

These lecture materials are for the Marine Coastal and Delta Sustainability for Southeast Asia (MARE) (Project No. 610327-EPP-1-2019-1-DE-EPPKA2-CBHE-JP).

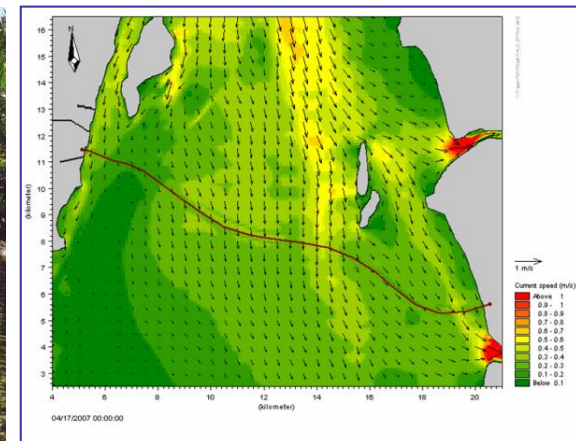
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Coastal Planning



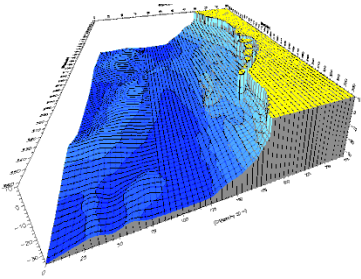
Re-cap from previous session



- Purpose of coastal and marine studies
- Overview of hydraulic and coastal modelling
- Example applications and case studies



Overall Learning Outcomes



CLO1 Assess the influencing environmental factors and related coastal processes, and analyze causes of coastal erosion/sedimentation



CLO2 Develop skills and knowledge for the planning and management of coastal zone in respecting the principles of sustainability



CLO3 Evaluate application of different coastal stabilization schemes and the governing factors for their selection and impacts



PO1 Acquire and apply engineering fundamentals to complex civil engineering problems

PO2 Identify, formulate and solve complex civil engineering problems using creativity and innovativeness



GARISPANDUAN JPS 1/97

**KAWALAN HAKISAN
BERIKUTAN DARI
PEMBANGUNAN
DI KAWASAN PANTAI**

JABATAN PENGAIRAN DAN SALIRAN
MALAYSIA

Guidelines on Erosion Control for Development in the Coastal Zone

Source: JPS Malaysia

Presentation Outline

- Background
- The guidelines explained..with pictures
 - Shorefront development
 - Backshore development
 - Coastal reclamation
 - Offshore sand-mining
- Data requirement
- Conclusion

Background

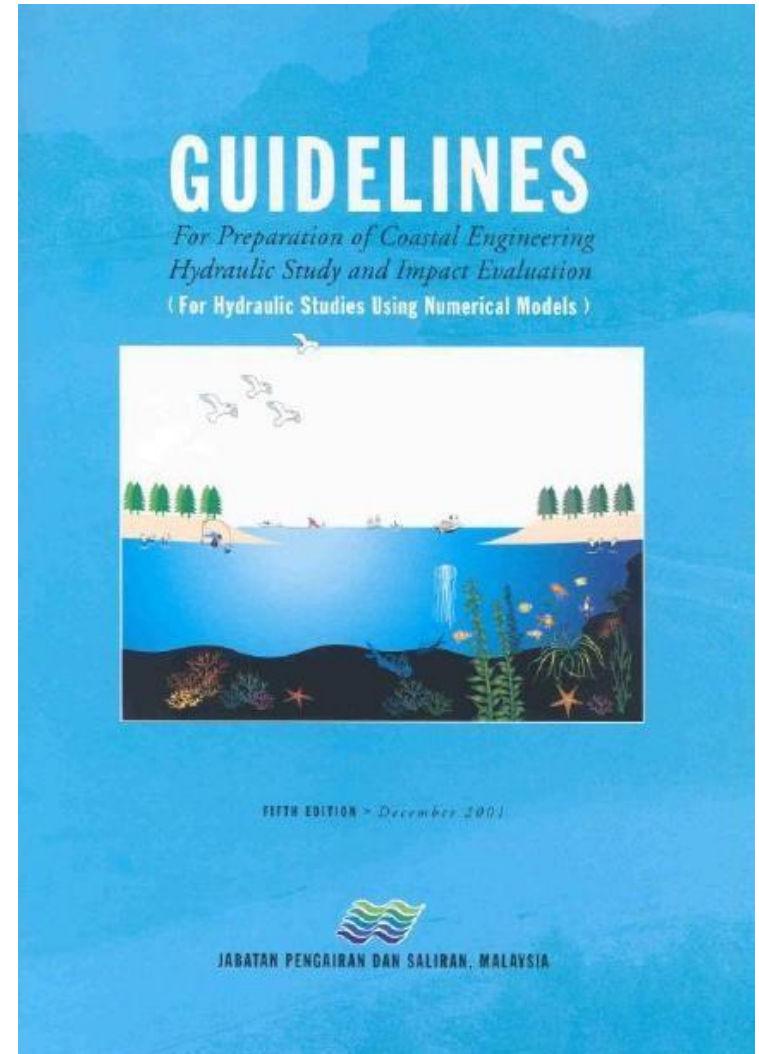
- National Coastal Erosion Study 1986
 - 29% shoreline eroding
 - Three categories
 1. Critical – serious erosion where property is immediately threatened
 2. Significant – serious erosion occurring and property may be threatened in 5 years if no action taken
 3. Acceptable – areas with serious erosion but of no significant economic value
- Uncontrolled development major contributor to erosion problems

Background

- Following completion of National Coastal Erosion Study 1987 – government implemented two-pronged strategy for coastal erosion control
 - Short term strategy is reactive – build coastal protection for critical areas
 - Long-term strategy is preventive – regulatory measures such as laws, administrative circulars, guidelines to control development
- Long-term strategy implemented for coastal protection
 - Surat Pekeliling Am. Bil. 5 Tahun 1987
 - **Garis panduan JPS 1/97**
 - Guidelines for Hydraulic Study

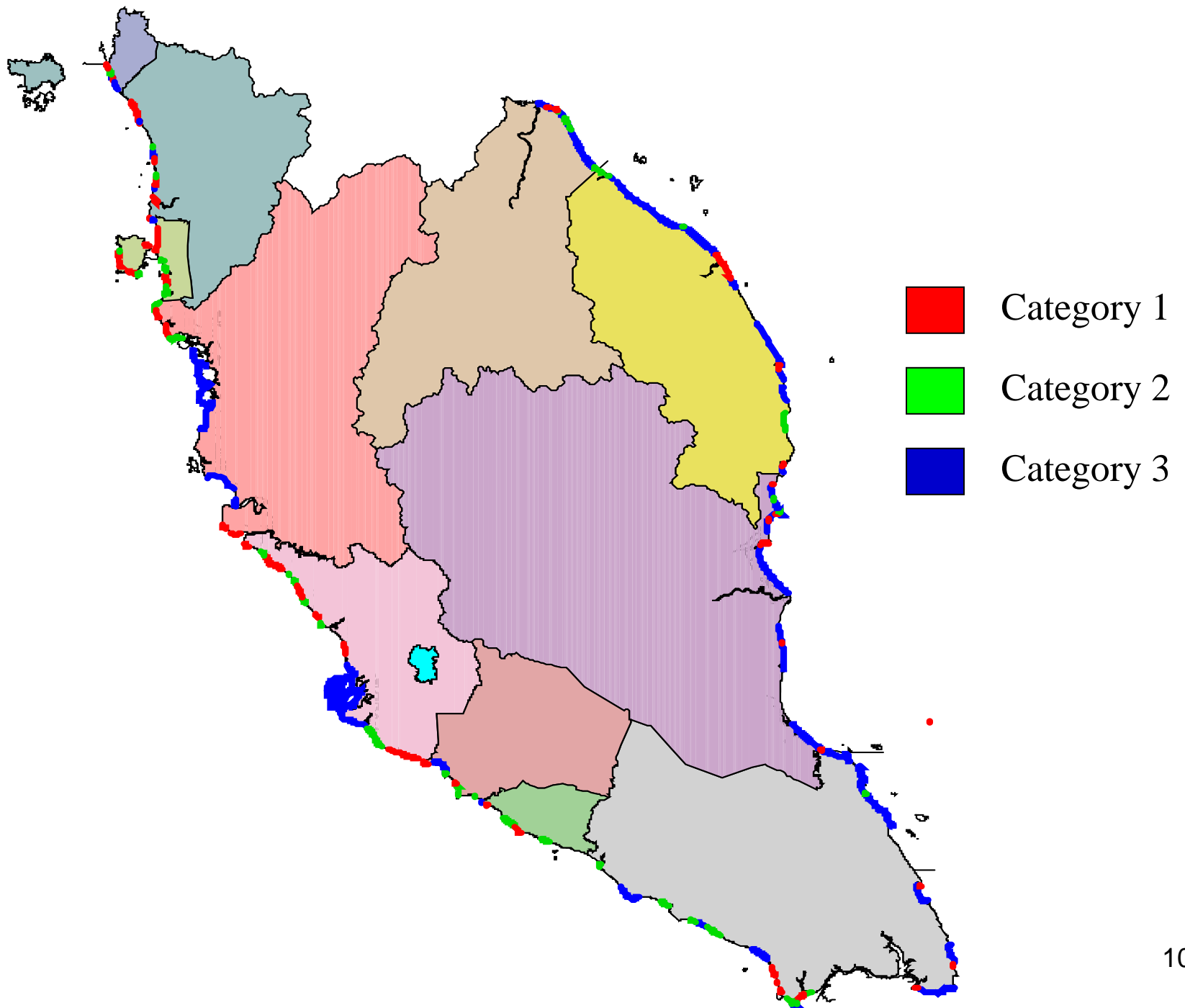
Guidelines for Hydraulic Study



- Specific guidelines for preparation of hydraulic study and impact evaluation including numerical modelling
- now is 5th edition : 2001
- 6th edition is being formulated

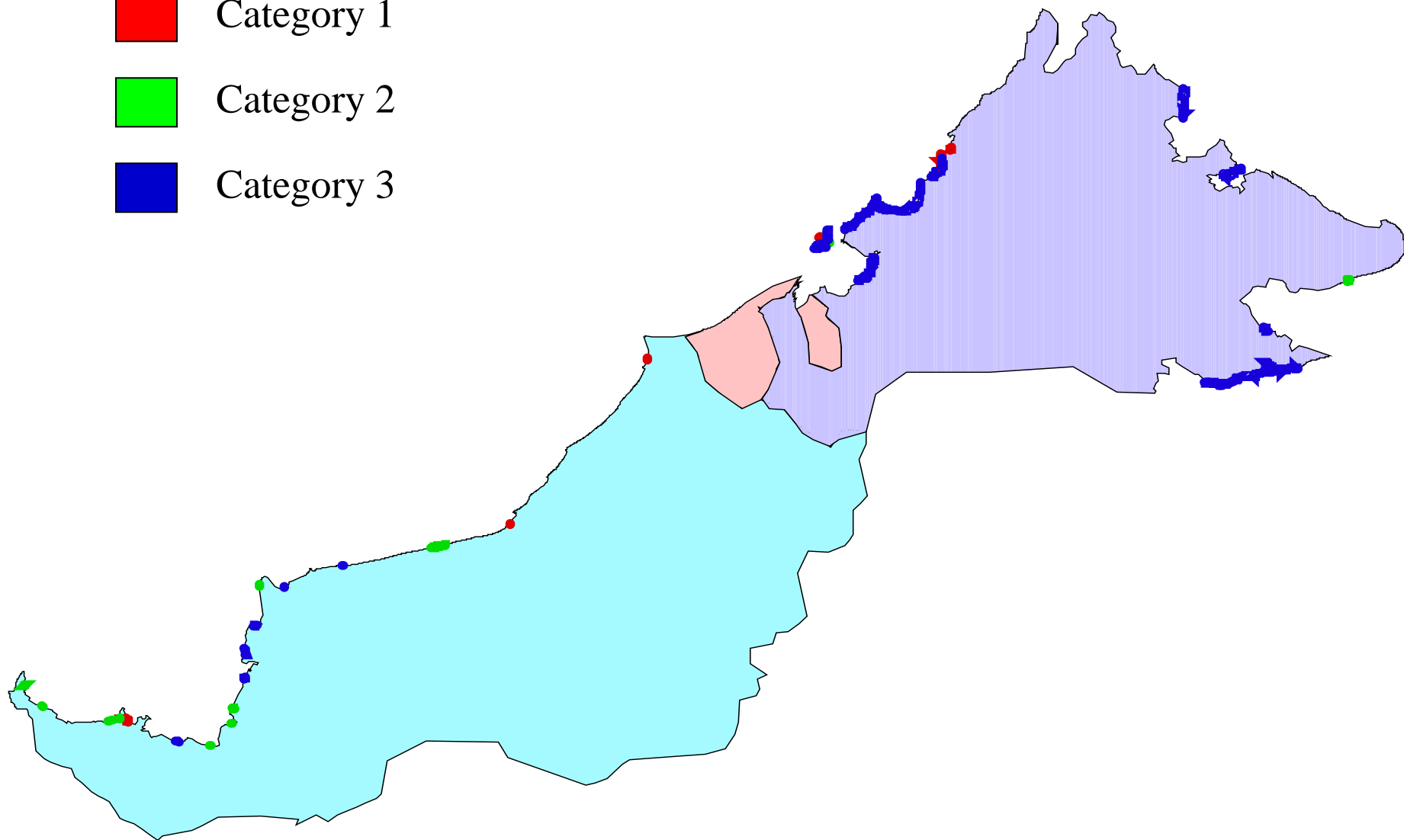


Background

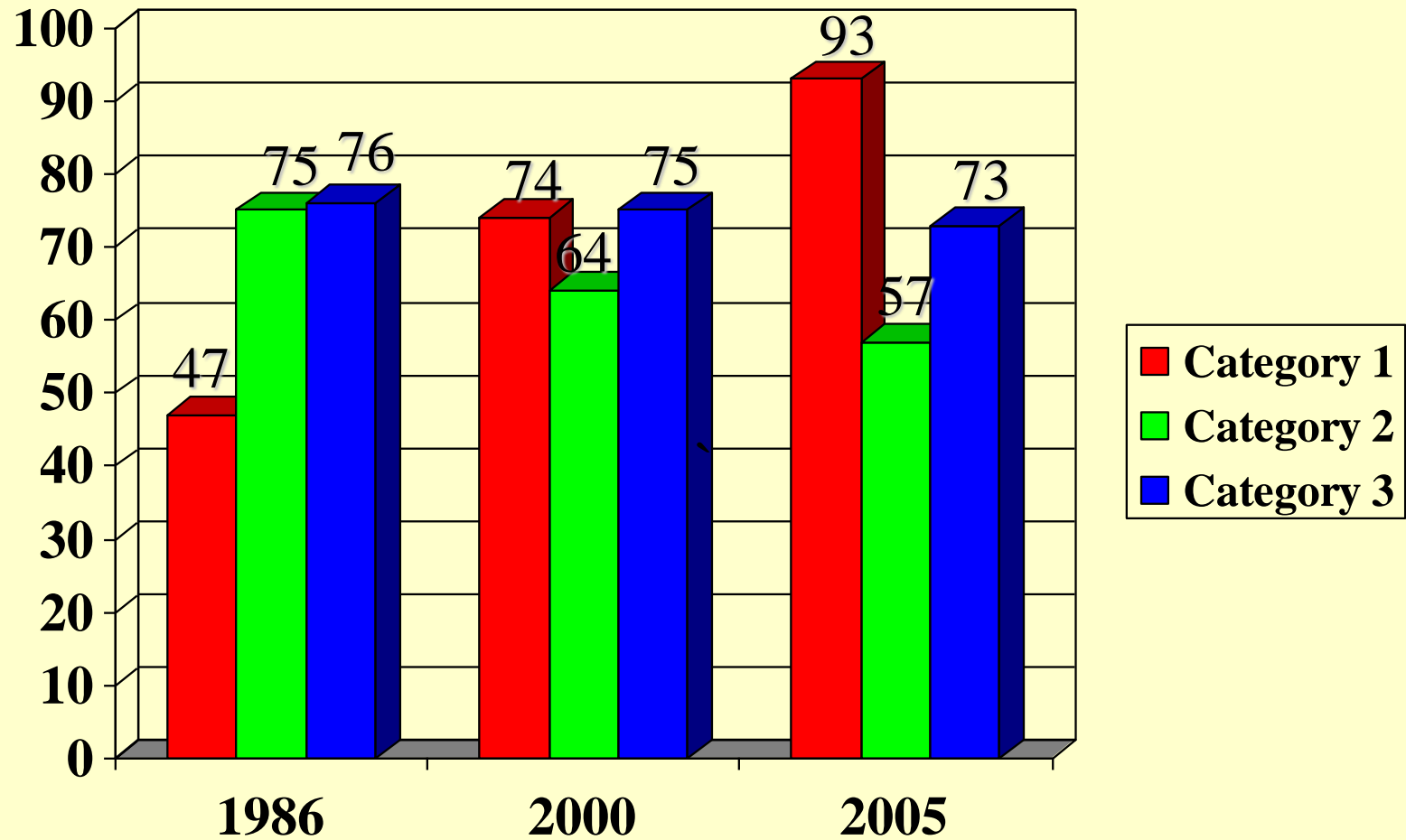
- Purpose
 - Ensuring proper planning and implementation of coastal development projects
 - Obviate/avoid coastal erosion problems due to human activities
 - Ensure sustainable development
- Status
 - Guidelines approved by Cabinet 29 January 1997



-  Category 1
-  Category 2
-  Category 3



Coastal Erosion



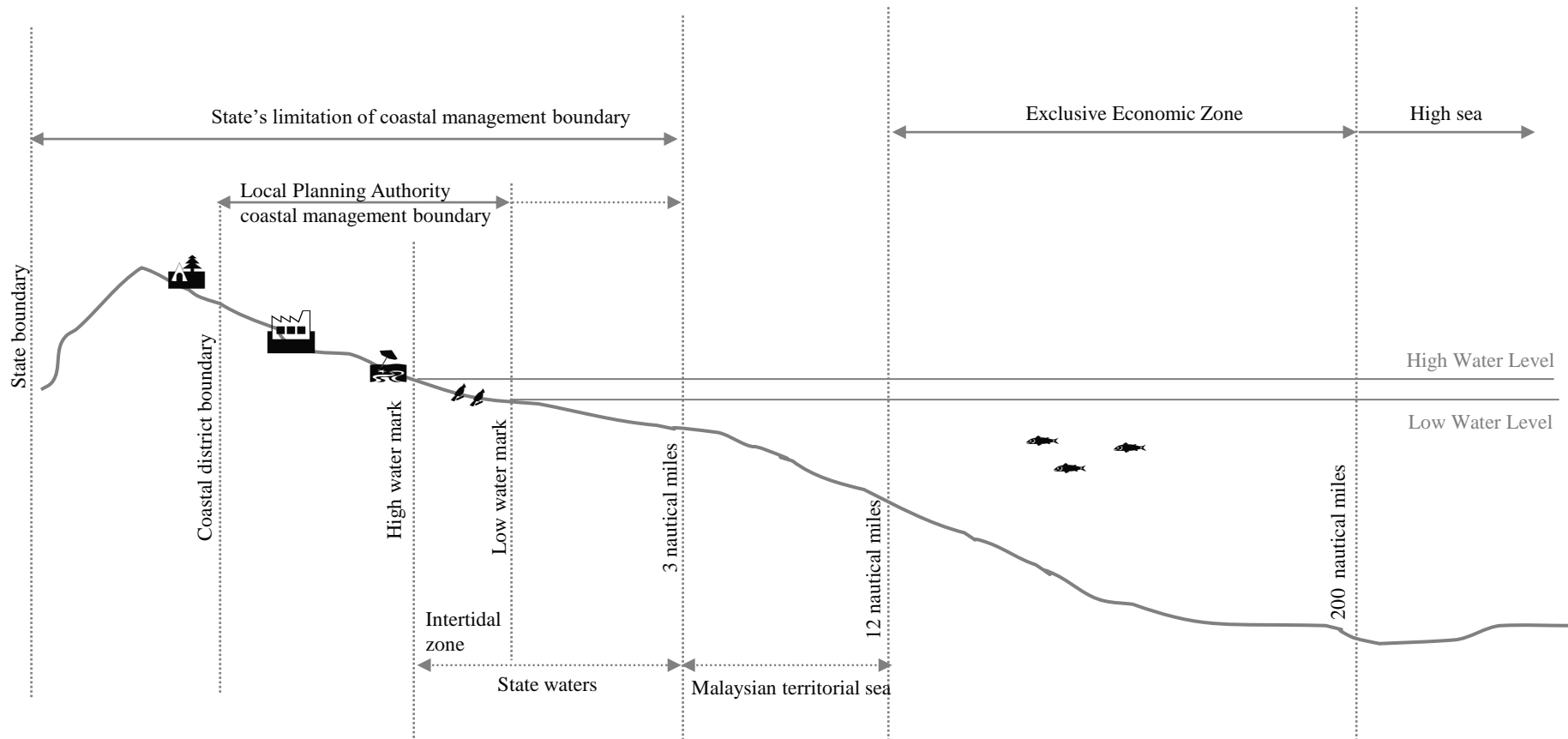
Source: JPS

DID Guidelines 1/97 (Garispanduan JPS 1/97)

- Types of Coastal Development addressed by Guidelines
 - Shorefront Development
 - Backshore Development
 - Coastal Reclamation
 - Offshore Sand Mining

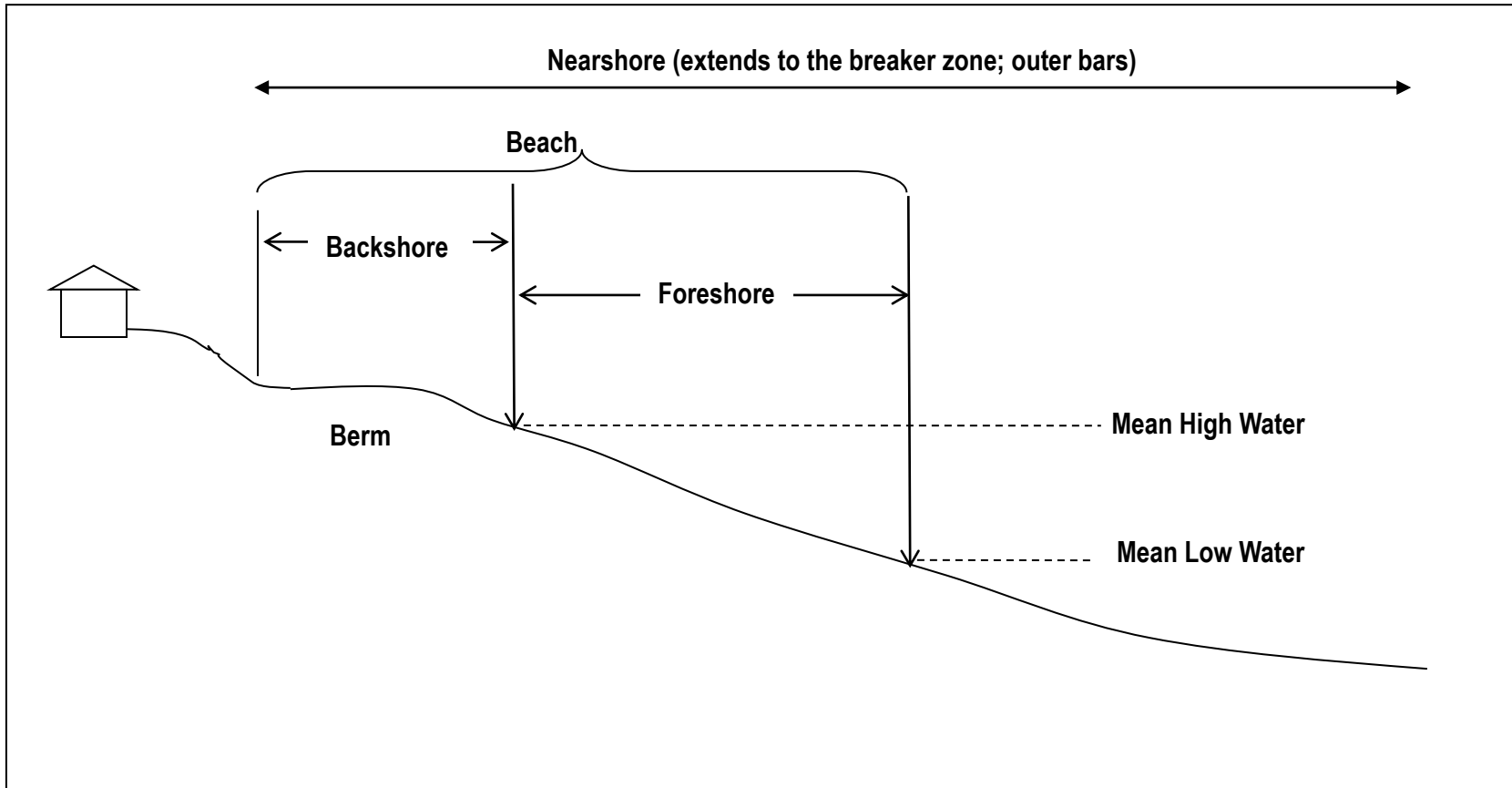
□ *Shorefront Development*

Coastal Definitions



Malaysia's Coastal Management Zones

Typical Beach Profile



Shorefront Development

- Projects located on the shoreline or foreshore or protruding seawards
 - Jetty
 - Groyne
 - Marina
 - Reclamation
 - Bridge
 - Ports
 - Breakwaters
 - Pipelines/marine cables
 - Outfalls



Marina



Jetty



Nearshore Breakwaters



Shore-connected breakwaters

Groyne (groyne field)



Shorefront Development

- Shorefront projects can interfere with equilibrium of natural processes
- Results in negative impacts – erosion, unwanted accretion, sedimentation
- ‘Solid structures’ interrupt littoral processes
- Developers need to conduct hydraulic studies to determine impacts – both longterm and short term
- Propose mitigative measures

Shorefront Development

- Projects located on the shoreline or foreshore or protruding seawards
 - Jetty
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Impact of Rivermouth breakwaters: improves navigation but changes shoreline processes

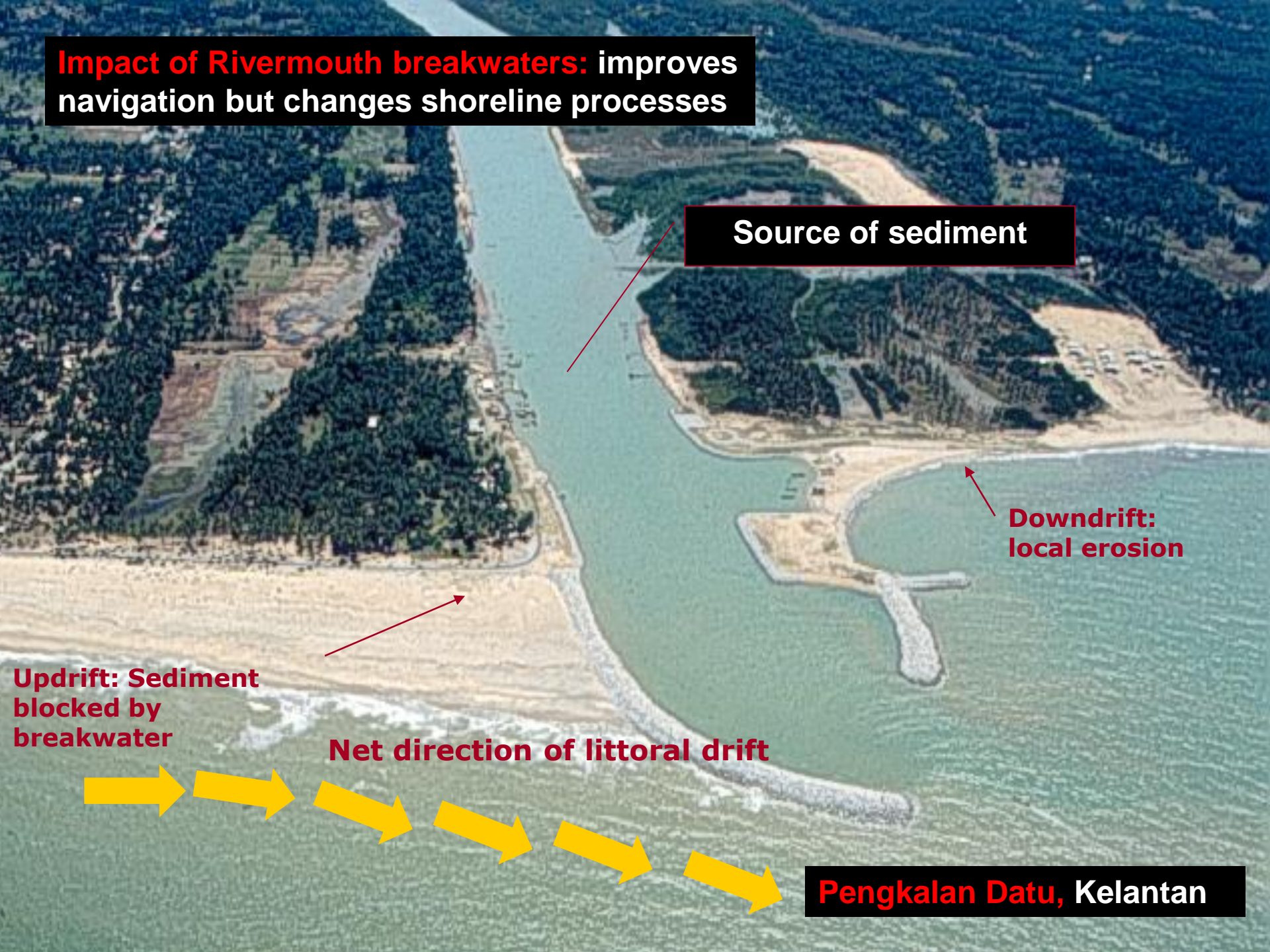
Source of sediment

Downdrift: local erosion

Updrift: Sediment blocked by breakwater

Net direction of littoral drift

Pengkalan Datu, Kelantan

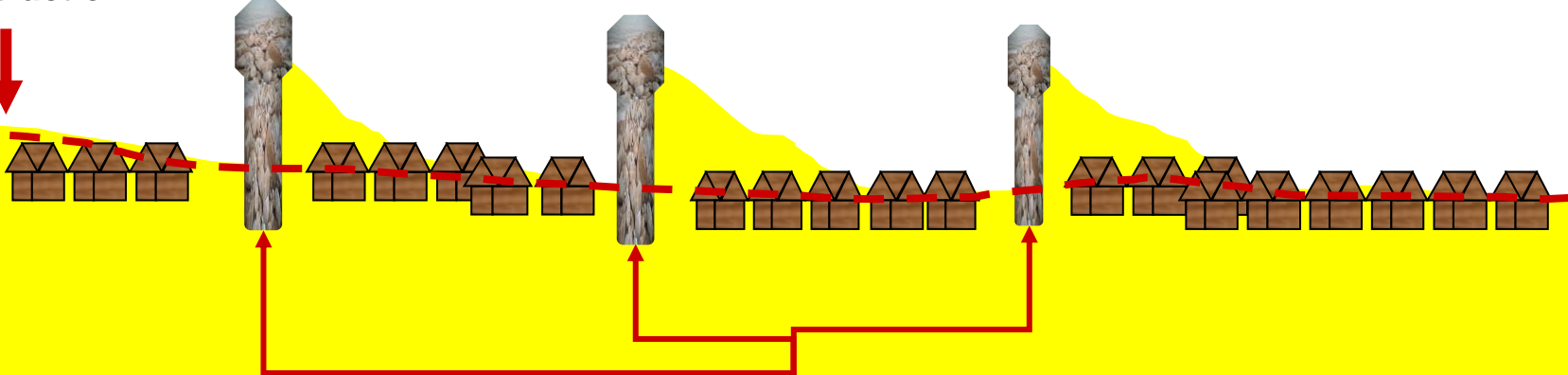


**Construction Of Groynes
Along Shore to Control
Erosion - requires
understanding of the local
sediment transport condition**

Longshore Drifts and Currents

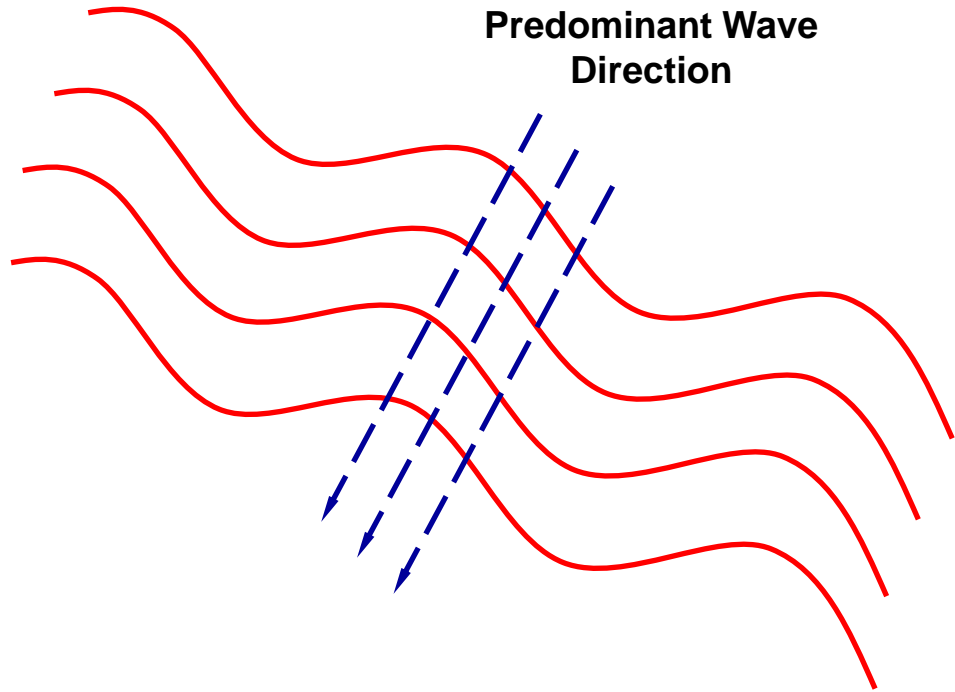


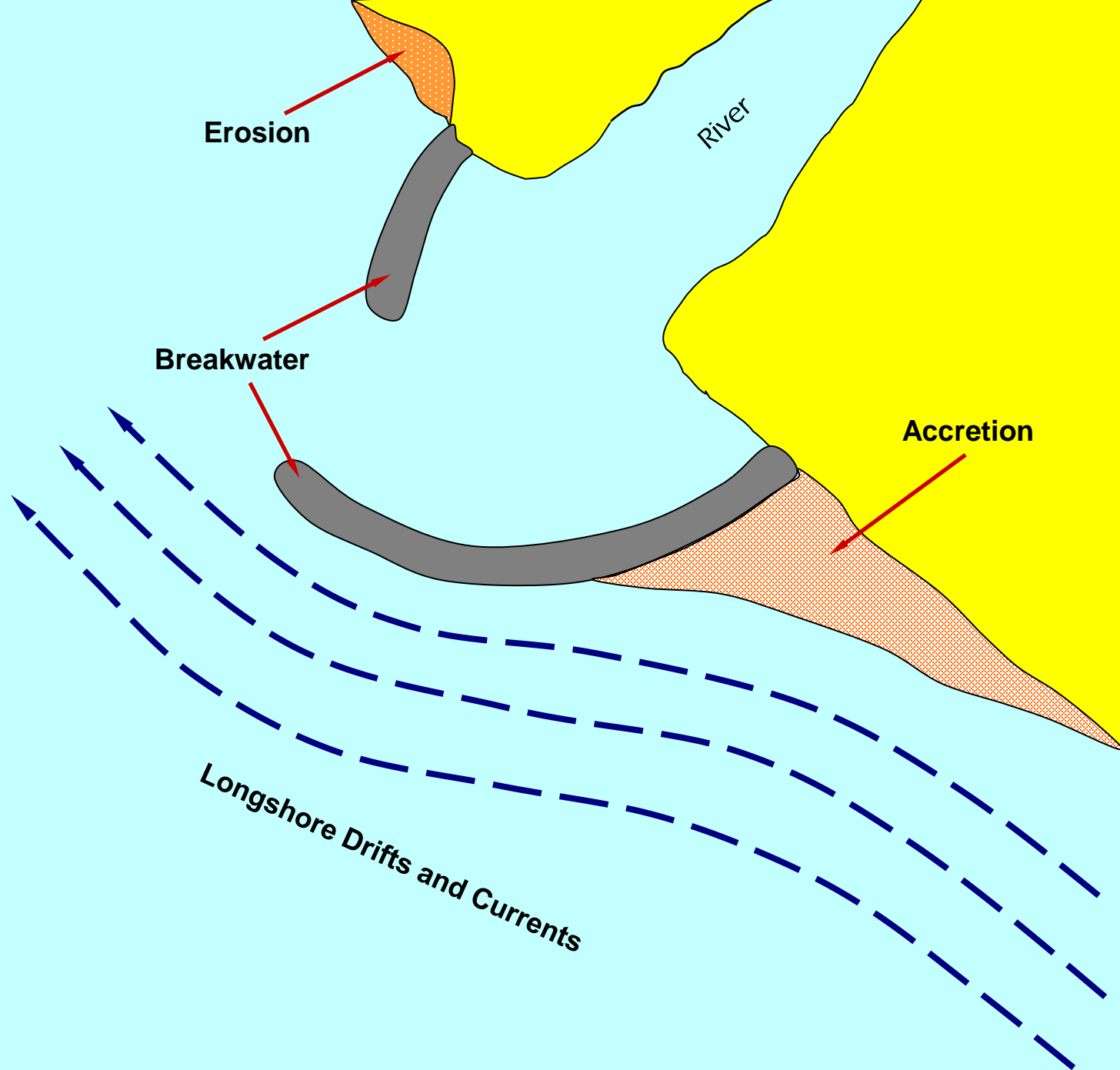
Shoreline before
Groyne construction



**Groyne
field**

Predominant Wave
Direction



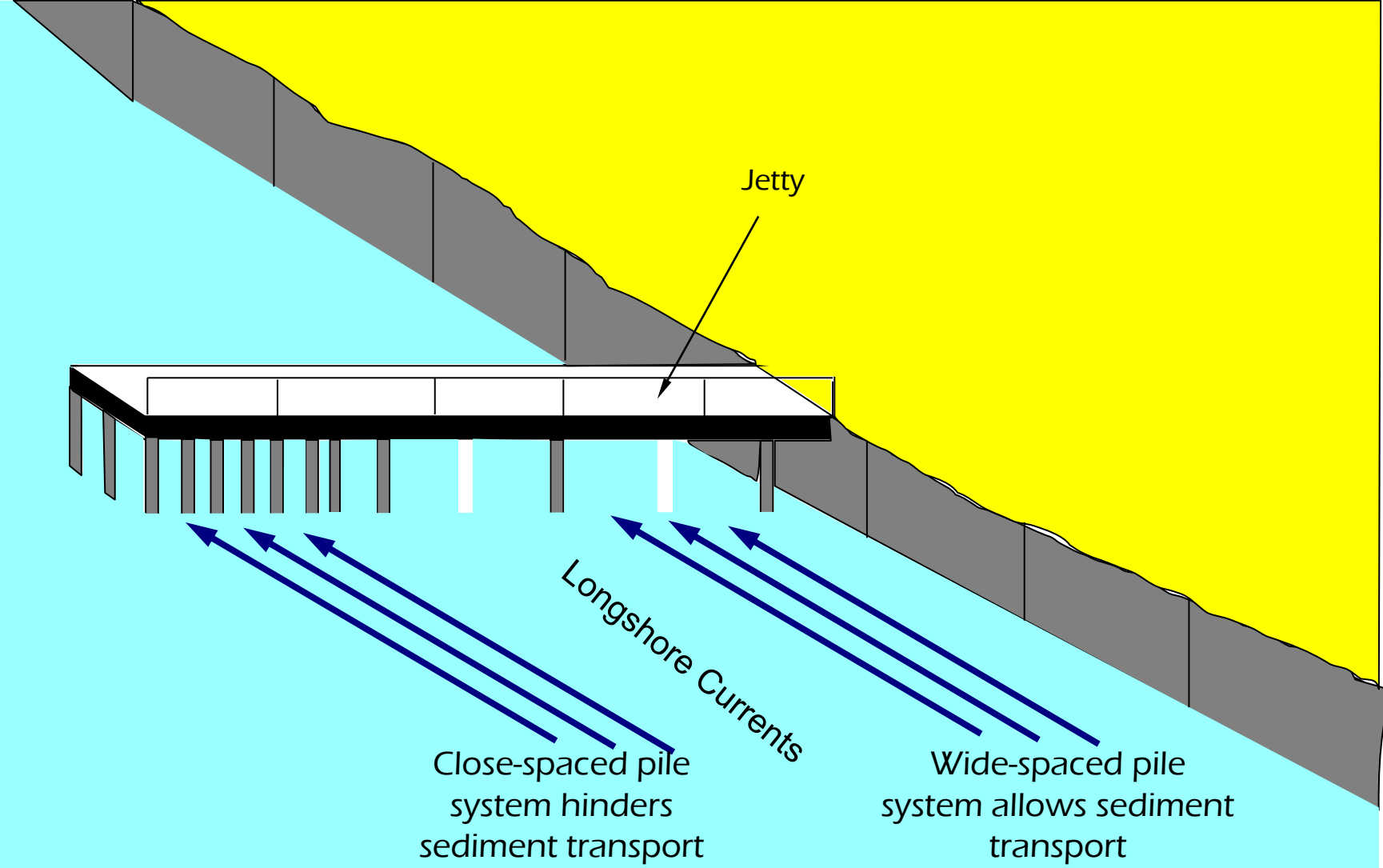


Shorefront Development

- Open piling system preferred
- Solid barriers (sheet pile wall) interfere with sediment transport



Concrete jetty near Tapa-Nyai Resort



PORT DICKSON: Chalet on stilts (open-pile)



31 2:02 PM

Shorefront Development

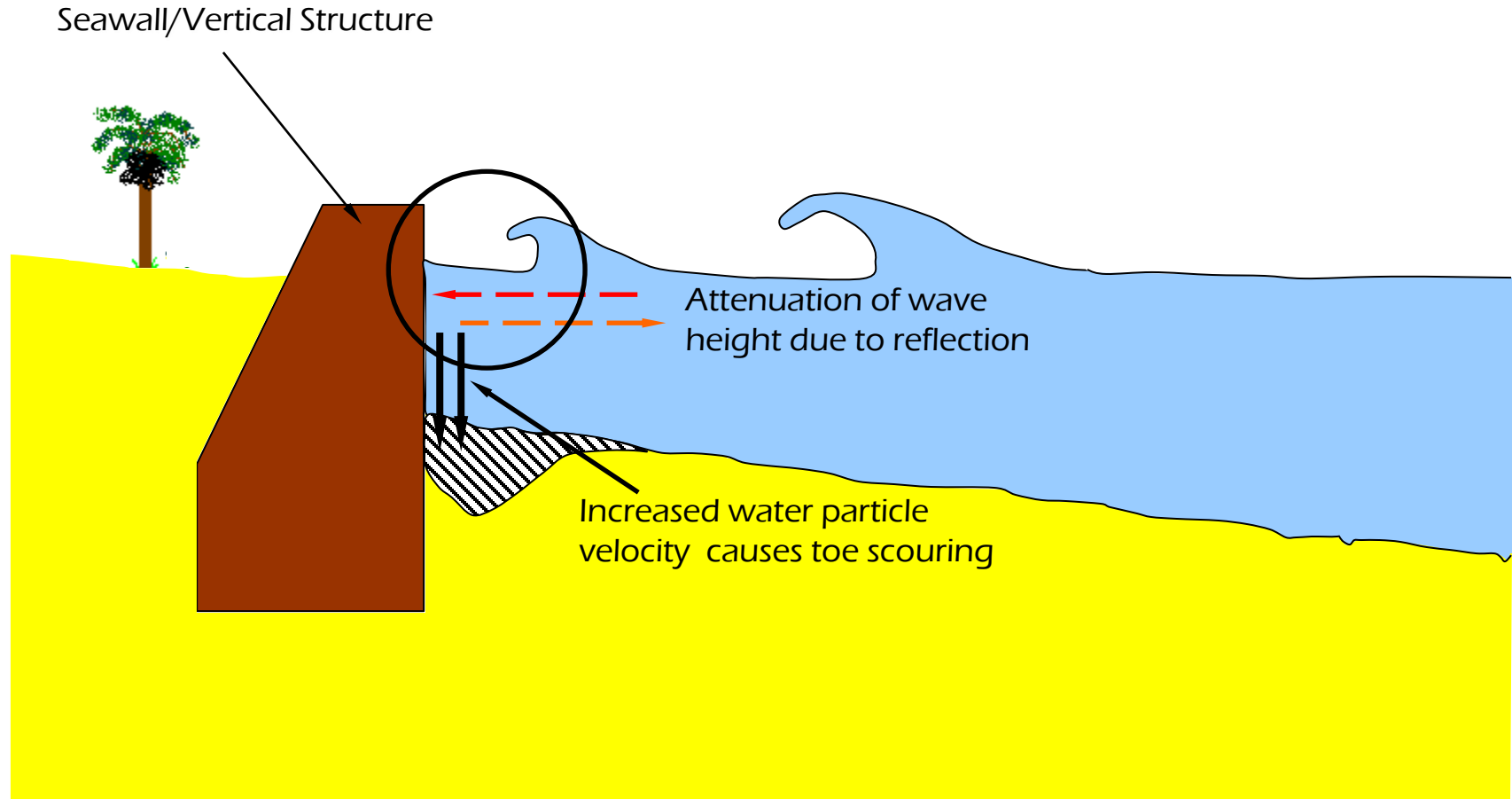
General guideline:

□ “vertical faced shoreline structure” not encouraged!



Shorefront Development

- ❑ “vertical faced shoreline structure” not encouraged!



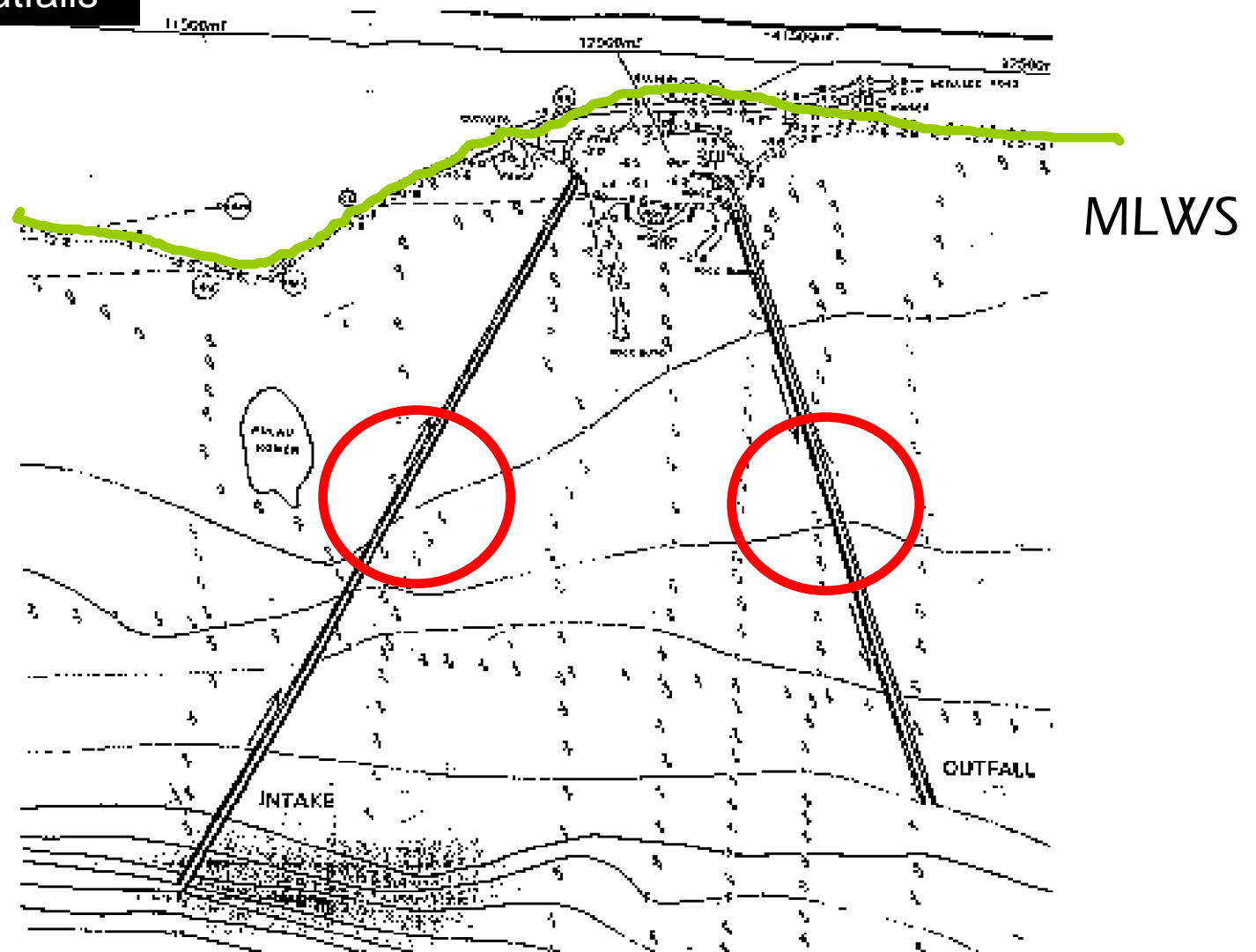
Shorefront Development

❑ Marine outfalls should be built with

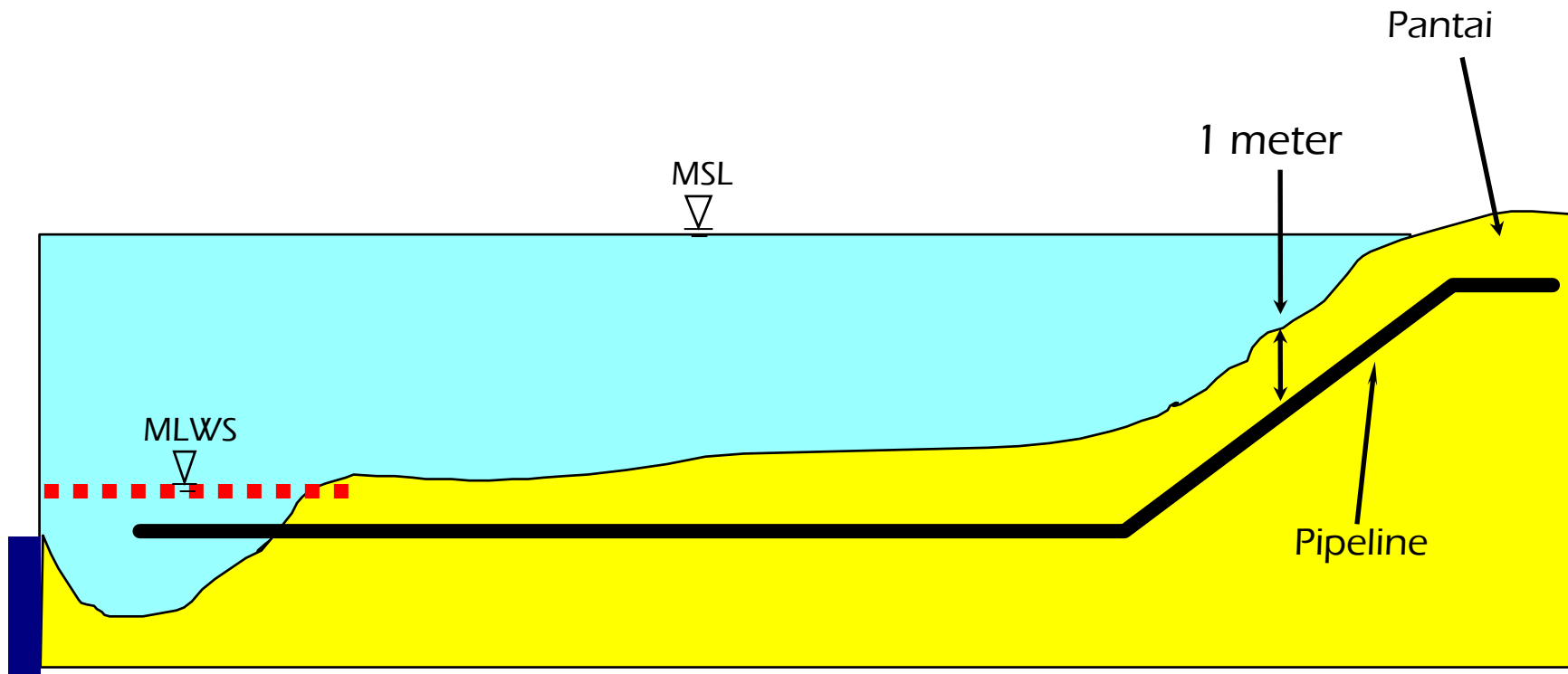
- Minimum 1 meter cover beneath seabed
- outlet should be beyond MLWS (MLLW)



Marine outfalls



Marine outfalls



□ *Backshore Development*

Backshore Development

- Hotel and condominiums
- Housing
- Industry
- Agriculture
- Change Status
- Application for government land (permanent or temporary)

Backshore Development



Batu Feringghi, Penang: High density backshore development



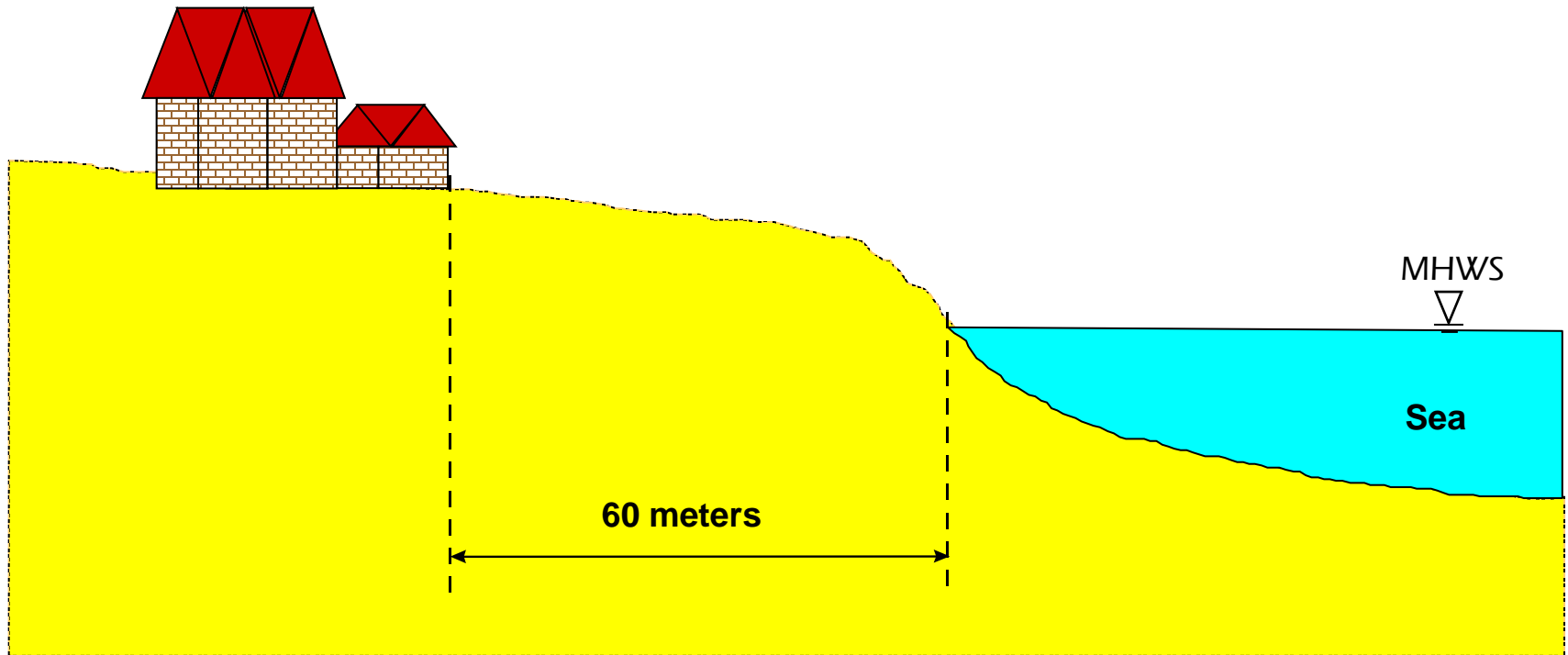
Backshore Development

- Changes to lagoon area due to backshore development affects 'tidal prism'
 - Results in rivermouth sedimentation
 - Hydraulic studies needed to ascertain impact and subsequent mitigative measures
- Reduction of 'sand bank' increases chances of erosion or unwanted accretion on adjacent beaches

Backshore Development

- General considerations for setback
 - Proposed development must be set-back behind and outside the dynamic zone in order to avoid cyclical erosion and deposition patterns
 - Current erosion classification or stability condition of the shoreline is not the decisive factor
 - Need to recognise (and respect) the unpredictability and dynamics of the coastal zone

Backshore Development

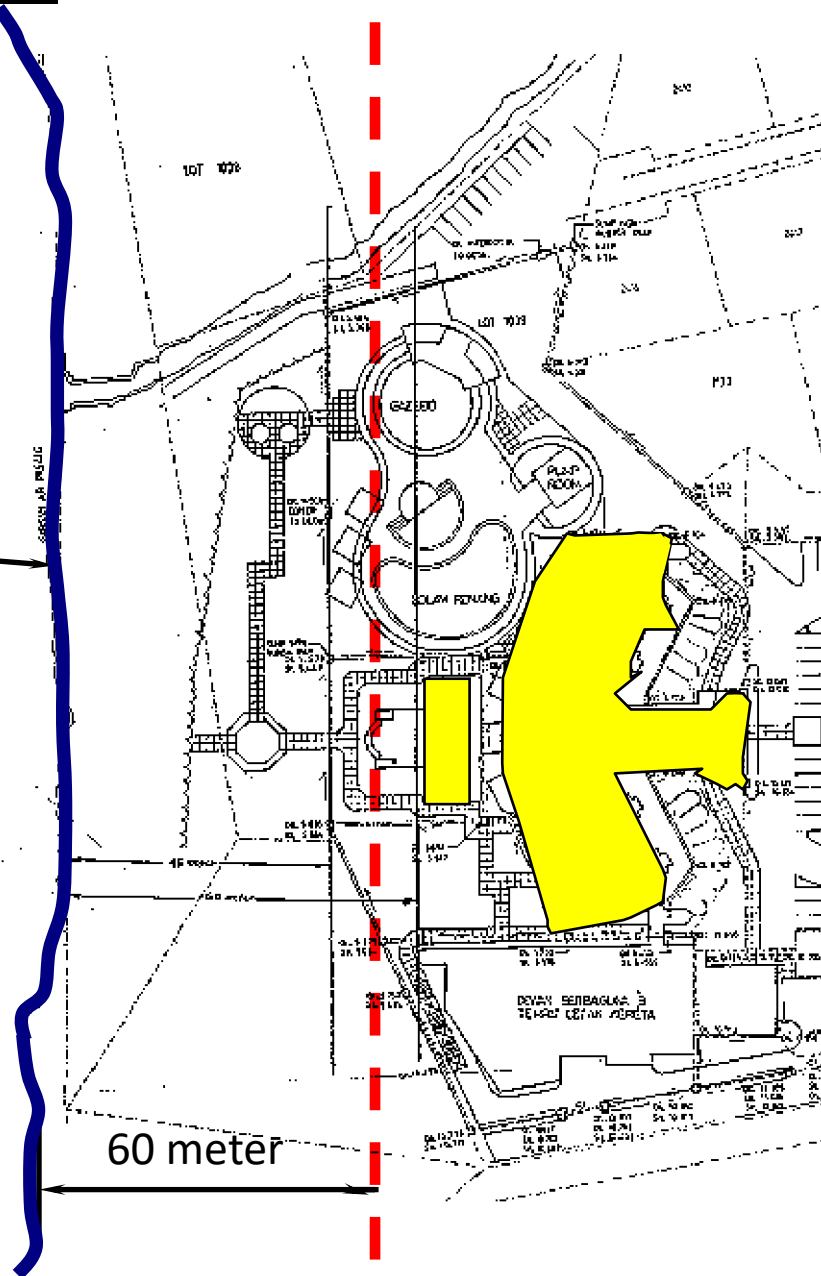


**Minimum Setback Requirement for Sandy Beaches is
60m from Mean High Water Line**

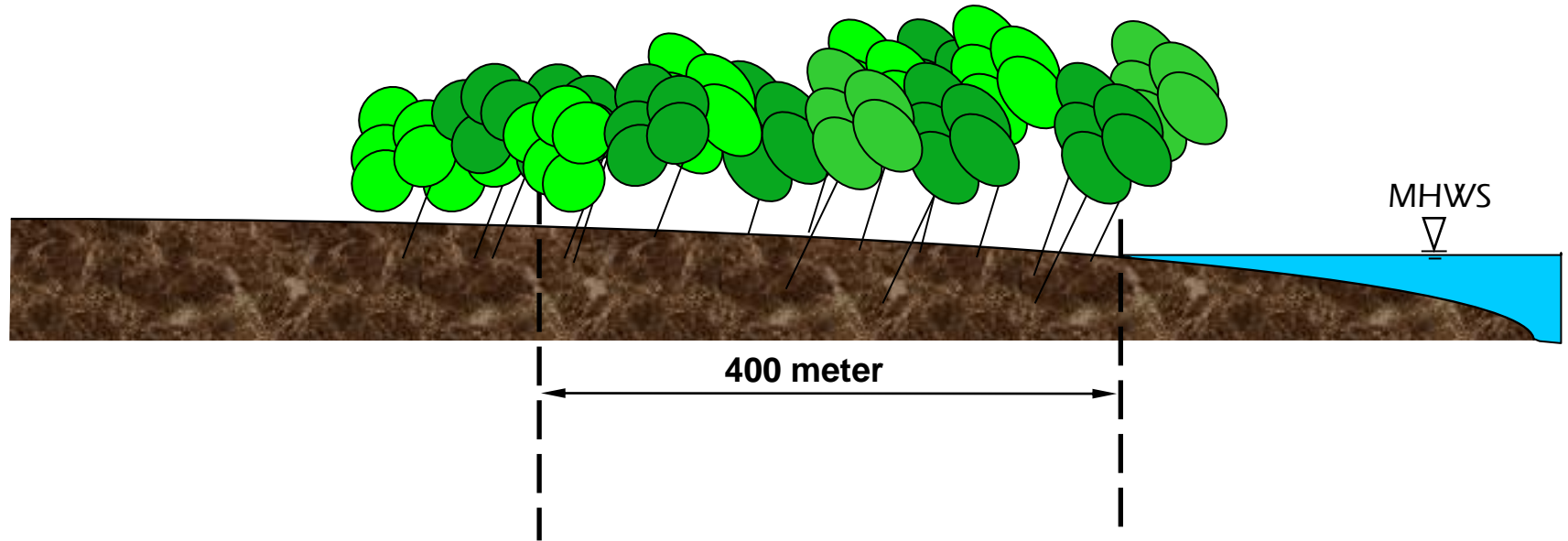
PLAN VIEW OF SETBACK

SEA

MHWS



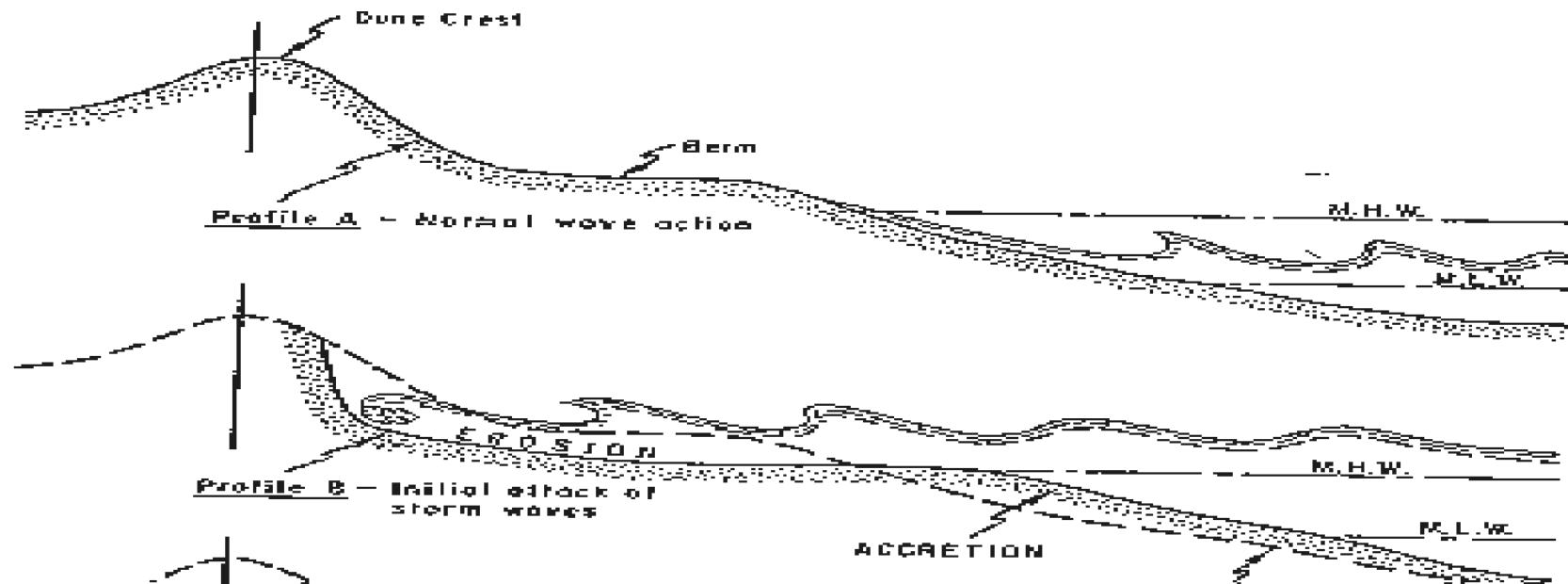
Backshore Development



Minimum Setback requirement for mud coasts is 400m from seaward edge of mangrove treeline

Backshore Development

- Avoid developing on beach/sand dunes: these are sediment banks or reserves that replenish the beach and absorb wave energy
- No development or re-development on sand spits and sand bars: these are often unstable features since they form in the dynamic zone



Sand Dune

Backshore Development

- No development or re-development on sand spits and sand bars
 - these are unstable features since they are very dynamic
 - Sand spits are prone to shift and change during storms and floods
 - Sand bars change considerably under storm conditions and can disappear entirely



Sand spit



Sand bar

Backshore Development

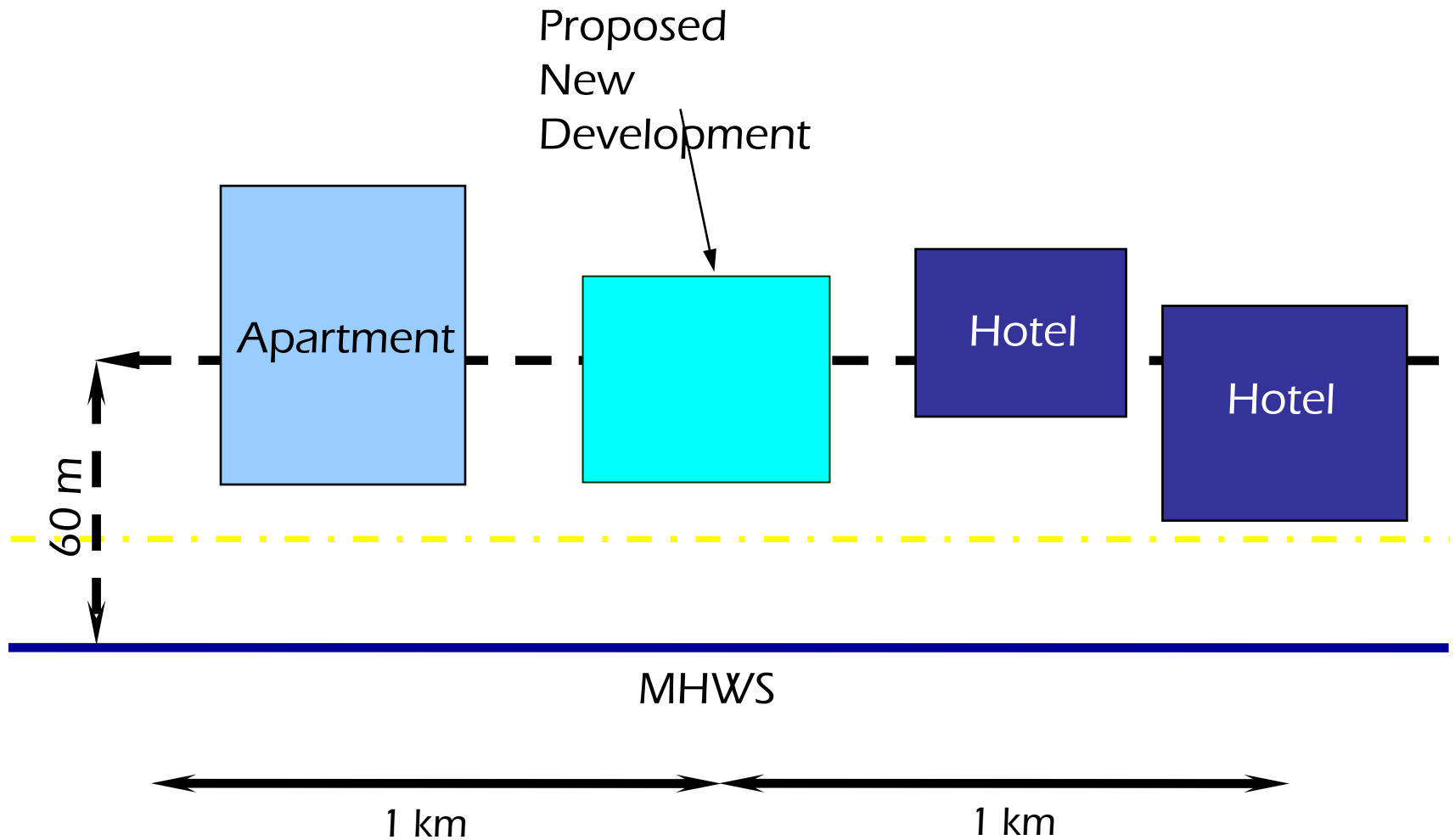
Exceptions: cases where setback distances can be reconsidered/ reviewed:-

- If proposed development is within 1 km of a well-developed area with high-value permanent buildings located at distances less than the general setback distance
- Erosion is not occurring
- Setback cannot be any less than the minimum existing setback



Port Dickson: Hotel Development

Backshore Development

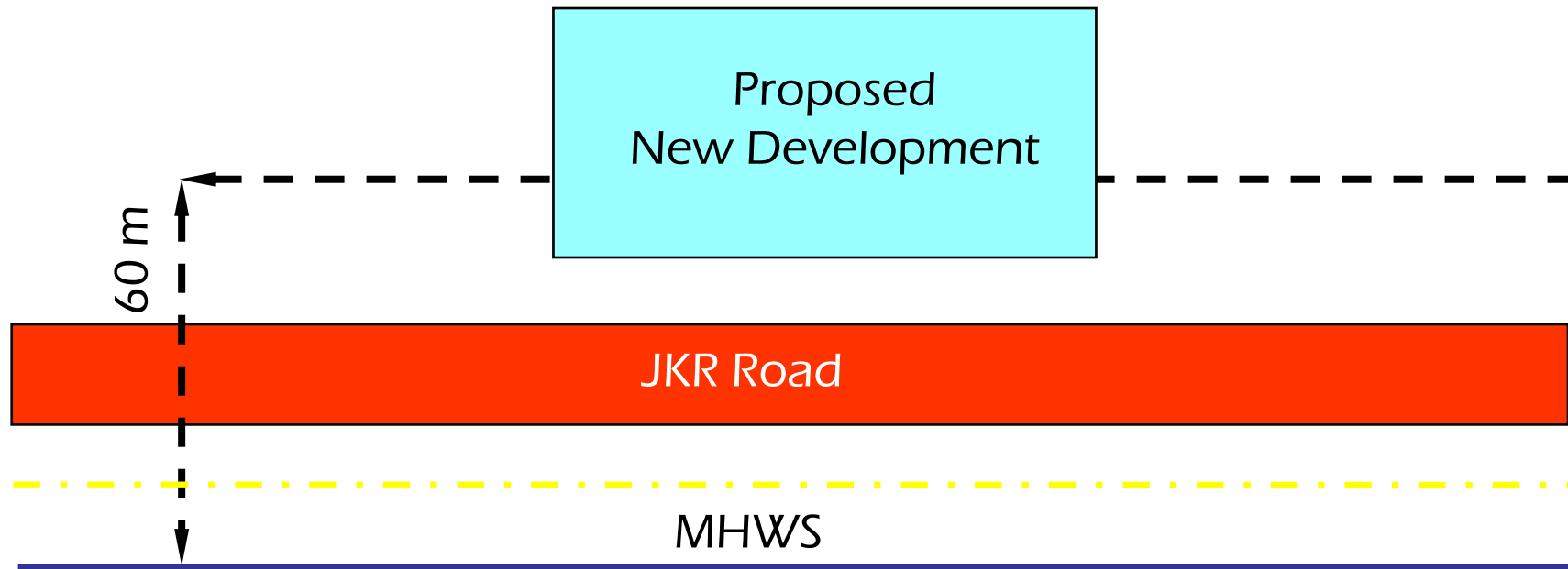


Backshore Development

Exceptions: cases where setback distances can be reconsidered/ reviewed:-

- Proposed development is behind a JKR road or coastal bund where these structures must be protected

Backshore Development



Backshore Development

Exceptions: cases where setback distances can be reconsidered/ reviewed:-

- Developer undertakes to do coastal erosion control (design still has to be approved by JPS*)

* cannot be applied for mangrove forests and/or public beaches with tourism potential



Backshore Development

Exceptions: cases where setback distances can be reconsidered/ reviewed:-

- Development is on erosion resistant headlands
- Developed area is 5 m above MSL
- Turtle nesting facilities (turtles need sand)

□ ***Coastal*** Reclamation

Coastal reclamation

- Types of reclamation
 - Island concept
 - Preserves mangroves
 - Drainage patterns maintained
 - Separation channel needs maintenance
 - Peninsular concept
 - Extension of original coastline
 - New sea frontage
 - Loss of beaches



Island concept: Tanjung Tokong Land Reclamation Project, Penang (980 ha)



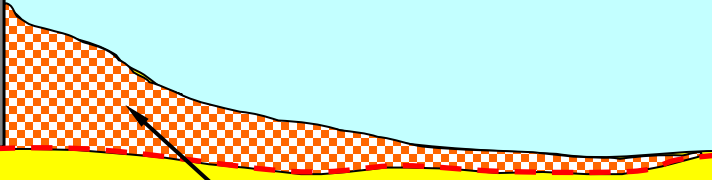
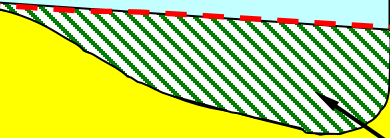
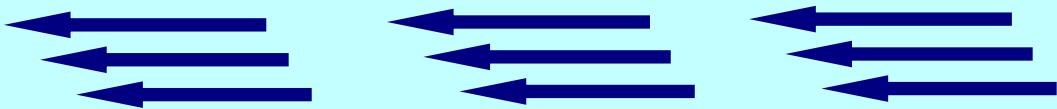
Reclamation in Langkawi: peninsular concept



Peninsular concept: Reclamation For Airport Runway - Kota Kinabalu, Sabah

Sea

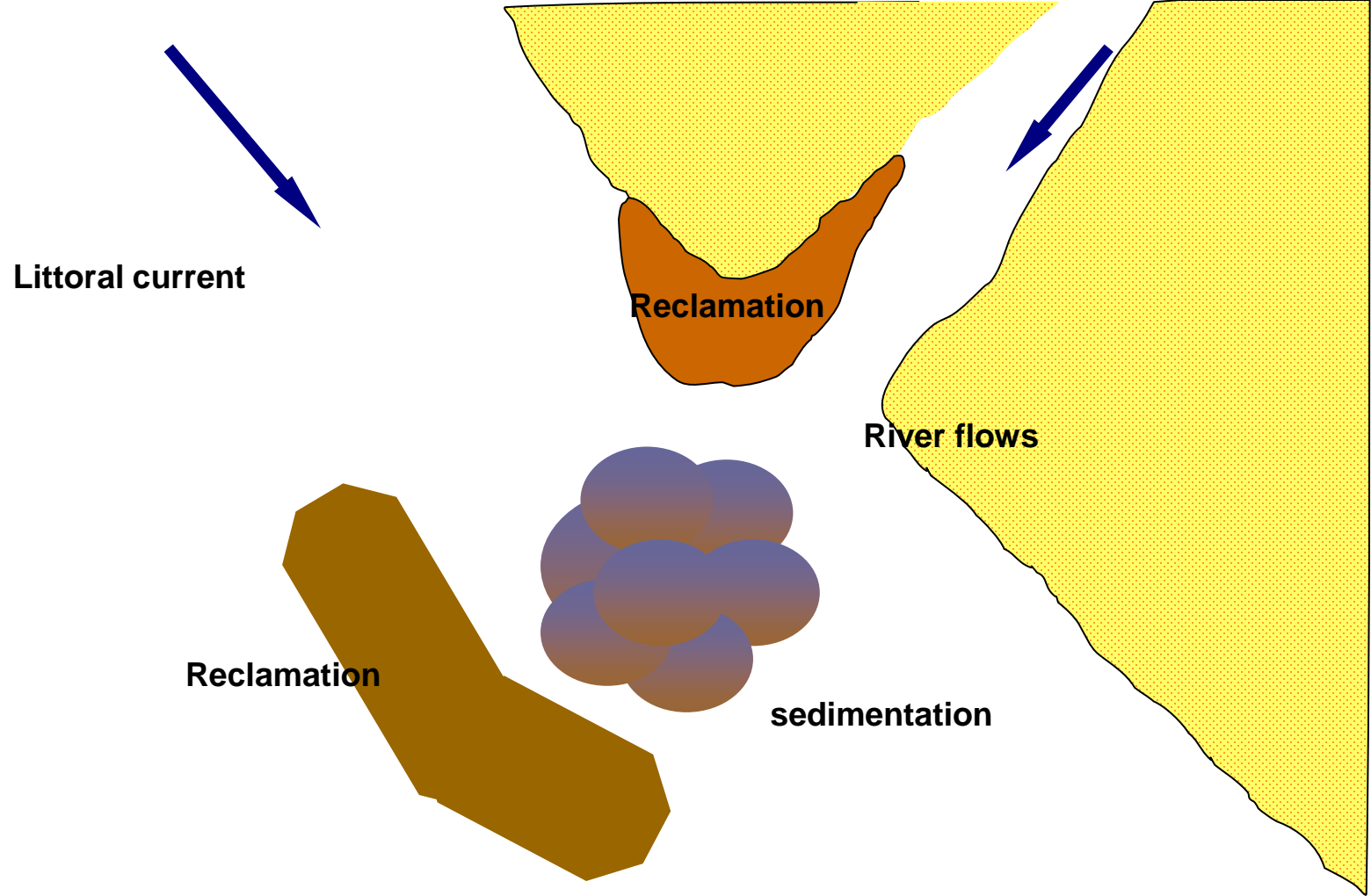
Net Longshore Sediment Transport



Erosion

Accretion Land

Land



**Reclamation effects: rivermouth
sedimentation**

Coastal Reclamation

- Impacts
 - Loss of sea-frontage and recreational beach
 - Interference with coastal processes
 - Erosion of adjacent beach
 - Siltation of drainage channels
 - Interference of natural drainage channels
 - Destruction of mangrove, other ecosystems and habitats
 - Pollution of coastal waters
 - Loss of aquaculture or fish landing sites

Coastal Reclamation

- Impacts...contd.
 - Silting-up of existing tidal gates
 - 'Backwater' effect in upstream areas lead to flooding

Coastal Reclamation

- Subject to impact evaluation studies including hydraulic studies
 - identify impacts of various reclamation scenarios
 - Propose mitigation measures
- Multiple reclamation projects along same coastline may need macro EIA to determine overall impact

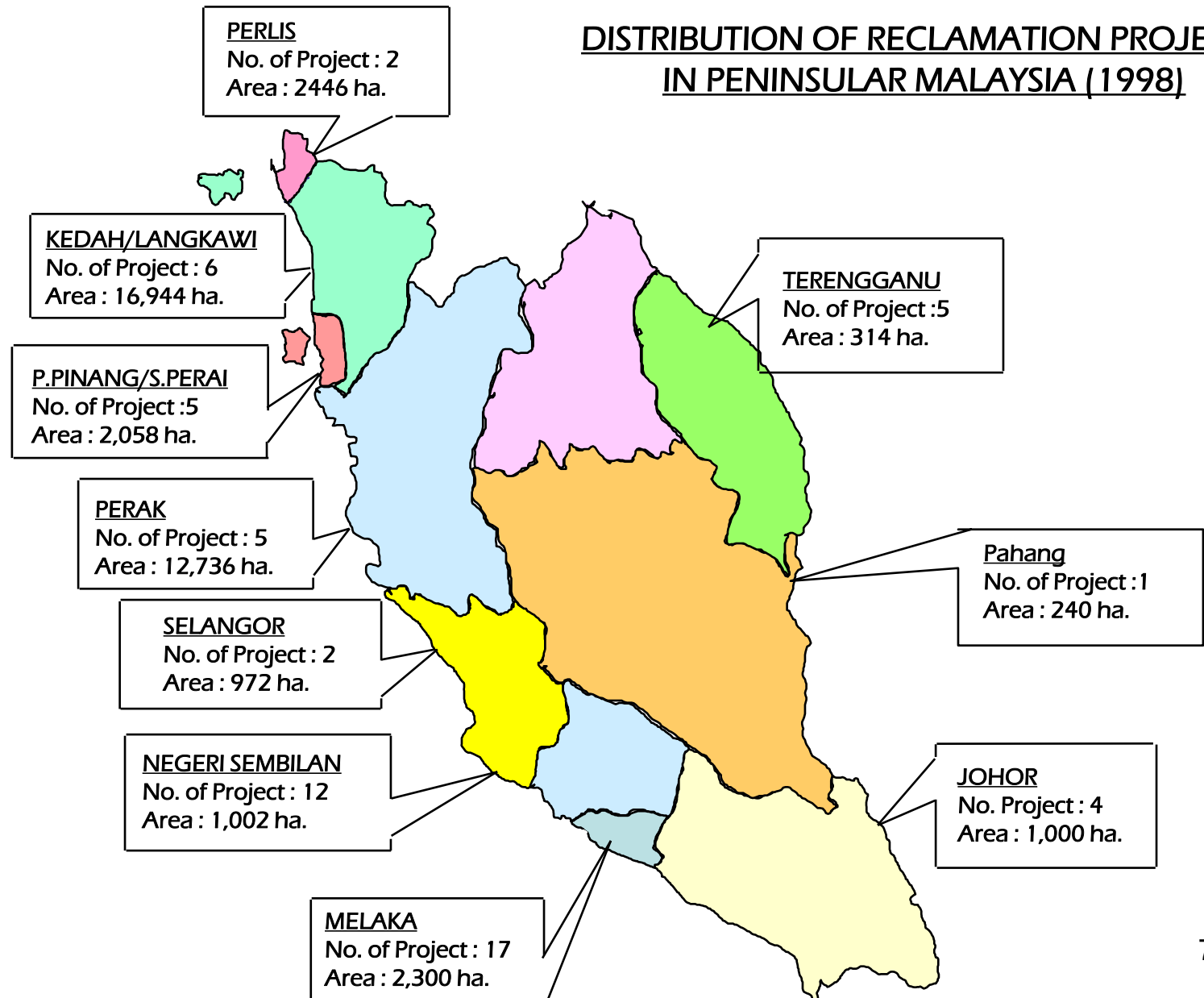
Coastal Reclamation

- Scope of Impact Evaluation Study
 - Key, location and site plan
 - Topographic, hydrographic, physical conditions of site and adjacent areas including socio-economics
 - Historical shoreline change
 - Prediction/measurement of sediment, littoral transport and sediment budget for pre and post project scenarios
 - Project affect on neighboring shoreline
 - Project impact on environment and economic activities
 - Identify and map mitigation measures to overcome adverse effects

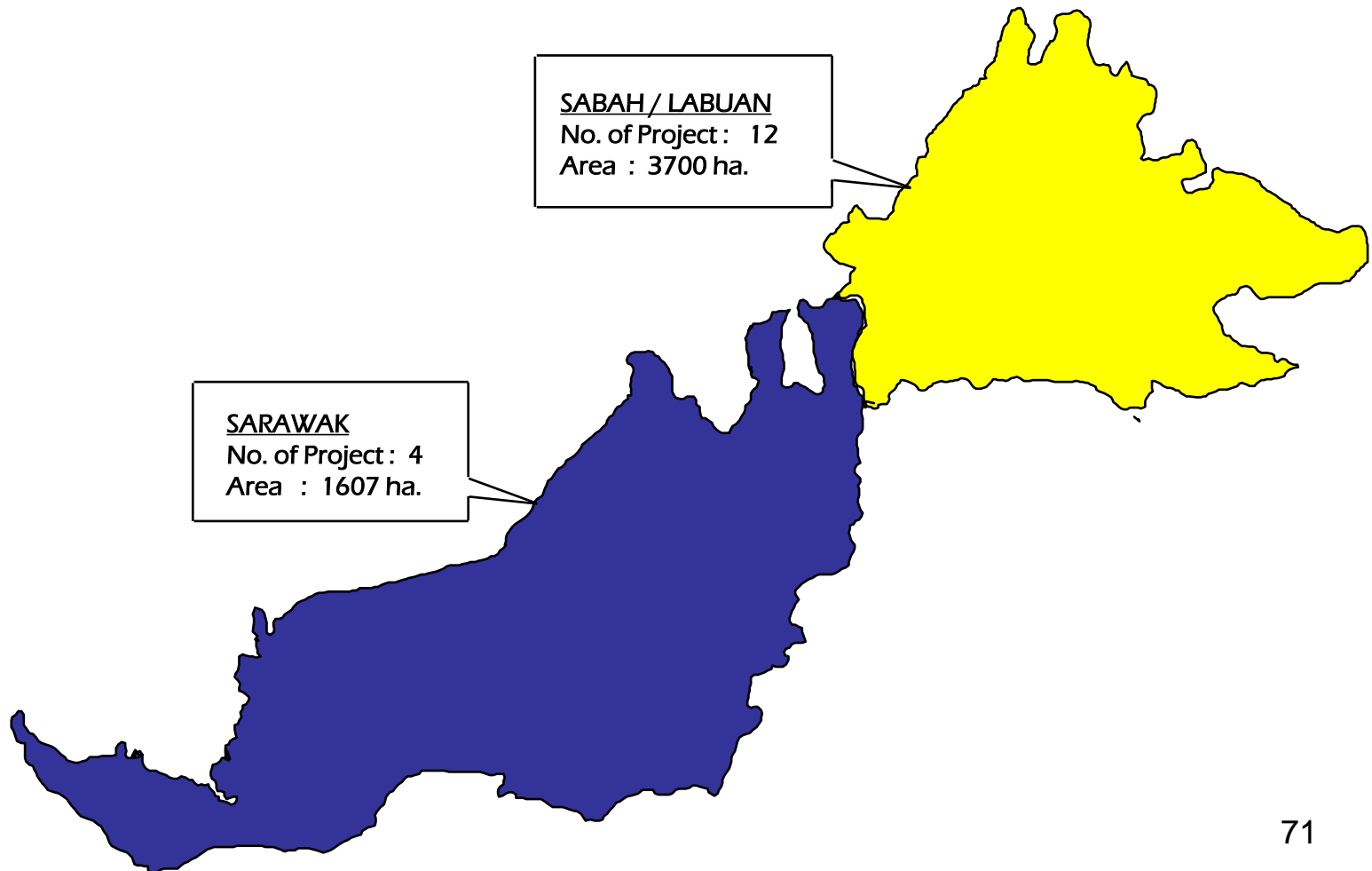
Data Requirement

- What needs to be included in proposal
 - Key plan 1:50000,
 - landuse, flora & fauna
 - Location plan
 - lots within 1 km of site
 - Layout of existing infrastructure eg roads, coastal structures, bunds, drains
 - Aquaculture, fisheries, habitat
 - Site plan 1:500
 - Buildings and structures
 - High water mark
 - Drainage system; erosion control structures
 - Design calculation
 - Photos
 - Info specific to proposed development

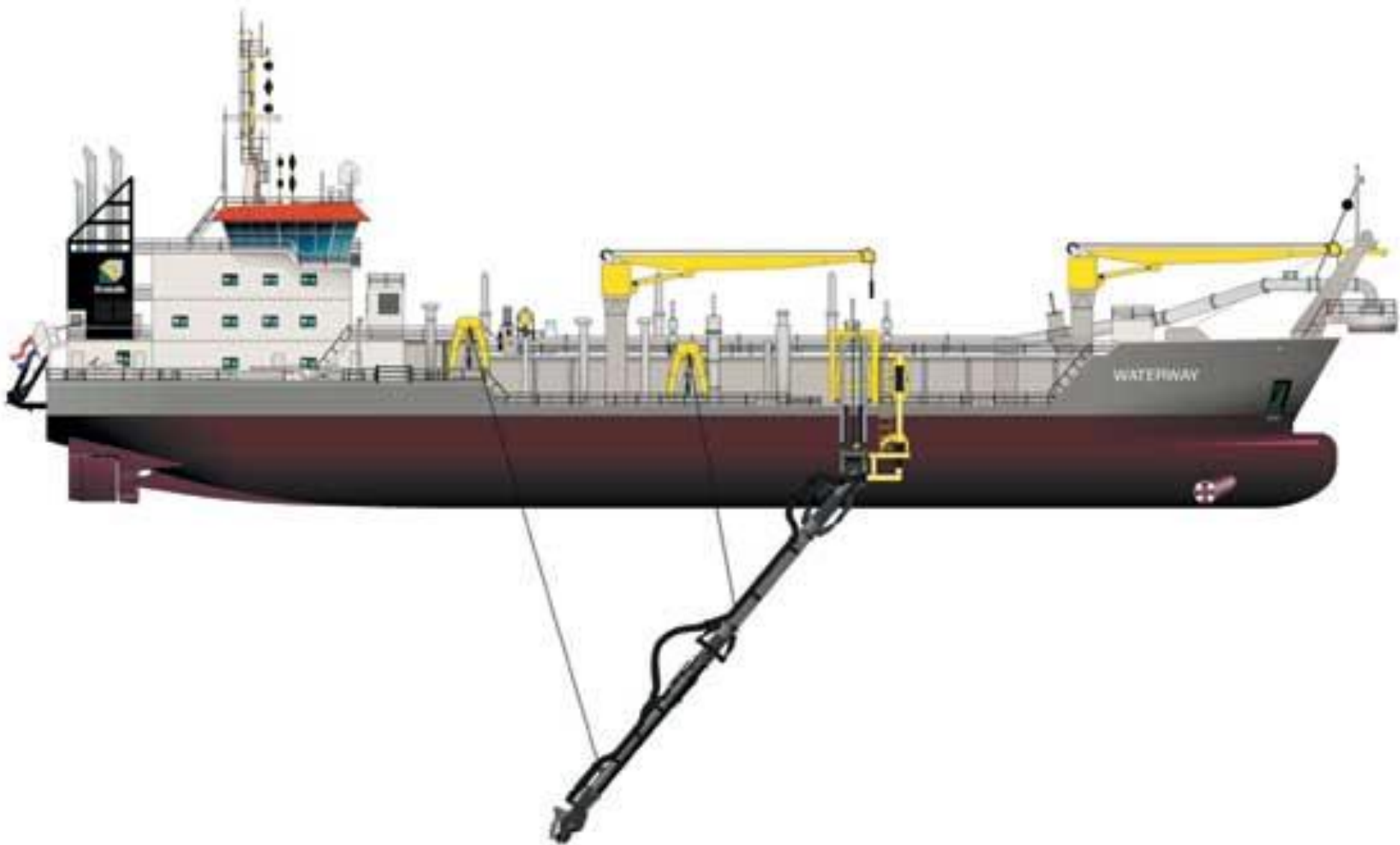
DISTRIBUTION OF RECLAMATION PROJECTS IN PENINSULAR MALAYSIA (1998)



DISTRIBUTION OF RECLAMATION PROJECTS
IN SABAH AND SARAWAK (1998)



□ *Offshore Sand Mining*



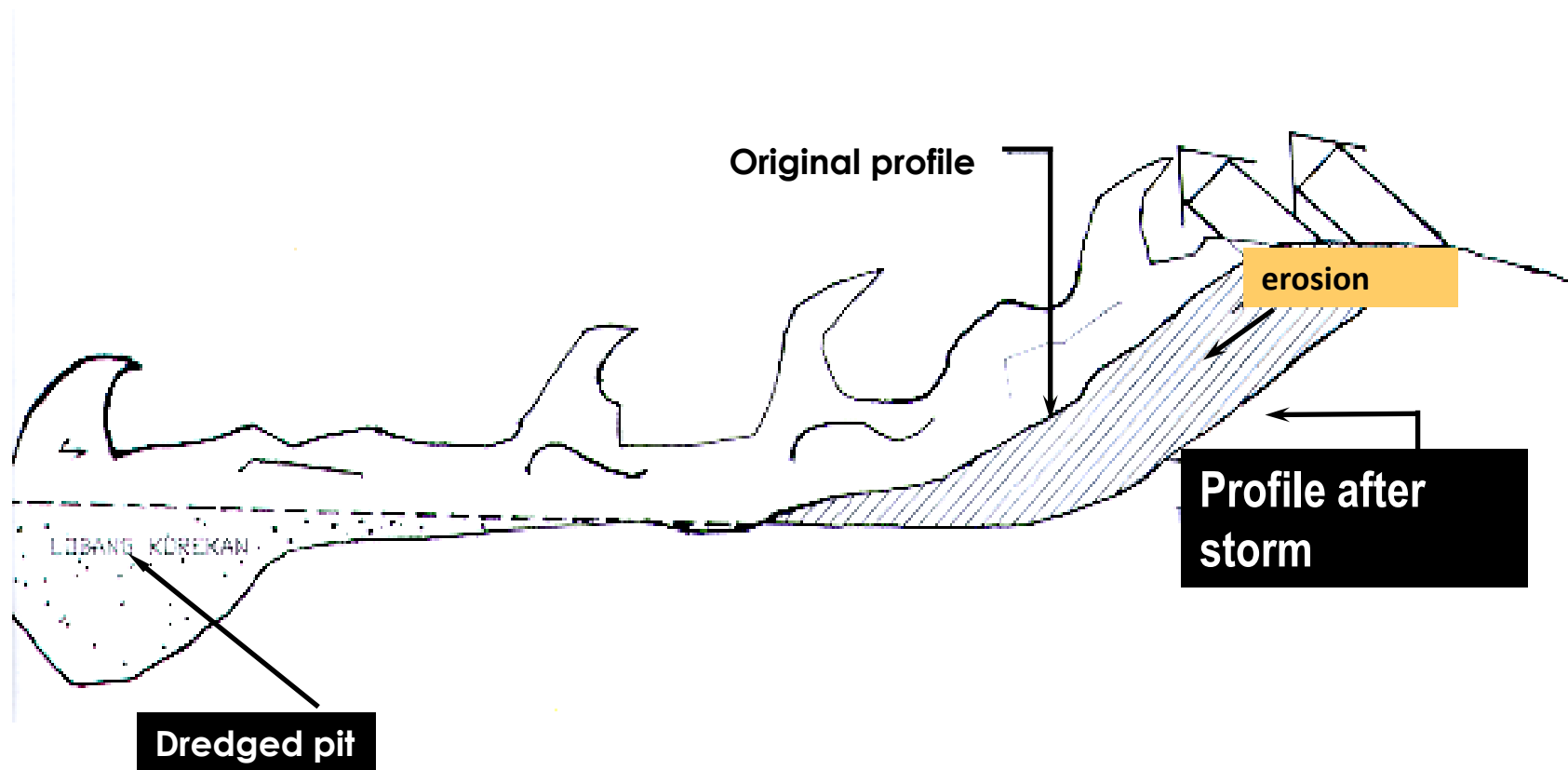


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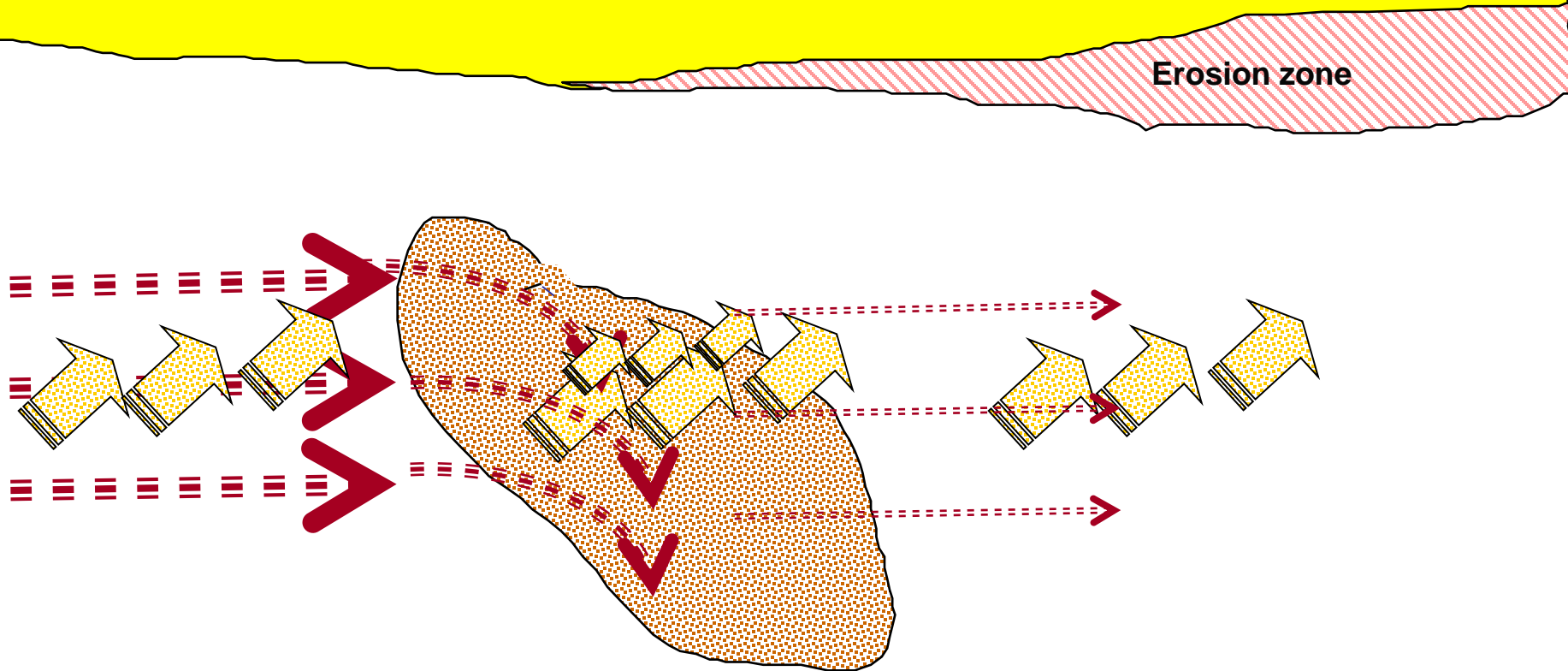


Drawdown effect due to dredged pit too close to shore

Offshore Sand-mining

- Impacts
 - Drawdown
 - Interference to sediment transport
 - Loss of offshore sandbars that are sediment 'banks'
 - Destruction of aquatic life
 - Benthic organisms on seabed
 - Turbidity due to dredging activity
 - Sedimentation over sensitive habitats (corals)

Affect of **sand mining** too close to shore

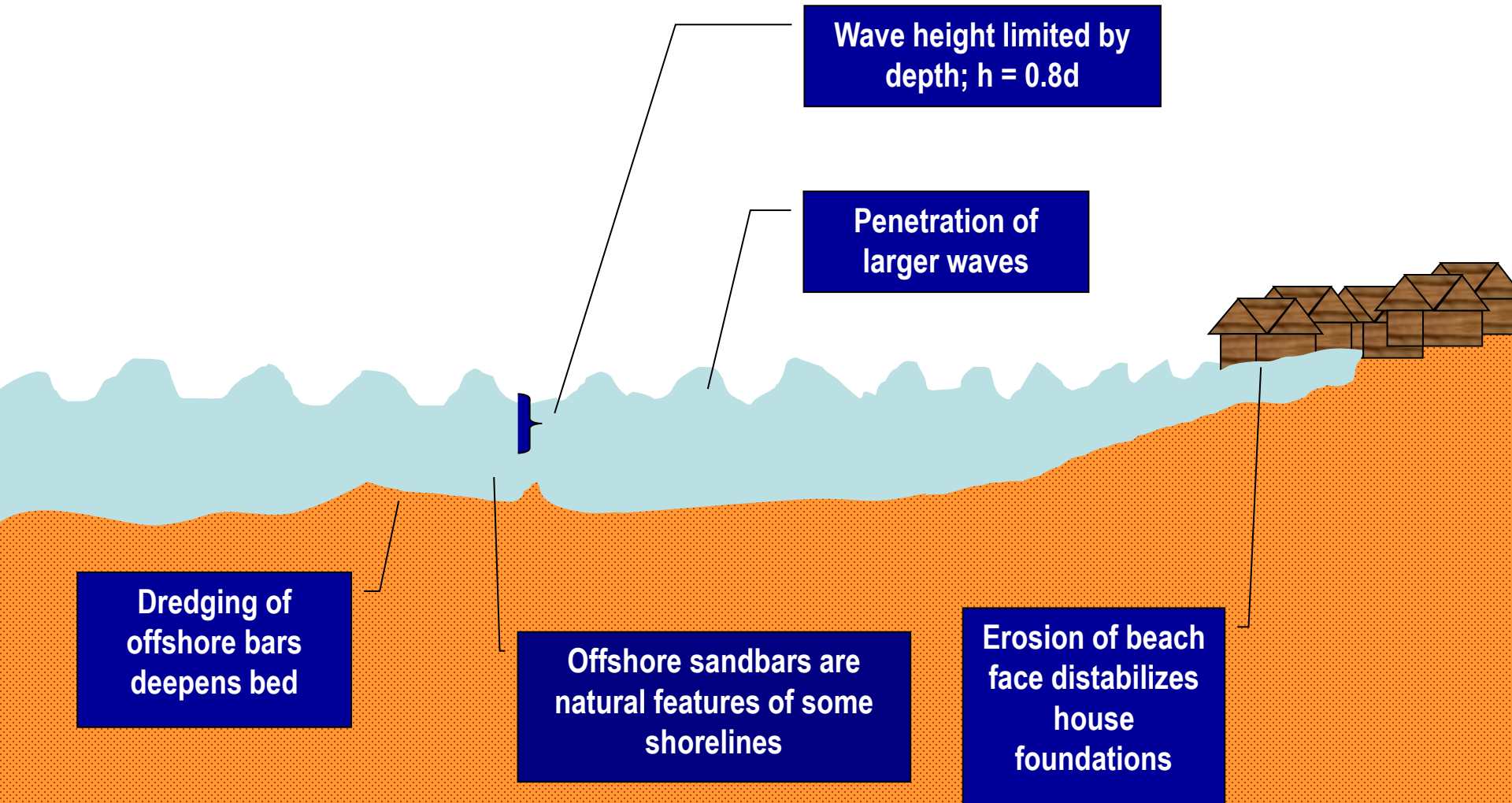


Dredged pit created near shoreline

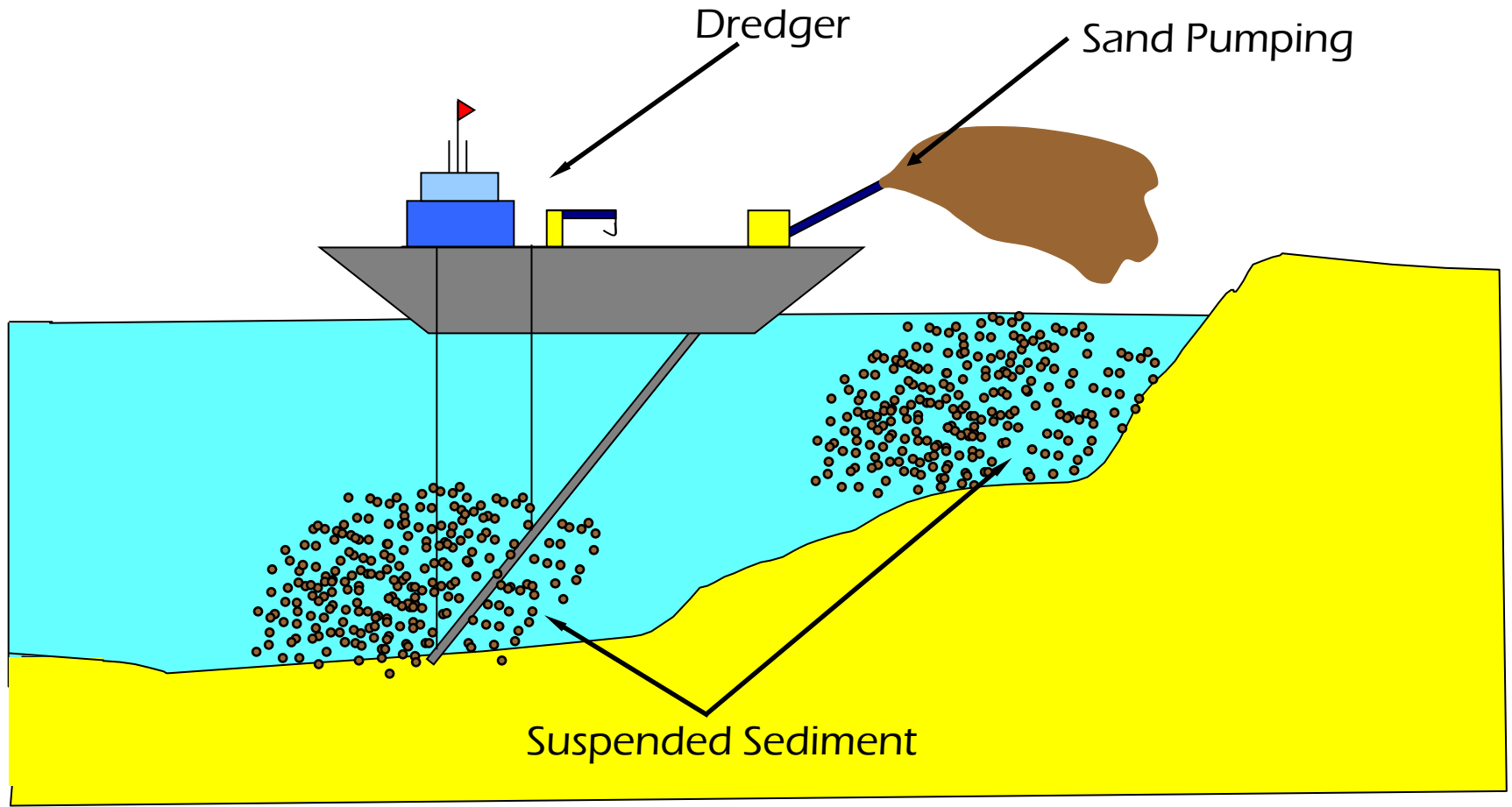
Over the pit, current velocity reduces, **sediment settles in**

Reduced sediment supply to downdrift beach

Affect of **sand mining** too close to shore



Suspended sediments endanger aquatic life

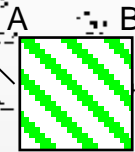


Offshore Sand-mining

- Jurisdiction
 - State Governments: from low water mark up to 3 nautical miles
 - Federal Government: from 3 nautical mile limit up to continental shelf

Limit of state
jurisdiction

Proposed
source area

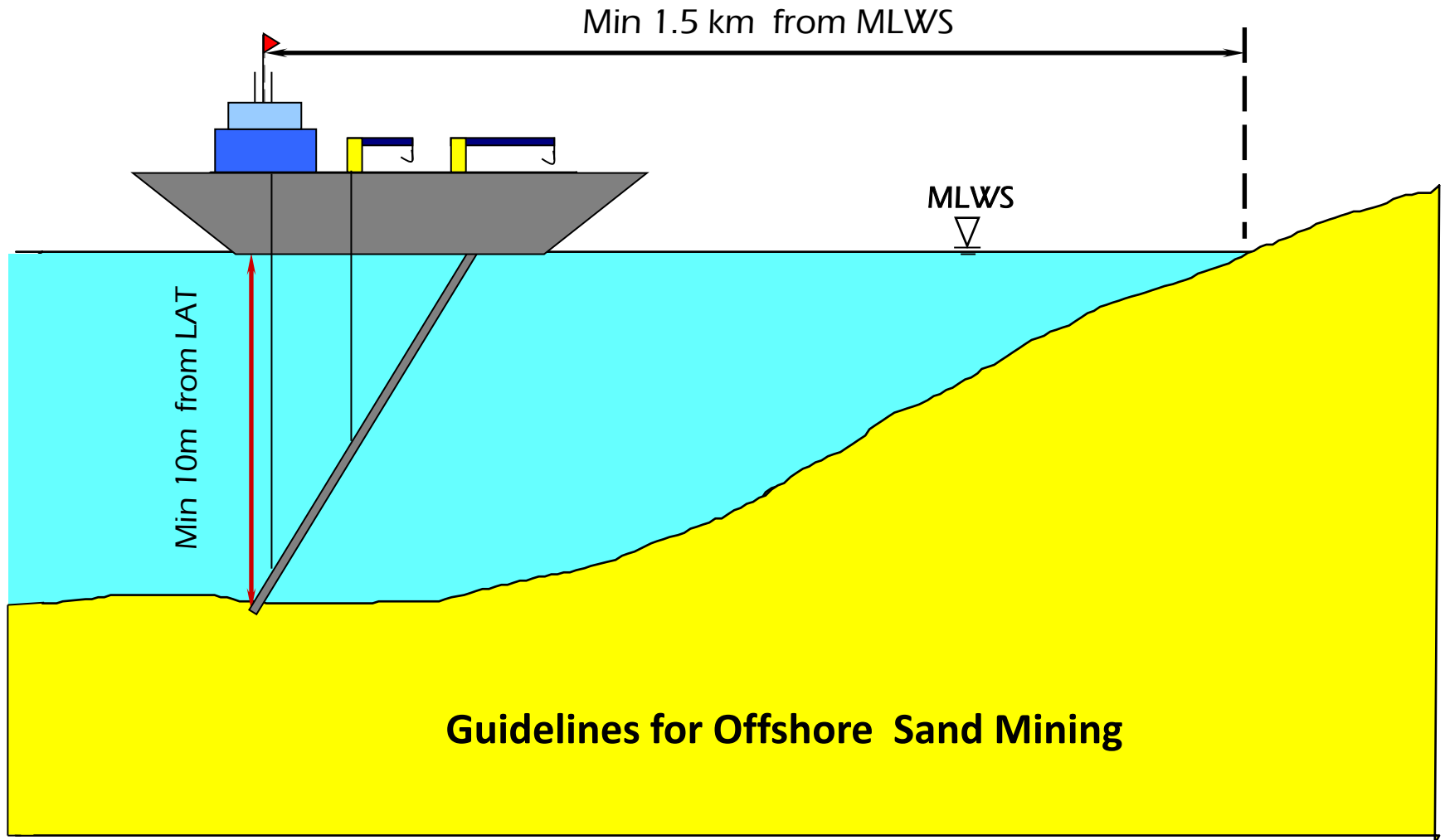


Koordinat

A)	2° 24'	32° 28'	U	C)	2° 24'	101° 45'
B)	2° 24'	16° 12'	U	D)	2° 24'	101° 45'
	101° 45'		T			

**Luas kawasan A. B. C. D. = 0.485 Km²
0.141 Bn²**

Guidelines for Offshore Sand-mining



Offshore Sand-mining

- Exceptions – if not possible to fulfil distance requirement of guidelines then,
 - Proponent must prove that dredging of sand source does not create adverse environment impact
 - Must conduct hydraulic study with numerical modelling
 - Must propose mitigation measures

Conclusion

- Guidelines designed as a preventive measure against coastal erosion/sedimentation and other environmental problems
- Explains the necessary scope of impact study for coastal development project
- To be used by all project proponents – government/private sector/individual