

EXECUTIVE SUMMARY

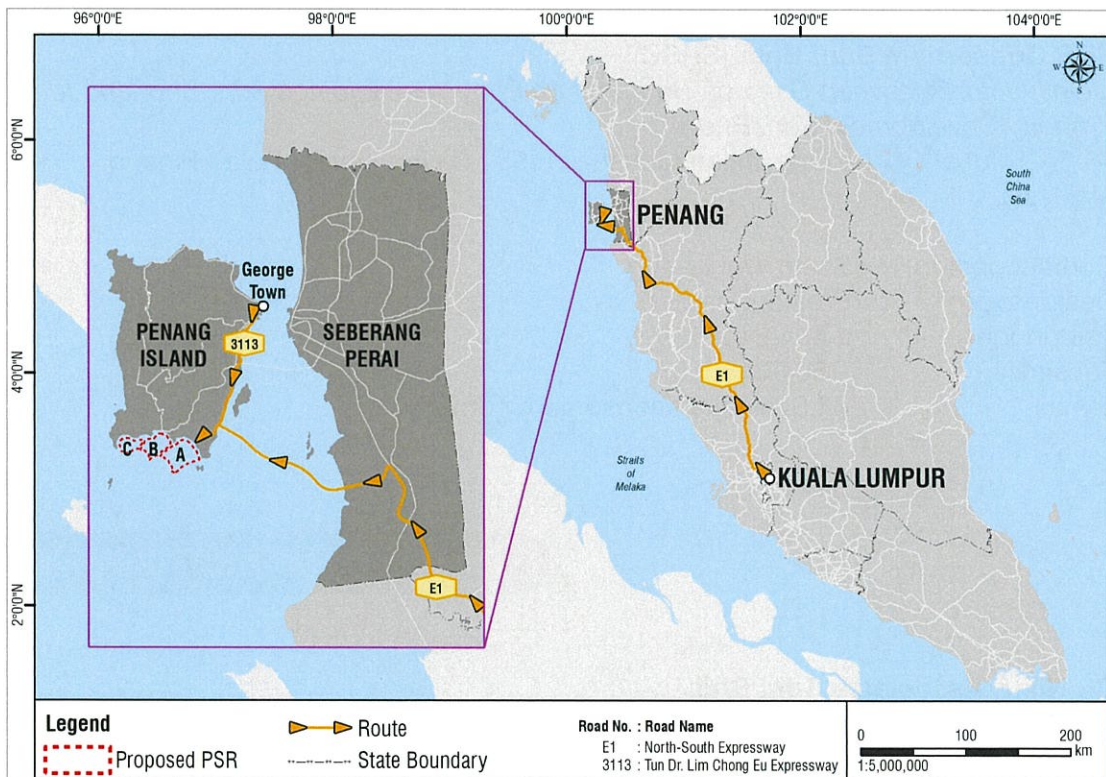
CHAPTER 1

PROJECT TITLE

THE PROPOSED RECLAMATION AND DREDGING WORKS FOR THE PENANG SOUTH RECLAMATION (PSR), PENANG

LOCATION

22 km away from Georgetown via the Tun Dr. Lim Chong Eu (LCE) Expressway and about 352 km away from Kuala Lumpur via the North-South Expressway



PROJECT BACKGROUND

- The Penang State Government intends to undertake land reclamation activities of three man-made islands at the south coast of Penang Island.
- The three man-made islands are intended to be developed as a part of the expansion of Bayan Lepas Free Industrial Zone (FIZ) as well as for mixed development comprising of residential and commercial area.

CHAPTER 1

LEGAL REQUIREMENTS



PRESCRIBED ACTIVITY

Second Schedule Activity 7:

Land Reclamation

- Coastal reclamation or land reclamation along river banks involving an area of 50 hectares or more.
- Coastal reclamation or land reclamation along river banks within or adjacent or near to environmentally sensitive areas.
- Reclamation for man-made island.

First Schedule Activity

15:

Dredging

- Capital dredging.

PLANNING POLICIES



CHAPTER 3

STATEMENT OF NEED

- 01** Planning for Penang's future generation

02 The transformation of Penang – Smart City

03 Human capital to drive Penang's transformation

04 Economic transformation of Penang

05 Relieve development pressures on George Town
- 06** Addressing new land scarcity and preserving Penang's Hills

07 Homes for all income levels served by well-planned amenities

08 Economic and employment benefit

09 New beginning for fishermen

CHAPTER 4

PROJECT OPTIONS

Location	Option 1 Mainland Penang
	Option 2 West coast of Penang Island
	Option 3 North coast of Penang Island
	Option 4 East coast of Penang Island
	Option 5 South coast of Penang Island
	Option 6 Further seaward of south coast of Penang Island

Phasing	Option 1 Reclamation of Island B first, then Island A and lastly Island C (B-A-C)
	Option 2 Reclamation of Island A first, then Island B and lastly Island C (A-B-C)

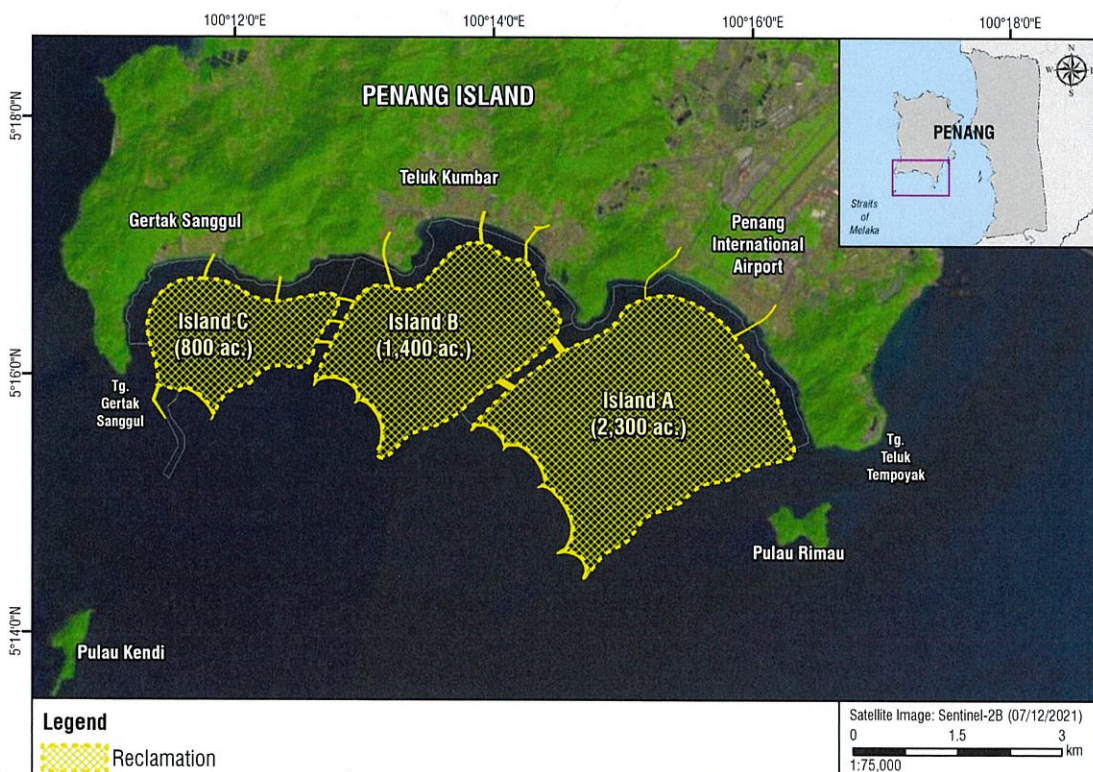
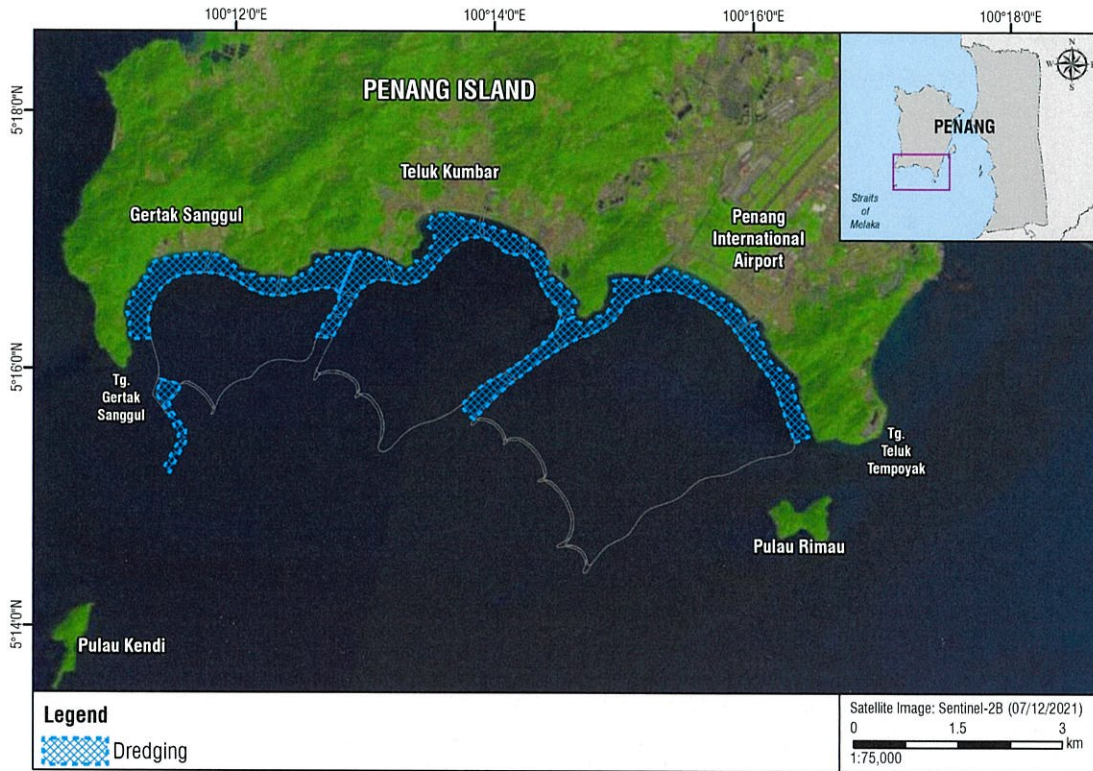
Layout	Option 1 Reclaimed islands with foreshore reclamation for airport extension
	Option 2 Streamlined edges of Island A with foreshore reclamation for airport extension
	Option 3 Reduction of size of Island A with no foreshore reclamation
	Option 4 Increased number of embayed beaches at the south coastlines of reclaimed islands

No-Build

CHAPTER 4

PROJECT LAYOUT

Located across the south coast of Penang Island and along the coastline of Tanjung Teluk Tempoyak to Tanjung Gertak Sanggul.



PROJECT COMPONENTS

1. **Reclamation of Islands A, B and C:**
 - Potential sand source locations: Perak and Selangor
 - Rock source locations: Teluk Tempoyak and Pantai Remis
2. **Dredging works around Islands A, B and C:**
 - Disposal ground at Muka Head
3. **Coastal structures:**
 - Revetment, artificial beach, vertical wall, breakwater, etc.
4. **Connection bridges:**
 - Seven bridges connecting PSR islands to Penang Island
 - Five bridges connecting the three islands internally
5. **Topside development:**
 - Made up of residential, commercial, industrial, etc.

RECLAMATION

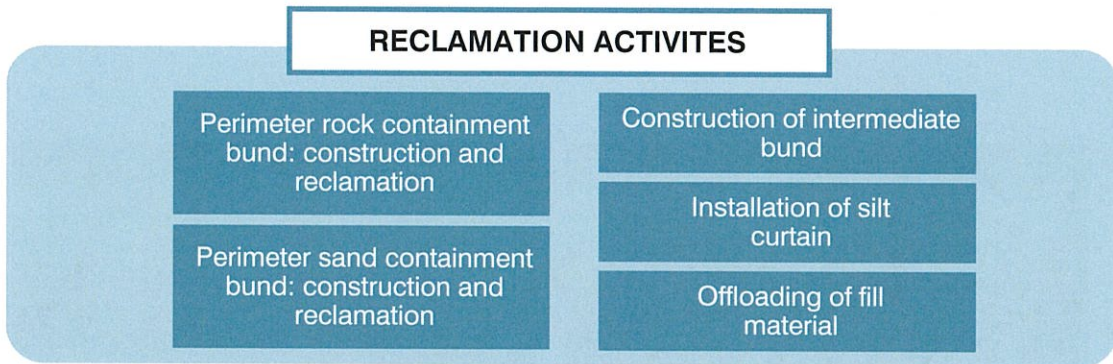
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|---|--|
| <ol style="list-style-type: none"> 1. Reclamation of Island A: <ul style="list-style-type: none"> ■ Area: 2,300 acres ■ Sand volume: 102 million m³ 2. Reclamation of Island B: <ul style="list-style-type: none"> ■ Area: 1,400 acres ■ Sand volume: 66 million m³ | <ol style="list-style-type: none"> 3. Reclamation of Island C: <ul style="list-style-type: none"> ■ Area: 800 acres ■ Sand volume: 39 million m³ |
|---|--|

DREDGING OF CHANNEL (UP TO -2m CD)

1. **Dredging of channel around Island A:**
 - Channel width: 150 – 250 m
 - Channel length: 8.1 km
 - Dredging volume: 2.2 million m³
2. **Dredging of channel around Island B:**
 - Channel width: 150 – 250 m
 - Channel length: 5.2 km
 - Dredging volume: 2.4 million m³
3. **Dredging of channel around Island C:**
 - Channel width: 150 – 250 m
 - Channel length: 5.5 km
 - Dredging volume: 1.7 million m³

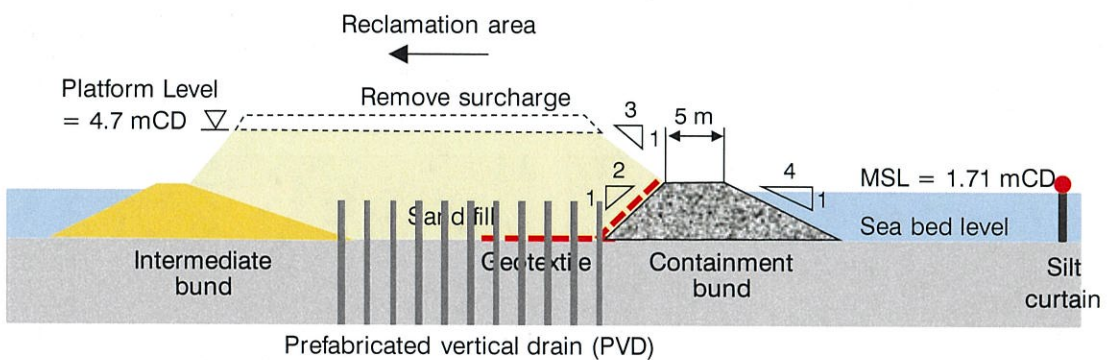
CHAPTER 5

PROJECT ACTIVITIES



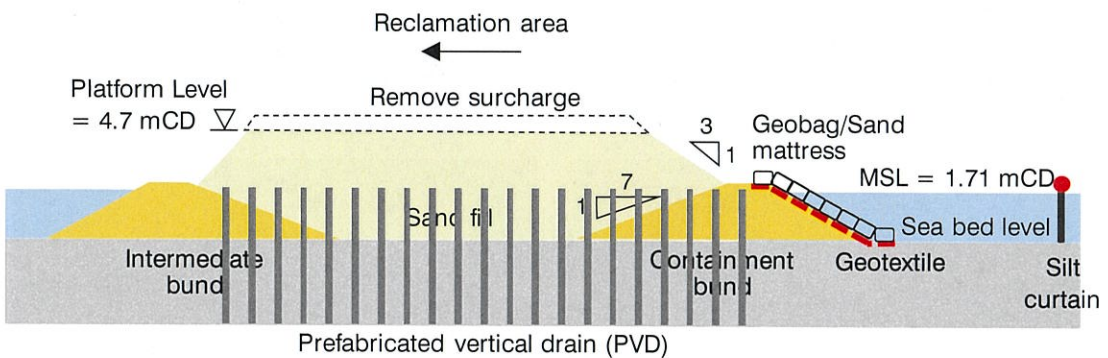
Perimeter Rock Containment Bund: Construction and Reclamation

- At areas with high current speed and ESAs

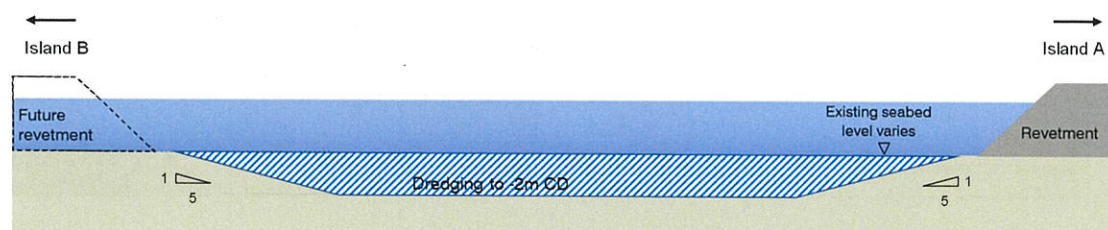


Perimeter Sand Containment Bund: Construction and Reclamation

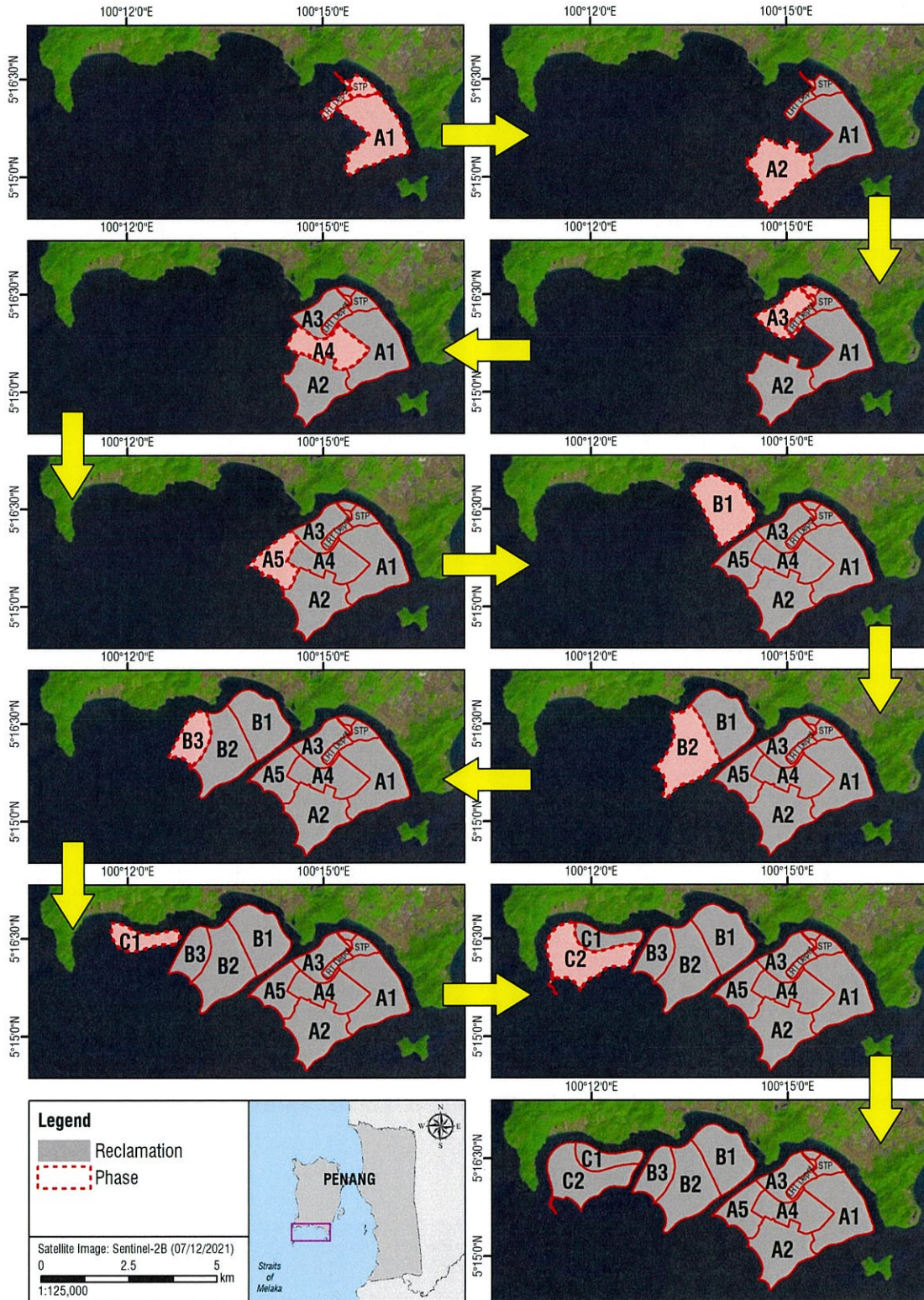
- At areas with low current speed



Cross-Section of Dredged Channel (Between Island A and Island B)



RECLAMATION SUB-PHASINGS FOR ISLANDS A, B AND C



CHAPTER 5

PROJECT SCHEDULE AND PHASES



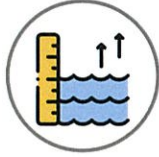
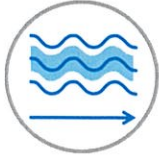






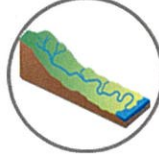

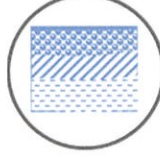




The Project is expected to complete in:



CHAPTER 6





EXISTING ENVIRONMENT

<p>LAND USE</p>  <ul style="list-style-type: none"> Administration: under Majlis Bandaraya Pulau Pinang Main land use type: agriculture (29.15%), forest (27.48%), residential (14.63%), transportation (10.20%) 	<p>BATHYMETRY</p>  <ul style="list-style-type: none"> The Project site is generally shallow Seabed level up to around -3 m CD 	<p>WATER LEVELS</p>  <ul style="list-style-type: none"> Maximum and mean spring tidal range is 3.09 and 1.97 m respectively Mean neap tidal range is 0.51 m
<p>CURRENTS</p>  <ul style="list-style-type: none"> Currents within Malacca Straits move southwardly during ebbing period and moving eastward during flood flow Mean current speed up to about 0.2 m/s and maximum current speed up to about 0.7 m/s for all climatic conditions 	<p>WAVES</p>  <ul style="list-style-type: none"> Wave heights along the southern coastline of Penang Island are relatively low 	<p>TSUNAMI</p>  <ul style="list-style-type: none"> Maximum water level is higher at the frontage of Permatang Damar Laut but reduces progressively westwards towards Gertak Sanggul

<p>GEOLOGY & GEOTECHNICAL</p>  <ul style="list-style-type: none"> Penang Island mostly comprise of granite with minor granodiorite Seabed subsoil stratum at the Project site mainly consists of clay and sandy clay 	<p>CLIMATE & METEOROLOGY</p>  <ul style="list-style-type: none"> Uniform temperature, humidity and rainfall distribution 	<p>HYDROLOGY & DRAINAGE</p>  <ul style="list-style-type: none"> Five main rivers: Sungai Gertak Sanggul, Sungai Teluk Kumbar, Sungai Batu, Sungai Bayan Lepas and Bayan Lepas Main Drain
<p>WATER</p>  <ul style="list-style-type: none"> 29 marine water quality sampling stations 4 estuarine water quality sampling stations Both marine and estuarine water quality considered generally clean 	<p>SEDIMENT</p>  <ul style="list-style-type: none"> 13 sediment quality sampling stations Several heavy metals were below Washington Marine Sediment Quality Standard (2013) 	<p>AIR</p>  <ul style="list-style-type: none"> 4 air quality sampling stations Existing air quality is generally good and complied with New Malaysia Ambient Air Quality Standard (DOE, 2014)
<p>NOISE</p>  <ul style="list-style-type: none"> 4 noise sampling stations Existing noise levels were below maximum permissible limit of Suburban Residential Areas category (DOE, 2004) 	<p>UNDERWATER NOISE</p>  <ul style="list-style-type: none"> Croaking sound and other fish sound tend to favour the mid frequency band Anthropogenic noise sources may vary from shipping, recreational boating and fishing activities 	<p>VIBRATION</p>  <ul style="list-style-type: none"> 4 vibration sampling stations Existing vibration levels were below safe limit of Planning Guideline for Vibration Limits & Control in the Environment (DOE, 2016)

CHAPTER 6

EXISTING ENVIRONMENT

<p>MARINE TRAFFIC & NAVIGATION</p>  <ul style="list-style-type: none">■ The Project site is located outside of the boundary of the Penang Port Limit■ Main existing marine facilities include pier, ferry terminal, cargo terminal, etc.	<p>TERRESTRIAL FLORA</p>  <ul style="list-style-type: none">■ 121 plant species from 61 families recorded■ Almost 75% of the total plants are from non-exclusive category■ 22 exclusive species of mangrove plants found■ No mangrove species on the IUCN Red List Categories and Criteria found	<p>TERRESTRIAL FAUNA</p>  <ul style="list-style-type: none">■ All recorded avifauna are categorised under the status of Least Concerned (IUCN, 2007)■ Migratory avifauna species were recorded during migratory season (October until May)■ All other types of fauna are considered as insignificant for this Project
<p>LAND TRAFFIC</p> 	<ul style="list-style-type: none">■ 3 existing major roads nearest to Project area■ Junctions are performing between LoS A and F during peak hours	

- Population dominated by *Bacillariophyta*
- No harmful algal blooms or pollutant indicator species were detected



PHYTOPLANKTON

- Population dominated by *Arthropoda*



ZOOPLANKTON

- Population dominated by *Arthropoda*
- No pollutant indicator species were detected



MACROBENTHOS

- Most turtle landings recorded within Penang National Park
- Green Turtle is the main species recorded in Penang overall



TURTLE

- Most fish species categorised as Least Concern at Pulau Kendi and Pulau Rimau (IUCN, 2010-2019)



REEF FISH

- Most invertebrates categorised as Not Evaluated at both Pulau Kendi and Pulau Rimau (IUCN, 2022)



INVERTEBRATES

- Unidentified dolphin species observed off the reclamation footprint during recent years, especially at Teluk Kumbar and Pulau Kendi



MARINE MAMMALS

- A total 79 species fish fauna recorded at study area, comprised of 70 fish species, 3 shrimp species, 4 crab species, 1 mantis shrimp species and 1 cephalopod species



FISH FAUNA

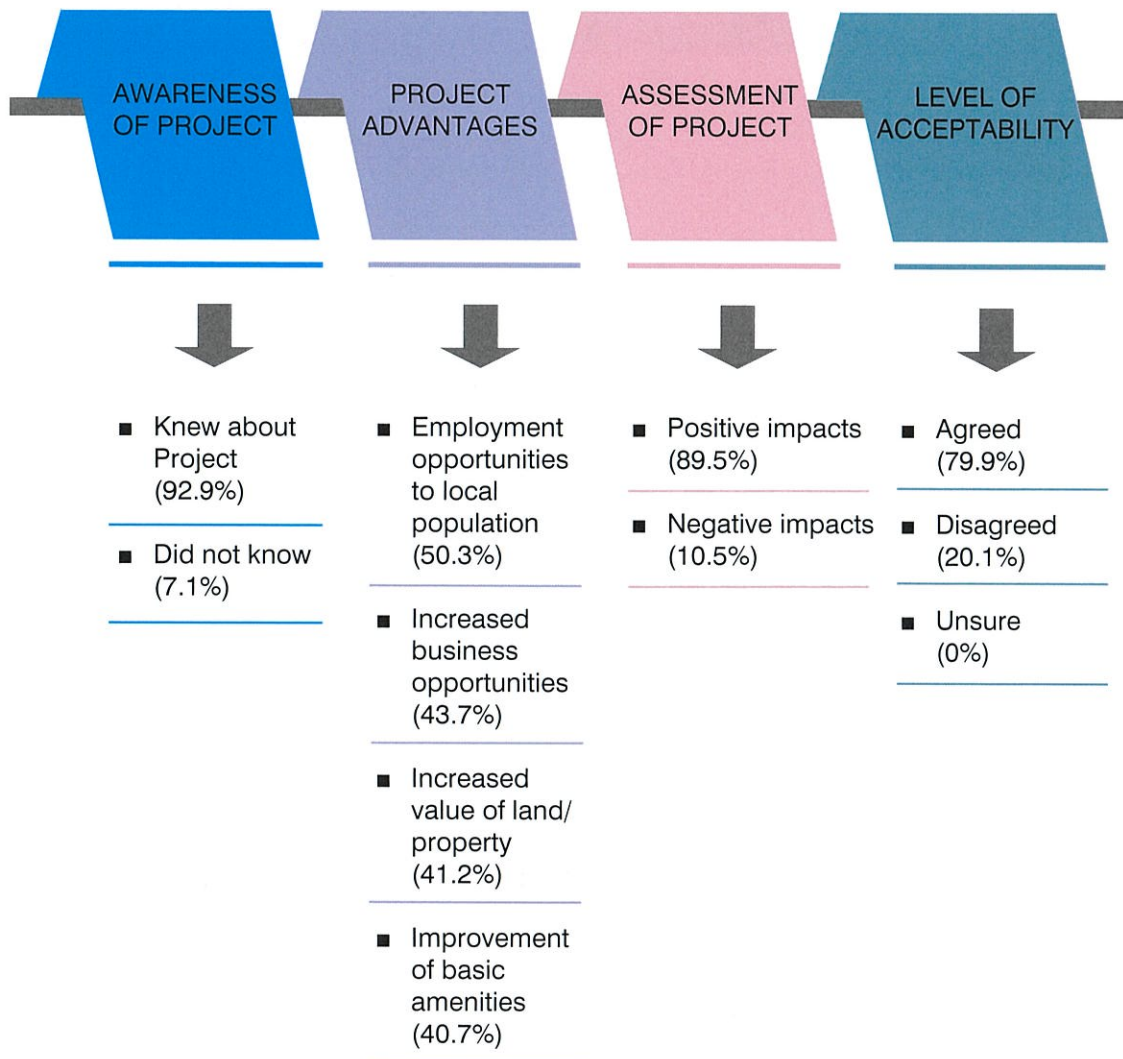
- Consists of 22 corals taxa (*Anthozoa*) recorded at both Pulau Rimau and Pulau Kendi
- *Diploastrea heliophora* is categorised as Near Threatened, while *Pachyseris speciosa* is categorised as Least Concern (IUCN, 2014)
- Coral bleaching is observed at Pulau Kendi
- Lower diversity and coral cover recorded at Pulau Rimau than Pulau Kendi



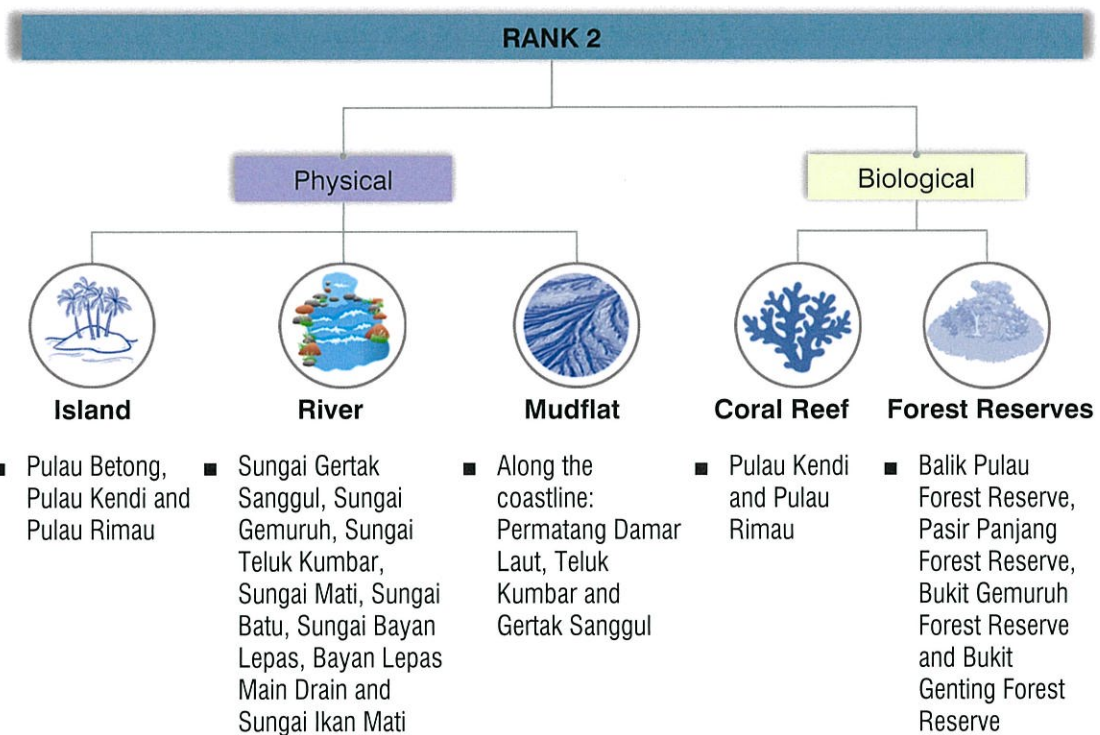
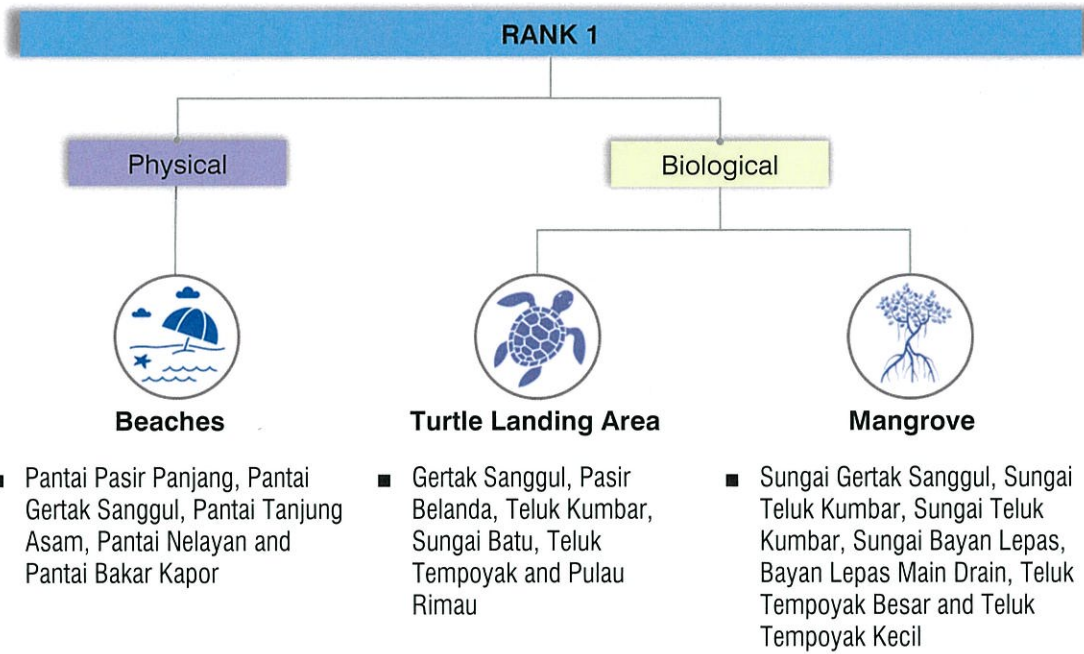
CORAL REEF

CHAPTER 6

SOCIO-ECONOMY

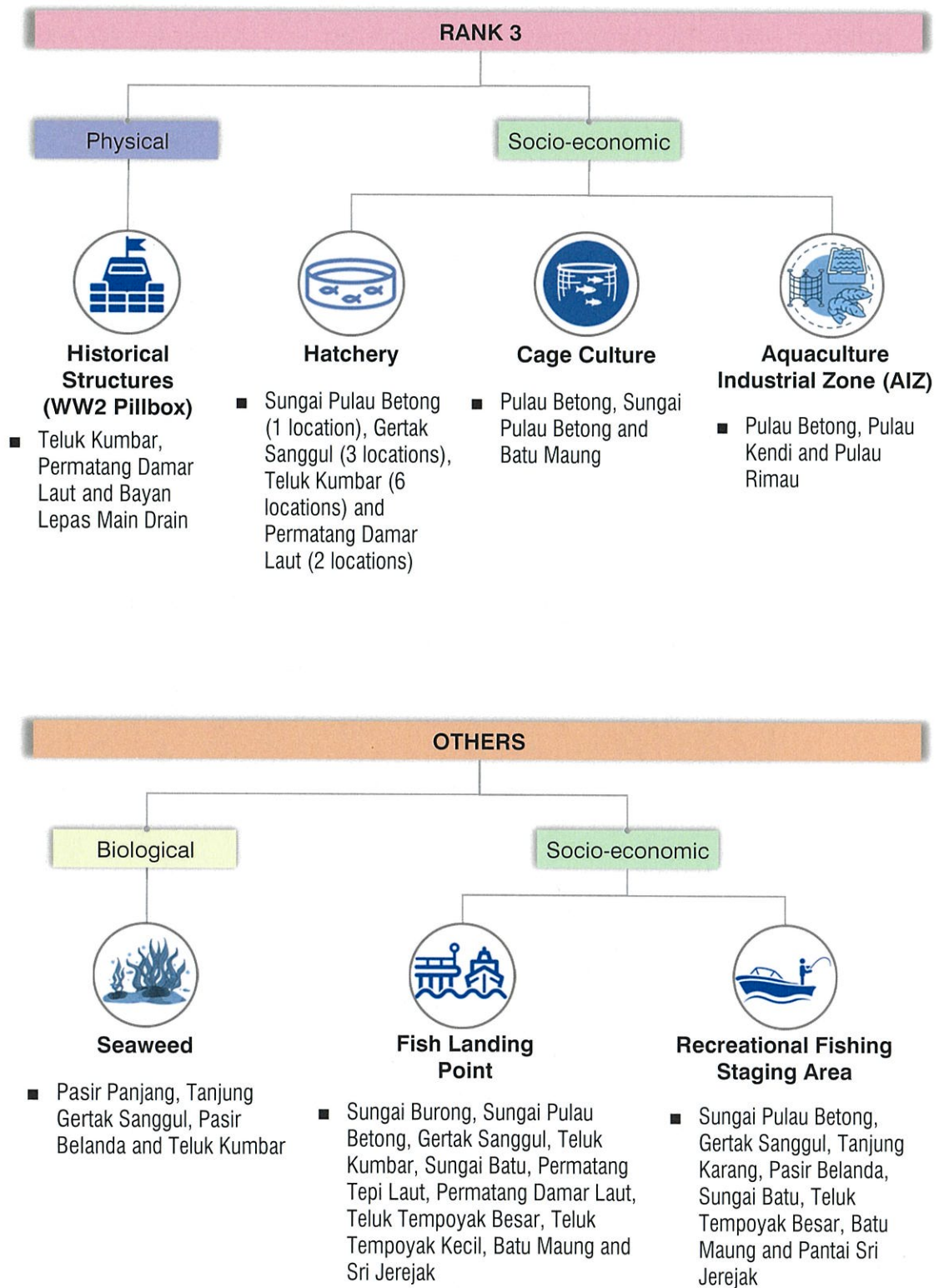


ENVIRONMENTALLY SENSITIVE AREAS (ESAS)






CHAPTER 6

ENVIRONMENTALLY SENSITIVE AREAS (ESAS)








SUMMARY OF POTENTIAL IMPACTS AND ITS ASSOCIATED P2M2


<p>RIVER OUTLET</p> 	<p>IMPACTS</p>	<p>Current speed, wave heights, bed level changes (erosion and sedimentation), water quality, aesthetics.</p>
	<p>P2M2</p>	<p>a) Bed level changes</p> <ul style="list-style-type: none"> ■ Maintenance dredging for sedimentation every 5 years, depending on bathymetric survey. ■ Coastal protection structure (hard and soft) for erosion such as revetment and beach nourishment. <p>b) Water quality</p> <ul style="list-style-type: none"> ■ Implementing Green River Programme to improve the water quality for major rivers in southern Penang Island ■ Reduction in pollution load especially for BOD (up to 70%), phosphorus (up to 99%) and ammoniacal nitrogen (up to 81%). ■ Control land use and point source discharge within the southern Penang Island area.
<p>HATCHERIES</p> 	<p>IMPACTS</p>	<p>Current speed, bed level changes (erosion), sediment spill dispersion, water quality, footprint.</p>
	<p>P2M2</p>	<p>a) Sediment dispersion</p> <ul style="list-style-type: none"> ■ Combination of perimeter bund and silt curtain in managing the sediment plume during reclamation. ■ Upgrading of filtration system, based on feedback from consultation with the operators. ■ Controlled dredging and reclamation operation. <p>b) Footprint</p> <ul style="list-style-type: none"> ■ Relocation of seawater intake pipe to suitable area, based on feedback from the operators. <p>c) Water quality</p> <ul style="list-style-type: none"> ■ Implementing Green River Programme to improve the water quality. ■ Reduction in pollution load especially for BOD (up to 70%), phosphorus (up to 99%) and ammoniacal nitrogen (up to 81%). ■ Widening of navigation channel based on results of detailed hydraulic analysis. ■ Best Management Practices (BMPs) for solid waste, scheduled waste and wastewater.
<p>CORALS</p> 	<p>IMPACTS</p>	<p>Current speed, wave heights, sediment spill dispersion.</p>
	<p>P2M2</p>	<p>a) Sediment dispersion</p> <ul style="list-style-type: none"> ■ Combination of perimeter bund and silt curtain in managing the sediment plume during reclamation. <p>b) Offset programme</p> <ul style="list-style-type: none"> ■ Provide grant or financial support for coral related research. ■ Deployment of artificial reefs.

CHAPTER 7 AND 8

SUMMARY OF POTENTIAL IMPACTS AND ITS ASSOCIATED P2M2




<p>ISLANDS</p> 	<p>IMPACTS -</p>	
<p>RECREATIONAL BEACH</p> 	<p>IMPACTS</p> <p>P2M2</p>	<p>Noise, aesthetics.</p> <p>a) Enhancement of existing beach</p> <ul style="list-style-type: none"> ■ Additional enhancement works may be required if the upper beach areas experience siltation of fine sediments. <p>b) Monitoring survey</p> <ul style="list-style-type: none"> ■ Periodic bathymetry and nearshore surveys to assess beach and bed level changes during and after Project implementation. <p>c) Beach nourishment</p> <ul style="list-style-type: none"> ■ If beach erosion is detected from monitoring survey, beach nourishment shall be conducted.
<p>RECREATIONAL FISHING STAGING AREA</p> 	<p>IMPACTS</p> <p>P2M2</p>	<p>Aesthetics.</p> <p>Improvement on current staging area i.e. improving public access to the area.</p>
<p>FISH-LANDING POINT</p> 	<p>IMPACTS</p> <p>P2M2</p>	<p>Current speed, wave heights, bed level changes (sedimentation), footprint, aesthetics.</p> <p>New fishermen jetties</p> <ul style="list-style-type: none"> ■ New jetties for fishermen will be built.
<p>AQUACULTURE</p> 	<p>IMPACTS</p> <p>P2M2</p>	<p>-</p> <p>Insignificant impact, thus no P2M2 proposed.</p>

SUMMARY OF POTENTIAL IMPACTS AND ITS ASSOCIATED P2M2

	HUMAN	IMPACTS	Current speed, sediment spill dispersion, water quality, footprint, noise, air quality, aesthetics.
	P2M2	Fishermen	<p>Implementation of SIMP that includes:</p> <p>a) <i>Ex-gratia</i></p> <ul style="list-style-type: none"> ■ Suitable quantum and eligibility criteria based in fishing operation. ■ Will benefit licensed fishermen of nine fishing units. <p>b) New boats and engines</p> <ul style="list-style-type: none"> ■ Larger boats with higher capacity will be offered for qualified fishermen. ■ This will allow fishermen to fish further and safer. <p>c) Pusat Perkhidmatan Setempat Nelayan (PPSN)</p> <ul style="list-style-type: none"> ■ Proactive measure in managing impact. ■ Mediator between State Government and stakeholders (fishermen). ■ Disseminating information and latest updates on the Project. ■ Conduct engagements and other joint activities with the fishermen and local community. ■ Receive complaints and feedbacks from the impacted fishermen and local community. ■ Three PPSN are already in operation. <p>d) PELITAKU</p> <ul style="list-style-type: none"> ■ Streamline the implementation of SIMP initiatives. ■ Spearheaded by the Fishermen Taskforce and implemented by the Penang Infrastructure Corporation, BPEN and PPSN. <p>e) Conserving/Restoring the fishery and ecosystem</p> <ul style="list-style-type: none"> ■ Deployment of Fish Aggregating Device (FAD) and artificial reefs. ■ Fish stocking/releasing of fish fry at strategic locations (sea ranching). ■ Monitoring of the released and natural stocks to assess the impacts. ■ Mangrove replanting programme. <p>f) Social proactive measures</p> <ul style="list-style-type: none"> ■ Improving local education status by providing scholarships (priorities to fishermen's children) and tuition centres. ■ Other commitments which include four fisherman's jetties.












CHAPTER 7 AND 8

SUMMARY OF POTENTIAL IMPACTS AND ITS ASSOCIATED P2M2

HUMAN 	IMPACTS	Current speed, sediment spill dispersion, water quality, footprint, noise, air quality, aesthetics.
	P2M2	<p>Local community and business operators</p> <p>a) Employment opportunities</p> <ul style="list-style-type: none"> ■ Construction works targeted to engage 30% of local workers. ■ Labour requirement to be partly recruited from locals. ■ Appropriate skills training programme for locals. <p>b) Community development</p> <ul style="list-style-type: none"> ■ Continuous community engagement to foster good relationship. ■ Marginalisation could be overcome by direct participation of locals in the development. ■ Add local amenities, schools, services and health facilities to cater for increased population. <p>c) Noise control</p> <ul style="list-style-type: none"> ■ Restriction on night works at specific area closest to residential area.
MANGROVE 	IMPACTS	Sediment spill dispersion, footprint.
	P2M2	An offset programme in collaboration with the Forestry Department and FRIM can be conducted. The small and localised mangrove area adjacent to the proposed Project area can be enhanced by replanting programme. This programme can be organised by PPSN set up by the Project Proponent.
MARINE BIOLOGY 	IMPACTS	Total loss within the Project's footprint (trade-off).
	P2M2	<p>Offset Programme:</p> <p>a) Mudflat</p> <ul style="list-style-type: none"> ■ Restoration of fish habitat in Penang. ■ Provide grant or financial support for Fisheries Research Fund which includes study on the migration route of shrimp. ■ Mangrove replanting programme. <p>b) Macrobenthos</p> <ul style="list-style-type: none"> ■ Deployment of Fish Aggregating Device (FAD). ■ Deployment of artificial reef. ■ Mangrove replanting programme. ■ Shoreline eco-enhancement on PSR.

ENVIRONMENTAL MANAGEMENT PLAN

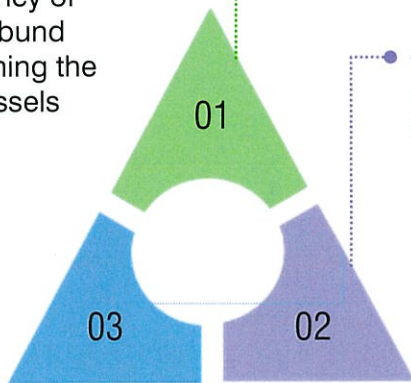
PROJECT IMPLEMENTATION

Competent person			Performance monitoring, compliance monitoring and impact monitoring
Environmental policy			Record keeping
Environmental regulatory compliance monitoring committee			Data analysis and interpretation
Environmental performance monitoring committee			Reporting and communicator
Mini laboratory			Future improvement/redundancy
			Budget

ENVIRONMENTAL MONITORING

Performance Monitoring (PM)

- To prevent system function failures and to ensure that it is working properly and optimally
- Required for efficiency of the perimeter rock bund structures, maintaining the silt curtains and vessels operation



Compliance Monitoring (CM)

- Include water quality, sediment quality, air quality, vibration and noise monitoring; and Dredging and Disposal Monitoring System (DDMS)

Impact Monitoring (IM)

- Cover offset monitoring, bathymetry survey and public complaint monitoring

CHAPTER 9

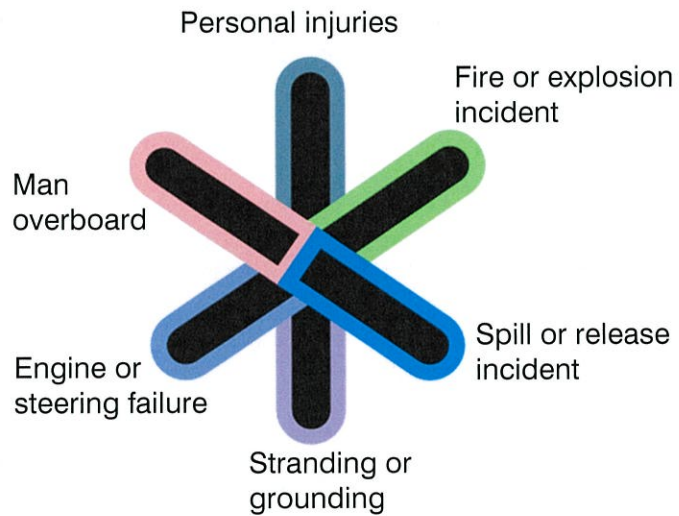
ENVIRONMENTAL MONITORING PROGRAMME

ITEM	PARAMETER	SAMPLING FREQUENCY	
Performance Monitoring	Daily turbidity and TSS monitoring (online)	TSS and turbidity Real-time monitoring	
Compliance Monitoring	Water quality	Temperature, salinity, pH, conductivity, turbidity, DO, BOD, TOC, TSS, oil & grease, AN, phosphate, nitrate, heavy metals, faecal coliform and <i>E.coli</i>	Monthly
	Sediment quality	Zinc, nickel, copper, chromium, lead, arsenic, cadmium, mercury & aluminium	Quarterly
	Air quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , O ₃ and CO	Quarterly
	Noise and vibration	L _{min} , L _{max} , L ₁₀ , L ₉₀ , L _{eq} (24 hours profile) Vibration levels	Quarterly
	Dredging and Disposal Management System (DDMS)	To track the movement of hopper barge from the dredging area to the disposal site off Muka Head	Real time monitoring
Impact Monitoring	Offset monitoring	To monitor whether proposed offset programmes in Chapter 8 are conducted correctly and are successful	Bi-annually
			Bi-annually <ul style="list-style-type: none"> ■ Quarterly during dredging and reclamation phase ■ Upon completion, continued monitoring for at least another two quarters
	Biological monitoring	To measure primary and secondary productivity of the area. The parameters are the density and diversity of phytoplankton, zooplankton, macrobenthos and fish	<ul style="list-style-type: none"> ■ Quarterly during dredging and reclamation phase ■ Upon completion, continued monitoring for at least another two quarters
	Fisheries and aquaculture monitoring	Continuous consultation with the local fishermen and aquaculture operators (hatcheries and cage cultures) on any deleterious effect or losses	<ul style="list-style-type: none"> ■ Quarterly during dredging and reclamation phase ■ Upon completion, continued monitoring for at least another two quarters
	Public complaint monitoring	Complaints from the public can be made at PPSN set up by the Project Proponent	-
Environmental Audits	To audit the compliances with the EIA approval conditions and the relevant environmental regulations and guidelines	Every 4 months	

CHAPTER 9

EMERGENCY RESPONSE PLAN (ERP)

On-site emergency plans will be prepared to protect personnel and the public in terms of health, safety and environment in any case of an accident or natural disaster affecting or relating to the Project.



ES-22

VOLUME II - MAIN REPORT
Executive Summary

CHAPTER 10

STUDY FINDINGS

From the overall assessment, it can be concluded that:

The proposed development is expected to cause various degree of impacts on the environment, social as well as the surrounding land use

The State Government has shown commitment and has already implemented some of the mitigating measures proposed so that this development will be beneficial to both the local communities and the Penang State

