutan simpan terdekat 11–21 km ke arah tenggara



Trafik

- Waktu puncak: 7–8 pagi & 5–6 petang.
- Laluan Persekutuan 5 & Jalan Tanjung Gemuk beroperasi pada LOS B–C semasa waktu puncak; lorong sedia ada mencukupi untuk permintaan semasa.
- Persimpangan utama (J1, J3, J4, J5) umumnya pada LOS B–C, dengan barisan terpanjang di J1 (sehingga 12 kenderaan).



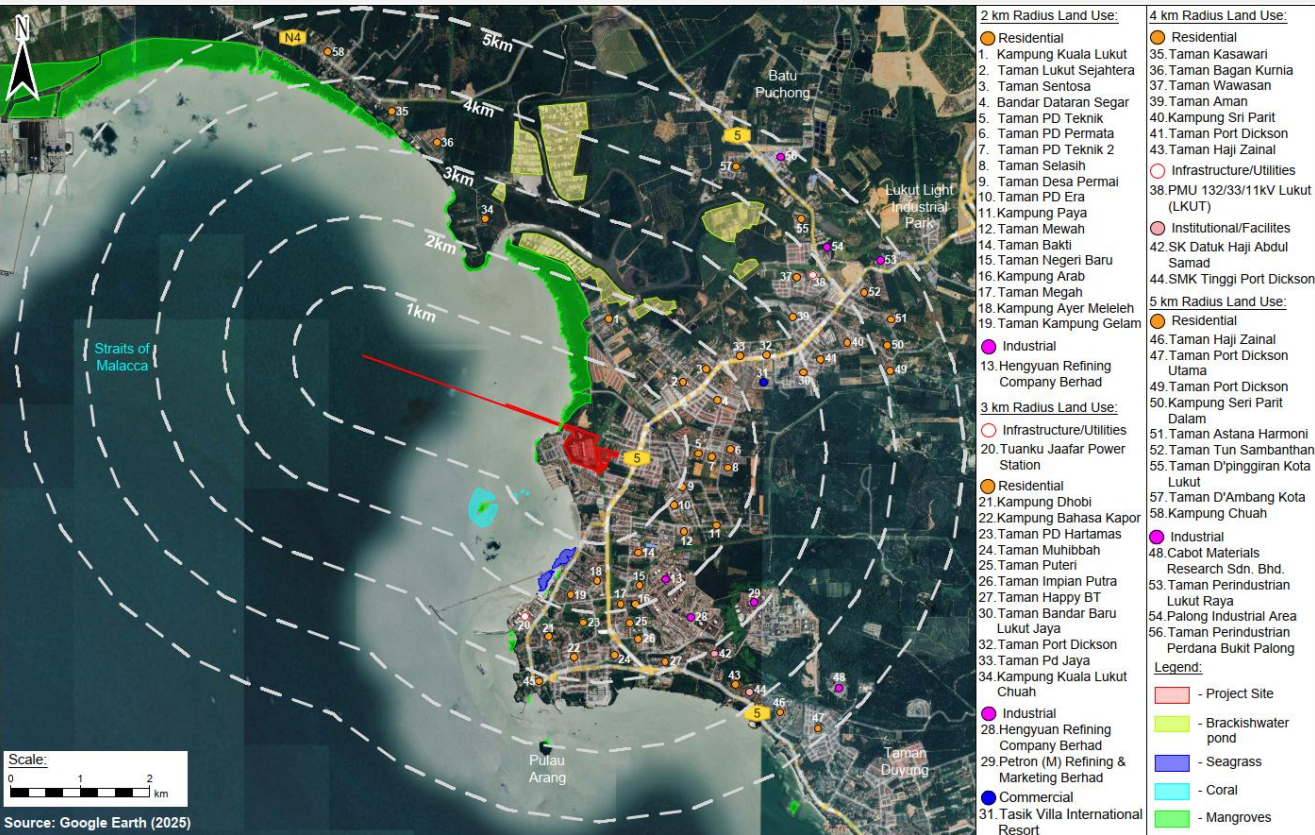
Sosio-Ekonomi

- Libat Urus: Tinjauan persepsi dengan penduduk, perniagaan, industri dan nelayan; FGD bersama agensi kerajaan dan Lembaga Kemajuan Ikan
- Kediaman & Komersial: Majoriti menyokong (~63%); kebanyakan melihat lebih banyak kelebihan berbanding kekurangan dan melaporkan sedikit kesan langsung
- Industri: Pandangan bercampur (~49% sokong, 37% tidak pasti); hampir separuh melaporkan tiada kesan langsung
- Nelayan: Sebahagian besar menentang (~66% tidak setuju), menyatakan kekurangan dan kesan yang lebih ketara

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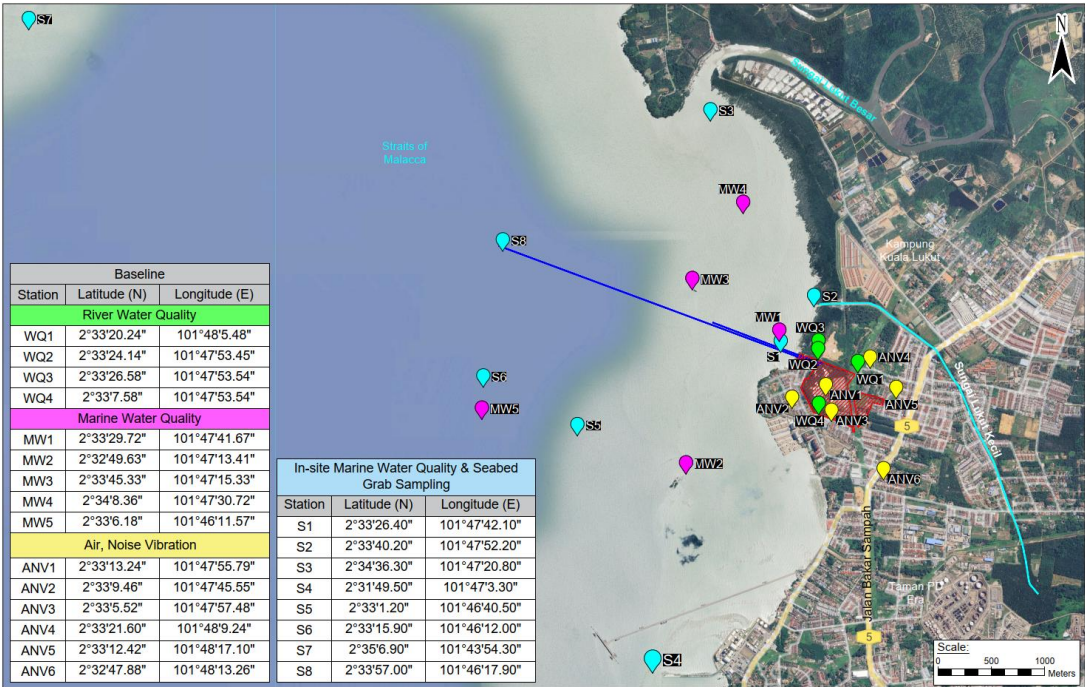
Guna Tanah Sedia Ada



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Lokasi Pemantauan Asas



Kualiti Air Marin In-Situ

- Lapan stesen dipantau (S1–S8) berbanding dengan MMWQS.
- TSS kerap melebihi had Kelas 1, Kelas 2, dan Interim Kelas E1; beberapa sampel juga melepasi ambang Kelas 3 (100 mg/L), dengan nilai lebih tinggi semasa air pasang besar dan di S8 (sehingga 187 mg/L).
- Kepekatan klorin sangat rendah (≤ 0.08 mg/L) dengan hanya sedikit pengaruh pasang surut.
- Suhu kekal dalam had; nilai di S8 konsisten dengan stesen garis dasar, menunjukkan tiada perbezaan terma yang signifikan.

Sedimen Dasar Laut

- Lapan stesen disampel (S1–S8). Sedimen kebanyakannya berpasir, dengan pecahan setempat kelodak dan tanah liat.
- Secara keseluruhan, sedimen dasar laut menunjukkan profil yang kebanyakannya berpasir dengan sedikit variasi.

Kualiti Udara Ambien

- Enam (6) stesen dipantau (A1–A6) berdasarkan Standard Kualiti Udara Ambien Malaysia Baharu 2020.
- PM_{10} dan $PM_{2.5}$ dalam had; SO_2 , NO_2 , O_3 tidak dikesan; CO hanya pada tahap surih.
- Semua parameter mematuhi piawaian.

Tahap Bunyi

- Enam stesen dipantau (N1–N6) berbanding Jadual Kedua: Tahap Bunyi Boleh Diterima (LAeq) untuk Kawasan Terbina Sedia Ada (Perumahan Pinggir Bandar & Bandar, Pembangunan Bercampur) dalam Garis Panduan Had & Kawalan Bunyi Alam Sekitar, Edisi Ketiga 2019 (Cetakan Semula 2021).
- LAeq siang hari di semua stesen mematuhi had 65 dBA.
- Waktu malam: N1–N3 dalam had 60 dBA; N4–N6 melebihi had kerana puncak awal pagi (trafik, aktiviti kediaman, hujan).

Tahap Getaran

Enam lokasi dipantau (V1–V6) mematuhi Jadual Ketiga dan Kesembilan dalam Guidelines for Environmental Vibration Limits and Control, Edisi Ketiga 2021 (RMS: 0.8–1.6 mm/s siang, 0.4 mm/s malam; PPV: 1.0 mm/s).

Kualiti Air Sungai

- Empat stesen (WQ1–WQ4) berbanding had Kelas IIB.
- pH: 6–9; DO di bawah had di semua lokasi kecuali WQ1.
- BOD dan COD melebihi hanya di WQ1; TSS mematuhi di semua stesen.
- Nitrogen amonia melebihi 0.3 mg/L di semua stesen.
- Kekeruhan di bawah 50 NTU kecuali di WQ1; warna dalam 150 TCU.
- TDS antara 2,070–25,270 mg/L, lebih tinggi di WQ2–WQ3.
- Koliform najis melebihi 400 CFU/100 mL di WQ1.

Kualiti Air Marin

- Lima stesen dipantau (WM1–WM5) berbanding Standard Kualiti Air Marin Malaysia (Kelas 2).
- DO melebihi had 5.0 mg/L; TSS dalam 50 mg/L.
- Logam berat (Cu, Zn, As^{3+} , Al) dikesan pada tahap surih di bawah had; Cd, Cr^{6+} , Pb tidak dikesan.
- Merkuri melebihi had di WM2–WM4 (0.050–0.055 $\mu\text{g/L}$ vs 0.04 $\mu\text{g/L}$).
- Nutrien: fosfat melebihi had di WM1 dan WM4; nitrit melebihi had di semua stesen; ammonia tak berion mematuhi.
- Bilangan koliform najis (1–4 CFU/100 mL) jauh di bawah had 70 CFU/100 mL.
- Minyak & gris, sianida, fenol total, dan PAH tidak dikesan.



Hakisan Tanah & Pemendapan

Pemodelan Hakisan Tanah

- Penilaian dijalankan menggunakan kaedah RUSLE di bawah tiga (3) senario: Keadaan Sedia Ada, Senario Terburuk (tanpa langkah mitigasi), dan Dengan Langkah Mitigasi.
- Risiko hakisan tertinggi diperhatikan dalam senario terburuk: 77.60 t/ha/tahun (Kritikal)
- Dengan pelaksanaan langkah mitigasi, jumlah kehilangan tanah berkurang kepada 2.74 t/ha/tahun (Risiko Rendah)

Hasil Enapan (Sediment Yield)

- Keadaan Sedia Ada: 116.45 tan
- Senario Terburuk: 218.69 tan
- Dengan Langkah Mitigasi: 17.22 tan



Hidrologi

Hydrologi

- Penilaian dijalankan untuk senario Pra-Projek (Kolam Sedia Ada), Pasca-Projek (Penambakan Kolam) dan Mitigasi (kolam takungan dicadangkan dengan saliran paip keluar).
- Bagi keadaan sedia ada, paras air maksimum di kolam dan saliran keluar kekal di bawah paras tebing. Sementara itu, saliran masuk hulu melimpah kira-kira 0.2 – 0.65 m melebihi paras tebing, menimbulkan potensi risiko banjir di hulu.
- Bagi Pasca-Projek, paras air maksimum meningkat, dengan limpahan di saliran masuk hulu (0.2 – 1.2 m melebihi paras tebing). Saliran keluar di hilir kekal mencukupi untuk melepaskan aliran ke laut.
- Selepas langkah mitigasi dilaksanakan, paras air di hulu berkurang berbanding senario Pasca-Projek, dan limpahan dapat dicegah.



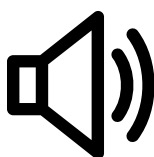
Kualiti Udara

Fasa Pembinaan

- Habuk yang ditiup angin dari kawasan terdedah – berkala (kering dan berangin) dan jarak terhad (6–9 m)
- Pelepasan habuk terlepas daripada aktiviti pengangkutan – jarak terhad (<200 m) Pelepasan ekzos kenderaan/peralatan – (kecil dan berselang-seli/sementara)
- Penerima terdekat >500 m — kesan habuk dianggap tidak signifikan

Fasa Operasi

- Penilaian dijalankan untuk pelepasan cerobong dalam dua (2) senario: operasi berasaskan 100% gas asli dan 100% minyak bahan api sulingan.
- Kepekatan Paras Tanah (GLC) yang dikira bagi pencemar udara kriteria di Penerima Sensitif Udara (ASR) di sekitar tapak Projek memenuhi Standard Kualiti Udara Ambien Malaysia (MAAQS) 2020, bagi kedua-dua senario. Kepekatan NO₂ menggunakan minyak bahan api adalah lebih tinggi berbanding penggunaan gas asli.
- Kepekatan purata tambahan maksimum (MAIC) bagi pencemar kriteria MAAQS 2020 berada dalam ambang yang dikira, semuanya mematuhi sepenuhnya had MAAQS 2020 serta had ambang 25% yang ditetapkan.



Bunyi

Fasa Pembinaan

- Pemodelan bunyi dijalankan di enam (6) NSR yang dikenal pasti di kawasan perumahan berdekatan.
- Tahap bunyi kumulatif yang diramal berada dalam had disyorkan iaitu 75 dB(A) dan 90 dB(A).
- Tindak balas komuniti terhadap bunyi akibat Projek dijangka “tiada” hingga “sedikit”.

Fasa Operasi

- Pihak Penggerak Projek komited untuk memasang peralatan dengan tahap tekanan bunyi (SPL) dikawal pada 85 dB(A) pada jarak 1 m dan di dalam bangunan.
- Tahap kumulatif LAeq di semua NSR yang dikenal pasti pada waktu siang berada di bawah had yang disyorkan iaitu 65 dB(A) pada siang hari dan 60 dB(A) pada waktu malam, di bawah Jadual Kedua.
- Tindak balas komuniti terhadap bunyi akibat Projek dijangka “tiada”.

Kajian Impak



Getaran

FASA PEMBINAAN

- Impak getaran dinilai menggunakan FTA 2018 dan Garis Panduan DOE 2021.
- Peralatan yang biasanya menghasilkan getaran (contoh: pemancang cerucuk, penggolek) dan jarak impaknya telah dinilai.
- Penerima sensitif tidak berada dalam ZOI 15 mm/s dan 10 mm/s.
- Kawasan berhampiran mungkin mengalami tahap getaran (<10 mm/s) yang boleh ditoleransi.

FASA OPERASI

- Getaran tanah yang disebabkan oleh trafik hanya berlaku dalam keadaan yang sangat ekstrem.
- Tiada impak getaran tanah dijangka berlaku.



Hidraulik
Persisiran dan
Kualiti Air

FASA PEMBINAAN

- Jika tiada langkah mitigasi dilaksanakan, projek ini boleh menyebabkan peningkatan jangka pendek dalam tahap TSS di salur penerimaan marin. Walau bagaimanapun, kepekatan TSS boleh dikurangkan secara berkesan dengan mematuhi had yang ditetapkan.
- Secara amnya, kelajuan arus semasa, ketinggian ombak, dan pengangkutan sedimen mengalami perubahan yang minimum.
- Keadaan sedimen sedia ada berada di bawah Kelas 3 manakala jumlah kepekatan sedimen kekal di bawah had keseluruhan operasi penggalai parit.

FASA OPERASI

- Air sisa yang dirawat kurang daripada 1% daripada jumlah air yang dibuang.
- Perubahan suhu akibat pelepasan air penyejuk bersuhu 40 °C mematuhi had MWQS (+2°C) bagi semua musim monsun di semua ESR
- Impak klorin terhadap ESR adalah tidak signifikan disebabkan oleh kelakuan degradasi yang hangat, masin, dan kaya dengan bahan organik.



Ekologi
Terrestrial

FASA PEMBINAAN

- Secara keseluruhan, impak dijangka rendah kerana kebanyakan kawasan telah dibersihkan.
- Monyet Silver Leaf dijangka berpindah ke kawasan bakau yang terletak berhampiran

FASA OPERASI

- Tiada gangguan dijangka berlaku kerana ekologi terrestrial sekeliling dijangka kekal tidak terjejas



Ekologi
Akuatik

FASA PEMBINAAN

- Tumpahan sedimen, peningkatan suhu air dan penurunan *Dissolved Oxygen* (DO).
- Pelepasan produk biogenik dan kimia, yang mengakibatkan peningkatan permintaan oksigen.
- Kepekatan TSS yang tinggi berpotensi menahan pengeluaran primer (plankton), mengurangkan kadar fotosintesis yang boleh menyebabkan migrasi organisma herbivor.
- Kemusnahan kawasan bertelur, penguburan, penutupan atau sesak organisma sessile.
- Pengurangan cahaya dan gangguan penglihatan di laut, kadar pembiakan berkurang dan migrasi fauna ikan ke kawasan yang kurang terganggu.
- Menimbulkan perubahan corak renangan dan orientasi penyu.
- Konflik antara PP dengan komuniti nelayan dan sistem akuakultur tempatan, serta pengurangan aktiviti rekreasi.
- Tiada impak signifikan terhadap terumbu karang, kawasan rumpai laut, hutan bakau berhampiran dan mamalia marin.

FASA OPERASI

- Impak ekologi daripada pelepasan haba dijangka tidak signifikan.
- Sebaran klorin residu di kebanyakan kawasan memberi impak yang rendah
- Terdapat potensi risiko penyu terperangkap di pintu atau dalam saluran pengambilan air

Kajian Impak



Penilaian Risiko
Kuantitatif

Permodelan Hakisan Tanah

- Kontour IR 1×10^{-5} /tahun di dalam sempadan tapak
- Kontour IR 1×10^{-6} /tahun berada di luar tapak Projek dan memberi impak kepada kawasan kediaman di sekitar tapak Projek di arah Timur, Timur Laut dan Tenggara.

Worst-Case Scenarios (WCS)

Pecah/Terbelahnya Tangki Simpanan Minyak Bahan Api

- *Pool Fire Event*: Zon bahaya 37.5 kW/m^2 and 4 kW/m^2 meluas sehingga 47 m dan 103 m
- *Jet Fire Event*: Zon bahaya 37.5 kW/m^2 and 4 kW/m^2 meluas sehingga 317 m and 422 m
- Kerosakan Saluran Paip dari Stesen Penerimaan Gas Bahan Api ke Turbin Gas
- *Explosion Event*: Zon bahaya tekanan letupan 0.14 bar explosion adalah sehingga 295 m



Sisa

FASA PEMBINAAN

- Jenis sisa: Biomass (1,424.25 tons/hari), serpihan pembinaan, sisa domestik (440 kg/hari) dan sisa terkawal.
- Pengurusan sisa yang tidak betul boleh meningkatkan risiko banjir serta menyebabkan pencemaran tanah, air bawah tanah dan bau

FASA OPERASI

- Jenis sisa: Sisa domestik (32.65 kg/hari), and sisa terkawal
- Pengurusan sisa yang tidak betul boleh meningkatkan risiko banjir dan penyebaran perosak
- Pencemaran kualiti tanah, air permukaan, dan air bawah tanah



Impak
Kesihatan

- Pencemar udara dan bunyi waktu fasa pembinaan dan operasi boleh diabaikan ($HQ < 1$)."
- Risiko kesihatan lain semasa pembinaan termasuk kemungkinan pembiakan nyamuk yang boleh membawa kepada denggi sekiranya pemantauan dan kawalan tidak dilaksanakan."
- Impaks kesihatan berkaitan kualiti udara tidak penting
- Potensi risiko penyakit berjangkit seperti COVID-19, tuberkulosis, kolera, dan malaria.



Sosio-
Ekonomi

FASA PEMBINAAN

- Kesan positif: Peningkatan peluang pekerjaan dan perniagaan
- Kesan negatif: Peningkatan sedikit dalam pergerakan trafik, kerosakan jalan, persepsi negatif dalam kalangan penduduk, kemasukan pekerja asing serta isu sosial, dan gangguan terhadap aktiviti nelayan.

FASA OPERASI

- Positif: Peningkatan bekalan elektrik di peringkat nasional.
- Negatif: Impak trafik yang tidak signifikan dengan langkah mitigasi dilaksanakan, gangguan bunyi yang tidak signifikan, dan potensi persepsi negatif dalam kalangan penduduk.



Trafik

FASA PEMBINAAN

- Laluan utama (*Federal Route 5*) beroperasi pada LOS B dan C manakala persimpangan beroperasi pada LOS B dan D semasa waktu puncak.
- Tambahan trafik dijangka tidak menimbulkan impak yang ketara dan impak terhadap persimpangan dijangka adalah minimum.

FASA OPERASI

- Laluan utama dijangka beroperasi pada LOS yang boleh diterima semasa waktu puncak, iaitu LOS B dan C pada tahun 2029 dan LOS C dan D pada tahun 2039.
- Persimpangan dijangka beroperasi pada LOS C dan D semasa waktu puncak, menunjukkan kemampuan yang mencukupi untuk menampung permintaan trafik masa depan.

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL
PERTAMA CADANGAN PEMBANGUNAN LOJI JANAKUASA
TURBIN GAS KITAR PADU (CCGT) BERKAPASITI 1,400 MW DI
MUKIM PORT DICKSON, DAERAH PORT DICKSON, NEGERI
SEMBILAN

Langkah Mitigasi

FASA PEMBINAAN

- Risiko hakisan tanah dan sedimen akan berada pada tahap minimum dengan pelaksanaan Amalan Pengurusan Terbaik (BMP) mengikut ESCP/LD-P2M2, termasuk
 - Penggunaan penanda pembinaan dan kawalan perimeter.
 - Pemasangan kolam sedimen dan *silt trap* serta penyelenggaraan berkala.
 - Pengurusan aliran permukaan dan bahan buangan secara betul serta pemeriksaan tapak secara berkala



Hakisan Tanah & Pemendapan

Mitigasi (Kolam Takungan)

- Takungan seluas 1.25 hektar dengan kedalaman 2.0 m.
- RC incoming U drain* (1.5 m × 1.5 m) untuk menyalurkan air hujan ke dalam kolam takungan.
- RC pipe drainage* sepanjang 340 m ($\varnothing = 0.15$ m) menghubungkan takungan ke laut.
- Flap gate ($\varnothing = 0.9$ m) di saluran keluar untuk mengelakkan aliran balik waktu MHWS



Hidrologi

Mitigasi (Pond Backfill)

- Saluran keluar kolam takungan digantikan dengan *RC U-drain* (4.0 m width x 2.0 m depth)
- Mengekalkan saluran paip berkembar sedia ada ($\varnothing = 1.4$ m) dan *flap gate*.

FASA PEMBINAAN

- Impak kualiti udara akan diminimumkan melalui *BMPs* bagi kawalan habuk
- Semua *BMPs* akan mematuhi CAR 2014 and panduan DOE mengenai *fugitive emissions*.

FASA OPERASI

- Pelepasan akan dipantau selaras dengan CAR 2014 JAS, berpandukan BATs dan dokumen teknikal JAS
- Ketinggian cerobong hendaklah sekurang-kurangnya 3 meter lebih tinggi daripada struktur tertinggi di kawasan sekitarnya.
- Port pensampelan akan direka bentuk mengikut Standard Malaysia MS1596:2003. Pelindung cuaca (*weather protection cowls*) akan direka bentuk dengan cara yang tidak menghalang aliran bebas gas, asap atau habuk.



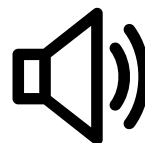
Kualiti Udara

FASA PEMBINAAN

- Mematuhi garis panduan *Environmental Noise Limits and Control: Annex E: Guidance on Noise Control (GENLC)* oleh JAS Malaysia
- Penggunaan penutup akustik atau skrin untuk jentera yang bising.

FASA OPERASI

- Kawasan kerja berbunyi tahap tinggi akan dikenal pasti dan waktu bekerja akan dihadkan.
- Mematuhi *permissible exposure limits set by DOSH's Occupational Safety and Health (Noise Exposure) Regulations 2019*
- Menggunakan PPE yang sesuai semasa bekerja dengan jentera yang bising.



Bunyi

FASA PEMBINAAN

- Mematuhi *Environmental Vibration Limits and Control (2021): Annex E, Management and Mitigation of Vibration in The Environment*
- Menggunakan hierarki kawalan untuk mengurangkan getaran.
- Menggunakan kaedah cerucuk yang sesuai, berimpak rendah dan mesra alam.

FASA OPERASI

- Sumber impak getaran tidak wujud semasa fasa operasi



Getaran

Langkah Mitigasi

FASA PEMBINAAN

- Melaksanakan Kawalan Erosi dan Sedimen (ESC) mengikut LD-P2M2, pengurusan bahan kimia dan sisa di tapak secara betul, serta latihan dan pengurusan pekerja di tapak Projek.
- Semasa pemasangan saluran paip, *silt curtain* yang berlapis dua akan digunakan dan pemantauan kualiti air marin akan dilaksanakan.

FASA OPERASI

- Memasang sistem pemantauan atas talian bagi suhu dan jumlah klorin pada paip air penyejuk.
- Melaksanakan pemantauan berkala terhadap efluen dan kualiti air marin.
- Shoreline Monitoring Program (SMP) dilaksanakan setiap 3 bulan semasa pembinaan saluran paip dan dua kali setahun selepas pembinaan selesai.



Hidraulik
Persisiran
dan Kualiti Air

FASA PEMBINAAN

- Mengekalkan sebahagian kawasan vegetasi di sempadan utara sebagai zon penampungan untuk kegunaan lutung dan primat lain.
- Pemantauan terhadap kera *Silver Leaf* dicadangkan

FASA OPERASI

- Tiada langkah mitigasi ekologi yang diperlukan



Ecologi
Terrestrial

FASA PEMBINAAN

- Pemasangan *silt curtain* dan penyelenggaraan berkala bagi *barge*, *dredger*, dan jentera.
- Menjalan pemantauan biologi marin dan kualiti air
- Bagi perlindungan penyu, mengurangkan bunyi bawah air, pengurusan sisa yang betul, mengelakkan kerja pembinaan waktu musim bertelur, dan memantau kehadiran penyu
- Menjalin komunikasi aktif antara Pemaju Projek (PP) dengan komuniti nelayan dan penternak akuatik.

FASA OPERASI

- Pemantauan berkala biologi marin dan kualiti air.
- Pemasangan penapis yang sesuai di pengambilan air penyejuk.
- Pemindahan Kelong Pozi



Ecologi
Akuatik

FASA PEMBINAAN

- Penggunaan semula sisa *biomass* sebagai mulsa.
- Pengurusan sisa pembinaan dan domestik yang betul.
- Pengurusan sisa terkawal akan dilaksanakan mengikut *Guidelines for Packaging, Labelling, and Storage of Scheduled Wastes in Malaysia*.

FASA OPERASI

- Sisa domestik akan diuruskan melalui penyediaan dan penyelenggaraan tong sampah secara berkala di dalam tapak projek
- Semua sisa terjadual akan diuruskan oleh Orang Kompeten sebagaimana yang dikehendaki di bawah keperluan Garis Panduan.



Sisa

- Menyediakan bekalan air yang mencukupi dan selamat serta kemudahan sanitasi.
- Amalkan pengurusan tempat kerja yang baik (good housekeeping).
- Menyediakan pengurusan komuniti pekerja di tapak.
- Pekerja asing hendaklah menjalani penilaian kesihatan pra-pekerjaan melalui FOMENA.
- Saringan kesihatan akan dijalankan setiap kali berlaku wabak penyakit.



Impak
Kesihatan

RINGKASAN EKSEKUTIF

PENILAIAN KESAN KEPADA ALAM SEKELILING JADUAL PERTAMA CADANGAN PEMBANGUNAN LOJI JANAKUASA TURBIN GAS KITAR PADU (CCGT) BERKAPASITI 1,400 MW DI MUKIM PORT DICKSON, DAERAH PORT DICKSON, NEGERI SEMBILAN

Langkah Mitigasi

FASA PEMBINAAN

- Menjalin hubungan rapat dengan komuniti jiran dan komuniti nelayan serta mengambil tindakan segera untuk menyelesaikan sebarang konflik.
- Mengekalkan kerjasama yang kukuh antara Pemaju Projek (PP), komuniti setempat, dan pihak berkuasa/agensi berkaitan.
- Melaksanakan penilaian risiko keselamatan dan kesihatan untuk pekerja, kontraktor, dan pelawat.

FASA OPERASI

- Membangun dan melaksanakan program Tanggungjawab Sosial Korporat (CSR)



Sosio-
Ekonomi

FASA PEMBINAAN

- Menyediakan papan tanda amaran dan petugas isyarat yang mencukupi di semua stesen kerja untuk memudahkan kawalan trafik.
- Lori akan dihadkan kepada waktu luar puncak (10 pagi hingga 4 petang, 8 malam hingga 6 pagi) di zon kerja yang dibenarkan.
- Menempatkan papan keselamatan dan amaran yang mencukupi.
- Kenderaan tunda dan pasukan tindak balas kecemasan yang mencukupi akan disediakan dengan masa tindak balas maksimum 15 minit.

FASA OPERASI

- Menyediakan laluan yang selamat dan selesa untuk pejalan kaki.
- Menyediakan perancangan dan kawalan yang lebih baik dalam pergerakan pejalan kaki.



Trafik

Cadangan Program Pemantauan Alam Sekitar



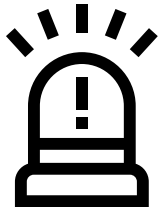
PEMANTAUAN PEMATUHAN (CM)

- Memastikan syarat kelulusan EIA dipatuhi oleh Pemaju Projek
- Dijalankan oleh makmal yang bertauliah



AUDIT PEMATUHAN ALAM SEKITAR

- Audit dilakukan oleh juruaudit alam sekitar yang berdaftar
- Memiliki kelayakan Certified Erosion, Sediment and Storm Water Inspector (CESSWI) atau Malaysian Certified Inspector of Sediment and Erosion Control (MY-CISEC)
- Amalan Pengurusan Terbaik (BMP) akan diguna pakai



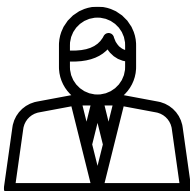
PEMANTAUAN PRESTASI (PM)

- Memastikan keberkesanan sistem kawalan pencemaran dan langkah-langkah mitigasi
- Dilakukan oleh EO di tapak



PEMANTAUAN GARIS DASAR

- Indikasi umum kepada garis dasar keadaan alam sekitar semasa laporan



PEMANTAUAN IMPAK (IM)

- Memastikan impak yang berpotensi seperti yang dinyatakan semasa penyediaan EIA adalah tepat
- Memastikan kaedah mitigasi dilaksanakan secara terurus



PROGRAM PEMANTAUAN ALAM SEKITAR

- Menyediakan pangkalan data impak alam sekitar
- Indikasi awal kepada impak alam sekitar

PEMANTAUAN KAWAL SELIA

- Memastikan keberkesanan langkah-Langkah mitigasi dan pematuhan terhadap peraturan alam Sekitar.
- Dijalankan oleh EO

Cadangan Program Pemantauan Alam Sekitar

Pemantauan	Kekerapan
Pemantauan Prestasi	
Seperti pelan LD-P2M2	- Mingguan - Selepas hujan lebat (>12.5 mm seperti diukur oleh alat pengukur hujan)
Pemantauan Pematuhan	
Saluran keluar kolam sediment	Bulanan
Pemantauan Impak	
- Kualiti Air (2 stesen) - Udara Ambien, Bunyi Bising & Getaran (5 stesen setiap satu) - Kualiti Air Laut (6 stesen) - Pemantauan Ekologi Lautan	- Bulanan - Tiga Bulan Sekali - Tiga Bulan Sekali
Fasa Operasi	
- Kualiti Emisi Udara (2 Cerobong) - Kualiti Air (2 stesen) - Kualiti Sisa Air (1 stesen – seal pit) - Udara Ambien, Bunyi Bising & Getaran (5 stesen setiap satu) - Pemantauan Ekologi Lautan	- CEMS dan Tiga Bukan Sekali - Pemantauan Atas Talian and Bulanan - Tahunan

PROGRAM
PEMANTAUAN
SEMASA FASA
PEMBINAAN

PROGRAM
PEMANTAUAN
SEMASA FASA
OPERASI

Pelan Respon Kecemasan

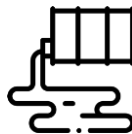
PASUKAN RESPON KECEMASAN

- Pasukan yang dianggotai oleh individu berkelayakan dengan peranan dan tanggungjawab yang spesifik semasa kecemasan
- Bertanggungjawab untuk melaksanakan prosedur tersebut:



RESPON KECEMASAN
KEBAKARAN

Menyelaraskan pergerakan
pekerja dan komunikasi dengan
jabatan berkaitan



PROSEDUR TUMPAHAN
Langkah mitigasi dan proses
laporan



RESPON KEGAGALAN ESCP
Kaedah kawalan dan
penyelenggaraan

Kesimpulan

Projek ini dikategorikan sebagai berisiko rendah terhadap alam sekitar. Semua impak berpotensi dapat dikurangkan dengan berkesan serta mematuhi had yang ditetapkan. Selain itu, projek ini memainkan peranan penting dalam menyokong bekalan tenaga negara dan mengurangkan risiko kekurangan kuasa di Malaysia pada masa terdekat.