GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___ th Screening

Date Submitted for Screening: ____________________
Form of Submission: ___ Hard ___ Digital
Project Title: **286.86 ha Parañaque Reclamation Project**
Project Location: **Along coast of Manila Bay in the territorial jurisdiction of the City of Parañaque**
Project Proponent: **City Government of Parañaque**
Authorized Representative: **Atty. Fernando Soriano, OIC-City Administrator**
Address: **San Antonio Avenue, San Antonio, City of Parañaque**
Contact No: **(02) 826 8244** Fax No: __________ Contact Person: **Mayor Edwin Olivarez**
EIS Consultant: **Technotrix Consultancy Services, Inc.**
Address: **Unit 305 FMSG Building, #9 Balete Drive corner 3rd St., Quezon City**
Contact No: **(02) 416-4625** Fax No: __________ Contact Person: **Dr. Edgardo G. Alabastro**
Project Category & Type *(based on Annex A of MC 2014-005 Guidelines)*: **Environmental Critical Project: Reclamation Project**
Project Size *(use parameter in Annex A of MC 2014-005 Guidelines)*: **286.86 hectares reclamation area**

Project Status *(Please Check)*:
X New Project
__Existing Year of Establishment: _____

With Previous ECC? *(Please check)* __Yes __No

If with Previous ECC, Date/s of Issuance and Reference Code/s: *(List in chronological order)*

Date/s of Issuance: Reference Code/s:

Date of Technical Scoping: **04 July 2019**
Venue of Technical Scoping: **Conference B, 3rd Floor, AQTMC Building, DENR Cmpd., Visayas Ave., Diliman, Quezon City**

Table 1. Checklist of Documentary Requirements
Boxes and blanks in the first column are to be filled-up during scoping and the rest, upon submission of EIS for screening

	Acceptable?		Screening Officers' Remarks
	Yes	No	
Check required EIA Report[1] ☑ Environmental Impact Statement (EIS) ☐ Environmental Performance Report and Management Plan (EPRMP) *(include photographs or plates of project site, impact/affected areas and communities and land-use plan showing compatibility of the proposed project)*			
Proof of Authority over the Project Site ☐ TCT ☐ Lease Agreement ☐ Others: (**LGU-PRA MOU)** **Notice to proceed issued by DENR NCR in accordance with DAO 2018-14 (See Annex A for the list of additional documentary requirements),** **Note:EO 74 and its Implementing Rules and Regulations**			
Accountability Statements of Preparers & Proponent (see Annexes 2-21 & 2-22 of Revised Procedural Manual for DAO 2003-30)			
Duly Accomplished Project Environmental Monitoring & Audit Prioritization Scheme (PEMAPS) Questionnaire (see Annex 2-7d of Revised Procedural Manual for DAO 2003-30)			
For EPRMP, Copy of previous ECC			

[1] *Please refer to attached checklist of EIS/EPRMP Contents*

☐ 1st ☐2nd ☐3rd ___ th Screening

For EPRMP, Proof of compliance in the submission of monitoring reports			

ACTION TAKEN: (Please check to indicate corresponding action taken)

- ☐ Document accepted; please submit __ copies
- ☐ Document not accepted

NOTED BY:

____
Screening Officer
Division

____
Section/Division Chief

EMB Office
Screening Office

Date: ________________

☐ 1st ☐2nd ☐3rd ___ th Screening

Table 2. EIS/EPRMP Annotated Outline

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
Executive Summary (maximum of 10 pages)				
Project Fact Sheet	Summary of Project Description *(For EPRMP, Include comparative matrix of the existing project components vis-à-vis the proposed changes)*			
Process Documentation	Documentation of the process undertaken in the conduct of EIA *(EIA Team, EIA Study Schedule & Area, description of key EIA Methodologies including sampling and measurement plan, Scoping and Public Participation)*			
EIA Summary	• Summary of alternatives considered in terms of siting, technology selection/operation processes and design • Concise integrated summary of the main impacts and residual effects after applying mitigation • Risks and uncertainties relating to the findings and implications for decision making			
1. **Project Description** Include as an introduction, basic information about the project and project proponent				
1.1 Project Location and Area *For EPRMP, discussions should be in the context of the proposed modification/changes*	a) Map showing sitio, barangay, municipality, province, region boundaries, vicinity, proposed buffers surrounding the area and Primary & secondary impact areas *Include maps of other reclamation project and proposed quarrying operation near the project site*			
	b) Geographic coordinates (shape file data) of project area (use WGS 84 datum - GPS setting)			
	c. Describe the vicinity and the accessibility of the project site/area			
I.2. Project Rationale *For EPRMP, discussions should be in the context of the proposed modification/changes*	• Cite and focus on the need for the project based on national and regional/local economic development in terms of contribution to sustainable development agenda or current development thrusts. • Describe the justification for the Project with particular reference made to the economic and social benefits, including employment and associate economic development, which the project may provide. The status of the project should be discussed in a regional and national context.			
I.3. Project Alternatives *For EPRMP, discussions should be in the context of the proposed modification/ changes*	a) Cite criteria used in determining options for facility siting, development design, process/technology selection, resource utilization and discuss how the decisions on the preferred options were made. <u>Siting</u>: Alternative project locations including factors significant to the selection such as severity of impacts, perception of affected communities with regards to project, ancestral domain issues, land classification, etc. Discuss other options on the siting of major components of the project within the project area. <u>Technology Selection/Operation Processes and design Selection for storage</u>: Alternative technologies, operation processes, and measures to minimize wastes, prevent adverse impacts such as air and water pollution, groundwater and land contamination, and for the prevention/control of emergency events (eg. fire, explosion, leaks, spills) including factors significant to the selection.			

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
	Resources: Alternative sources of power, water, raw materials and other resources needed including factors significant to the selection such as supply sustainability and climate change projections *Likewise contextualize the determination of preliminary options in terms of project site factors significant to the selection such as supply sustainability and susceptibility to:* • *Liquefaction, Ground Shaking, Ground Rupture, Earthquake induced Landslides Volcanic eruptions, tsunami (PHIVOLCS)* • *Rain-induced landslide and flooding (MGB)* • *Storm surge, and flooding as well as extreme climatologic conditions (PAGASA)*			
	b) Summarize and discuss comparison of environmental impacts of each alternative for facility siting, development design, process/technology selection, resource utilization			
	c) Discuss the consequences of not proceeding with the project or no project option			
1.4 Project Components *For EPRMP, discussions should be in the context of the proposed modification/changes; boundaries of current project area should be delineated from the proposed expansion area, if any*	a) General layout of facilities;			
	b) Maps showing in particular, the location and boundaries of project area, location and footprint of main facilities, storage and support facilities, and proposed buffers. ***Indicative site development plan to state the usage/ purpose of the area, including buffer zone, mini-park development, road side tree planting or conceptual development plan, land use plan and sea use plan including site of identified sources at appropriate scale indicating relative distance to project***			
	c) Identification and general description of major components such as materials, capacity, number, safety features , etc.			
	d) Identification and description of support facilities and infrastructure requirements such as energy/power generating facility (if any) or energy source, water supply/storage, storm water drainage, sewerage, telecommunications, safety devices/emergency facilities, accommodation and similar facilities			
	e)Identification and description of pollution control devices and waste management system for the waste materials: wastewater, air emissions, domestic wastes, toxic and hazardous wastes, non toxic and non hazardous wastes, etc.			
I.5. Process/ Technology *For EPRMP, include discussion/comparison of existing and proposed modifications or expansion*	a) Description of the Processing/Manufacturing technology o process flow sheet showing material, and water (and energy, if applicable) balance including inputs and similar data on products, recycling and waste streams o materials/product handling and transport including storage protocols • ***Description of the reclamation site – Average depth, boundaries, immediate vicinity, distance from shoreline, existing road/ access/ egress and ingress, available infrastructure program which will enhance viability of proposed reclamation*** • ***Valid sources of fill materials***			

☐ 1st ☐2nd ☐3rd ___ th Screening

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
	• ***Reclamation methodology – the procedure/ technique in undertaking the activity to include the estimate volume of fill materials, type of materials and sources, containment/ retention wall and consolidation materials***			
	b) Description of the pollution control devices and waste management system			
	c) Description of the operations and maintenance of facility			
I.6. Project Size *For EPRMP, include discussion/comparison of existing and proposed modifications or expansion*	a) Total capacity / stock population/dimension (whichever is applicable based on screening parameter in the Guidelines for Coverage Screening per MC 2014-005)			
	b)Total Project Area in sq.m. or hectares			
I.7. Development Plan, Description of Project Phases and Corresponding Timeframes For EPRMP, *discussions should be in the context of the proposed modification/changes*	Phases to be described in terms identifying specific activities (w/ special attention on those with significant environmental impacts as well as climate change adaptation options relevant to the project and project activities) and corresponding projected implementation timeframes: • ***Pre-construction*** (e.g. planning, acquisition of rights to use land, etc.) • ***Construction*** (e.g. land/site clearing, temporary housing, transport of materials, health and other services for the workforce, discussion of temporary facilities including the progress of works/milestones and the number workers required per milestones) ***Proposed timetable – reclamation, land development and other related activities*** • ***Operation*** (projected period of start-up/commissioning/full operation of various project components) include discussion on the operation of various components (as identified above) in terms of raw materials, fuel requirements, waste management and infrastructure requirements • ***Decommissioning/Abandonment/Rehabilitation*** - projected life of the project and alternatives for the future use of the project area which should be consistent with long term zoning and land use development plan of the municipality; - Abandonment Plan (general) to include management plan for the projected cumulative/long term project impacts such as remediation of contaminated soil and water resources, land restoration, proper dismantling/abandonment of facilities/ equipment and other necessary activities			
I.8. Manpower	Tabulate the following per project phase (pre-construction, construction, operation and maintenance): • manpower requirements; • expertise/skills needed; • nature & estimated number of jobs available for men, women, and indigenous peoples (if in IP ancestral land); • scheme for sourcing locally from host and neighboring LGUs			

☐ 1st ☐2nd ☐3rd ___ th Screening

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
I.9. Project Cost	Indicative Project Investment Cost (Philippine Peso) • ***Estimated cost of reclamation and land development including supporting data (i.e., existing labor force, structure, and average cost and available equipment and average cost/ rental rates)*** • ***Proposed funding/ financing of the project***			
2. Assessment of Environmental Impacts See Table 3 for the list of key environmental impacts which shall be subjected to assessment. The assessment shall done using the prescribed approach/method and in relation to the corresponding baseline characterization in the primary and secondary impact areas (*as determined using the Guidelines in Annex 2-2 of the Revised Procedural Manual (RPM) for DAO 2003-30 or succeeding issuances*). The sampling and measurement plan used shall be discussed. Likewise, the assessment should be done for the various phases of development (i.e. pre-construction, construction and operation) and should consider climate change projections and disaster risks based on existing natural hazard information. For all maps, include overlays of project area footprint, show sensitive/critical receptors and sampling points for baseline data (indicate geographical coordinates). In conclusion, the residual and cumulative impacts shall be assessed. For EPRMP, the result of the proponent's monitoring shall be used as baseline. The assessment of environmental impacts of proposed modification shall be discussed in relation to the actual impacts of existing project operations which shall be presented from a summary of the results of compliance monitoring (in matrix and graphical form) as described in 6.1.				
3. Environmental Management Plan Appropriate mitigation/management measures should be specified for each of the identified key impacts (Table 3). Appropriate climate change adaptation and disaster risk reduction measures/options shall likewise be thoroughly discussed. The impact management plan should be summarized using at the minimum, the format in Annex 2-17 of RPM for DAO 2003-30 For EPRMP, the proposed impact management plan to be discussed shall consider review of performance of existing project based on the Environmental Quality Performance Levels (EQPLs) set. Also include change in adaptation measures / options and remediation of contaminated soil and water resources, land restoration proper dismantling, if any.				
4. Environmental Risk Assessment (ERA) & Emergency Response Policy and Guidelines The level of coverage and type of document required shall first be determined based on Annex 2-7e of RPM for DAO 2003-30. For EPRMP, discuss status of implementation of the safety policies/guidelines and any proposed changes. Include last three (3) years of safety statistics. Also include incidence such as spills, near spills and similar incidents such as accidents and emergency. Discuss actions taken. See Table 4 for details				
5. Social Development Plan/Framework (SDP) and IEC Framework For EPRMP, discussion should focus on the status of implementation of SDP and IEC commitments. Discuss adjustments that should be undertaken.				

GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___ th Screening

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
5.1 Social Development Program (SDP)	Community development or livelihood programs/activities, projected beneficiaries, partner institutions, timeframe of implementation as well as source and amount allotted per activity/component (See Annex 2-18 of RPM for DAO 2003-30) SDP should be able to address the issues/concerns that will be raised during the stakeholder participation activities.			
5.2.Information and Education Campaign (IEC)	Target sector, key messages, scheme/strategy/methods, Information medium, timelines and frequency, cost (See Annex 2-19 of RPM for DAO 2003-30) IEC should be able to address the issues/concerns that will be raised during the stakeholder participation activities			
6. Environmental Compliance Monitoring				
6.1 Environmental Performance (for EPRMP only)	• Results of compliance monitoring in matrix and graphical form showing and explaining the trend in environmental conditions • Analyze performance based on the Environmental Quality Performance Levels (EQPLs) set • Discuss compliance to ECC conditions and performance against the originally approved Environmental Management and Monitoring Plan, MMT requirements/commitments, third party audits (if any) • Discuss implementation of appropriate and effective environmental impact remedial actions in case of exceedances • Discuss operationalization of complaints management system			
6.2.Self-Monitoring Plan	The monitoring plan shall be summarized using Annex 2-20 of RPM for DAO 2003-30 or succeeding issuances as template. For EPRMP, the original and proposed additional/changes in sampling sites/stations shall be discussed and shown in map/s. Proposed reduction in or additional parameters especially for air and water shall likewise be identified. The proposed changes in parameters and/or sampling stations which shall be based on the results of the impact assessment reported in Chapter 2 shall be discussed in this section.			
6.3.Multi-Sectoral Monitoring Framework	Discussion on the necessity of creating a Multi-Partite Monitoring Team (MMT). If deemed necessary, describe the proposed scope of MMT responsibilities and activities and tabulate the list of proposed stakeholder-members of the MMT, basis of selection and proposed role. (See Annex 3-4 of the RPM for DAO 2003-30). Use DAO 2017-15 as reference.			
6.4 Environmental Guarantee and Monitoring Fund Commitments	• Discussion on the necessity of putting up an EGF. If deemed necessary, present a proposed amount of EGF indicating the basis for the estimate (per guidelines in annex 3-6 of RPM for DAO 2003-30) • If MMT is deemed necessary, present a proposed amount of EMF (based on a draft AWFP in following the format in Annex 3-4 and consistent with guidelines in Annex 3-5 of RPM for DAO 2003-30); Use DAO 2017-15 as reference			

GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___ th Screening

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
7.Decommissioning / Abandonment /Rehabilitation Policy Statement on Proponent's policies to implement the abandonment plan described in Item 1.7 and to formulate and submit procedures for Rehabilitation/ Decommissioning/Abandonment within a timeframe specified in the ECC. For EPRMP, present approved plan/program, if any, and proposed changes.				
8. Institutional Plan for EMP Implementation Present the organizational scheme of the proponent including line of command and reporting procedures as well as manpower complement and relationships with other operating departments. Provide framework for grievance mechanism. For EPRMP, discuss status of implementation and any proposed changes in the plan to cover modification/expansion if any.				

Table 3. Key Environmental Impacts to be included in the Assessment and Formulation of Management and Monitoring Plan to be reflected in the EIS/EPRMP

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			*✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
I. Land											
1.1. Land Use and Classification											
1.1.1 Impact in terms of compatibility with existing land use	Description & Map showing the project area in relation to existing land use.	Assessment of the compatibility of the proposed project vis-a-vis actual land use and the approved comprehensive land use plan/zoning classification, ECA Classification and/or the coastal resource management plan of the LGU if any.									
1.1.2 Impact on compatibility with classification as an Environmentally Critical Area (ECA)	Identify ECA where the project is located or near the project area. Identify areas vulnerable/susceptible to natural hazards where the project is located or near the project area (include map/s).	Historical Typhoon passage frequency									
1.1.3 Impact in existing land tenure issue/s	Determine if the project area is under CARP or with CADC / CADT / CALC/ CALT, with IFMA/CBFMA, within COC, within MPSA or other tenurial instruments and identify corresponding existing tenure issues including presence of informal settlers.	Identify and assess impact in terms of land tenure issues in relation to project implementation Include discussion on municipal/barangay fisheries and aquatic management council									
1.1.4 Impairment of visual aesthetics	Visually significant landforms/ landscape/structures	Identify and assess impact of the project on these visually significant landforms/landscape/structures									
1.1.5 Devaluation of land value as a result of improper solid waste management and other related impacts	Existing solid waste management and related land management scheme in the area	Identify and assess impacts of the estimated generation of solid wastes in terms of: - amount and - characteristics (hazardous or domestic) and other related issues on the existing management scheme									
1.2 Geology/Geomorphology											
1.2.1 Change in surface landform/geomorphology/ topography/ terrain/slope	Slope and Elevation/Topographic Map;	Identify and assess project impact in terms of the changes in surface landform/topography/terrain/slope									

☐ 1st ☐2nd ☐3rd ___th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			*✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
		including existing hazard as maybe aggravated by climate change as projected by PAGASA On the proposed reclaimed area in relation to storm surges and tsunamis, liquefaction, ground shaking, subsidence.									
1.2.2 Change in sub-surface geology/underground conditions	Regional/General Geological Map Natural Hazard Map (sub surface)	Identify and assess project impact in terms of the changes in sub-surface geology and inducement of subsidence, liquefaction, landslides, mud/debris flow to the environment including the possibility of aggravating existing natural hazards Peak ground acceleration analysis map. Discuss and assess the impacts of geologic hazards and planned earthworks on the project facilities (e.g., landslides, mudflows, subsidence, ground shaking from earthquake, liquefaction, flooding, etc.). Note in the discussion how climate change can aggravate the hazards and impacts. The geologic hazards map must consider the hazards/exposure/vulnerability/ risk maps of Section 1.1.2. Relate discussion on the proposed reclaimed area in relation to storm surges and tsunamis, liquefaction, ground shaking, subsidence. Geotechnical Analysis									
1.2.3 Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.	Geological Map as needed.; hazard maps (NAMRIA, NDRRMC, MGB, PHIVOLCS, PAGASA) Storm surges, liquefaction, ground rupture and tsunami maps, earthquake generators, historical earthquakes.										
1.3 Pedology											

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
1.3.1 Soil erosion / Loss of topsoil/overburden	• Summary of Soil Investigation Report on soil type and quality, on geotechnical investigation only • Soil map showing soil types, sampling stations, topography, streams, built-up areas, and planned project features • Water and wind erodibility potential • Sediment sources, and • Riverbank stability	Describe capability of the land to accommodate the proposed development with minimal or without soil erosion/loss of topsoil/overburden Only on the results of the geotechnical analysis. As far as compaction potentials, proposed methodology for compaction. Describe the physical properties and erodibility potential of the soil, ongoing erosion processes and assess the erosional impacts of the project. The Universal Soil Loss Equation (USLE) and its variants may be used in the modeling.									
1.3.2 Change in soil quality/fertility	Laboratory results on soil sample analysis for N, P, K, pH, organic matter, micronutrients and trace metals e. g. Pb, Hg, As, Cd, Cr hexavalent, etc.	Assess the impact of the project activities including the possibility of spills on soil quality and fertility									
1.4 Terrestrial Ecology (N/A)											
1.4.1 Vegetation removal and loss of habitat	• Map showing land cover; sampling sites; location of observed important, endangered, and keystone species; ecologically sensitive sites; planned land development works • Flora and fauna species inventory or survey report to cover species listing, abundance, richness, dominance, diversity, evenness, ecological status, and uses; • Historical occurrences of pest infestation, forest/grass fire and/or similar incidences	To establish baseline, - Use quadrat sampling for flora to cover all land cover types - Use transect walk ~~,~~ mist nets, traps, for fauna - show survey locations in a map Identify and assess specific impacts of the project activities guided by the following: 1. Habitat loss or degradation – Land clearing, river damming, etc. will result in the loss of habitat. Some activities may lead to the alteration of habitat composition, structure or function. Some									
1.4.2 Threat to existence and/or loss of important local species	Summary of endemicity / conservation status										

☐ 1st ☐2nd ☐3rd __ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
1.4.3Threat to abundance, frequency and distribution of important species	• Summary of abundance, frequency and distribution • Economic importance and uses of significant flora and fauna	habitats, e.g., wetlands, are critical to ecological processes or endangered species.									
1.4.4 Hindrance to wildlife access	Survey map in relation to the project site	2. Habitat fragmentation – This is the break-up of the natural landscape into small patches isolated from one another. It affects the number of species present, movement of species, and transfer of materials among habitats. 3. Loss of species – Of special interest are the keystone, endangered, and endemic species. 4. Pollution effects on species – The stressors include dust, noise, chemical/ petrochemical spills, eroded sediment, increased temperature, etc. Relate discussions to estimated GHG emissions and possible carbon sequestration program/s									
2. THE WATER											
2.1 Hydrology/Hydrogeology											
2.1.1 Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow	Drainage map (also showing local drainage system/infrastructures); Historical flooding/drought occurrences, stream flow measurements/estimates; Delineation of watershed /sub-watersheds/ floodplain; and identification of aquifers if any Include flood modelling	Identify and assess project impact on the change in drainage morphology/local drainage system and resulting effects of flooding pattern in the project area and surrounding. Include climate projections effects on flooding. Relate discussions to item 3.1.1									

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
2.1.2 Change in stream, lake water depth	Regional hydrogeological map	Identify and assess project impact in terms of change in stream, lake water depth									
2.1.3 Depletion of water resources / competition in water use	Current / projected water use (groundwater/surface water) in the area and adjacent areas Inventory of water supply source including springs and wells(indicate depth of water table) and show location in a map of appropriate scale	Identify and assess project impact on the existing water resources and the resulting competition in the water use using analysis/estimation of water availability. Include discussions taking into consideration the PAGASA medium to long term projections									
2.2 Oceanography *(applicable to projects with jetty/port and/or subsea structures that will change the bathymetry in the area)*											
2.2.1 Change/disruption in water circulation pattern, littoral current, and coastal erosion and deposition	• Bathymetric survey and map • Measurement of water currents • Analysis of available proximate tides data • Hydrodynamic modeling • Particle dispersion modeling and map • Storm surge hazard, exposure, vulnerability, risk maps • Water quality modeling Note: All modeling shall include nearby reclamation projects	Identify and assess project impact on the degree of change/disruption of circulation pattern and the potential for coastal erosion Build a hydrodynamic model based on the measured bathymetry and currents and tidal analysis and then validate the model. A public domain software like the United States Environmental Protection Agency Environmental Fluid Dynamics Code (EFDC) may be used. Through the validated hydrodynamic model, assess the impacts of the project on water circulation, littoral current, and coastal erosion and deposition. Use the modeling results of Sec. 1.3.1 and 2.1.1. Discuss how the impacts may be affected by climate change especially sea level rise.									

☐ 1st ☐2nd ☐3rd ___th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
2.2.2 Change in bathymetry	Bathymetric map;	USLE / similar modeling when applicable / sediment transport modelling Use the hydrodynamic model to assess the impacts of the bathymetric changes. Discuss how the impacts may be affected by climate change. Compare projected new bathymetry as a result of the project with the existing Include storm surge/ tsunami modelling to consider maximum possible storm.									
2.3 Water Quality											
2.3.1 degradation of groundwater quality (N/A)	Physico-Chemical characterization of water: ☑ COD ☑ DO ☑ Oil and grease ☑ TSS ☑ Heavy Metals (Table 3 and 5 of DAO 2016-08) ☑ fecal / total coliform ☑ Nutrients: (Table 4 of DAO 2016-08) ☑ Secondary parameters required in Table 5 DAO 2016-08 Include baseline data for DAO 2016-08 ☑ sampling site map	Identify and assess project impact in terms of degradation of groundwater, coastal surface water and coastal/marine water quality. Use DENR standard methods and procedures for sampling and analysis. Assess impact on siltation of surface and coastal/marine waters. Link discussion of spills with Section 1.3 especially if spills affect soil and groundwater. Show in a map, sampling sites for monitoring purposes based on the above assessment. Compare results with SB Classification of marine water based on DAO 2016-08									
2.3.2 degradation of freshwater water quality (N/A)											
2.3.3 degradation of coastal/marine water quality											

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
2.4 Freshwater Ecology (N/A)											
2.4.1 Threat to existence and/or loss species of important local and habitat	• Summary of endemicity / conservation status • Abundance of ecologically and economically important species (fishes, benthos, planktons); • Matrix of species (micro and macro) observed during the study (scientific names, common names, local names and conservation status • Photos of activities undertaken per methodology/tool used during the study. • Implication of the project to the species observed. Discuss the mitigating measures. • Presence of pollution indicator species; • sampling site map	Identify and assess project impact in terms of threats to existence/and or loss of species, abundance frequency and distribution species and include discussions on overall impact to freshwater ecology. Relate discussions to air and water Show in a map, sampling sites for monitoring purposes based on the most significant threats identified.									
2.4.2 Threat to abundance, frequency and distribution of species											
2.5 Marine Ecology *(applicable if project involves activities, discharges and structure in marine waters)*											
2.5.1 Threat to existence and/or loss of important local species and habitat	• Abundance/densities/distribution of ecologically and economically important species (mangroves, fishes, benthos, planktons, coral reefs, algae, seaweeds, sea grasses); • Matrix of species (micro and macro) observed during the study (scientific names, common names, local names and conservation status • Photos of activities undertaken per methodology/tool used during the study. • Presence of pollution indicator species; • Historical occurrences of red-tide, fish kill or any related event • marine resource map	Quadrat, transect, line intercept, spot dive, manta tow, marine resource characterization (e.g. municipal and commercial fisheries data) for baseline gathering. Identify and assess project impact in terms of threats to existence, loss of important local species, threat to abundance, frequency and distribution and include discussions on overall impact to marine ecology. Relate discussions to air, water and oceanography Show in a map, sampling sites for monitoring purposes based on the most significant threats identified.									
2.5.2 Threat to abundance, frequency and distribution											

☐ 1st ☐2nd ☐3rd ___ th Screening

<table>
<tr><td colspan="3">During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided</td><td colspan="9">✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP</td></tr>
<tr><td rowspan="2">List of Key Impacts</td><td rowspan="2">Baseline Data Parameter Requirements</td><td rowspan="2">Required Assessment Methodology/Approach</td><td colspan="2">Baseline Conditions</td><td colspan="2">Impact Analysis</td><td colspan="2">Mgmt. Plan</td><td colspan="2">Monitoring Plan</td><td rowspan="2">Remarks</td></tr>
<tr><td>Page</td><td>✓</td><td>Page</td><td>✓</td><td>Page</td><td>✓</td><td>Page</td><td>✓</td></tr>
<tr><td></td><td>• samplings site map showing stations with technical descriptions where studies conducted
• Map of marine protected areas either under RA 11038 or locally managed

Quantitative data on the coastal resources that will be affected by the reclamation activities.

Fisheries and fishing activities in the area

Coastal resources population, structure and interrelationships
Migratory birds and other avian species</td><td>Show in a map, if there will be MPAs both National/Locally Managed that will be affected</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="12">3.0 THE AIR</td></tr>
<tr><td colspan="12">3.1 Meteorology/Climatology</td></tr>
<tr><td>3.1.1 Change in the local micro-climate e.g. local temperature</td><td>Monthly average rainfall and temperature of the area; Climatological normals/extremes; Wind rose diagrams; Frequency of Tropical cyclones</td><td>Identify and assess project impact in terms of change in the local micro- climate change. Also discuss effects of climate change using PAGASA medium to long term projections</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.1.2 Contribution in terms of greenhouse gas emissions (or GHG mitigation potential)

Note: applicable only for projects with significant GHG emissions</td><td>Data on Greenhouse gasses (i.e. carbon dioxide, nitrous oxide);</td><td>Estimate projected greenhouse gases (GHG) (i.e. carbon dioxide, nitrous oxide) using IPCC guidelines; include mitigation and/or sequestration for both construction and operation phases.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="12">3.2 Air Quality (& Noise)</td></tr>
<tr><td>3.2.1 Degradation of air quality</td><td>Characterization of ambient air quality based on EMB Air Quality Monitoring Stations.</td><td>Use DENR standard methods and procedures for sampling and analysis.</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
		Relate selection of sampling locations using data collected in 3.1.1 Identification and assessment of impact of the project to the identified parameters including VOCs and odor through air dispersion modeling (as may be applicable) Show in a map, sampling sites for monitoring purposes based on the above assessment. *Compare changes in air quality over time using statistical tools e.g. across sampling sites over time, and test for significant changes*									
3.2.2 Increase in ambient noise level	Characterization of ambient noise level sampling site map	Use DENR standard methods and procedures for sampling and measurement. Identification and assessment of impact to ambient noise level using noise attenuation modeling and comparing it with relevant standards. (Applicable if estimated total noise level will exceed noise standard).									
4.0 THE PEOPLE -Provide most recent barangay level socio-demographic data. -Conduct perception survey among households in the impact barangays. Draft questionnaire to be submitted to the EIARC prior to the conduct of the survey. -Provide a discussion on the statistical method used to determine the sample size for the perception survey -Conduct FGDs among mussel farmers and other fisher folk in the impact areas and nearby establishments.											
4.1 Displacement of settler/s Displacement / disturbance of properties	Demographic data of impact area: - Number of households and household size - Land area,	Identify and assess project impacts on demography of affected communities. Use assessment in the formulation of SDP/IEC									

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
Change/conflict in land ownership Change/conflict Right of way Impact on Public Access	- Population, - Population density /growth - gender and age profile, - literacy rate, profile of educational attainment - settlements map	Assess availability of alternative public access and housing options for displaced settlers For project with displacement/ disturbance of properties/settlers, change/conflict in land ownership and change/conflict right of way, formulate resettlement framework plan or RAP									
4.2 In-migration proliferation of informal settlers	Census of population / property that will be displaced / disturbed Housing ownership profile / availability of housing/ number of informal settlers Include discussion on updated CLUP and demographic data (2015 data) Include a census of fishers, boats, and gears.	Identify and assess project impact due to in-migration patterns including proliferation of informal settlers									
4.3 Cultural/Lifestyle change		Identity and assess project impact in terms of Culture/Lifestyle that may be affected and/or introduced Provide discussion on the impact on Manila Bay Sunset									
4.4 Impacts on physical cultural resources	Inventory and description of physical cultural resources and landscapes that have archaeologic, paleontologic, historical, religious, aesthetic, or cultural significance: Movable or immovable objects, below ground or under water, sites, structures, groups of structures, and natural features Classify cultural interest value/ importance into local, provincial, national, or international level *Sources of information: UNESCO, National Museum (NM), National Historical Commission of the Philippines (NHCP), National Commission for Culture and Arts (NCAA) and the Local Government Units (LGUs) in the project area and other UN or National Publications*	Identify all potential project impacts in an integrated manner considering the type, significance, and value/importance of the physical cultural resource/s Identify risks in terms of capacity and commitment in managing the impacts *(protocols in handling chance finds shall be implemented)*									
4.5 Threat to delivery of basic services /resource competition	Availability of public services in terms of:	Identify and assess project impact in terms of threats to delivery of basic services									

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
	• Water supply • Power supply • Communications /transportation • peace and order / crime • education facilities • recreational facilities / sports facilities statistical data / information related to public services: • literacy rate, profile of educational attainment • Crime rate • Food security	including potential for resource competition in the area including effects of in-migration									
4.6 Threat to public health and safety	Availability of public services in terms of: health resources (Government and Private) Statistical data / information related to public services: • Morbidity and mortality rates (infants and adults - 5-year trend) • Common diseases in the area including endemic diseases; Environmental Health and Sanitation Profile	Identify and assess specific threats to public health and safety due to project impacts. Relate discussions to land, air and water (Item 1 to 3) Analysis of the impact of project implementation on existing disease profile including weather sensitive diseases and impact aggravation as a result of climate change as projected by PAGASA									
4.7 Generation of Local Benefits from the project Enhancement of employment and livelihood opportunities Increased business opportunities and associated economic activities Increased revenue of LGUs	Socioeconomic data: • Main sources of Income • Employment rate/ profile • Poverty incidence • sources of livelihood • commercial establishments and activities • banking and financial institutions	Identify and assess local benefits of the project in terms of enhancement of employment and livelihood opportunities, increased business opportunities and associated economic activities and increased revenue of LGU									

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			*✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
4.8 Traffic congestion	Road network/ systems Existing Transportation/traffic situation	Identify and assess project impact on the traffic situation in the area including congestion based on existing capacity of road system									

Table 4. Environmental Risk Assessment to be included in EIS/EPRMP

During scoping: Check (✓) required/applicable items; items with ✓ are automatically required; write specific instructions (if any) on the blanks/spaces provided.			*✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*						
Level of Coverage & Type of Risks	**CONTENTS OF ERA AS PART OF EIS/EPRMP For the identified safety risks in column 1**	Remarks/ Specific Scoping Instruction/s	ERA		ERP		Monitoring Plan		REMARKS
			Page	✓	Page	✓	Page	✓	
Level of Coverage: Refer to Annex 2-7e of the RPM for DAO 2003-30 ☐ Level 2 (QRA Required) ☑ Level1 (Emergency Plan based on hazard analysis) ☑ Risk Screening Level	For EPRMP, include HAZOP or QRA for existing facilities and compare with that for the expansion. Also include discussions on safety incidents/records/history (in relation to environmental risks) classified into first aid, medical attention cases, days away from work cases, fatalities (including contractors), record of drills (fire, spills, explosion, among others) and any experience in implementing the ERP For EIS, check type of report to be submitted prior to Operation: ☐ Quantitative Risk Assessment(QRA) ☐ HAZOP ☐ Others : ____________								
Safety Risks Type: ☑ Fire ☑ Explosion ☑ Release of toxic substances	☑ Description of conditions, events and circumstances which could be significant in bringing about identified safety risks ☑ Description & assessment of the possible accident scenarios posing risk to the environment ☑ Description of the hazards, both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the release of toxic substance, as applicable ☑ The safety policy and emergency preparedness guidelines consistent with the regulatory requirements. Emergency								

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Check (✓) required/applicable items; items with ✓ are automatically required; write specific instructions (if any) on the blanks/spaces provided.			✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP						
Level of Coverage & Type of Risks	**CONTENTS OF ERA AS PART OF EIS/EPRMP For the identified safety risks in column 1**	Remarks/ Specific Scoping Instruction/s	ERA		ERP		Monitoring Plan		REMARKS
			Page	✓	Page	✓	Page	✓	
	Preparedness should also consider natural hazards to the infrastructures and facilities. For EPRMP, present actual Emergency Response Policy,record of drills and recorded events.								
☑ Physical Risks (Failure of Structure w/c could endanger life, property and/or the environment)	☑ Description of conditions, events and "trigger" which could be significant in bringing about identified physical risks ☑ Description & assessment of the possible accident scenarios posing risk to the environment ☑ Description of the hazards both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the failure of structure, as applicable								

Noted By:	Signature		Signature
Review Committee Members		**EMB Representatives**	
1. Dr. Maria Lourdes Moreno		1. Engr. Carlo Vic Arida, EnP	
2. Dr. Edmundo Vargas		2. Engr. Joel G. Polintan	
3. Engr. Emiterio Hernandez		3. Mr. Carl Louie Santiago	
4. Dr. Soledad Natalia Dalisay		**Project Proponent:**	
Internal Reviewer		1. Atty. Fernando Soriano	
1. Engr. Cesar Siador, Jr.		**Project Preparer/Consultant:**	
2. Engr. Nicanor Mendoza		1. Dr. Edgardo Alabastro	
Resource Person			
1. Engr. Elizabeth S. Mendoza			
2. Ms. Aida Esguerra			
3. Ms. Sandra Victoria R. Arcamo			

☐ 1st ☐2nd ☐3rd ___ th Screening

During scoping: Check (✓) required/applicable items; items with ✓ are automatically required; write specific instructions (if any) on the blanks/spaces provided.			✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP						
Level of Coverage & Type of Risks	**CONTENTS OF ERA AS PART OF EIS/EPRMP For the identified safety risks in column 1**	Remarks/ Specific Scoping Instruction/s	ERA		ERP		Monitoring Plan		REMARKS
			Page	✓	Page	✓	Page	✓	
	Preparedness should also consider natural hazards to the infrastructures and facilities. For EPRMP, present actual Emergency Response Policy,record of drills and recorded events.								
☑ Physical Risks (Failure of Structure w/c could endanger life, property and/or the environment)	☑ Description of conditions, events and "trigger" which could be significant in bringing about identified physical risks ☑ Description & assessment of the possible accident scenarios posing risk to the environment ☑ Description of the hazards both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the failure of structure, as applicable								

Noted By:	Signature		Signature
Review Committee Members		**EMB Representatives**	
1. Dr. Maria Lourdes Moreno		1. Engr. Carlo Vic Arida, EnP	
2. Dr. Edmundo Vargas		2. Engr. Joel G. Polintan	
3. Engr. Emiterio Hernandez		3. Mr. Carl Louie Santiago	
4. Dr. Soledad Natalia Dalisay		**Project Proponent:**	
Internal Reviewer		1. Atty. Fernando Soriano	
1. Engr. Cesar Siador, Jr.		**Project Preparer/Consultant:**	
2. Engr. Nicanor Mendoza		1. Dr. Edgardo Alabastro	
Resource Person			
1. Engr. Elizabeth S. Mendoza			
2. Ms. Aida Esguerra			
3. Ms. Sandra Victoria R. Arcamo			

☐ 1st ☐2nd ☐3rd ___ th Screening

4. Ms. Marla Clarisol Agas			
5. LCDR CLARIZA B DOMINGUEZ PCG			
6. Ms. Jane Galleto			

☐ 1st ☐2nd ☐3rd ___ th Screening

ANNEX ES-B

SWORN STATEMENT OF ACCOUNTABILITY OF THE PROPONENT

This is to certify that all the information and commitments in this Environmental Impact Statement (EIS) Report for the **PROPOSED 286.86 HECTARE PARANAQUE RECLAMATION PROJECT** are accurate and complete to the best of our knowledge, and that an objective and thorough assessment of the Project was undertaken in accordance with the dictates of professional and reasonable judgment. Should I/we learn of any information, which would make this Environmental Impact Statement (EIS) Report inaccurate, I shall immediately bring the said information to the attention of DENR-EMB.

I hereby certify that no DENR-EMB personnel was directly involved in the preparation of this **PROPOSED 286.86 HECTARE PARANAQUE RECLAMATION PROJECT** Report other than to provide procedural and technical advice consistent with the guidelines in the DAO 03-30 Revised Procedural Manual.

I hereby bind myself to answer any penalty that may be imposed arising from any misrepresentation or failure to state material information in this Environmental Impact Statement (EIS) Report.

In witness whereof, I hereby set my hand this AUG 2 0 2019 day of ______ at PARAÑAQUE CITY.

FERNANDO C. SORIANO
OIC - City Administrator
City Government of Paranaque

SUBSCRIBED AND SWORN TO before me this AUG 2 0 2019 day of ______ 2019, affiant exhibiting his/her Community Tax Certificate No. ______ issued at ______ on ______.

Doc. No. 290
Page No. 47
Book No. III
Series of 2019

Elena P. Tec-Rodriguez
ATTY. ELENA P. TEC-RODRIGUEZ
NOTARY PUBLIC
UNTIL DECEMBER 31, 2020
PTR NO. 1705947
ISSUED ON 01-03-19 AT PQUE. CITY
IBP OR NO. 047518
ISSUED ON 01-03-19 AT PASIG CITY
ROLL OF ATTORNEY NO. 31898

PARAÑAQUE CITY GOVERNMENT
FOCUS GROUP DISCUSSION (FGD) REPORT
PROPOSED PARAÑAQUE RECLAMATION PROJECTS
ALONG COAST OF MANILA BAY IN THE TERRITORIAL JURISDICTION OF THE CITY OF PARAÑAQUE

1.0 Date and Venue / Objectives

The Focus Group Discussion (FGD) Report for the Project was conducted on 16 July 2018 at Parañaque City Hall.

2.0 Basis for selection of Participants

As provided in DENR Administrative Order No. 2017-15 on Guidelines on Public Participation under the Philippine Environmental Impact Statement (EIS) System Section 5.2 “At the minimum, the following groups shall be the audience of the IEC

a) Local government units in areas where all project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken
b) Government agencies with related mandate on the type of project and its impacts.
c) Interest groups (NGOs/POs) preferably those with mission/s specifically related to the type of impacts of the proposed undertaking/project
d) households, business activities, industries that will be displaced
e) people whose socio-economic welfare and cultural heritage are projected to be affected by the project especially vulnerable sectors and indigenous populations
f) local institutions (schools, churches, hospital)”

3.0 Invitations

Formal written invitation was issued and received before the scheduled date. A sample invitation letter is attached in **Annex 1.0** and the Official list of invitees is provided in **Annex 2.0.**

4.0 The Focus Group Discussion (FGD) started at 9:30 a.m. on 16 July 2018. The attendance sheet is given in **Annex 3.0** showing a total of 49 participants.

5.0 The session was moderated by the EIA preparer representative **Ms. Maria Catherine Rontos.** And It was formally opened through an opening remarks conducted by **City Administrator Atty. Ding Soriano.** Project details and environmental aspects were presented and discussed by the EIA preparer **Ms. Jean Ravelo**. Shown in **Annex 4.0** is the copy of the power point presentation.

6.0 The presentation was followed by an Open Question and Answer Session as recorded in a Summary Matrix Format in **Annex 5.0**.

7.0 Photographs of the Focus Group Discussion are shown in **Annex 6.0**.

ANNEX 1.0. SAMPLE INVITATION LETTER

Republic of the Philippines
CITY OF PARAÑAQUE

Office of the Mayor

5 July 2018

MR. ERNESTO M. PERNIA
Director General
National Economic and Development Authority
No. 12 St. Jose Maria Escriva Drive,
Ortigas Center, Pasig City
Trunkline: +63 631 0945 – 56
Email: KM@neda.gov.ph

Subject: Invitation to Focus Group Discussion on **Proposed Paranaque Reclamation Projects**

Dear **DIRECTOR PERNIA:**

In compliance with a prerequisite for an application for an Environmental Compliance Certificate (ECC) which we will be filing for the above-captioned projects, we wish to invite you to a Focus Group Discussion (FCG) on Monday, July 16, 2018 from 8:00AM to 12:00 Noon, to be held at the 2/F Legislative Building Session Hall, Parañaque City Hall, Hernandez Avenue, SAV 1, Barangay San Antonio, Parañaque City.

We have asked our Consultant, Technotrix Consultancy Services Inc. (TCSI) to coordinate with us in assuring full stakeholders' participation.

We trust that you will favour us with this request.

By the Authority of the Honorable
Mayor **EDWIN L. OLIVAREZ:**

FERNANDO C. SORIANO
OIC – City Administrator

cc. Technotrix Consultancy Services, Inc. (TCSI)
Environmental Impact Assessment (EIA) Preparer)

Republic of the Philippines
CITY OF PARAÑAQUE

Office of the Mayor

5 July 2018

ATTY. JANILO E. RUBIATO
General Manager and Chief Executive
PHILIPPINE RECLAMATION AUTHORITY (PRA)
27/F Legaspi Towers 200, Paseo de Roxas St., Legaspi Village, Makati City
02-817-4711

Subject: Invitation to Focus Group Discussion on **Proposed Paranaque Reclamation Projects**

Dear Atty. Rubiato:

In compliance with a prerequisite for an application for an Environmental Compliance Certificate (ECC) which we will be filing for the above-captioned projects, we wish to invite you to a Focus Group Discussion (FCG) on Monday, July 16, 2018 from 8:00AM to 12:00 Noon, to be held at the 2/F Legislative Building Session Hall, Parañaque City Hall, Hernandez Avenue, SAV 1, Barangay San Antonio, Parañaque City.

We have asked our Consultant, Technotrix Consultancy Services Inc. (TCSI) to coordinate with us in assuring full stakeholders' participation.

We trust that you will favour us with this request.

By the Authority of the Honorable
Mayor **EDWIN L. OLIVAREZ:**

FERNANDO C. SORIANO
OIC – City Administrator

Cc: Technotrix Consultancy Services, Inc. (TCSI)
Environmental Impact Assessment (EIA) Preparer)

ANNEX 2.0. LIST OF INVITEES

1. MS. JACQUELINE A. CAANCAN, CESO V
OIC-Regional Executive Director
DENR- NATIONAL CAPITAL REGION
National Ecology Center Compound
East Avenue, Diliman, Quezon City

2. **ATTY. JANILO E. RUBIATO**
General Manager and Chief Executive
PHILIPPINE RECLAMATION AUTHORITY (PRA)
27/F Legaspi Towers 200, Paseo de Roxas St., Legaspi Village, Makati City

3. **ATTY. DOMINGO M. CLEMENTE, JR.**
Regional Director
DENR-EMB NCR
NATIONAL ECOLOGY CENTER COMPOUND
East Ave., Diliman, Quezon City

4. **DR. MARIA MAGDALENA M. LIM**
Division Superintendent
Division of City Schools, Parañaque
DEPARTMENT OF EDUCATION (DEPED)
Parañaque Central School, Kabihasnan St., San Dionisio
Parañaque City 1700

5. **DR. MARGARITO B. MATERUM**
Division OIC
Division of City Schools, Parañaque
DEPARTMENT OF EDUCATION (DEPED)
Parañaque Central School, Kabihasnan St., San Dionisio
Parañaque City 1700

6. **MR. JAY DANIEL R. SANTIAGO**
General Manager
PHILIPPINE PORTS AUTHORITY (PPA)
PPA Corporate Bldg. Bonifacio Drive, South Harbor, Port Area, Manila 1018, Philippines

7. **ADMIRAL ROBERT EMPEDRAD, AFP**
Flag Officer in Command (FOIC)
PHILIPPINE NAVY
Naval Station Jose V. Andrada
#2335 Roxas Boulevard, Manila

8. **MS. AIMEE GONZALES**
Executive Director
PARTNERSHIP IN ENVIRONMENTAL MANAGEMENT FOR THE SEAS OF EAST ASIA (PEMSEA)
DENR Compound, Diliman, Quezon City

9. **MR. JEFFREY C. LIM**
Director and President
SM Prime Holdings, Inc.
10th Floor, Mall of Asia Arena Annex Building, Coral Way, Pasay City

10. **DR. RENATO U. SOLIDUM, JR.**
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY (PHIVOLCS)
PHIVOLCS Building, C.P. Garcia Avenue, U.P. Campus, Diliman
Quezon City, Philippines

phivolcs_mail@phivolcs.dost.gov.ph

11. **MR. JAIME "JOEY" C. MEDINA**
General Manager
LAGUNA LAKE DEVELOPMENT AUTHORITY (LLDA)
4/F Annex Bldg., Sugar Regulatory Administration (SRA) Compound
North Ave., Diliman, Quezon City

12. **MR. JOSE ANGELITO PALMA**
President, World Wildlife Fund
WWF-PHILIPPINES HEADQUARTERS
4th Floor JBD Plaza #65 Mindanao Avenue
Barangay Bagong Pag-asa, Quezon City
1105 Philippines

13. **THE UNITED ARCHITECTS OF THE PHILIPPINES**
UAP Building, 53 Scout Rallos Street, Barangay Laging Handa
Diliman 1103 Quezon City, Philippines

14. **DIRECTOR CRISANTA MARLENE P. RODRIGUEZ**
OIC Director
Biodiversity Management Bureau
Department of Environment and Natural Resources
Ninoy Aquino Parks and Wildlife Center
Diliman, 1100 Quezon City
Philippines

15. **MS. MARLYNN M. MENDOZA**
Division Chief
Coastal and Marine Protection
Biodiversity Management Bureau
Department of Environment and Natural Resources
Ninoy Aquino Parks and Wildlife Center
Diliman, 1100 Quezon City
Philippines

16. **ARCHITECT JUN PALAFOX**
Palafox & Associates
5/F PCCI Corporate Center, 118 L.P. Leviste Street,
Salcedo Village, Makati City

17. **CLIMATE CHANGE COMMISSION**
Bulwagan Ninoy
Ninoy Aquino Parks and Wildlife,
North Avenue, Quezon City

18. **MR. ERNESTO M. PERNIA**
Director General
National Economic and Development Authority
No. 12 St. Jose Maria Escriva Drive,
Ortigas Center, Pasig City

19. **MR. MELVIN B. NAVARRO**
Regional Director
Department of Public Works and Highways
2nd Street, Port Area, Manila

20. **COMMODORE EDUARDO B. GONGONA**
Director
BUREAU OF FISHERIES AND AQUATIC RESOURCES (BFAR)
PCA Bldg. Diliman
Quezon City

21. **THE MARINE SCIENCE INSTITUTE**
University of the Philippines
Velasquez St.
Diliman, Quezon City 1101
Philippines

22. **JEREMY BARNS, CESO III**
DIRECTOR IV
NATIONAL MUSEUM OF THE PHILIPPINES
P.Burgos Drive, Rizal Park, Manila

23. **NOEMI A. PARANADA**
Regional Director for Environment
Region IV-A CALABARZON
1515 L&S Building DENR by the Bay,
Roxas Boulevard. Ermita, Manila

24. **MARIA SOCORRO A. ABU**
OIC-Regional Director for Environment
Region IV-B MIMAROPA
1515 L&S Building DENR by the Bay,
Roxas Boulevard. Ermita, Manila

25. **DR. RENE R. ESCALANTE**
Chairman
NATIONAL HISTORICAL COMMISSION OF THE PHILIPPINES (NHCP)
NHCP Building, T.M. Kalaw St., Manila, 1000

26. **MR. DANILO DELAPUZ LIM**
Chairman
METROPOLITAN MANILA DEVELOPMENT AUTHORITY (MMDA)
Epifanio de los Santos Avenue (EDSA) corner Orense Street, Guadalupe, Makati

27. **COMMODORE ELSON E. HERMOGINO**
Commandant
PHILIPPINE COAST GUARD (PCG)
139 25TH St. South Harbor, Port Area

28. **MS. BERNADETTE ROMULO PUNO**
Secretary
DEPARTMENT OF TOURISM (DOT)
The New DOT Building, 351 Senator Gil Puyat Avenue, Makati City

29. **MSGR. ALLEN C. AGANON**
SAINT ANDREW CATHEDRAL
Quirino Ave., La Huerta, Parañaque City, Metro Manila

30. **SAN DIONISIO CREDIT COOPERATIVE**
544Quirino Avenue, San Dionisio, Paranaque City
826-1055, 826-6726

sdcreditcoop@yahoo.com

31. **PARAÑAQUE CITY COLLEGE**
Brgy. Sto, Nino Parañaque City

32. **STO. NIÑO ELEMENTARY SCHOOL**
Ibayo Town Center, 8301 J.P. Rizal, Sto. Nino, Parañaque, 1704 Metro Manila

33. **MR. LORETO TAYO**
President
KAINGIN TRICYCLE OPERATOR & DRIVERS ASSOCIATION PARAÑAQUE CITY (KATODA)
Paranaque City

34. **PARAÑAQUE SCIENCE HIGH SCHOOL**
Col.E.L.De Leon, Parañaque, Metro Manila

35. **UNIFIED MARKETING AND SERVICES COOPERATIVES OF PARAÑAQUE FISHERMANS WHARF Paranaque City**

36. **SOCIETY FOR THE CONSERVATION OF PHILIPPINES WETLANDS, INC.**
Unit 208 Grand Emerald Tower, F. Ortigas Ave. corner Garnet St., Ortigas Center, Pasig City,

37. **VILLAR SIPAG**
C5 Extension Road
Pulanglupa Uno
Las Piñas City, Philippines 1740

38. **SENATOR CYNTHIA A. VILLAR**
Senate Office: Rm. 503 GSIS Bldg., Financial Center, Diokno Blvd., Pasay City
Trunk Lines: (632) 552-6601 local nos. 6508 to 6511
Direct Line: (632) 552-6715
Telefax No.: (632) 552-6734
Email: sencynthiavillar@gmail.com

39. **DEPARTMENT OF FOREIGN AFFAIRS**
Office of Consular Affairs
Bradco Avenue, cor. Macapagal Boulevard Aseana Business Park, Barangay Tambo
Parañaque 1714 Metro Manila

40. **SEC. ALAN PETER S. CAYETANO**
Secretary
DEPARTMENT OF FOREIGN AFFAIRS (DFA)
2330 Roxas Blvd. Pasay City

41. **PARAÑAQUE NATIONAL HIGH SCHOOL**
Dimasalang, Baclaran, Parañaque, 1702 Kalakhang Maynila

ANNEX 3.0. ATTENDANCE SHEETS

FOCUS GROUP DISCUSSION

NAME OF PROJECT: Proposed Parañaque Reclamation projects

PROJECT PROPONENT: City of Parañaque

16 July 2018, Monday - Parañaque City Hall

NAME	AFFLIATION / OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
1. Carmen Guevarra	Oceans [illegible] MPC	09272978265		[signature]
2. FLOYD PERRY C. FERRER	PALABA MPC	09052611712		[signature]
3. JAIME C GARCIA	PALABA MPC			[signature]
4. JAIME C. GUTIERREZ	PALABA MPC			[signature]
5. GUADALUPE OWENS	Palaba MPC	0999470015?		[signature]
6. TESSIE J. Balbastro	Unified [illegible]	0915-026895?		[signature]
7. MARLYN GUTIERREZ	PFT-MPC - UMSC	09474380921		[signature]
8. ALEX D. CASANTUSAN	PPA	09063710437		[signature]
9. LCDR JOSEPH CONLU PN	TNCEO, PHL. NAVY	0927850015		[signature]
10. RODRIGO C. GAVINO	DFA			[signature]
11. BOB Y. REYES	DFA	09217101080	boyreyes@yahoo.com	[signature]
12. PRINCESS MERCADO	NE 101	09177769704		[signature]
13. Mila Jean Dela Cruz	Pandan Coop	09169758457	jhing.quela@yahoo.com	[signature]
14. VIVIAN ALCANTARA	SDCC	0918-2764247		[signature]
15. Jeanette U. Gamboa	San Dionisio Credit Coop	09178001014	jannygamboa@yahoo.com	[signature]
16. Cielito L. Garrido	San Dionisio Credit Coop	09173277768		
17. ARNOLD B. VILLEGAS	PPA		abvillegas@ppa.com.ph	[signature]
18. ALBERT T. TAYABAS	PPA		attayabas@ppa.com.ph	[signature]
19. JOSEPH M BORGONIA	KASAMPA MPC	09215607938		[signature]
20. Myrna M. Rodriguez	DPWH-NCR	304 38 81		[signature]
21. Morena S. Moraleda	Manila Bay Marketing Coop	09464280393	monnamoraleda@yahoo.com	[signature]
22. Ikagami S. Cruz	Oceania Gold	09201237432		[signature]
23. Mabel Maria Barte	ASAP			[signature]
24. ARMI CORPUZ	Office of Sen. Villar	09175203252	armicorpuz@yahoo.com	[signature]

NO to Reclamation

NO TO RECLAMATION

FOCUS GROUP DISCUSSION

NAME OF PROJECT: Proposed Parañaque Reclamation Projects

PROJECT PROPONENT: City of Paranaque

July 2018, Monday · Parañaque City Hall

NAME	AFFLIATION / OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
1. DR. NELSON A. SILVA	PCC	[illegible]	neal_silva[illegible]	
2. Conita Tayo	Kotoda	09075254300	Kaangon	
3. LAMBILLA F Remy	" "	09078086453	" "	
4. Mating y Roberto	" "		" "	
5. ~~Engr~~ MA. TERESA QUIBAL	CENRO	8266147	cenro.quiacio@gmail.com	
6. MADELINE ESCOMAL	PRA	8771714	info@pea.gov.ph	
7. Elizabeth S. Mendoza	PRA	09175815038	"	
8. LORRAINE MATANGUIHAN	PRA	09177197750	l.matanguihan@yahoo.com	
9. RACHELLE M. GUMATANG	PRA	459-5000	mtv@pra.gov.ph	
10. PINEDA MARK JOHN	PRA	459-5000	mjdpineda@pea.gov.ph	
11. YD FIEL	MMDA	8820926	yolandafiel06@yahoo.com.ph	
12. RUSSELL MOLETA	"	8820926	russell[illegible]@yahoo.com	
13. ARMAN CALOCOR	KATODA		KATODA	
14. Conchita Camposano	PaHWA	09362376639		
15. Federico C. Diño	STP COOP	09667136066		
16. MYRNA N. QUINTO	Hanggahan	09983028967		
17. Yolanda Tarres	PFW Katarungan	09296583900		
18. MARGARITO B. MATEMAN	DEPED-Parañaque	09778232125		
19. WALTON P. LUGO	SSO	09355564836	MOONWALK	
20. RENATO L. YUMANG	PPA	09228447606	renato_y@yahoo.com	
21. RAYMOND CALMA	PIO / MAYORS	0915-4496274	calma[illegible]@yahoo	
22. RAMIR JULIUS C. PETRONICE	MMDA-SWMO	09473610709		
23. ARON RAVEN L. PALMA	MMDA-SWMO	09754994978	raven_ay.c	
24. Ma. Cristina B. Dinglasan	Vice mayor's / City Council	09976013129	cristinadinglasan@yahoo.com	
25. CECIL R. Gallardo	L.A	09982299857		

ANNEX 4.0. POWERPOINT PRESENTATION

FOCUS GROUP DISCUSSIONS (FGDs)
for the
PROPOSED PARANAQUE RECLAMATION PROJECTS

Along Coast of Manila Bay in the territorial jurisdiction of the City of Parañaque

Date: 16 July 2018
Place: Paranaque City Hall

WELCOME REMARKS

LGU REPRESENTATIVE

RATIONALE FOR THE FGD

MS. JEAN RAVELO
EIA PREPARER

A requirement in application for Environmental Compliance Certificate (ECC) for preliminary identification of sectoral stakeholders who will be invited to attend the Public Scoping Proper; the next prescribed activity

What is PRE-IEC

WHAT OTHER PUBLIC FORA FOLLOW PRE-IEC

- PUBLIC SCOPING (EMB DRIVEN)
- PUBLIC HEARING (EMB DRIVEN)

BASIC PROJECT INFORMATION

Name of Projects	**PROPOSED 300 HECTARE RECLAMATION PROJECT** **AND** **PROPOSED 261 HECTARE RECLAMATION PROJECT**
Location	Along Coast of Manila Bay in the territorial jurisdiction of the City of Parañaque
Nature of Project	Major Reclamation Project ≥ 50 hectares
Size / Scale	300 Hectares 261 Hectares
ECC Status	Being Applied For

PROJECT PROPONENT / EIA PREPARER

ITEM	PROJECT INFORMATION
Project Proponent	**City Government of Parañaque**
Telephone No.	02 (826-8244)
Proponent Address	San Antonio Ave., San Antonio, Parañaque, Metro Manila
EIA Preparer	**Technotrix Consultancy Services Inc.**
Telefax	02 (416-4625)

PROJECT BRIEF

1) Gross Surface Area (at PQE municipal waters) – 261 has. plus 300 has. which may still be reduced slightly due to containment wall design;
2) Proponents for both the 261 has. & 300 has. islands are the PQE LGU and the private sector;
3) Proposed Development includes a cruise ship port at the southern part of the 300 has. island (requiring a turning basin at the northern part of the 261 has. island; and
4) Reclamation Period – Minimum of say 2 years for the 261 has. island.

PROJECT DESCRIPTION

Reclamation of ONE (1) parcel of bay water of **300 hectare** area

Project coverage through HORIZONTAL DEVELOPMENT only

- ✓ Dredging, Transport of Fill Materials
- ✓ Containment Structure
- ✓ Engineered Drainage System
- ✓ Pollution Abatement Facilities
- ✓ Internal and access road networks
- ✓ Access way
- ✓ Street lighting; electrical, water, communications

PROJECT DESCRIPTION

Reclamation of ONE (1) parcel of bay water of **261hectare** area

Project coverage through HORIZONTAL DEVELOPMENT only

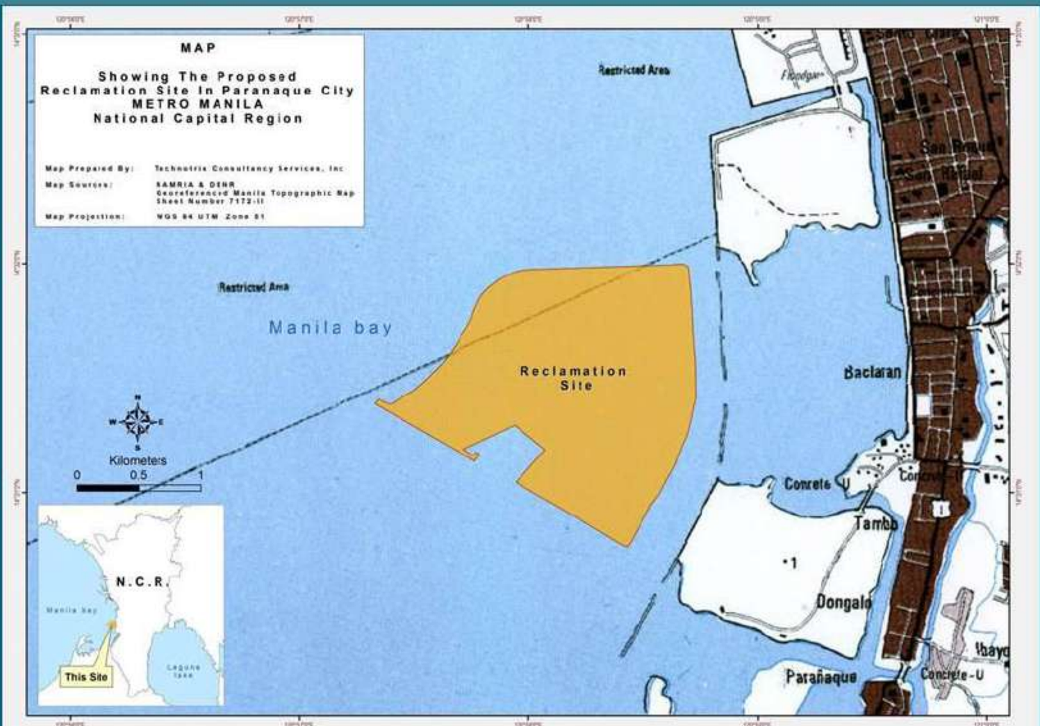
- ✓Dredging, Transport of Fill Materials
- ✓Containment Structure
- ✓Engineered Drainage System
- ✓Pollution Abatement Facilities
- ✓Internal and access road networks
- ✓Access way
- ✓Street lighting; electrical, water, communications

PROJECT RATIONALE

2 PROJECTS: DIFFERENT PRIVATE SECTOR PARTNERS / DIFFERENT TIMELINES

- ✓ Promote well-being of the people of the City of Parañaque in particular of the host Barangay(s)
- ✓ Stimulate commercial growth by providing a basic infrastructure, namely land to government and to investors
- ✓ Land at no cost to government
- ✓ Provide much needed employment and livelihood opportunities to the City
- ✓ Help in decongesting Metro Manila by providing alternative site for commercial/mixed-use property project developments instead of such developments being located inland.

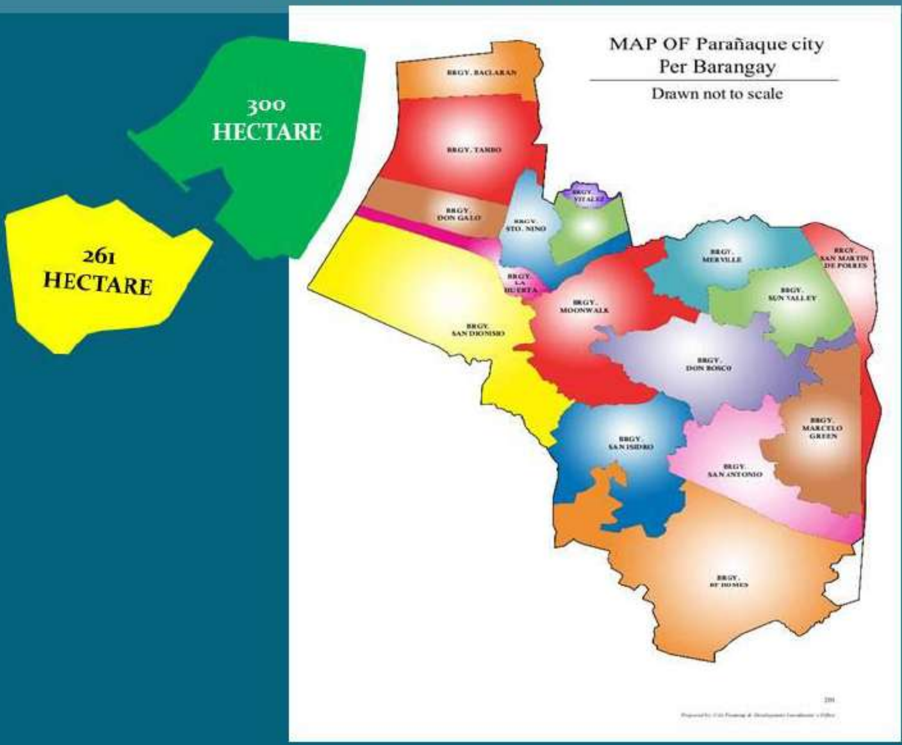
PROJECT SITE (300 HECTARE)



PROJECT SITE (261 HECTARE)

THE PROJECT SITES (300 & 261 HECTARE)

THE PROJECT SITE RELATIVE TO THE BARANGAYS



THE PROJECT SITES & LPPCHEA

PROJECT COMPONENTS (261 HECTARES)

The reclamation will be designed and built for mix-use development. The project components are the following:

- ✓ 1 Island
- ✓ Internal road networks
- ✓ Drainage system
- ✓ Storm surge protection
- ✓ Access way

At this stage of the project cycle, the above components are still subject to firm design.

PROJECT COMPONENTS

Initial Land Use Plan 261 Hectares

PROJECT COMPONENTS (300 HECTARES)

GENERAL CONCEPTS ONLY

For mix-use development. Key components are:

- ✓ 1 Island
- ✓ Internal road networks
- ✓ Drainage system
- ✓ Storm surge protection
- ✓ Access way

At this stage of the project cycle, theabove components are still subject to firm design.

PROCESS AND TECHNOLOGY

- ✓ Dredging at the Reclamation Site to remove unwanted sea bed materials and prepare the sea bed for filling.

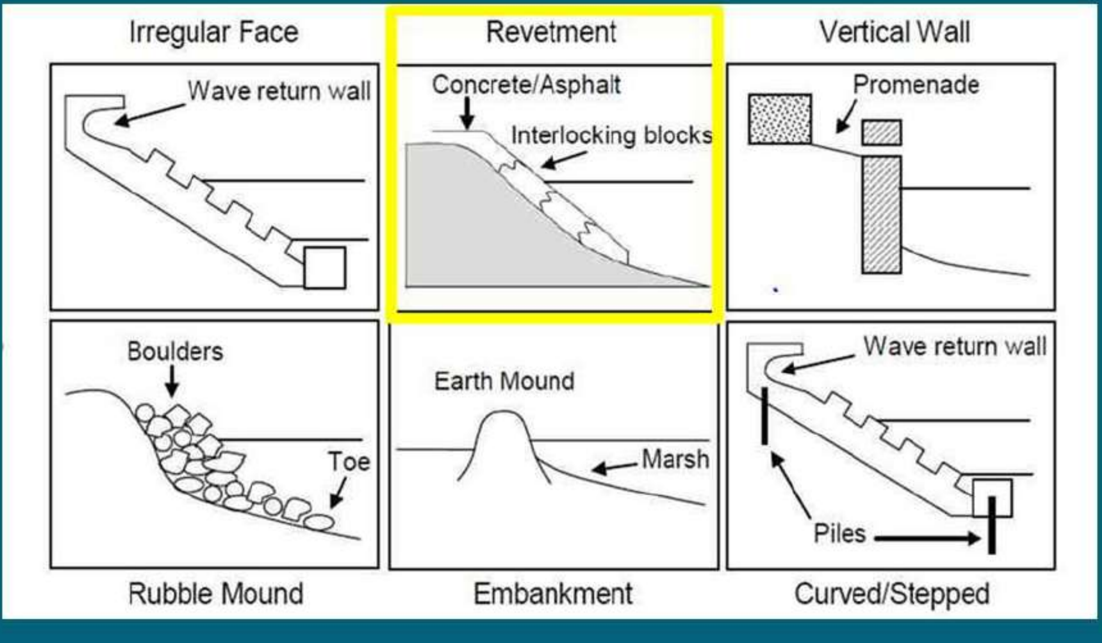
- ✓ Transport of the Dredging Vessel To/From Source of Fill Materials

- ✓ Filling with suitable materials to the finished platform elevation.

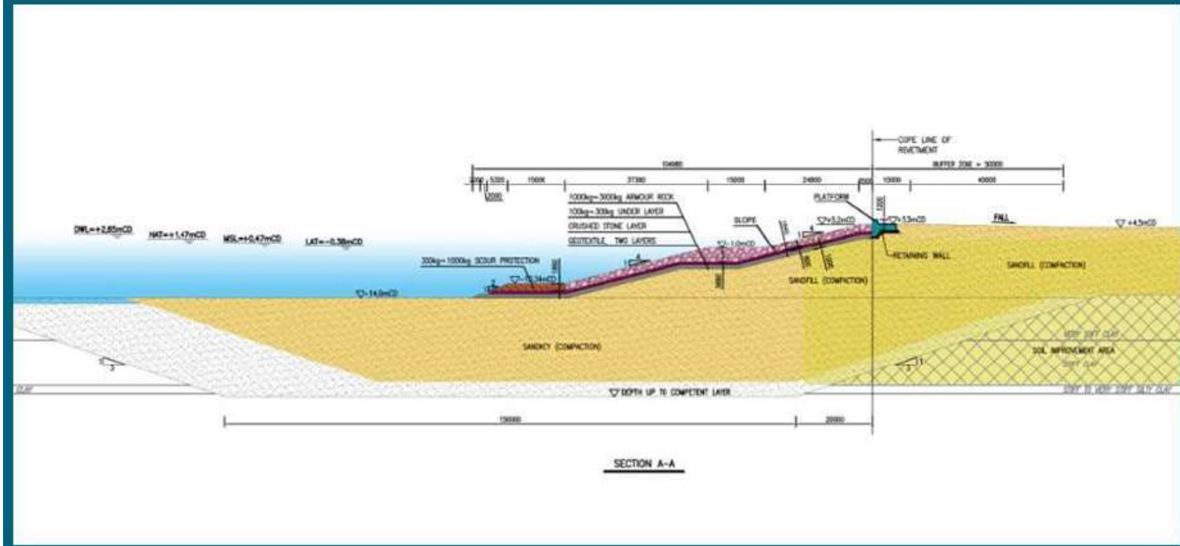
DREDGING AND RECLAMATION ILLUSTRATION ONLY

- Preparation and Dredging of Site
- Transport of TSHD Vessel To/From Source of Fill Materials
- Extraction of sand at the source
- Placement of fills at reclamation site area

CONTAINMENT STRUCTURE – ILLUSTRATION ONLY



CONTAINMENT STRUCTURE BELOW WATER – ILLUSTRATION ONLY



ENVIRONMENTAL ASPECTS

JEAN RAVELO
EIA PREPARER

MANAGING ENVIRONMENTAL ISSUES

- ✓LAND
- ✓WATER
- ✓AIR
- ✓PEOPLE AND PUBLIC HEALTH

CONSTRUCTION / RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Perception of flooding on shore as a result of reclamation	Reclamation itself provides protection against storm surges
	City drainage system not disturbed

CONSTRUCTION / RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Storm surges/waves and flooding on land	Reclamation platform itself with wave deflector gives sheltering effect
Land Subsidence	Caused by underground water extraction which will not be undertaken

CONSTRUCTION / RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Protected Area	Project site not in NIPAs protected area
Aesthetics (Manila Bay Sunset)	Viewing spots not in Paranaque
Ground shaking and liquefaction	Structural and engineering design intercession

CONSTRUCTION / RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Disturbance of marine species/Damage to or impairment of economically significant marine life	Absence of significant marine species at impact areas of project
Silt dispersal/turbidity increase due to sea bed disturbance	Silt curtains and screens, etc.
	Phased construction schedule

WATER CIRCULATION AND CURRENTS BY DESIGN OF ISLAND

CONSTRUCTION / RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Contamination from filling materials	Filling materials from Manila Bay Pre Screening
Sea Level Rise	Due to other global climate change not to the reclamation project
Water contamination, e.g. oil leaks, domestic wastes from construction workers	On board vessel oil containment and recovery equipment
	Own temporary toilet facilities. Disposal on land by 3rd parties

CONSTRUCTION / RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Disposal of unwanted dredged materials	Recycle
	Disposal at deep waters Clearances/Permits
Reclamation does not use significant water	Arrangement with concessionaires
	No underground abstraction

CONSTRUCTION / RECLAMATION PHASE

✓AIR

POTENTIAL IMPACT	MITIGATING MEASURES
Noise	Not Significant
Criteria Pollutants discharged by equipment and vehicles	Temporary in nature
	Use quality fuel in equipment and power generating sets

OPERATIONS PHASE

✓PEOPLE

Ensure Public Health

OPERATIONS PHASE

✓PEOPLE

SOCIO-ECONOMIC

Increase demand for social services

THANK YOU!

EIA Preparer:

TECHNOTRIX CONSULTANCY SERVICES, INC.
Address: Unit 305 FMSG Bldg., #9 Balete Drive, New Manila, Quezon City
Email: technotrixinc@gmail.com
Tel no: (02)416-4625

ANNEX 5.0. SUMMARY MATRIX OF ISSUES AND CONCERN

Issues/Suggestions Raised by Stakeholder	Issues and Concerns	Response
SDCC	Yung presentation, preparing the area, walang discussion tungkol sa protection ng existing barangays possible effects and mga impacts. Meron ng buong reclamation area na lumubog, mas maganda na ma present ang impact given na yung mga tao. Ibig sabihin walang reclamation, bumabaha na, paano ito ma poproteksyonan? Paano ito nakakasiguro? Hindi pa tayo na hit gaya ng Yolanda kaya dapat ipakita ang existing impact. I present ang negative impacts sa presentation sa previous Public Participation. Sinabi ko na din iyong concern na iyon.	**Ms. Jean:** Sa paunang salita ko, nagsisimula palang tao. Sa ngayon wala pa tayong ginagawa. Sa sinasabing epekto may mga kailangan baguhin gaya ng korte at nag iiba ang epekto sa water circulation either siltation or erosion. At this stage wala pa kaming sagot.
	Sa presentation meron subsidence, yung irereclaim mas may chance ba na pumantay sa existing land? Na experience natin yan sa coastal mall na naipon na naipon ang tubig. Magkakaroon ba ng chance na papantay ang lupa dahil bumibigat ang existing city.	**Ms. Jean:** We assured na yung effect sa coastal barangays at effect sa munisipyo, yun po ng sinasabi kanina na circulation modeling na kailangan sagutin ni Preparer sa EMB. Yun po sabi ko kanina meron pang Public Scoping at Public Hearing. Ang mga aspeto/concerns na kailangan ay kailangan sasagutin sa EMB. Pero para sa chance na para magpantay ang lupa sa existing land, hindi po. **PRA:** Water extraction ang nag cacause ng subsidence, kung hindi mag extract hindi sya bababa. Pero kung magpapantay, hindi.
	Dapat ang "people" ng primary concern at tama ang sinabi ni Sen. Villar, simpleng explanation sa mga tao at sa aming mga nakatira.	**Ms. Jean:** Ipapadating ko po iyan sa Sociologist ng grupo.
	Ang baso lagyan mo ng bato aapaw, so saan pupunta ang pag apaw? Sa ibang lugar? E may tao din naman doon. Mashado tayong marunong. May mga city na hindi na developed. There should be certain stop. Yung Barangay Tambo ang dami pang lugar na hindi pa na developed. Dapat aralain ang epekto sa tao, tingnan maigi ang epekto sa tao at the end of the day mga kapamilya natin ang maaapektuhan. Positive sa development but in the contrary non ay negative impacts.	
	SDCC: Wala bang mag pepresent na walang bias? They are the proponent, as much as they want to objective, wala bang dapat na mas objective na mag present ng two sides (Positive and Negative Impacts)	**Ms. Jean:** As this point pagdating ng Public Scoping ay EMB driven.

Issues/Suggestions Raised by Stakeholder	Issues and Concerns	Response
	ASAP: But we know based from Pasay Reclamation, parang madikit na ang preparer sa DENR. Na hindi na sila nagiging objective meron na silang biases.	**Ms. Jean:** Hindi po ako expert na makakasagot sa mga ganyan. **Atty. Corpus:** Maybe we can ask my boss to have this in Senate discussion. **PRA:** Maybe the main avenue is during the review meeting, the REVCOM can dictate the proponent to address the concern. My process ang securing ng ECC that is the venue na pwedeng I raised.
	DPWH: Pero hindi naman lahat invited?	**Ms. Jean:** Ang Review Committee ay private na tao. For every part of the project, meron sociologist, engineer, mathematician. Ang mga resource peron na iniinvite Example: MBCO, LGU, sa karatig bayan, usually kagaya nito Manila Bay project iniinvite BFAR, Philvocs. **PRA:** REVCOM is medyo limited pero ang area ay Public Scoping at Public Hearing nandon ang REVCOM. Naka published yan sa website nandon din ang REVCOM members.
SDCC	As a suggestion, ang dami pong strategic places, baka pwede po I post so that all affected could really see the schedule and date para they can come at marinig. Ipost po ang scoping at hearing with enough time so people can attend I was expecting na mapupupuno ito para s FGD, sanay ako na kapag FGD pinag uusapan talaga.	**Ms. Jean:** Well noted po.
ASAP	The result of the review, actually parang kinocomply nalng. Parang may approval na.	**PRA:** Public Hearing and Public Scopig wala pang approval, ibabato sa proponent ang mga concerns na I address ang mga ito, pag may mga hindi pa na address pwedeng ma I raise ito sa proponent.
PRA	Tatanggalin ang suitable areas materials within containment wall?	**Engr. Princess:** Yes.
	Sa possibility ng green spaces, dapat may percentage of that. Kasi sa Netherlands marami silang man-made forest, yun ang sinusubukn naming pwedeng gamitin sa reclamation project.	**Ms. Jean:** Noted.
	Strom surge - kailangan I explain sa mga tao what about fluvial flooding. After Yolanda nagkaroon ng fluvial flooding bumaha ang Tacloban, I think you should explain na	**Ms. Jean: Noted.** We assured that we include sa study. Yung fluvial flooding hindi nabanggit kanina na kasama ang sea level rise at effects ng climate change.

Issues/Suggestions Raised by Stakeholder	Issues and Concerns	Response
	considerations of including the "*kinakatakutan ng mga tao*". Possibility of be protected sa reclamation dapat include sa discussion.	
PRA	Ito bang area n irereclaim ay part ng Comprehesive Land Use Plan (CLUP) ng City?	**ASAP:** It is only a proposed kaya alam ko na hindi pa pinag aaralan pati documents pati 300, umabot na sa local but for the 261 wala pa.
Atty. Ding Soriano	What is the effect of the proposed project to the existing barangays such as Baclaran, San Dionisio, etc.? Sana magkaroon ng dalawang muka, ngayon palang we are across realization, ano ang impact samin? Para naman guided kame, we have to face the Public Hearing. What are we going to do? Possible impact? Solution?	**Ms. Jean:** Noted.
Myrna Rodriguez **DPWH NCR**	Purpose ng discussion ay IEC lang at supposed to be sino ang invited sa Public Scoping. Sana sa sususnod invite ang DENR dhil sa Mandamus lalo na sa LPPCHEA, committee on environment sa senate.	**Ms. Jean:** Noted.
	Sa presentation, sa amenities may drainage. How about the Black and Gray water? Dapat kasama ang sewer and sewerage system. Introduce treatment plant, yun po ang problem wala silang area for water treatment.	**Ms. Jean:** Yung waste water treatment actually required po sya isama at kailangan pag aralan kasama din po na hiwalay si sweage sa storm water sewage. Dapat wala po itapon na madumi.
Dr. Joseph Carabeo **Archdiocese**	Ang presentation ay parang ok Ing. Reclamation is permanent. All the TCSI walang updated na study sa Manila Bay. Meron nagsabi dati na walang isda. We do not have damn good study sa Manila Bay. Ang ginagawa na reclamation y dobleng ilang hectares ang kukunin. Walang isda? Walang corals? Ang daming studies sa land conversion, baka sa susunod imported na ang isda. Ganon nalang ba ang pagtinggin ang daming kulang, not single study wala pa.	**Ms. Jean:** Sa ganitong stage palang magkakaiba ang view, mapa laymanized o scientific magkaib ang kuro-kuro khit s EIS na proseso magakakaiba. Hindi pwedeng geologist lang dapat may mga sociologist. At tama po kaysa mga engineering solutions ang pag aralan at solution dapat. Ganon din po tayo sa ECC hindi pwede positibo o negatibo. Ang people ay walang engineering solution pang apat po sya n component pero hindi pang huli.
	Massive reclamation ang tingin natin. Reclamation is the last resort not the first resort. Walang na factor na environmental cause and social cause na maaapektuhan. We demand before ang project ay mag based sa karanasan hindi sa magtutuldok sa mga negosyante. As if engineering solution can be a solution to poverty.	

Issues/Suggestions Raised by Stakeholder	Issues and Concerns	Response
	Sana bago mag consultation ay ma furnished ng copy para lumawak dahil my mga experts na magakakaiba ang posisyon at meron mga resource persons.	
Atty. Corpus **Office of Senator Cynthia Villar**	It was mentioned that there was a concern because it is very near in LPPCHEA. RA 11038, LPPCHEA is officially a Protected Area. Ibig sabihin all residents of Manila ay dapat protektahan. Dapat ang ipresnt na this area is no to reclamation. Kasi baka ang Technotrix ang technical expert sa reclamation. Manila bay is within the buffer zone.	**Ms. Jean:** Yes Maam, we assured that we will put that on record.
	Indicate that the whole Manila Bay should have a presentation in the Public Scoping. Manila bay covers 16 cities and municipalities. Sa usapin ng reclamation all cities and munciipalities should be part of the Public Scoping. Maraming naka depend sa Manila Bay.	
PPA	In the presentation hindi na discuss ang means and bounds (boundary) ng project. Pwede bang maisama ang coordinates ng means and bounds ng reclamation.	**Ms. Jean:** Ang Philippine Coast Guard ay invited, sisiguraduhin po namin na makakausap ang Philippine Coast Guard.
	San itatapon ang unsuitable materials? Ang diposal nyo ay within or outside Manila Bay? Suggest that you invite Philippine Coast Guard para mapag aralan saan ang unsuitable materials.	

ANNEX 6.0. PHOTOGRAPHS DURING THE FGD

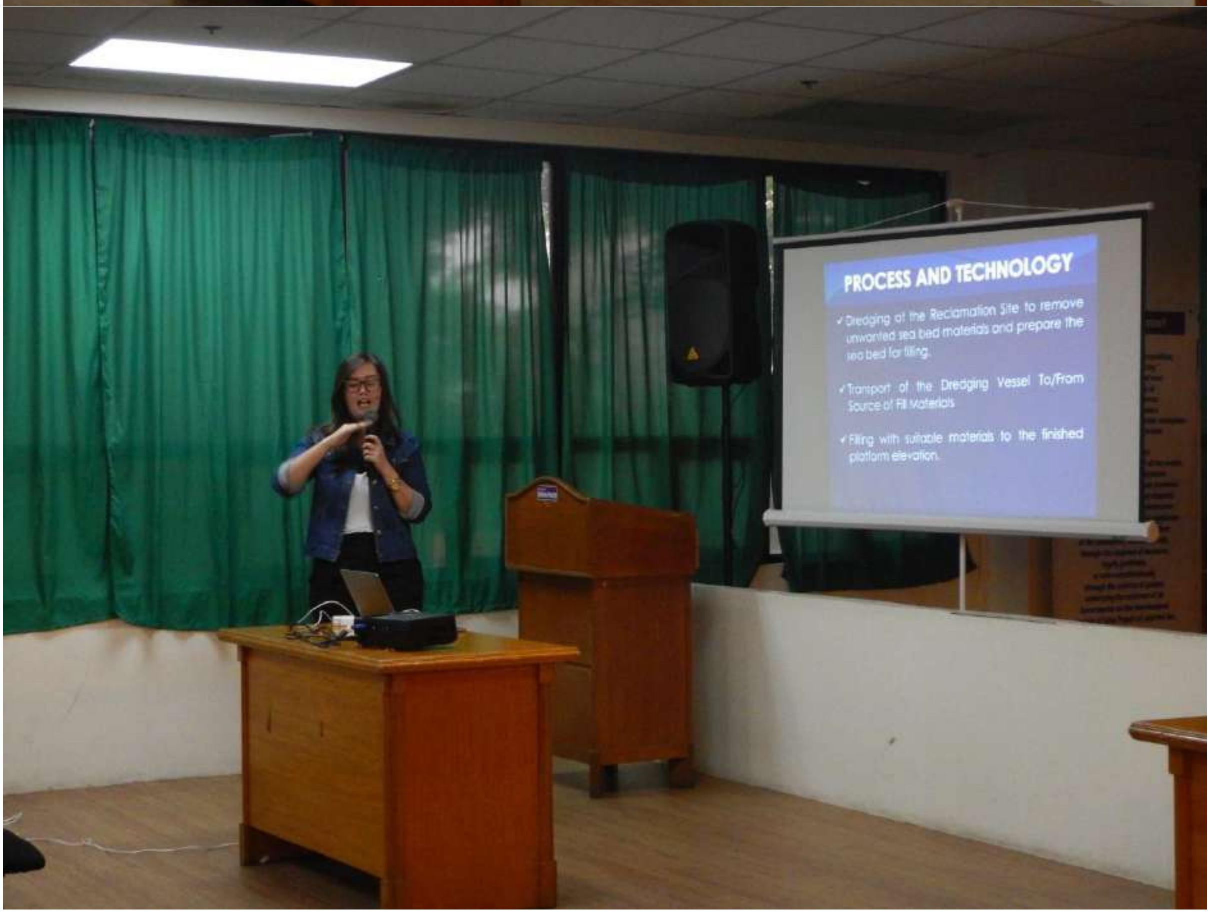

EXIT


EXIT


FOCUS GROUP DISCUSSIONS
(FGDs)

\\\\]


ENVIRONMENTAL ASPECTS
JEAN RAVELO
EIA PREPARER


PROCESS AND TECHNOLOGY
Dredging of the Reclamation Site to remove unwanted sea bed materials and prepare the sea bed for filling.
Transport of the Dredging Vessel To/From Source of Fill Materials
Filling with suitable materials to the finished platform elevation.

Annex C: Materials for Public Scoping

Sample Public Scoping Invitation

DENR LETTERHEAD

(DATE)

HONOURABLE MAYOR EDWIN L. OLIVAREZ
City Mayor
Parañaque City Hall Building
San Antonio Ave, San Antonio, Parañaque, Metro Manila

Dear **Honourable Mayor Olivarez:**

In connection with the **PROPOSED PARAÑAQUE RECLAMATION PROJECTS** to be located along the coast of Manila Bay under the territorial jurisdiction of the City of Parañaque, we wish to cordially invite you to attend and deliver the Welcome Remarks in the **Public Scoping** on the following date, time and place:

Date :
Time : **8:30 a.m. (start of registration); 9:00 a.m. (program proper)**
Place :

As provided in DENR Department Administrative Order No. 2003 – 30 as amended, this Public Scoping will be conducted to define the range of actions, alternatives and impacts for / of a Project that are to be examined in an Environmental Assessment Report. It is a formal step governed by guidelines and requiring documentation of outcomes under the regulatory system of Environmental Impact Assessment (EIA). Scoping provides an early link between the DENR and the proponent, and more importantly with the affected communities, so as to ensure that the EIA addresses relevant issues and presents results in a form consistent with the regulatory review requirements.

Attached is the proposed Program for your reference.

Should you have any questions, please contact the Environmental Impact Assessment and Management Division (EIAMD) of this Office at Tel. Nos. (02) 931-2397 OR (02) 931-2954 look for the project case handlers XXXXXX and XXXXXX.

We hope you and/or your authorized representative can attend this important meeting.

Thank you.

Sincerely yours,

ATTY. MICHAEL DRAKE MATIAS
Chief, EIAM Division

Intial List of Invitees

LIST OF INVITEES

1. **HONORABLE MAYOR EDWIN OLIVAREZ**
   San Antonio Valley 1
   Parañaque City

2. **HONORABLE VICE MAYOR RICO GOLEZ**
   San Antonio Valley 1
   Parañaque City

3. **PARAÑAQUE CITY COUNCIL**
   San Antonio Valley 1
   Parañaque City

4. **CITY PLANNING & DEVELOPMENT OFFICE**
   San Antonio Valley 1
   Parañaque City

5. **CITY ENGINEER**
   San Antonio Valley 1
   Parañaque City

6. **CITY TRAFFIC MANAGEMENT OFFICE**
   San Antonio Valley 1
   Parañaque City

7. **MS. DONNA MAYOR- GORDOVE CESO IV**
   Manila Bay Coordinating Office
   DENR Building, Visayas Avenue, Diliman, Quezon City, 1100, Metro Manila
   Tel. No. 928-1225
   Trunkline 929-6626 local 2102
   www.themanilabay.com

8. **MS. JACQUELINE A. CAANCAN, CESO V**
   OIC, Regional Director
   DENR-National Capital Region
   Nursery Compound, North Avenue, Diliman, Quezon City
   Tel No. 373-34-33

9. **ATTY. DOMINGO M. CLEMENTE**
   Regional Director
   DENR-EMB NCR
   National Ecology Center Compound
   East Avenue, Diliman, Quezon City

10. **ATTY. JANILO E. RUBIATO**
    General Manager and Chief Executive
    Philippine Reclamation Authority (PRA)
    7th Floor, Legaspi Towers 200 Bldg, 107
    Paseo de Roxas Street, Legaspi Village
    02-817-4711

11. **ATTY. MICHAEL DRAKE MATIAS**
    Chief, EIAMD
    DENR -EMB Central Office

12. **COMMODORE ILDEFONSO TRONQUED JR.**
    Manila Yacht Club
    2351 Roxas Boulevard, Malate,
    City of Manila, Metro Manila 1000

13. **MR. JAY DANIEL R. SANTIAGO**
    General Manager
    PHILIPPINE PORTS AUTHORITY
    PPA Corporate Bldg. Bonifacio Drive, South Harbor, Port Area, Manila 1018, Philippines
    527-4855 or 527-83-56 to 83
    horecords@ppa.com.ph

14. **ADMIRAL RPBERT EMPEDRAD, AFP**
    Flag Officer in Command (FOIC)
    Philippine Navy
    Naval Station Jose V Andrada
    #2335 Roxas Boulevard, Manila
    PLDT Line: +632-524-20-61 to 69

15. **MR. STEPHEN ADRIAN ROSS**
    Executive Director
    Partnership in Environmental Management for the Seas of East Asia (PEMSEA)
    DENR Compound, Diliman Quezon City

16. **SEC. WANDA CORAZON TULFO-TEO**
    Secretary
    Department of Tourism
    The New DOT Bldg., 351 Sen. Gil Puyat Avenue 12.., Makati City
    Tel No. 02-459-5200

17. **Non-Government Organization (NGO's)**
    Accredited with the City of Parañaque

Others:

1. **MS. GEMMA G. CRUZ-ARANETA**
   Chairperson
   Heritage Conservation Society (HCS)
   G/F Museo Pambata Building, Roxas Boulevard, Ermita Manila, Philippines
   Tel. No. +632 353 4494
   Fax No. +632 522 2497

2. **SAVE OUR SUNSET (SOS) MANILA BAY PHILIPPINES**
   https://www.facebook.com/savemanilabay

3. **Mr. JEFFREY C. LIM**
   Director and President
   SM Prime Holdings, Inc.
   10th Floor, Mall of Asia Arena Annex Building, Coral Way, Pasay City

4. **REV. FR. BENITO TUAZON**
   Ministry on Ecology and Commission on Social Services and Development
   The Roman Catholic Archdiocese of Manila
   Caritas Manila Compound
   2002 Jesus St., Pandacan, Manila

5. **ARCHBISHOP LUIS ANTONIO G. TAGLE**
The Archdiocese of Manila
121 Arzobispo St, Intramuros, Manila, Metro Manila
527-3962

6. **DR. RENATO SOLIDUM**
Philippine Institute of Volcanology and Seismology (PHIVOLCS)
PHIVOLCS Building, C.P. Garcia Avenue, U.P. Campus, Diliman
Quezon City, Philippines
phivolcs_mail@phivolcs.dost.gov.ph
+632 426 1468 to 79
+632 929 8366, 927 4524

7. **MR. JAIME "JOEY" MEDINA**
General Manager
Laguna Lake Development Authority (LLDA)
4/F Annex Bldg., Sugar Regulatory Administration (SRA) Compound
North Ave., Diliman, Quezon City
Phone 332-2346

8. **ENGR. EMITERIO HERNANDEZ**
Hydrologist
Laguna Lake Development Authority (LLDA)
4/F Annex Bldg., Sugar Regulatory Administration (SRA) Compound
North Ave., Diliman, Quezon City
Phone 376-4044

9. **MR. JOSE ANGELITO PALMA**
President, World Wildlife Fund
WWF-Philippines Headquarters
4th Floor JBD Plaza #65 Mindanao Avenue
Barangay Bagong Pag-asa, Quezon City
1105 Philippines
Tel: +632 920 79 23/26/31
Fax: +632 426 39 27
Email: kkp@wwf.org.ph

10. **THE UNITED ARCHITECTS OF THE PHILIPPINES**
UAP Building, 53 Scout Rallos Street, Barangay Laging Handa
Diliman 1103 Quezon City, Philippines
Phone (+632) 4126403; 4126364; 4123311; 4120051; 4126394
Fax (632) 3721796
E-mail: uapnational@yahoo.com; uapnational@gmail.com

11. **DIRECTOR THERESA MUNDITA S. LIM**
Protected Area and Wildlife Bureau
Department of Environment and Natural Resources
Ninoy Aquino Parks and Wildlife Center
Diliman, 1100 Quezon City
Philippines
+(63 2) 9246031-35
+(63 2) 9240109
www.pawb.gov.ph
planning@pawb.gov.ph

12. **BRIG. GEN. DANILO DELAPUZ LIM (Ret)**
Chairman
Metro Manila Development Authority (MMDA)
MMDA Bldg., EDSA cor. Orense St., Guadalupe, Makati City
Directline (632) 882-0854; 882-0893

13. **ARCHITECT JUN PALAFOX**
Palafox & Associates
11th Floor 6782 Ayala Avenue, Makati
(02) 812 1254

14. **MR. ERNESTO M. PERNIA**
Director General
National Economic and Development Authority
No. 12 St. Jose Maria Escriva Drive,
Ortigas Center, Pasig City
Trunkline: +63 631 0945 – 56
Email: KM@neda.gov.ph

15. **MR. MELVIN B. NAVARRO**
Regional Director
Department of Public Works and Highways
2nd Street, Port Area, Manila
Contact No(s).: (02) 304-3910
Fax No.: (02)304-3910
Email: navarro.melvin@dpwh.gov.ph

16. **COMMODORE EDUARDO B/ GONGONA**
Director
BUREAU OF FISHERIES AND ACQUATIC RESOURCES (BFAR)
PCA Compound, Q. C. Elliptical Road, Diliman, Quezon City, 1101 Metro Manila
(929-8074, 929-9597)

17. **<u>DR. FRANCISCO DUQUE III</u>**
Secretay
DEPARTMENT OF HEALTH (DOH)
San Lazaro Compound, Tayuman, Sta. Cruz, Manila

18. **DR. FERNANDO SIRINGAN**
National Academy of Science and Technology
3rd Level Science Heritage Building,
DOST Complex Bicutan,
Taguig City
(632) 837-3170 / 838-7739

19. **CITY OF DREAMS MANILA**
Asean Avenue corner Roxas Boulevard,
Entertainment City, Parañaque 1701,
Manila, Philippines
(632) 800-8080

20. **JEREMY BARNS, CESO III**
DIRECTOR IV
NATIONAL MUSEUM OF THE PHILIPPINES
P.Burgos Drive, Rizal Park, Manila
02-527-1209

22. Office of the President
De La Salle University
14th Floor, Henry Sy, Senior Hall
De La Salle University,
2401 Taft Avenue,
1004 Manila
Tel. 524-1611 loc. 802

23. Office of the President
De La Salle College of St. Benilde
2544 Taft Avenue, Malate Manila
Tel. 230-5100 loc 1801 to 1803

24. DR. RENE R. ESCALANTE
Chairman
NATIONAL HISTORICAL COMMISSION OF THE PHILIPPINES (NHCP)
NHCP Building, T.M. Kalaw St., Manila, 1000
Tel No. +632.536.3181

18. COMMODORE ELSON E. HERMOGINO
Commandant
PHILIPPINE COAST GUARD (PCG)
139 25TH St. South Harbor, Port Area
527-8482 loc. 6291

19. **BIODIVESITY MANAGEMENT BUREAU**
Ninoy Aquino Parks and Wildlife Ceter, Diliman, 2200 Quezon City
02-924-6031

20. **CENTER FOR ENVIRONMENTAL CONCERNS**
175-B Kamias Road, Quezon City, Metro Manila
02-920-9099

28. ATTY. LUTGARDO B. BARBO
Senate Secretary
SENATE OF THE PHILIPPINES

29. SEC. ALAN PETER S. CAYETANO
Secretary
DEPARTMENT OF FOREIGN AFFAIRS (DFA)
2330 Roxas Blvd. Pasay City

--CITY OF MANILA---------------------------------------

01. HONOURABLE MAYOR JOSEPH EJERCITO ESTRADA
City Mayor
Manila City Hall, Arroceros, Manila

02. HONOURABLE VICE MAYOR HONEY LACUNA
City Vice Mayor, Manila
Manila City Hall, Arroceros, Manila

03. MANILA CITY COUNCIL
4th Floor Manila City Hall, Arroceros, Manila

04. CITY ENGINEER
Dept. of Engineering & Public Works

3rd Floor Manila City Hall, Arroceros, Manila

05. CITY PLANNING & DEVELOPMENT OFFICE
3rd Floor Manila City Hall, Arroceros, Manila

06. CITY TRAFFIC & PARKING BUREAU
3rd Floor Manila City Hall, Arroceros, Manila

---LAS PIÑAS CITY ---------------------------

01. HONORABLE MAYOR IMELDA AGUILAR
Alabang Zapote Road, Pamplona Tres
Las Piñas City

02. HONORABLE VICE MAYOR LOUIE BUSTAMANTE
Alabang Zapote Road, Pamplona Tres
Las Piñas City

03. LAS PIÑAS CITY COUNCIL
Alabang Zapote Road, Pamplona Tres
Las Piñas City

------------------------------PASAY CITY---

1. HON MAYOR ANTONINO G. CALIXTO
Pasay City Mayor
Pasay City Hall Building
F.B. Harrison, Pasay City

2. HON. BOYET DEL ROSARIO
PASAY CITY VICE MAYOR
Pasay City Hall Building
F.B. Harrison, Pasay City

3. CITY PLANNING AND DEVELOPMENT COORDINATOR
Pasay City Hall Building
F.B. Harrison, Pasay City

4. CITY ENGINEER
Pasay City Hall Building
F.B. Harrison, Pasay City

5. CITY HEALTH OFFICER
Pasay City Hall Building
F.B. Harrison, Pasay City

6. CITY COUNCILS OFFICE
Pasay City Hall Building
F.B. Harrison, Pasay City

----------------------------Additional Entries----------

15	Society for the Conservation of Philippines Wetlands, Inc.	Unit 208 Grand Emerald Tower, F. Ortigas Ave. corner Garnet St., Ortigas Center, Pasig City,	President	T/F: +63 2 637 2409

		Philippines 1605		
16	Villar Sipag	C5 Extension Road Pulanglupa Uno Las Piñas City, Philippines 1740	President	Tel. No. (632) 551-1871 villar_sipag@yahoo.com.ph

- Residents of Barangay
  - ✓ Baclaran
  - ✓ Tambo
  - ✓ Don Galo
  - ✓ San Dionisio
  - ✓ Sto. Niño
  - ✓ La Huerta
  - ✓ Vitalez
  - ✓ Monnwalk
  - ✓ Merville
  - ✓ Don Bosco
  - ✓ San Isidro
  - ✓ BF Homes
  - ✓ San Antonio
  - ✓ Sun Valley
  - ✓ San Martine De Porres
  - ✓ Marcelo Green

DRAFT POWERPOINT PRESENTATION FOR PUBLIC SCOPING

PUBLIC SCOPING
for the
PROPOSED PARANAQUE RECLAMATION PROJECTS

Along Coast of Manila Bay in the territorial jurisdiction of the City of Parañaque

Date: xxxxx
Place: xxxxxx

PUBLIC SCOPING
PROPOSED PARAÑAQUE RECLAMATION PROJECTS
xxxxxxx/ 9:00 am
xxxxxxxxxx
PROGRAMME

8:30 – 9:00 a.m.	**Registration** **Assisted by:** **Environmental Impact Assessment (EIA) Preparer**
9: 00 – 9:10 a.m.	**Invocation and National Anthem** **LGU Representative**
9: 10 – 9:20 a.m.	**Welcome Remarks** **City of Parañaque Government**
9: 20 – 9:30 a.m.	**Introduction and Acknowledgement of Participants** **xxxxxxxxxxxxxxx**
9: 30 – 9:40 a.m.	**Brief Overview of the EIS System: Objectives and Mechanics of the Public Scoping under DAO 2003-30 as amended**
9: 40 – 10:10 a.m.	**Brief Presentation of the Project** A.Presentation of Project B.Presentation of the Initial/Predicted Environmental Impacts and Mitigation Measures
10: 10 –10:25 a.m.	**SNACKS/BREAKTIME**
10:25 a.m. - Onwards	**Open Forum**
	Synthesis and Next Step
	Closing Remarks


OPENING
PRAYER


NATIONAL ANTHEM

WELCOME REMARKS

XXXXXXXXXXX

INTRODUCTION AND ACKNOWLEDGEMENT OF PARTICIPANTS

XXXXXXXXXXX

Brief Overview of the EIS System:

Brief Overview of the EIS System:

1. SCOPING
   - PUBLIC SCOPING
   - Technical Scoping with EMB and Review Committee
2. Report Preparation
3. Submission of Draft EIS Report
4. Public Hearing (if required)
5. Public Consultation (If required)
6. Final EIS Report/Substantial Review with EIARC members
7. Decision on the ECC Application

Objectives and Mechanics of the Public Scoping under DAO 2003-30 as amended

To define the range of actions, alternatives and impacts for / of a Project that are to be examined in an Environmental Impact Assessment Report

Objectives and Mechanics of the Public Scoping under DAO 2003-30 as amended

Provides early link between the DENR and the proponent, and more importantly, with the affected communities, so as to ensure that the EIA addresses relevant issues and presents results in a form consistent with the regulatory review requirements.

PROJECT PRESENTATION

BASIC PROJECT INFORMATION

Name of Projects	**PROPOSED 300 HECTARE RECLAMATION PROJECT** **AND** **PROPOSED 261 HECTARE RECLAMATION PROJECT**
Location	Along Coast of Manila Bay in the territorial jurisdiction of the City of Parañaque
Nature of Project	Major Reclamation Project ≥ 50 hectares
Size / Scale	300 Hectares 261 Hectares
ECC Status	Being Applied For

PROJECT PROPONENT / EIA PREPARER

ITEM	PROJECT INFORMATION
Project Proponent	**City Government of Parañaque**
Telephone No.	02 (826-8244)
Proponent Address	San Antonio Ave., San Antonio, Parañaque, Metro Manila
EIA Preparer	**Technotrix Consultancy Services Inc.**
Telefax	02 (416-4625)

PROJECT BRIEF

1) Gross Surface Area (at PQE municipal waters) – 261 has. plus 300 has. which may still be reduced slightly due to containment wall design;
2) Proponents for both the 261 has. & 300 has. islands are the PQE LGU and the private sector;
3) Proposed Development includes a cruise ship port at the southern part of the 300 has. island (requiring a turning basin at the northern part of the 261 has. island; and
4) Reclamation Period – Minimum of say 2 years for the 261 has. island.

PROJECT DESCRIPTION

Reclamation of ONE (1) parcel of bay water of **261hectare** area

Project coverage through HORIZONTAL DEVELOPMENT only

- ✓Dredging, Transport of Fill Materials
- ✓Containment Structure
- ✓Engineered Drainage System
- ✓Pollution Abatement Facilities
- ✓Internal and access road networks
- ✓Access way
- ✓Street lighting; electrical, water, communications

PROJECT DESCRIPTION

Reclamation of ONE (1) parcel of bay water of **300 hectare** area

Project coverage through HORIZONTAL DEVELOPMENT only

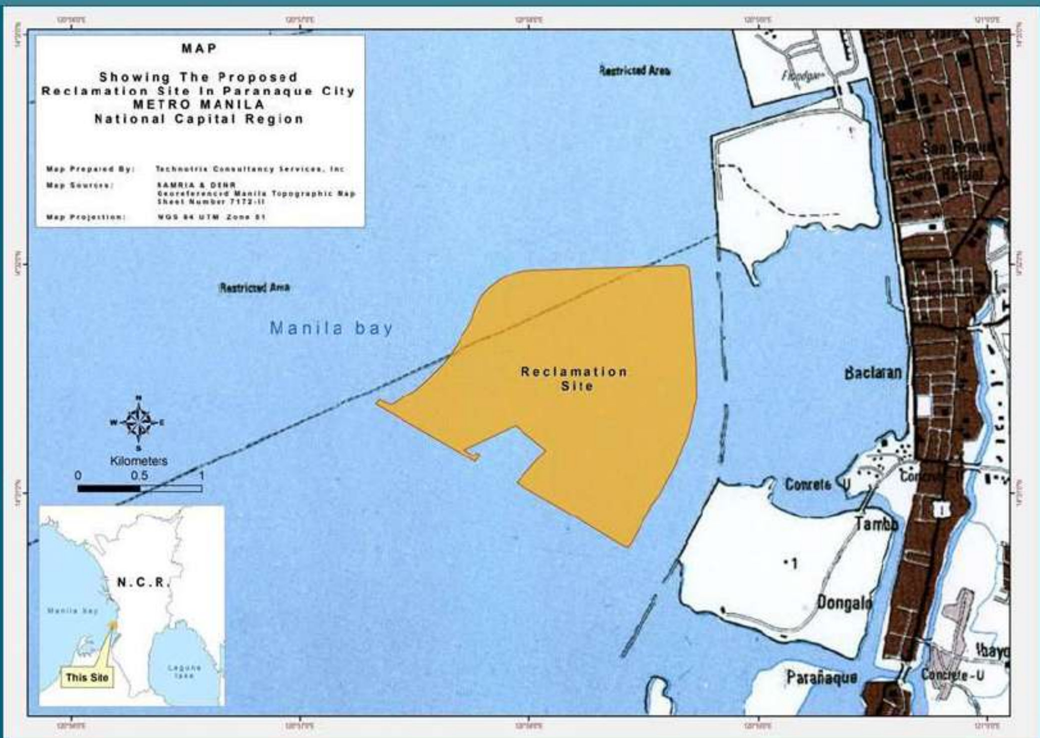
- ✓ Dredging, Transport of Fill Materials
- ✓ Containment Structure
- ✓ Engineered Drainage System
- ✓ Pollution Abatement Facilities
- ✓ Internal and access road networks
- ✓ Access way
- ✓ Street lighting; electrical, water, communications

PROJECT RATIONALE

2 PROJECTS: DIFFERENT PRIVATE SECTOR PARTNERS / DIFFERENT TIMELINES

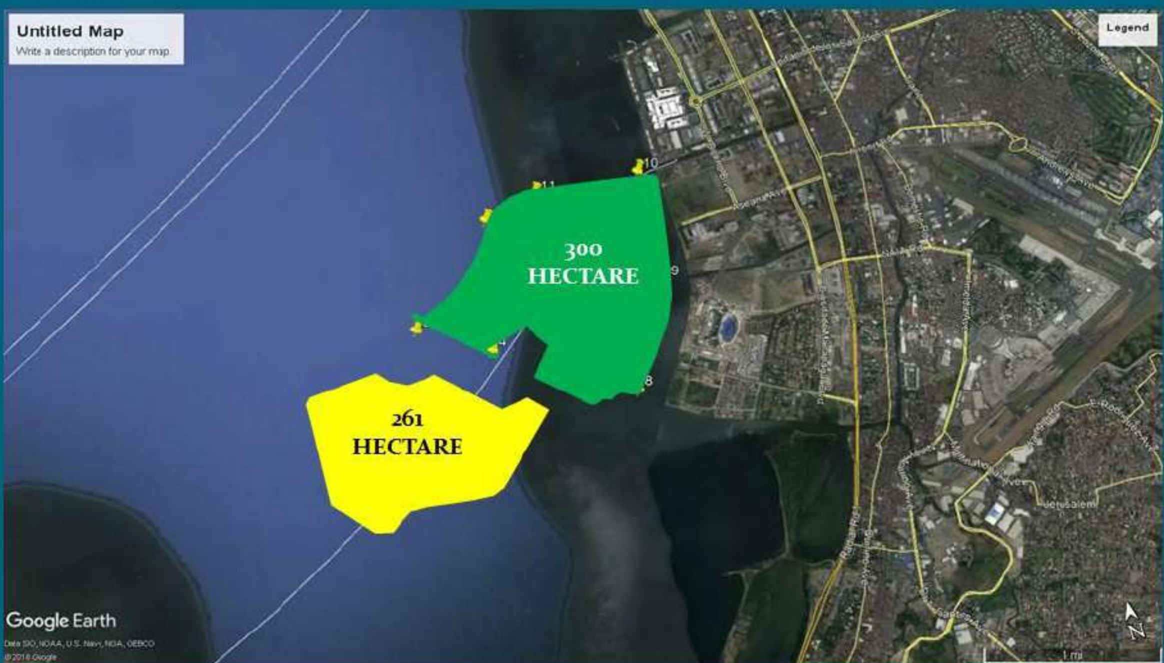
- ✓ Promote well-being of the people of the City of Parañaque in particular of the host Barangay(s)
- ✓ Stimulate commercial growth by providing a basic infrastructure, namely land to government and to investors
- ✓ Land at no cost to government
- ✓ Provide much needed employment and livelihood opportunities to the City
- ✓ Help in decongesting Metro Manila by providing alternative site for commercial/mixed-use property project developments instead of such developments being located inland.

PROJECT SITE (300 HECTARE)



PROJECT SITE (261 HECTARE)

THE PROJECT SITES (300 & 261 HECTARE)



PROJECT ACCESSIBILITY

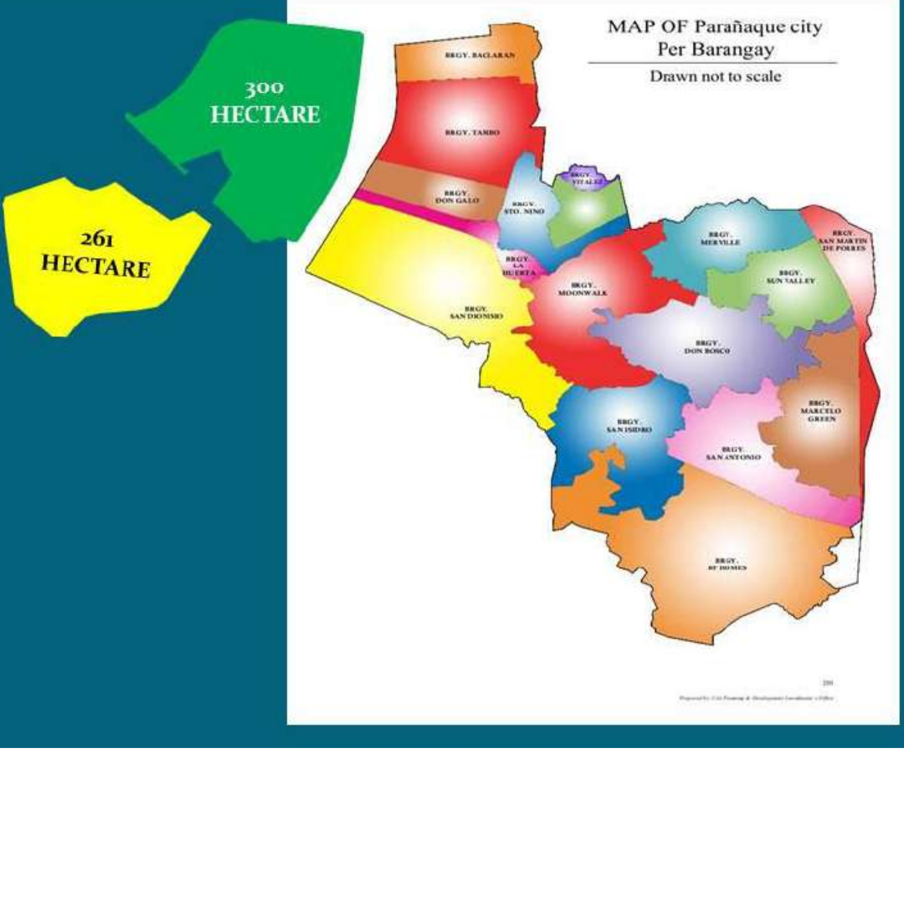
IMMEDIATE VICINITY / LANDMARKS

PRELIMINARY ENVIRONEMNTAL IMPACT ASSESSMENT

PRE-DIRECT IMPACT AREAS

PRE-INDIRECT IMPACT AREAS

THE PROJECT SITE RELATIVE TO THE BARANGAYS



THE PROJECT SITES & LPPCHEA

PROJECT COMPONENTS (261 HECTARES)

The reclamation will be designed and built for mix-use development. The project components are the following:

- ✓ 1 Island
- ✓ Internal road networks
- ✓ Drainage system
- ✓ Storm surge protection
- ✓ Access way

At this stage of the project cycle, the above components are still subject to firm design.

PROJECT COMPONENTS

Initial Land Use Plan 261 Hectares

PROJECT COMPONENTS (300 HECTARES)

GENERAL CONCEPTS ONLY

For mix-use development. Key components are:

- ✓ 1 Island
- ✓ Internal road networks
- ✓ Drainage system
- ✓ Storm surge protection
- ✓ Access way

At this stage of the project cycle, theabove components are still subject to firm design.

PROCESS AND TECHNOLOGY

✓ Dredging at the Reclamation Site to remove unwanted sea bed materials and prepare the sea bed for filling.

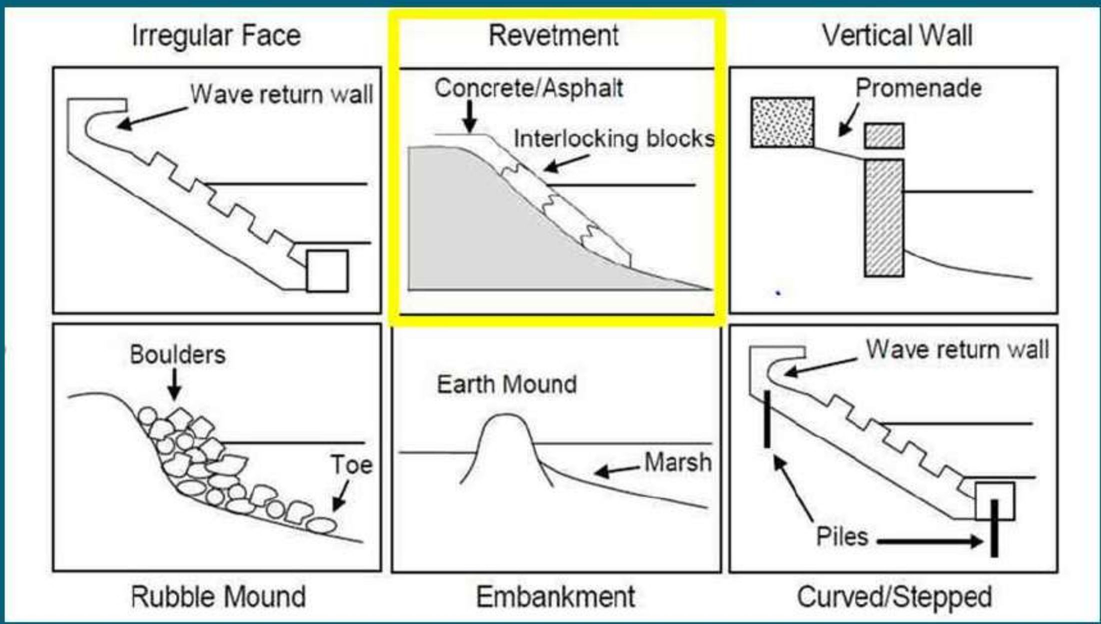
✓ Transport of the Dredging Vessel To/From Source of Fill Materials

✓ Filling with suitable materials to the finished platform elevation.

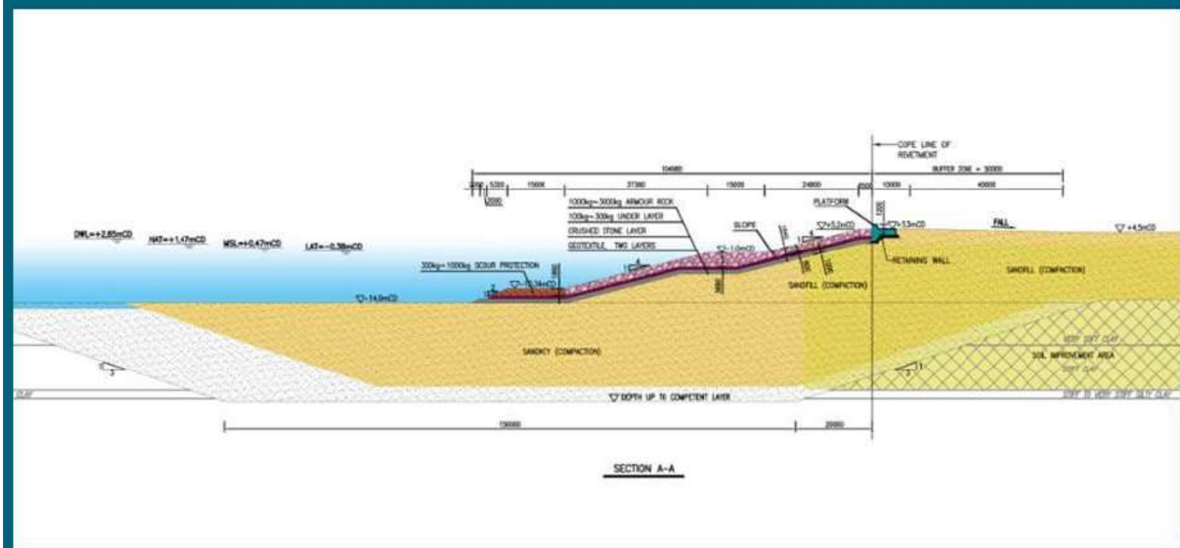
DREDGING AND RECLAMATION ILLUSTRATION ONLY

- Preparation and Dredging of Site
- Transport of TSHD Vessel To/From Source of Fill Materials
- Extraction of sand at the source
- Placement of fills at reclamation site area

CONTAINMENT STRUCTURE – ILLUSTRATION ONLY



CONTAINMENT STRUCTURE BELOW WATER – ILLUSTRATION ONLY



MANAGING ENVIRONMENTAL ISSUES

- ✓ LAND
- ✓ WATER
- ✓ AIR
- ✓ PEOPLE AND PUBLIC HEALTH

CONSTRUCTION / RECLAMATION PHASE

✓ LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Perception of flooding on shore as a result of reclamation	Reclamation itself provides protection against storm surges
	City drainage system not disturbed

CONSTRUCTION / RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Storm surges/waves and flooding on land	Reclamation platform itself with wave deflector gives sheltering effect
Land Subsidence	Caused by underground water extraction which will not be undertaken

CONSTRUCTION / RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Protected Area	Project site not in NIPAs protected area
Aesthetics (Manila Bay Sunset)	Viewing spots not in Paranaque
Ground shaking and liquefaction	Structural and engineering design intercession

CONSTRUCTION / RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Disturbance of marine species/Damage to or impairment of economically significant marine life	Absence of significant marine species at impact areas of project
Silt dispersal/turbidity increase due to sea bed disturbance	Silt curtains and screens, etc.
	Phased construction schedule

WATER CIRCULATION AND CURRENTS BY DESIGN OF ISLAND

CONSTRUCTION / RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Contamination from filling materials	Filling materials from Manila Bay Pre Screening
Sea Level Rise	Due to other global climate change not to the reclamation project
Water contamination, e.g. oil leaks, domestic wastes from construction workers	On board vessel oil containment and recovery equipment
	Own temporary toilet facilities. Disposal on land by 3rd parties

CONSTRUCTION / RECLAMATION PHASE

✓ **WATER**

POTENTIAL IMPACT	MITIGATING MEASURES
Disposal of unwanted dredged materials	Recycle
	Disposal at deep waters Clearances/Permits
Reclamation does not use significant water	Arrangement with concessionaires
	No underground abstraction

CONSTRUCTION / RECLAMATION PHASE

✓ **AIR**

POTENTIAL IMPACT	MITIGATING MEASURES
Noise	Not Significant
Criteria Pollutants discharged by equipment and vehicles	Temporary in nature
	Use quality fuel in equipment and power generating sets

OPERATIONS PHASE

✓PEOPLE

Ensure Public Health

OPERATIONS PHASE

✓PEOPLE

SOCIO-ECONOMIC

Increase demand for social services

OPEN FORUM / DIALOGUE

EIA Preparer:

CITY GOVERNMENT OF PARAÑAQUE

Address: San Antonio Avenue, San Antonio Parañaque, Metro Manila

OR

TECHNOTRIX CONSULTANCY SERVICES, INC.

Address: Unit 305 FMSG Bldg., #9 Balete Drive, New Manila, Quezon City

Email: technotrixinc@gmail.com

Tel no: (02) 416-4625

Republic of the Philippines
CITY OF PARAÑAQUE

Office of the Mayor

4 March 2019

ENGINEER ESPERANZA SAJUL
Chief, EIA Management Division
Environmental Management Bureau
DENR Compound, Visayas Avenue, Quezon City

Subject : **Public Scoping Report for the Proposed 286.86 Hectare Reclamation Project**

Dear Engr. Sajul:

We are pleased to submit herewith two (2) sets of the Public Scoping Report for the above-captioned project.

With this submission, which we trust meets your requirements, may we request for the scheduling at the earliest most convenient date by your Good Office of the Technical Scoping activity.

Thank you.

By the Authority of the Honorable
Mayor **EDWIN L. OLIVAREZ:**

FERNANDO C. SORIANO
OIC – City Administrator

Cc: **Technotrix Consultancy Services, Inc.**
(EIA Preparer)

PUBLIC SCOPING REPORT
PROPOSED 286.86 HECTARE RECLAMATION PROJECT

TO BE LOCATED ALONG COAST OF MANILA BAY IN THE WATERS OF THE CITY OF PARAÑAQUE

1.0 Date and Venue / Objectives

The Public Scoping for the above-caption Project was conducted on 27 February 2019 at Barangay San Dionisio Sports Complex, Parañaque City.

Following are the objectives of the Public Scoping:

- To define the range of actions, alternatives and impacts for / of a project that should be examined in an Environmental Assessment Report.
- To provide an early link between the DENR and the proponent, and more importantly with the affected communities, so as to ensure that the EIA addresses relevant issues and presents results in a form consistent with the regulatory review requirements.
- To allow interested parties (e.g. stakeholders) to make their concerns known and to help ensure that EIA study proper actually addresses issues and potential impacts of concern to all parties.

2.0 Basis for selection of Participants

- Local government units that are identified to have concerns with the proposed reclamation
- Government agencies with related mandate on the type of project and its impacts
- Identified interest groups (NGOs/POs) preferably those with missions / specifically related to the proposed project and impacts of the proposed undertaking/project
- Households, business activities, industries which are considered to be affected by the proposed project
- People whose socio-economic welfare and cultural heritage are projected to be affected by the project
- Local institutions (schools, churches, hospital)

3.0 Invitations

Formal written invitations were issued and received before the scheduled date and compliant with the time prescription for notice under the new DAO on Public Participation. An invitation letter is attached in **Annex 1.0.** Invitations sent were duly acknowledged, received and forwarded to the concerned persons. Shown in **Annex 2.0** are the receiving copies of invitations and sample receiving copy of invitation via LBC. The Master List of Invitations sent is attached in **Annex 3.0.**

4.0 The attendance sheets are given in **Annex 4.0**.

5.0 Protocol and Programme observed. This is as follows:

- Registration
- Opening Messages
- Acknowledgment of Participants

- Project Presentation including the Environmental Aspects
- Question and Answer
- Closing Messages

6.0 The Project Presentation including the discussion on environmental impacts and mitigating measures are provided in **Annex 5.0**. Each presentation was followed by a Question and Answer Session as recorded in a Summary Matrix Format in **Annex 6.0**.

7.0 Photographs during the Public Scoping Activity are shown in **Annex 7.0.**

8.0 Annexes

1. Invitation Letter
2. Acknowledgement Receipts of the Invitations and sample receiving copy of invitation via LBC
3. List of Invitees
4. Attendance Sheets
5. Copy of the Presented PowerPoint
6. Summary Matrix Format of Issues and Concerns Raised
7. Photographs during the Public Scoping Activity

ANNEX 1.0
INVITATION LETTER
(TYPICAL)

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

MR. EDWIN OLIVAREZ
City Mayor
City of Paranaque
San Antonio Ave., San Antonio
Parañaque City

Dear **Mayor Olivarez:**

Greetings!

We are pleased to invite you to attend and deliver the **Welcome Remarks** for the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

OFFICE OF THE MAYOR
PARAÑAQUE CITY
DATE&TIME: 2.19.19 / 1:49
RECEIVED BY: NINA

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

ANNEX 2.0
ACKNOWLEDGEMENT RECEIPTS OF THE INVITATIONS and SAMPLE RECEIVING COPY OF INVITATION SENT BY LBC

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

THE PRESIDENT
PESO – Public Employment Service Office
San Antonio Valley, Barangay San Antonio,
Paranaque Ciy

Dear **Sir/Madam:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

Received by:
M. Maronet
2/19/2019

Protect the environment... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

BULUNGAN SEAFOOD MARKET
Coastal Road, Paranaque City,
Metro Manila

Dear **Sir/Madam:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

2/20/19
Tess J. Balbastro
Board Secretary, UPSCPPW

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

THE CATHEDRAL PARISH OF ST. ANDREW
448 Quirino Ave, Parañaque,
1700 Metro Manila

Dear **Sir/Madam:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

Jasmin
2/21/19

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

PARAÑAQUE TRAFFIC BUREAU
Paranaque Cityhall
San Antonio Ave., San Antonio
Parañaque City

Dear **Sir/Madam:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

Protect the environment... Protect life...

TPMD
RECEIVED
BY: Jinky
DATE: 2/19/19 1:25 pm.
829-1458

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

MR. REMO M. DELGADO / MR. RAYMUNDO LOSANTA
Officials
SAMAHANG MANGINGISDA NG TAMBO MULTI-PURPOSE COOPERATIVE
(SAMATA MPC)
Parañaque City

Dear **Mr. Delgado/Mr. Losanta:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

2/20/19

Protect the environment... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

MR. JULIUS ANTHONY SAYDE
Barangay Chairman
Brgy. Baclaran, Parañaque City

Dear **Mr. Sayde:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

RECEIVED BY:
A. DELOS SANTOS
FEB 20, 2019
11:04 am
BACLARAN

Protect the environment... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

MS. MARILYN BURGOS
Barangay Chairwoman
Brgy. Don Galo, Parañaque City

Dear **Ms. Burgos:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

RECEIVED
BY:
DATE: 02/20/19
BARANGAY
DON GALO

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

Protect the environment... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

HOLY EUCHARIST PARISH CHURCH
Armstrong Ave, Parañaque,
1709 Metro Manila

Dear **Sir/Madam:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

M. CASTILLO
FEB. 21, 2019
821-44-37

Protect the environment... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

MR. ENRICO T. GOLEZ
City Vice Mayor
City of Paranaque
San Antonio Ave., San Antonio
Parañaque City

Dear **Vice Mayor Golez:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

OFFICE OF THE VICE MAYOR
RECEIVED BY: Jaws
DATE: Feb 19 TIME: 1:25 pm

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

Protect the environment... Protect life...

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

Augustine
MR. PETER AGUSTIN N. VELASCO
Barangay Chairman
Brgy. La Huerta, Parañaque City

Dear **Mr. Velasco:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

RECEIVED
FEB 21 2019
Anna Bedano
Brgy La Huerta
9:25am

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

Republic of the Philippines
Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Quezon City 1116
Telephone Nos.: (632)927-15-17, 928-37-25; Fax No.: (632) 920-22-58
Website: http://www.emb.gov.ph / Email: mail@emb.gov.ph

MR. GOHNNY C. CO
Barangay Chairman
Brgy. Sto. Niño, Parañaque City

Dear **Mr. Co:**

Greetings!

We are pleased to invite you to attend the **Public Scoping** for the proposed **286.86 Hectare Parañaque Reclamation Project** of the City of Parañaque. The said activity is scheduled on the following date, time and place:

Date	:	**February 27, 2019 (Wednesday)**
Time	:	9:00 AM *(Registration starts at 8:00 AM)*
Place	:	Barangay San Dionisio Sports Comnplex, Parañaque City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

Attached are a copy of the project fact sheet and tentative program for your reference. For more details, you may contact this Office at telephone numbers (02) 920-2240 to 41.

Thank you and we look forward to your participation.

Sincerely,

ENGR. ESPERANZA A. SAJUL
Chief, EIA and Management Division

PAMAHALAANG BARANGAY NG STO. NIÑO
OFFICE OF THE BRGY. SECRETARY
RECEIVED
DATE : 02-21-2019 / 8:55 am
NAME : Kakai Marca
SIGNATURE :

Protect the environment... Protect life...

LBC EXPRESS, INC.
UPPER GROUND 01110 & 01111 AURORA BOULEV
ARD, COR. DONA HEMADY AND N DOMINGO STS.,
Tel. No : (63) 2 - 9615734
TIN No. : 000-782-140-01381

Customer's Copy

1268 0793 7501

THIS SERVES AS AN OFFICIAL RECEIPT
MIN : 16052014491165083
Serial No : BR01381-SGH2250BV3
Official Receipt No : CCE0410000194283

SHIPPER:

CONSIGNEE:
And or/ care of:/

TECHNOTRIX CONSULTANCY, SERVICES I RUBIATO, JANILO E
Address: SUITE 305 FMSG BLDG 9 BALETE DRIVE, NEW MANILA, QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 /9328638605
Card Number: TIN:

Address: 24/F LEGASPI TOWERS 200 PASEO DE ROXAS ST. LEGASPI VILLAGE, MAKATI CITY, METRO MANILA
Contact No.(s).: 8174711 / 9000000000

Courier N-Pouch Regular

Origin	: MMA-CCE04-ROBINSONS MAGNOLIA	VATable(Freight) :	80.36
Tran. Date	: 02/19/2019 01:31:52 PM	VAT-Exempt :	0.00
Delivery Date	: 02/20/2019	VAT Zero-Rated :	0.00
Area Dest.	: METRO MANILA	10AM Pickup Fee :	0.00
Tran. Type	: Delivery	Discount :	0.00
Cut-Off	: 07:00 PM	Total Sales :	80.36
Actual Wt (Kg.)	: 0.00	12% VAT :	9.64

Amount Due : 90.00
Mode : CASH

Said to Contain : DOCUMENTS ONLY

Track your padala at:
www.lbcexpress.com
Talk to our Care Representative
www.lbcexpress.com
Tel. (632) 8585-999
1-800-10-8585-999
*Only for PH outside NCR
Let us know of your experience:
survey.lbcexpress.com

LBC Express values your privacy, for more info on our privacy policy visit www.lbcexpress.com/privacy-policy
SHIPPER WARRANTS THAT THE SHIPMENT HAS NO CASH INSIDE CLAIMS OF CARGO ARE LIMITED UP TO ACTUAL DECLARED VALUE ONLY
I hereby agree to be bound with the terms and conditions written at the back set forth by LBC EXPRESS

SHARMAINE RUFFA TUBIG
Signature of Associate

TECHNOTRIX CONSULTANCY, SERVICES INC
Signature of Shipper

OR Series No : CCE0410000000001 to CCE0489999999999 BIR Final PTU#:FP052016-122-0003960-00000
BIR Accreditation No: 1220007821402015060318 Date Issued: 06/26/2015 valid until 06/25/2020
*THIS INVOICE/RECEIPT SHALL BE VALID FOR FIVE(5) YEARS FROM THE DATE OF THE PERMIT TO USE. *

LBC EXPRESS, INC.
UPPER GROUND 01110 & 01111 AURORA BOULEV
ARD, COR. DONA HEMADY AND N DOMINGO STS.,
Tel. No : (63) 2 - 9615734
TIN No. : 000-782-140-01381

Customer's Copy

3509

1268 0793 7483

THIS SERVES AS AN OFFICIAL RECEIPT
MIN : 16052014491165083
Serial No : BR01381-SGH2250BV3
Official Receipt No : CCE0410000194208

SHIPPER:

CONSIGNEE:
And or/ care of:/

TECHNOTRIX CONSULTANCY, SERVICES I GONZALES, AIMEE
Address: SUITE 305 FMSG BLDG 9 BALETE DRIVE, NEW MANILA, QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 /9328638605
Card Number: TIN:

Address: PARTNERSHIP IN ENVIRONMENT MNGT FOR THE SE AS ODF EAST DENR COMPD DILIMAN , QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 / 9000000000

Courier N-Pouch Regular

Origin	: MMA-CCE04-ROBINSONS MAGNOLIA	VATable(Freight) :	80.36
Tran. Date	: 02/19/2019 01:44:48 PM	VAT-Exempt :	0.00
Delivery Date	: 02/20/2019	VAT Zero-Rated :	0.00
Area Dest.	: METRO MANILA	10AM Pickup Fee :	0.00
Tran. Type	: Delivery	Discount :	0.00
Cut-Off	: 07:00 PM	Total Sales :	80.36
Actual Wt (Kg.)	: 0.00	12% VAT :	9.64

Amount Due : 90.00
Mode : CASH

Said to Contain : DOCUMENTS ONLY

Track your padala at:
www.lbcexpress.com
Talk to our Care Representative
www.lbcexpress.com
Tel. (632) 8585-999
1-800-10-8585-999
*Only for PH outside NCR
Let us know of your experience:
survey.lbcexpress.com

LBC Express values your privacy, for more info on our privacy policy visit www.lbcexpress.com/privacy-policy
SHIPPER WARRANTS THAT THE SHIPMENT HAS NO CASH INSIDE CLAIMS OF CARGO ARE LIMITED UP TO ACTUAL DECLARED VALUE ONLY
I hereby agree to be bound with the terms and conditions written at the back set forth by LBC EXPRESS

SHARMAINE RUFFA TUBIG
Signature of Associate

TECHNOTRIX CONSULTANCY, SERVICES INC
Signature of Shipper

OR Series No : CCE0410000000001 to CCE0489999999999 BIR Final PTU#:FP052016-122-0003960-00000
BIR Accreditation No: 1220007821402015060318 Date Issued: 06/26/2015 valid until 06/25/2020
*THIS INVOICE/RECEIPT SHALL BE VALID FOR FIVE(5) YEARS FROM THE DATE OF THE PERMIT TO USE. *

LBC EXPRESS, INC.
UPPER GROUND 01110 & 01111 AURORA BOULEV
ARD, COR. DONA HEMADY AND N DOMINGO STS.,
Tel. No : (63) 2 - 9615734
TIN No. : 000-782-140-01381

Customer's Copy

1268 0793 7493

THIS SERVES AS AN OFFICIAL RECEIP
MIN : 16052014491165083
Serial No : BR01381-SGH2250BV
Official Receipt No : CCE0410000194205

SHIPPER:

CONSIGNEE:
And or/ care of:/

TECHNOTRIX CONSULTANCY, SERVICES I SANTIAGO, JAY DANIEL R
Address: SUITE 305 FMSG BLDG 9 BALETE DRIVE, NEW MANILA, QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 /9328638605
Card Number: TIN:

Address: PHILLIPINE PORTS AUTHORITY PPA CORPORATE LDG BONIFACIO DRIVE SOUTH HARBOR PORT AREA , MANILA CITY, METRO MANILA
Contact No.(s).: 9000000000

Courier N-Pouch Regular

Origin	: MMA-CCE04-ROBINSONS MAGNOLIA	VATable(Freight) :	80.36
Tran. Date	: 02/19/2019 01:33:36 PM	VAT-Exempt :	0.00
Delivery Date	: 02/20/2019	VAT Zero-Rated :	0.00
Area Dest.	: METRO MANILA	10AM Pickup Fee :	0.00
Tran. Type	: Delivery	Discount :	0.00
Cut-Off	: 07:00 PM	Total Sales :	80.36
Actual Wt (Kg.)	: 0.00	12% VAT :	9.64

Amount Due : 90.00
Mode : CASH

Said to Contain : DOCUMENTS ONLY

Track your padala at:
www.lbcexpress.com
Talk to our Care Representat
www.lbcexpress.com
Tel. (632) 8585-999
1-800-10-8585-99
*Only for PH outside NCR
Let us know of your experier
survey.lbcexpress.com

LBC Express values your privacy, for more info on our privacy policy visit www.lbcexpress.com/privacy-policy
SHIPPER WARRANTS THAT THE SHIPMENT HAS NO CASH INSIDE CLAIMS OF CARGO ARE LIMITED UP TO ACTUAL DECLARED VALUE ONLY
I hereby agree to be bound with the terms and conditions written at the back set forth by LBC EXPRESS

SHARMAINE RUFFA TUBIG
Signature of Associate

TECHNOTRIX CONSULTANCY, SERVICES INC
Signature of Shipper

OR Series No : CCE0410000000001 to CCE0489999999999 BIR Final PTU#:FP052016-122-0003960-00000

LBC EXPRESS, INC.
UPPER GROUND 01110 & 01111 AURORA BOULEV
ARD, COR. DONA HEMADY AND N DOMINGO STS.,
Tel. No : (63) 2 - 9615734
TIN No. : 000-782-140-01381

Customer's Copy

1268 0793 7511

THIS SERVES AS AN OFFICIAL RECEIPT
MIN : 16052014491165083
Serial No : BR01381-SGH2250BV3
Official Receipt No : CCE0410000194195

SHIPPER:

CONSIGNEE:
And or/ care of:/

TECHNOTRIX CONSULTANCY, SERVICES I THE MARINE SCIENCE, INSTITUTE
Address: SUITE 305 FMSG BLDG 9 BALETE DRIVE, NEW MANILA, QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 /9328638605
Card Number: TIN:

Address: UNIVERSITY OF THE PHILIPPINES VELASQUEZ ST DILIMAN , QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 / 9000000000

Courier N-Pouch Regular

Origin	: MMA-CCE04-ROBINSONS MAGNOLIA	VATable(Freight) :	80.36
Tran. Date	: 02/19/2019 01:09:01 PM	VAT-Exempt :	0.00
Delivery Date	: 02/20/2019	VAT Zero-Rated :	0.00
Area Dest.	: METRO MANILA	10AM Pickup Fee :	0.00
Tran. Type	: Delivery	Discount :	0.00
Cut-Off	: 07:00 PM	Total Sales :	80.36
Actual Wt (Kg.)	: 0.00	12% VAT :	9.64

Amount Due : 90.00
Mode : CASH

Said to Contain : DOCUMENTS ONLY

Track your padala at:
www.lbcexpress.com
Talk to our Care Representative
www.lbcexpress.com
Tel. (632) 8585-999
1-800-10-8585-999
*Only for PH outside NCR
Let us know of your experience:
survey.lbcexpress.com

LBC Express values your privacy, for more info on our privacy policy visit www.lbcexpress.com/privacy-policy
SHIPPER WARRANTS THAT THE SHIPMENT HAS NO CASH INSIDE CLAIMS OF CARGO ARE LIMITED UP TO ACTUAL DECLARED VALUE ONLT
I hereby agree to be bound with the terms and conditions written at the back set forth by LBC EXPRESS

SHARMAINE RUFFA TUBIG
Signature of Associate

TECHNOTRIX CONSULTANCY, SERVICES INC
Signature of Shipper

OR Series No : CCE0410000000001 to CCE0489999999999 BIR Final PTU#:FP052016-122-0003960-00000

LBC EXPRESS, INC.
UPPER GROUND 01110 & 01111 AURORA BOULEV
ARD, COR. DONA HEMADY AND N DOMINGO STS.,
Tel. No : (63) 2 - 9615734
TIN No. : 000-782-140-01301

Customer's Copy

1268 0793 7521

THIS SERVES AS AN OFFICIAL RECEIPT
MIN : 16052014491165083
Serial No : 8R01301-5GH2250BWJ
Official Receipt No : CCE0410000194265

SHIPPER:
CONSIGNEE:
And or/ care of:/

TECHNOTRIX CONSULTANCY, SERVICES IN LIM, DANILO DELAPUZ
Address: SUITE 305 FMSG BLDG 9 BALETE DRIVE, NEW MANILA, QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 /9328638605
Card Number: TIN:

Address: MMDA EDSA COR ORENSE ST BARANGAY GUADALUPE NUEVO, MAKATI CITY, METRO MANILA
Contact No.(s).: 8820854 / 9000000000

Courier N-Pouch Regular

Origin	: MMA-CCE04-ROBINSONS MAGNOLIA	VATable(Freight)	80.36
Tran. Date	: 02/19/2019 03:27:27 PM	VAT-Exempt	0.00
Delivery Date	: 02/20/2019	VAT Zero-Rated	0.00
Area Dest.	: METRO MANILA	10AM Pickup Fee	0.00
Tran. Type	: Delivery	Discount	0.00
Cut-Off	: 07:00 PM	Total Sales	80.36
Actual Wt (Kg.)	: 0.00	12% VAT	9.64

Amount Due : 90.00
Mode : CASH

Said to Contain : DOCS ONLY

Track your padala at:
www.lbcexpress.com
Talk to our Care Representative
www.lbcexpress.com
Tel. (632) 8585-999
1-800-10-8585-999
*Only for PH outside NCR
Let us know of your experience:
survey.lbcexpress.com

LBC Express values your privacy. for more info on our privacy policy visit www.lbcexpress.com/privacy-policy
SHIPPER WARRANTS THAT THE SHIPMENT HAS NO CASH INSIDE CLAIMS OF CARGO ARE LIMITED UP TO ACTUAL DECLARED VALUE ONLY
I hereby agree to be bound with the terms and conditions written at the back set forth by LBC EXPRESS

SHIELA PEREZ
Signature of Associate

TECHNOTRIX CONSULTANCY, SERVICES INC
Signature of Shipper

OR Series No : CCE0410000000001 to CCE0469999999999 BIR Final PTU#:FP052016-122-0003960-00000
BIR Accreditation No: 122000782140201506031 Date Issued: 06/26/2015 valid until 06/25/2020
*THIS INVOICE/RECEIPT SHALL BE VALID FOR FIVE(5) YEARS FROM THE DATE OF THE PERMIT TO USE. *

LBC EXPRESS, INC.
UPPER GROUND 01110 & 01111 AURORA BOULEV
ARD, COR. DONA HEMADY AND N DOMINGO STS.,
Tel. No : (63) 2 - 9615734
TIN No. : 000-782-140-01301

Customer's Copy

1268 0793 7591

THIS SERVES AS AN OFFICIAL RECEIPT
MIN : 16052014491165083
Serial No : 8R01301-5GH2250BWJ
Official Receipt No : CCE0410000194266

SHIPPER:
CONSIGNEE:
And or/ care of:/

TECHNOTRIX CONSULTANCY, SERVICES IN TIANGCO, JOHN REY M
Address: SUITE 305 FMSG BLDG 9 BALETE DRIVE, NEW MANILA, QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 /9328638605
Card Number: TIN:

Address: NAVOTAS CITY HALL , NAVOTAS CITY, METRO MANILA
Contact No.(s).: 2818706 / 9000000000

Courier N-Pouch Regular

Origin	: MMA-CCE04-ROBINSONS MAGNOLIA	VATable(Freight)	80.36
Tran. Date	: 02/19/2019 03:26:27 PM	VAT-Exempt	0.00
Delivery Date	: 02/20/2019	VAT Zero-Rated	0.00
Area Dest.	: METRO MANILA	10AM Pickup Fee	0.00
Tran. Type	: Delivery	Discount	0.00
Cut-Off	: 07:00 PM	Total Sales	80.36
Actual Wt (Kg.)	: 0.00	12% VAT	9.64

Amount Due : 90.00
Mode : CASH

Said to Contain : DOCS ONLY

Track your padala at:
www.lbcexpress.com
Talk to our Care Representative
www.lbcexpress.com
Tel. (632) 8585-999
1-800-10-8585-999
*Only for PH outside NCR
Let us know of your experience:
survey.lbcexpress.com

LBC Express values your privacy. for more info on our privacy policy visit www.lbcexpress.com/privacy-policy
SHIPPER WARRANTS THAT THE SHIPMENT HAS NO CASH INSIDE CLAIMS OF CARGO ARE LIMITED UP TO ACTUAL DECLARED VALUE ONLY
I hereby agree to be bound with the terms and conditions written at the back set forth by LBC EXPRESS

SHIELA PEREZ
Signature of Associate

TECHNOTRIX CONSULTANCY, SERVICES INC
Signature of Shipper

OR Series No : CCE0410000000001 to CCE0469999999999 BIR Final PTU#:FP052016-122-0003960-00000
BIR Accreditation No: 122000782140201506031 Date Issued: 06/26/2015 valid until 06/25/2020
*THIS INVOICE/RECEIPT SHALL BE VALID FOR FIVE(5) YEARS FROM THE DATE OF THE PERMIT TO USE. *

LBC EXPRESS, INC.
UPPER GROUND 01110 & 01111 AURORA BOULEV
ARD, COR. DONA HEMADY AND N DOMINGO STS.,
Tel. No : (63) 2 - 9615734
TIN No. : 000-782-140-01301

Customer's Copy

1268 0793 7651

THIS SERVES AS AN OFFICIAL RECEIPT
MIN : 16052014491165083
Serial No : 8R01301-5GH2250BWJ
Official Receipt No : CCE0410000194267

SHIPPER:
CONSIGNEE:
And or/ care of:/

TECHNOTRIX CONSULTANCY, SERVICES IN NAVARRO, MELVIN B
Address: SUITE 305 FMSG BLDG 9 BALETE DRIVE, NEW MANILA, QUEZON CITY, METRO MANILA
Contact No.(s).: 4164625 /9328638605
Card Number: TIN:

Address: REGIONAL DIRECTOR DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS 2ND ST PORT AREA , MANILA CITY, METRO MANILA
Contact No.(s).: 3910 / 9000000000

Courier N-Pouch Regular

Origin	: MMA-CCE04-ROBINSONS MAGNOLIA	VATable(Freight)	80.36
Tran. Date	: 02/19/2019 03:25:12 PM	VAT-Exempt	0.00
Delivery Date	: 02/20/2019	VAT Zero-Rated	0.00
Area Dest.	: METRO MANILA	10AM Pickup Fee	0.00
Tran. Type	: Delivery	Discount	0.00
Cut-Off	: 07:00 PM	Total Sales	80.36
Actual Wt (Kg.)	: 0.00	12% VAT	9.64

Amount Due : 90.00
Mode : CASH

Said to Contain : DOCS ONLY

Track your padala at:
www.lbcexpress.com
Talk to our Care Representative
www.lbcexpress.com
Tel. (632) 8585-999
1-800-10-8585-999
*Only for PH outside NCR
Let us know of your experience:
survey.lbcexpress.com

LBC Express values your privacy. for more info on our privacy policy visit www.lbcexpress.com/privacy-policy
SHIPPER WARRANTS THAT THE SHIPMENT HAS NO CASH INSIDE CLAIMS OF CARGO ARE LIMITED UP TO ACTUAL DECLARED VALUE ONLY
I hereby agree to be bound with the terms and conditions written at the back set forth by LBC EXPRESS

SHIELA PEREZ
Signature of Associate

TECHNOTRIX CONSULTANCY, SERVICES INC
Signature of Shipper

OR Series No : CCE0410000000001 to CCE0469999999999 BIR Final PTU#:FP052016-122-0003960-00000

ANNEX 3.0
LIST OF INVITEES

List of Invitees to the Public Scoping

1. **MR. EDWIN L. OLIVAREZ**
   City Mayor
   Parañaque City Hall,
   San Antonio Avenue, San Antonio
   Parañaque City

2. **MR. JOSE ENRICO T. GOLEZ**
   City Vice Mayor
   Parañaque City Hall,
   San Antonio Avenue, San Antonio
   Parañaque City

3. **PARAÑAQUE CITY COUNCIL**
   Parañaque City Hall,
   San Antonio Avenue, San Antonio
   Parañaque City

4. **ATTY. JANILO E. RUBIATO**
   General Manager and Chief Executive
   Philippine Reclamation Authority (PRA)
   27/F Legaspi Towers 200, Paseo de Roxas St., Legaspi Village, Makati City
   02-817-4711

5. **DEPT. OF ENGINEERING & PUBLIC WORKS**
   Paranaque City

6. **CITY PLANNING & DEVELOPMENT OFFICE**
   Parañaque City Hall,
   San Antonio Avenue, San Antonio
   Parañaque City

7. **PARAÑAQUE TRAFFIC BUREAU**
   Parañaque City Hall,
   San Antonio Avenue, San Antonio
   Parañaque City

8. **DR. MARIA MAGDALENA M. LIM**
   Division Superintendent
   DR. MARGARITO B. MATERUM
   Division OIC
   Division of City Schools, Parañaque
   Department of Education (DepEd)
   Parañaque Central School, Kabihasnan St., San Dionisio
   Parañaque City 1700
   Telefax: 501-1455; 826-7937; 829-9889

9. **COMMODORE ILDEFONSO TRONQUED JR.**
Manila Yacht Club
2351 Roxas Boulevard, Malate,
City of Manila, Metro Manila 1000
+63(2) 521 4458

10. **MR. JAY DANIEL R. SANTIAGO**
General Manager
PHILIPPINE PORTS AUTHORITY (PPA)
PPA Corporate Bldg. Bonifacio Drive, South Harbor, Port Area, Manila 1018, Philippines
527-4855 or 527-83-56 to 83
horecords@ppa.com.ph

11. **VICE ADMIRAL ROBERT EMPERAD, AFP**
Flag Officer in Command (FOIC)
PHILIPPINE NAVY
Naval Station Jose V. Andrada
#2335 Roxas Boulevard, Manila
PLDT Line: +632-524-20-61 to 69

12. **MS. AIMEE GONZALEZ**
Executive Director
Partnership in Environmental Management for the Seas of East Asia (PEMSEA)
DENR Compound, Diliman, Quezon City
929-2992

13. **DR. RENATO U. SOLIDUM, JR.**
Philippine Institute of Volcanology and Seismology (PHIVOLCS)
PHIVOLCS Building, C.P. Garcia Avenue, U.P. Campus, Diliman
Quezon City, Philippines
phivolcs_mail@phivolcs.dost.gov.ph
+632 426 1468 to 79
+632 929 8366, 927 4524

14. **HON JAIME "JOEY" C. MEDINA**
General Manager
Laguna Lake Development Authority (LLDA)
4/F Annex Bldg., Sugar Regulatory Administration (SRA) Compound
North Ave., Diliman, Quezon City
Phone 332-2346

15. **ENGINEER EMITERIO HERNANDEZ**
Hydrologist
Laguna Lake Development Authority (LLDA)
4/F Annex Bldg., Sugar Regulatory Administration (SRA) Compound
North Ave., Diliman, Quezon City
Phone 376-4044

16. **MR. JOSE ANGELITO PALMA**
President, World Wildlife Fund

WWF-Philippines Headquarters
4th Floor JBD Plaza #65 Mindanao Avenue
Barangay Bagong Pag-asa, Quezon City
1105 Philippines
Tel: +632 920 79 23/26/31
Fax: +632 426 39 27
Email: kkp@wwf.org.ph

17. **THE UNITED ARCHITECTS OF THE PHILIPPINES**
UAP Building, 53 Scout Rallos Street, Barangay Laging Handa
Diliman 1103 Quezon City, Philippines
Phone (+632) 4126403; 4126364; 4123311; 4120051; 4126394
Fax (632) 3721796
E-mail: uapnational@yahoo.com; uapnational@gmail.com

18. **DIRECTOR THERESA MUNDITA S. LIM**
Biodiversity Management Bureau
Department of Environment and Natural Resources
Ninoy Aquino Parks and Wildlife Center
North Avenue, Diliman, 1100 Quezon City
Philippines
+(63 2) 9246031-35
+(63 2) 9240109
www.pawb.gov.ph
planning@pawb.gov.ph

19. **ARCHITECT FELINO "JUN" PALAFOX**
Palafox & Associates
5/F PCCI Corporate Center, 118 L.P. Leviste Street,
Salcedo Village, Makati City
+632-812-1254

20. **SOLAIRE RESORT AND CASINO**
Aseana Avenue, Entertainment City,
Paranaque, Metro Manila
+632-888-8888

21. **CLIMATE CHANGE COMMISSION**
6TH floor, First Residences 1557 J.P Laurel St.,
Malacañang, San Miguel, Manila
+632 353 8494

22. **MS. DONNA MAYOR-GORDOVE CESO IV**
Manila Bay Coordinating Office
DENR Building, Visayas Avenue, Diliman, Quezon City, 1100, Metro Manila
Tel. No. +632 928-1225
Trunkline 929-6626 local 2102
www.themanilabay.com

23. **COMMODORE EDUARDO B. GONGONA**

Director
Bureau of Fisheries and Aquatic Resources
PCA Bldg. Diliman
Quezon City
(929-8074, 929-9597)

24. MR. ERNESTO M. PERNIA
Director General
National Economic and Development Authority
No. 12 St. Jose Maria Escriva Drive,
Ortigas Center, Pasig City
Trunkline: +63 631 0945 – 56
Email: KM@neda.gov.ph

25. MR. MELVIN B. NAVARRO
Regional Director
Department of Public Works and Highways
2nd Street, Port Area, Manila
Contact No(s).: (02) 304-3910
Fax No.: (02)304-3910
Email: navarro.melvin@dpwh.gov.ph

26. DR. FERNANDO P. SIRINGAN
National Academy of Science and Technology
3rd Level Science Heritage Building,
DOST Complex Bicutan,
Taguig City
(632) 837-3170 / 838-7739
(632) 837-3170
(632) 837- 2071 to 82 ext. 2170-75

27. DR. KELVIN S. RODOLFO
3rd Level, Biological Sciences Division,
Philippine Science Heritage Center,
General Santos Avenue, Bicutan,
Taguig, Metro Manila

28. CITY OF DREAMS MANILA
Asean Avenue corner Roxas Boulevard,
Entertainment City, Parañaque 1701,
Manila, Philippines
(632) 800-8080

29. MANILA GOLDCOAST DEVELOPMENT CORPORATION
Solar Century Tower
Tordesillas cor. Dela Costa Sts., Makati City

30. The Marine Science Institute
Velasquez St.
University of the Philippines

Diliman, Quezon City 1101
Philippines

31. **JEREMY BARNS, DIRECTOR IV**
National Museum of the Philippines
National Museum Fine arts Gallery Bldg., P. Burgos Drive, Rizal Park, Manila
02-5271209

32. **Churches**
- National Shrine of Our Mother of Perpetual Help
- The Cathedral Parish of St. Andrew
- Holy Eucharist Parish Church

33. **BARANGAYS and Residents**
- Brgy. Baclaran
- Brgy. Tambo
- Brgy. Don Galo
- Brgy. San Dionisio
- Brgy. Moonwalk
- Brgy. Vitalez
- Brgy. La Huerta
- Brgy. Sto. Nino

34. **NOEMI A. PARANADA**
Regional Director for Environment
Region IV-A CALABARZON
1515 L&S Building DENR by the Bay,
Roxas Boulevard. Ermita, Manila
536-2808

35. **ATTY. MICHAELDRAKE MATIAS**
Regional Director
Region IV-B MIMAROPA
1515 L&S Building DENR by the Bay,
Roxas Boulevard. Ermita, Manila
536-9786

36. **MS. JACQUELINE CAANCAN**
Regional Executive Director
DENR NCR
DENR Nursery Compound
East Avenue, Diliman
Quezon City

37. **ATTY. DOMINGO CLEMENTE**
Regional Director
EMB-NCR
DENR Nursery Compound
East Avenue, Diliman,
Quezon CIty

38. **DR. RENE R. ESCALANTE**

Chairman
National Historical Commission of the Philippines (NHCP)
NHCP Building T.M. Kalaw St., Manila 1000
Tel No.: 02-5363181

39. **BRIG. GEN. DANILO DELAPUZ LIM (Ret)**
Chairman
Metro Manila Development Authority (MMDA)
MMDA Bldg., EDSA cor. Orense St., Guadalupe, Makati City
Directline (632) 882-0854; 882-0893

40. **SEC. BERNADETTE ROMULO-PUYAT**
Secretary
Department of Tourism
The New DOT Bldg., 351 Sen. Gil Puyat Avenue.., Makati City
Tel No. 02-459-5200
601 - 602

41. **OKADA MANILA**
The President
New Seaside Dr. Parañaque
02-888-0777

42. **ASEANA HOLDINGS INC.**
The President
2nd Floor, Aseana Powerstation, Bradco Avenue cor. President Diosdado Macapagal Blvd.
Aseana City, Parañaque
02-854-5711

43. **ADMIRAL ELSON E. HERMOGINO**
Commandant
Philippine Coast Guard (PCG)
139 25th St., South Harbor Port Area Manila
cpcg@coastguard.gov.ph
Tel no.: 02-5278482 loc 6291

44. **WITH POSSIBLE INTEREST IN LPPCHEA**

- **SOCIETY FOR THE CONSERVATION OF PHILIPPINES WETLANDS, INC.**
Unit 208 Grand Emerald Tower, F. Ortigas Ave. corner Garnet St., Ortigas Center, Pasig City, Philippines 1605 T/F: +63 2 637 2409

- **VILLAR SIPAG**
C5 Extension Road
Pulanglupa Uno
Las Piñas City, Philippines 1740
Tel. No. (632) 551-1871
villar_sipag@yahoo.com.ph

- **SENATOR CYNTHIA A. VILLAR**
Senate Office: Rm. 503 GSIS Bldg., Financial Center, Diokno Blvd., Pasay City
Trunk Lines: (632) 552-6601 local nos. 6508 to 6511
Direct Line: (632) 552-6715

Telefax No.: (632) 552-6734
Email: sencynthiavillar@gmail.com

- **BULUNGAN SEAFOOD MARKET**
  Coastal Road, Paranaque City, Metro Manila

45. **MS. GEMMA G. CRUZ-ARANETA**
    Chairperson
    HERITAGE CONSERVATION SOCIETY (HCS)
    G/F Museo Pambata Bldg. Roxas Blvd. Ermita Manila
    02-353-4494

46. **SAVE OUR SUNSET (SOS) MANILA BAY PHILIPPINES**
    https://www.facebook.com/savemanilabay

47. **ALFONSO G. CUSI**
    DEPARTMENT OF ENERGY (DOE)
    Energy Center, Rizal Drive
    Fort Bonifacio, Taguig City

48. **MR. ELISEO M. RIO, JR.**
    DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY (DICT)
    C.P Garcia Ave., Diliman, Quezon City
    Philippines 1101
    Tel.No.: (02) 920-0101 local 1004

49. **THE PRESIDENT**
    San Dionisio Credit Cooperative
    0554 Quirino Ave, Paranaque, 1700 Metro Manila
    02-826-1055

50. **SEC. FRANCISCO T. DUQUE**
    Secretary
    Department of Health (DOH)
    San Lazaro Compound, Tayuman, Sta.Cruz, Manila Philippines, 1003
    02-651-7800

51. **THE PRESIDENT**
    PESO – Public Employment Service Office
    San Antonio Valley, Barangay San Antonio, Paranaque Ciy
    02 829-6886

52. **REMO M. DELGADO / RAYMUNDO LOSANTA**
    Official
    SAMAHANG MANGINGISDA NG TAMBO MULTI-PURPOSE COOPERATIVE (SAMATA MPC)

53. **MSGR. ALLEN C. AGANON**

SAINT ANDREW CATHEDRAL
Quirino Ave., La Huerta, Parañaque City, Metro Manila (02) 826-1760

54. **THE PRESIDENT**
THE KING'S SCHOOL MANILA
Bradco Avenue, Aseana Business Park, Parañaque, 1700 Metro Manila
02-519-5799

55. **THE PRESIDENT**
PARAÑAQUE NATIONAL HIGH SCHOOL
Dimasalang, Baclaran, Parañaque, 1702 Kalakhang Maynila
02-851-8540

56. **MR. JOSEPH EJERCITO ESTRADA**
City Mayor
City of Manila
Manila CityHall,Padre Burgos Avenue
Manila

57. **MR. JOHN REY M. TIANGCO**
City Mayor
City of Navotas
Navotas CityHall, Navotas City

58. **MR. ANTONINO CALIXTO**
City Mayor
City of Pasay
F.B. Harrizon, Pasay City

59. **MS. IMELDA AGUILAR**
City Mayor
City of Las Pinas
Las Pinas Cityhall
Las Pinas City

60. **MS. LANI MERCADO-REVILLA**
City Mayor
City of Bacoor
New Bacoor Cityhall
Molino Boulevard, Bacoor City

61. **MR. ANGELO EMILIO AGUINALDO**
Municipal Mayor
New Municipal Bldg. Centennial Rd.
Batong Dalig, Kawit Cavite.

ANNEX 4.0
ATTENDANCE SHEETS

PRIVATE

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along the coast of Manila Bay in the territorial jurisdiction of City of Parañaque

DATE ***27 February 2019** (Wenesday) * **9:00 am** * VENUE * Barangay San Dionisio Sports Complex, Parañaque City

ATTENDANCE SHEET

NAME	AFFILIATION/OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
✓ 1. Atty. Pia Dagdayan	Quinto Law Office		atty.piadagdayan@gmail.com	[signature]
2. JERWIN PALMARIO	FFC	09451207471	Jerwin.palmario@gmail.com	[signature]
3. JOSE RENE F VILLEGAS	MARINE SURVEY TEAM c/o TECHNOTRIX			[signature]
✓ 4. JOHN DIOQUINO	Entertainment City	0919 957 5298	johndioquino2011@gmail.com	[signature]
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				

Barangay

1

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along the coast of Manila Bay in the territorial jurisdiction of City of Parañaque

DATE ***27 February 2019** (Wenesday) * **9:00 am** * VENUE * Barangay San Dionisio Sports Complex, Parañaque City

ATTENDANCE SHEET

NAME	AFFILIATION/OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
1. ARNOLD VILLEGAS	PPA			[signature]
2 [illegible]				
3. JEFF MIRANDA	LAS PIÑAS CENTRO	800 3191		[signature]
4. A.C. AGUILAR	Cosfiñas Cen	[illegible]		[signature]
5. ISRAEL ACOSTA	LAS PIÑAS CENTRO	09372292639		I. Acosta
6. NESSIE BACULO	P'QUE	09171368842		[signature]
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				

Government

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along the coast of Manila Bay in the territorial jurisdiction of City of Parañaque

DATE ***27 February 2019** (Wenesday) * **9:00 am** * VENUE * Barangay San Dionisio Sports Complex, Parañaque City

ATTENDANCE SHEET

NAME	AFFILIATION/OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
1. CDR PABLO ABEJUELA	PCG	09989831109	proabe09@gmail.com	
2. JIM JOSON	PHIL PORTS AUTHORITY	0918 905 8796	jim.joson@gmail.com	
3. RENATO L. YUMANG	PPA	09228447606	rlyumang@ppa.com.ph	
4. Atty. Armi Corpuz	Office of Sen Cynthia Villar (Senate)	09175203252	armicorpuz@yahoo.com	
5.				
6.				
7. CPO Rogelio C Casupang	PCG	09985858191		
8. SN1 Patrick John E Juliano	PCG	09430360560		
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				

Govern

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along the coast of Manila Bay in the territorial jurisdiction of City of Parañaque

DATE ***27 February 2019** (Wenesday) * **9:00 am** * VENUE * Barangay San Dionisio Sports Complex, Parañaque City

ATTENDANCE SHEET

NAME	AFFILIATION/OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
1. Atty Fernando Soriano	City Administrator			
2 Coun. Marvin Santos	Kgwd. City Council			
3. [illegible]	City Hall			
4. Edlyne Brazas	City Hall			
5. Annaliza [illegible]	City Hall			
6. MIA CONCHE	CITY HALL			
7. LTJG VELERACION PCG	CGDNCR-CL			
8. PO1 Dodie Miguel	MEPU NCR-CL			
9. Atty. Bernadette Carrasco	Bacoor -LGU			
10. Coleta Bamba	Bacoor LGU.			
11. ASN Roy Tabujara PCG	CGDNCR-CL			
12. Shello de Leon	City Engineering	09563888827	deleonshello@gmail.com	
13. DIOMAR TIRANG	DPWH - MMIII DEO	0949320168		
14.				
15.				
16.				

NGOs / POs

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along the coast of Manila Bay in the territorial jurisdiction of City of Parañaque

DATE ***27 February 2019** (Wenesday) * **9:00 am** * VENUE * Barangay San Dionisio Sports Complex, Parañaque City

ATTENDANCE SHEET

NAME	AFFILIATION/OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
✓ 1. Antonio Miguel Cardenas	BA Consortium	815-9571	mmcardenas@pecabor.ph	
2. Ann Daniel Albaña	"	815 9571	adalbana@pecabor.ph	
3. Jeanette Gamboa	San Dionisio Credit Cooperative	820-1748	[illegible]@yahoo.com	
4. [illegible]	San Dionisio Credit Cooperative		[illegible]	
✓ 5. Mabel Marie Banba	PDFI / ASP		mariemabel60@gmail.com	NO TO RECLAMATION
6. Bill Dim Jr	RI Consortium		[illegible]	
7. Mannix Melencia	DM Wenceslao	8545711	egmelencia@dmwai.com	
8. Noel Cabuan	MGDC	09175008153	simonn1@yahoo.com	
9. Francis Tan	MGDC	09272682122	[illegible]	
10. Nelson Olleta	BRHI	09985914373		
✓ 11. Ellan Pailan	BKAI	09985740193		
12. Jezreel Bonquin	CENTURY PEAK CORP	09756889602		
13. Leticia T. Basilio	PDFI - NGO	7825774		NO TO Reclamation
14. Joseph Carabio	ASAP	09178222758	jomcan_58@yahoo.com	No to Reclamation
✓ 15. Ma. Filipina [illegible]	SAMAHUBAPA MPC	09982763749		
16.				

Government

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along the coast of Manila Bay in the territorial jurisdiction of City of Parañaque

DATE ***27 February 2019** (Wenesday) * **9:00 am** * VENUE * Barangay San Dionisio Sports Complex, Parañaque City

ATTENDANCE SHEET

NAME	AFFILIATION/OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
1. NOEL S. ORTUA	PPA	0905 294US70	noelortua@gmail.com	
2. RUSSELL F.N. MOLETA	MMDA	09166423136	russellfatimamoleta@yahoo.com	
3. NORDY Q. PIMENTEL	MMDA	09228543039	landresaura@yahoo.com	
4. AUGERIO TAYABAS	PPA	336-5751	attayabas@ppa.com.ph	
5. ERNESTO J. AVAÑEZ Jr.	LGU- MANILA	0916-933-9792	jhune.javier2002@yahoo.com.ph	
6. ROLINIO POZAS	LGU- KAWIT	09177770936	rolipoz@yahoo.com	
7. AMEJ JANABAJAL	LGU-KAWIT	09176358038		
8. MR. BERNIE AMURAO	CENRO			
9. MR. BAL MUJICA	CENRO	826 6147	cenro.swaeso@gmail.com	
10. ENGR TENE QUIOGUE	CENRO			
11. Mitch Chapitea	Nord Anglia Intl School Manila	5195799	admissions@naismanila.edu.ph	
12. Edel Cruz	Brgy Don Galo	09171761501	brgydongalo@gmail	
13. MAMON E. MALBAGRO	LGU	09055677409	[illegible]@gmail.com	
14. RAMIR P. TIZON	LGU	09104284101		
15. MADELINE ESCOSAR	PRA	817 1314	maclhenj@yahoo.com	
16. ADOLF P. NEGADO	PRA	-do-	negado_adolf@yahoo.com.ph	

N GO

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along the coast of Manila Bay in the territorial jurisdiction of City of Parañaque

DATE ***27 February 2019** (Wenesday) * **9:00 am** * VENUE * Barangay San Dionisio Sports Complex, Parañaque City

ATTENDANCE SHEET

NAME	AFFILIATION/OFFICE	CONTACT NUMBERS	EMAIL ADDRESS	SIGNATURE
1. Marilyn J. Cartunan	Cooperative	09993450514		
2 Pearly Yaldi	Samahibapa MPC			
✓ 3. FR. HERMAN ABCEDE	CVPS / MERVILLE PQue	09175460413	herman@rcj.org	
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
16.				

ANNEX 5.0

COPY OF THE PRESENTED POWERPOINT

PUBLIC SCOPING

FOR THE

PROPOSED 286.86 HECTARE RECLAMATION PROJECT

CITY GOVERNMENT OF PARANAQUE

DATE: 27 FEBRUARY 2019

VENUE: BRGY. SAN DIONISIO SPORTS COMPLEX PARANAQUE CITY

PUBLIC SCOPING

PROPOSED 286.86 HECTARE PARANAQUE RECLAMATION PROJECT

27 February 2019* 9:00 PM* Brgy. San Dionisio Sports Complex, Paranaque

P R O G R A M

12:30-1:00 PM	**Registration**
1:00-1:10	**Invocation and National Anthem**
1:10-1:20	**Welcome Remarks**
1:20-1:30	**Introduction and Acknowledgement of Participants**
1:30-1:40	**Brief Overview of the EIS System: Objectives and Mechanics of the Public Scoping under DAO 2003-30 as amended by DAO 2017-15**
1:40-2:10	**Brief Presentation of the Project** A. Presentation of Project B. Presentation of the Initial/Predicted Environmental Impacts and Mitigation Measures
2:10-2:25	**SNACKS/BREAKTIME**
2:25 - Onwards	**Open Forum**
	Synthesis and Next Steps
	Closing Remarks

OPENING PRAYER

WELCOME REMARKS

INTRODUCTION AND ACKNOWLEDGEMENT OF PARTICIPANTS

ENVIRONMENTAL COMPLIANCE CERTIFICATE (ECC)

BASIC REQUIREMENT FOR ALL PROJECTS

- A planning tool which stakeholders can use in exercising their individual mandates or missions.

An ECC is not a permit

Brief Overview of the EIS System:

Objectives and Mechanics of the Public Scoping under DAO 2003-30 as amended

BASIC PROJECT INFORMATION

Name of Project	**PROPOSED 286.86 HECTARE RECLAMATION PROJECT**
Location	**Along Coast of Manila Bay in the Waters of the City of Parañaque**
Nature of Project	**Major Reclamation Project ≥ 50 hectares**
Size / Scale	**286.86 Hectares**
ECC Status	**Being Applied For**

PROJECT PROPONENT / EIA PREPARER

ITEM	PROJECT INFORMATION
Project Proponent	**City Government of Parañaque**
Telephone No.	**02 (826-8244)**
Proponent Address	**San Antonio Ave., San Antonio, Parañaque, Metro Manila**
EIA Preparer	**Technotrix Consultancy Services Inc.**
Telefax	**02 (416-4625)**

PROJECT DESCRIPTION

Reclamation of ONE (1) parcel of bay water of 286.86 hectare area

- ✓ **Containment Wall**
- ✓ **Storm surge protection**
- ✓ **Dredging, Transport of Fill Materials**
- ✓ **Engineered Drainage System**
- ✓ **Internal and access road networks**
- ✓ **Access way**
- ✓ **Street lighting; electrical, communications**

PROJECT RATIONALE

- ✓ **Promote well-being of the people of the City of Parañaque, in particular, of the host barangay(s)**

- ✓ **Stimulate commercial growth by providing a basic infrastructure, namely land to investors**

- ✓ **Provide land at no cost to the City**

PROJECT RATIONALE

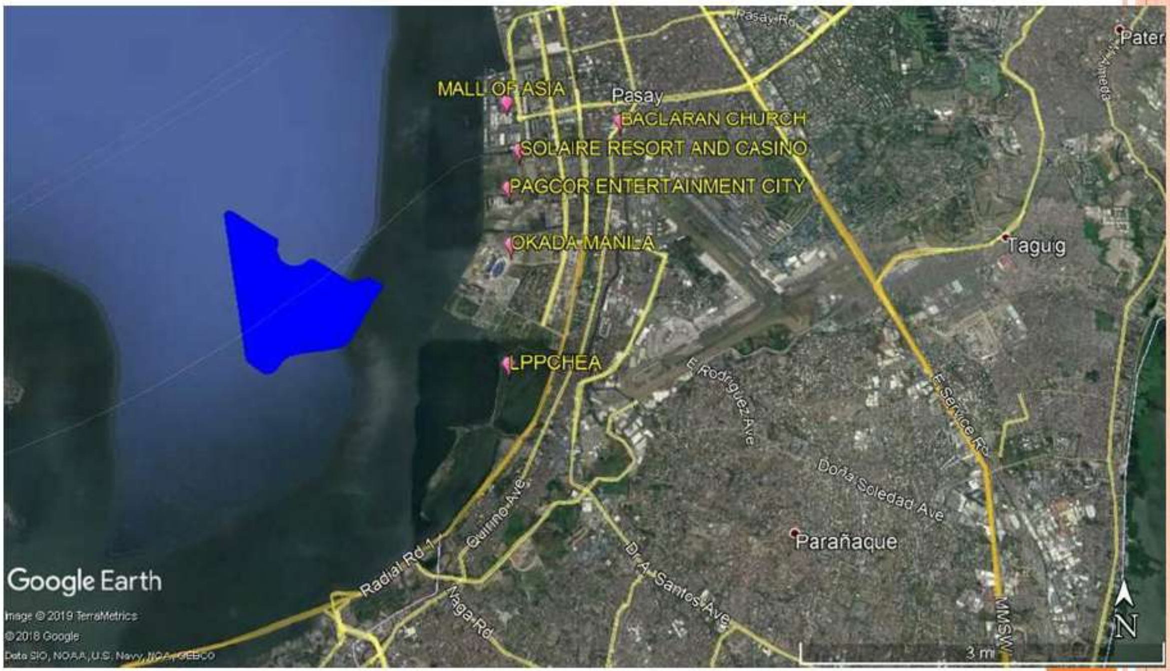
- ✓ Provide much needed employment and livelihood opportunities

- ✓ Help in decongesting Metro Manila by providing alternative site for commercial/mixed-use property project developments instead of such developments being located inland.

THE PROJECT SITE

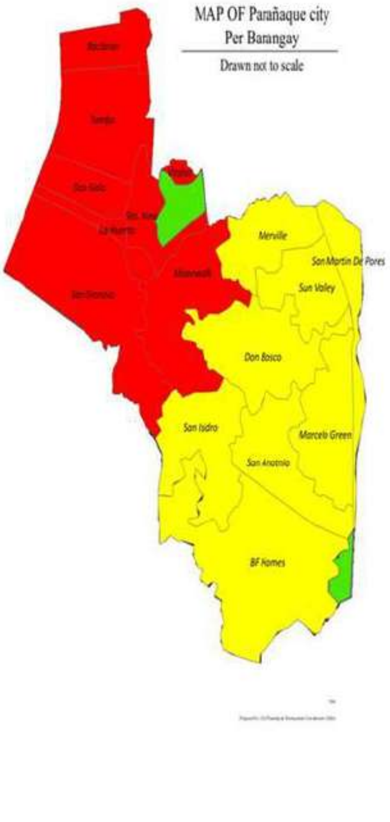
Google Earth Map indicating the Proposed Project

THE PROJECT SITE



Vicinity Map and other Important Landmarks relative to the Proposed Project Site

THE IMPACT BARANGAYS



PROJECT ALTERNATIVES

The alternatives evaluated refer to:

- Landform: Choice of one (1) versus multiple islands
  Site selection
- Method of Reclamation: Choice of most suitable equipment for dredging and filing operation and methodology for soil stabilization
- Resources and source(s): The large volume of fills make the fill materials as the largest aspect of resources involved

The Landform

PROJECT ALTERNATIVES

Site Selection

The site should not be in very deep waters (of more than 12 meters as a "rule of thumb") otherwise the project viability is jeopardized due to attendant much higher reclamation costs. Moreover, the amount of fill materials as well as the reclamation activities are more involved with deep waters.

Territorial Jurisdiction

The site should be legally within the jurisdiction of the LGU-Proponent, which for this project is the LGU of Parañaque.

PROJECT ALTERNATIVES

Resources and source(s):

The *"raw materials"* needed for reclamation are the fill materials and rocks.

PROCESS AND TECHNOLOGY

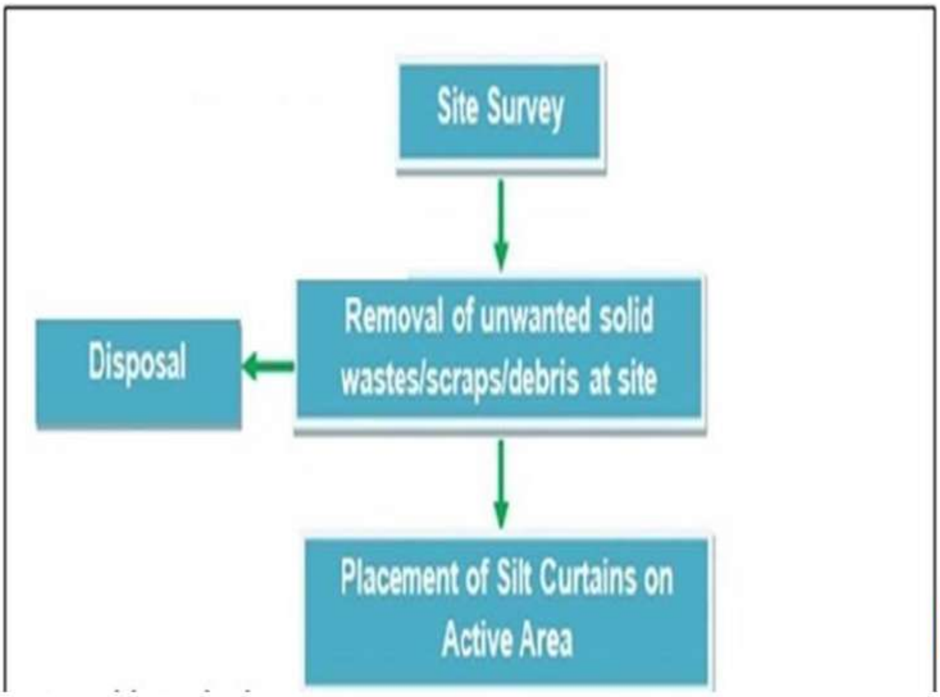
- ✓ Dredging at the reclamation site to remove unwanted seabed materials and prepare it for filling.
- ✓ Filling with suitable materials to the finished platform elevation.
- ✓ Transport of the Dredging Vessel To/From Source of Fill Materials

PROCESS AND TECHNOLOGY

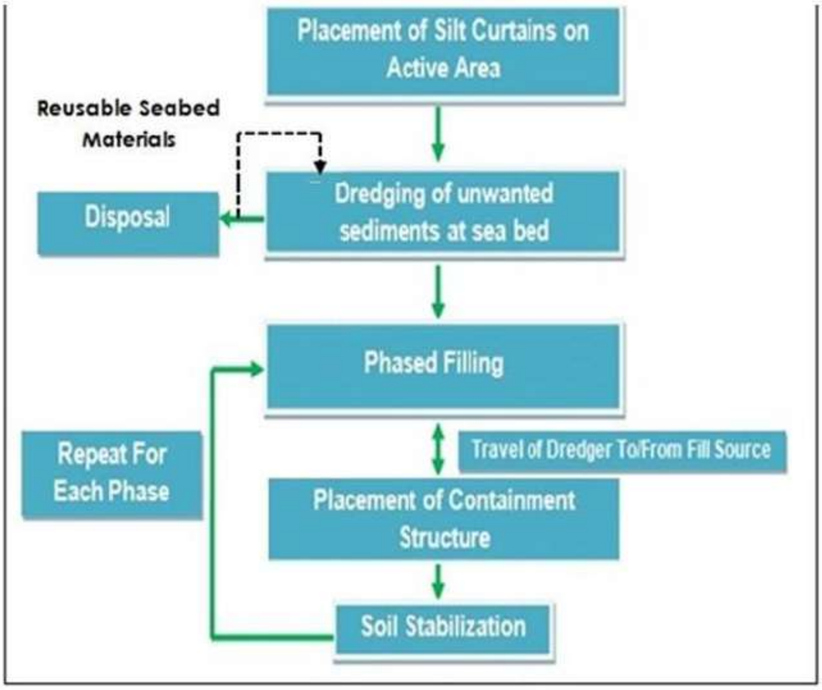
Reclamation Method

- The most environmentally sound filling method, which is by direct discharge from the TSHD without the need for using temporary storage (rehandling pit) of fill materials before discharging by high pressure pumps.
- The optimum method and choice of equipment by the Reclamation Contractor considering that each contractor has its own particular vessels and dredging equipment.
- The required timetable to complete the project noting also that each contractor will have different timelines based on the equipment available.
- The geotechnical aspects, which will dictate the type and amount of containment structure, i.e. whether made of rocks or steel piles or a combination.

PROCESS AND TECHNOLOGY



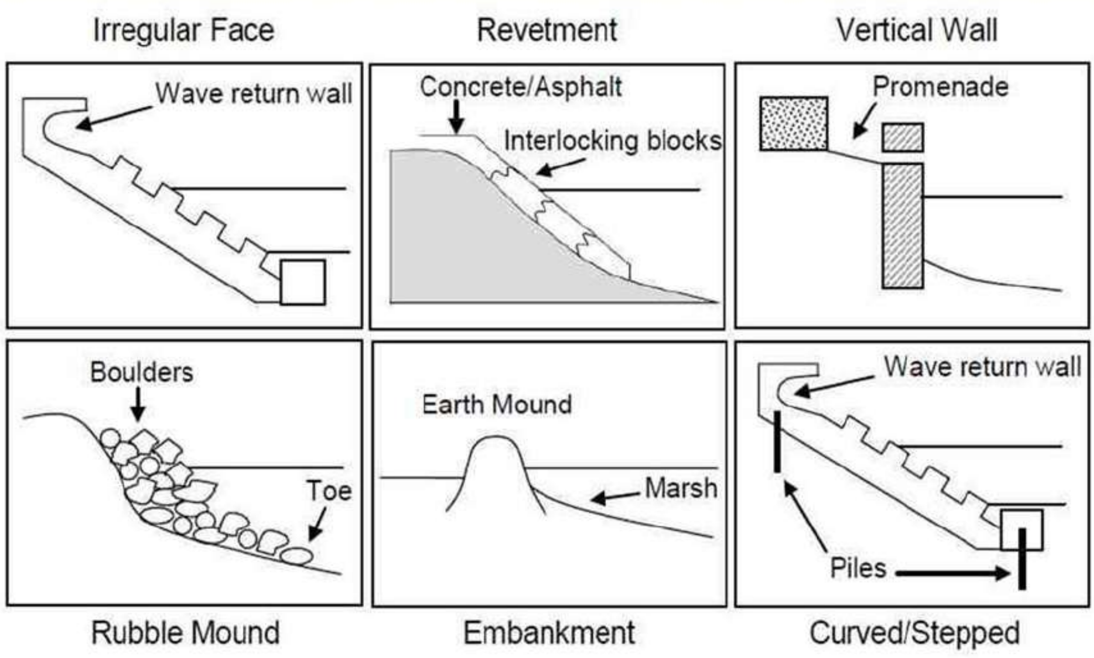
PROCESS AND TECHNOLOGY



PROCESS AND TECHNOLOGY

- Transport of the Dredging Vessel To/From Source of Fill Materials (**e.g. Trailing Suction Hopper Dredger or TSHD**)
- Extract the sand at the source (Approximately **127M Cu. M. est. Volume)**
- Place fills directly at reclamation site; e.g. bottom dumping or rainbowing

CONTAINMENT



Hard, concrete structures are typically replaced by revetments and embankment-type structures in more sheltered environments

SOIL STABILIZATION-ILLUSTRATION ONLY

- ✓ **COMPACTION**
- ✓ **USE OF WICK DRAINS**

PROJECT TIMELINE

The estimated timetable will cover a period of 3-5 years up to the rendering of the reclaimed land ready for the next phase involving vertical developmental works.

MANAGING ENVIRONMENTAL ISSUES

- ✓LAND
- ✓WATER
- ✓AIR
- ✓PEOPLE

CONSTRUCTION/RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Perception of flooding onshore as a result of reclamation	Floods caused by • Blocking/disturbing rivers/channels • Clogging of discharge canals with garbage .

CONSTRUCTION/RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Storm surges/waves and flooding on land	Platform level will be above extreme water level that can occur
	Adoption of measures from predictions/modeling studies that will include Sea Level Rise predictions

CONSTRUCTION/RECLAMATION PHASE

✓ **LAND**

POTENTIAL IMPACT	MITIGATING MEASURES
Storm surges/waves and flooding on land	Wave deflectors and other similar defenses such as revetment will be part of the study.

CONSTRUCTION/RECLAMATION PHASE

✓ **LAND**

POTENTIAL IMPACT	MITIGATING MEASURES
Storm surges/waves and flooding on land	Public Awareness and Vigilance for emergency preparedness

CONSTRUCTION/RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Land Subsidence	Solid bedrock and appropriate foundation design based on geotechnical studies
	e.g. By compaction; pore water pressure rod (vibro) compaction, dissipation – installing permeable drain pipes; cementation and solidification; replacement; etc.

CONSTRUCTION/RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Protected Area	Project site not in and will not impact on NIPAs protected area

CONSTRUCTION/RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Ground shaking and liquefaction	• Through engineering intervention and compliance with Structural Codes • Reclamation Methodology

CONSTRUCTION/RECLAMATION PHASE

✓LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Ground shaking and liquefaction	Public Information Campaign for Disaster/Risk Management
	Emergency Preparedness Programs

CONSTRUCTION/RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Increase in siltation/sedimentation loading in coastal waters; increase in turbidity and suspended solids	• Provision of silt curtains • Collection and trans-location of macro-invertebrates found within the reclamation area. • Short-term Reclamation Phase
Reduction in photosynthesis and primary productivity Disruption of fish and benthos larval growth;	

CONSTRUCTION/RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Inadvertent spill of domestic wastewaters can cause coastal water pollution, loss of macro-invertebrate population, impairment in fish and shellfish reproductive physiology.	Onboard vessel bilge wastewater management system No direct discharges to sea
	Installation of latrines and waste receptacles & collection facilities during soil stabilization phase;

CONSTRUCTION/RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Accidental oil and grease spills	Bilge wastewater management; Adoption of an oil and grease recovery and treatment system; Implementation of rigid policies against indiscriminate disposal of oily waste and marine vessel bilge water.

CONSTRUCTION/RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Dislocation of lift nets and mussel farms	Inventory and transfer of affected lift nets and mussel farms. Provision of alternative livelihoods to dislocated fishermen.

CONSTRUCTION/RECLAMATION PHASE

✓WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Disposal of unwanted dredged materials	• Minimize through reclamation methodology • Disposal subject to clearances and protocols

CONSTRUCTION/RECLAMATION PHASE

✓WATER SUPPLY CONFLICT

POTENTIAL IMPACT	MITIGATING MEASURES
Reclamation does not use significant water	Own water supply
	No underground abstraction

CONSTRUCTION/RECLAMATION PHASE

✓AIR

POTENTIAL IMPACT	MITIGATING MEASURES
Noise	Not Significant
Pollutants discharged by equipment and vehicles	Temporary in nature
	Use of quality fuel in equipment and power generating sets

CONSTRUCTION/RECLAMATION PHASE

✓PEOPLE

POTENTIAL IMPACT	MITIGATING MEASURES
Potential Dislocation of Fisherfolks	Mutually acceptable agreements Compensation Plans
Employment and Livelihood	Preference to qualified local residents
	Small businesses

OPERATIONS PHASE

NOT INCLUDED IN SCOPE OF ECC APPLICATION-FOR INFO ONLY

✓ LAND

POTENTIAL IMPACT	MITIGATING MEASURES
Impact on Traffic / Traffic density increased	Internal roadway and traffic scheme to be part of reclamation planning. Ingress and egress points to be designed.
	Integrated traffic management with the City of Parañaque
	Access Road
Land Subsidence	Principal cause which is groundwater abstraction absent

OPERATIONS PHASE

✓ WATER

POTENTIAL IMPACT	MITIGATING MEASURES
Discharges of effluents from locators	Individual/Locators wastewater treatment units
Generation of domestic wastes	Sectionalized central wastewater treatment system

OPERATIONS PHASE

✓ **AIR**

POTENTIAL IMPACT	MITIGATING MEASURES
Vehicular emissions	Traffic Management
	Use of Euro IV-P fuels (or better)

OPERATIONS PHASE

✓ **PEOPLE**

Ensure Public Health

OPERATIONS PHASE

✓ **PEOPLE**

Employment Generation

OPERATIONS PHASE

✓ **PEOPLE**

SOCIO-ECONOMIC

Increase demand for social services

OPERATIONS PHASE

✓ **PEOPLE**

SOCIO-ECONOMIC

Increase in government revenue

PHOTOGRAPHS OF PROJECT SITE

Public Participation

Information Education Communication(IEC)

February 20, 2018

Name	Issues/Concerns Raised	Response
San Dionisio Credit Cooperative Representative	The Proposed Project is supposed to be 300 hectares only, why did it become 400 ?	As presented on the map, the proposed 300 hectare-project is different from the 400 hectares reclamation project. Parañaque has 2 different reclamation projects being applied for an ECC
	We were informed in a very short notice to attend this meeting. Suggest on the next meeting you invite everybody else like our fisherfolks, and any other concerned groups.	Your concern is duly noted Ma'am. We thank you for your attendance.
	Since this 400 hectare is a separate project from 300, we assume you already have a resolution signed by the Sanggunian? Can we get a copy of that resolution or the resolution No.?	The appropriate document will be part of submission in the EIS Report as may be required during the Technical Scoping.

Name	Issues/Concerns Raised	Response
Kag. Shannin Olivares (Brgy. San Dionisio)	Distance of the proposed project from Las Piñas Parañaque Critical Habitat Area (LPPCHEA)	The proposed project is not located within the protected areas and is about 3 km away from LPPCHEA.
	Consider the effect or impact of the proposed project to the protected areas specifically LPPCHEA	We will make sure to include protection of LPPCHEA in our study/EIS report.

Name	Issues/Concerns Raised	Response
Mr. Jon Salvador (Brgy. San Dionisio)	Issue on Social Economic Impact: 1. From pre-construction phase of the project, will the barangay be benefited especially in terms of taxes? 2. Will the project abide with our barangay resolution?	Proponent/Developer will comply with barangay ordinances. Host Barangay will be benefited with this project
	Prerequisite to the ECC, Barangay endorsement is needed, will the project need a Barangay Endorsement? What if, we, as barangay official will not endorse the project, will it push through?	For ECC application purposes, barangay endorsement is not necessary, but for other permits before the operation phase, barangay endorsements might be necessary.
		Project will not push through after getting the ECC until proponent/developer complies with all the permits or requirement of the PRA and NEDA. Proponent need to secure NTP (Notice to Proceed) before its project implementation. ECC is just an initial or planning tool.

Name	Issues/Concerns Raised	Response
San Dionisio Credit Cooperative Representative	Can you provide us with the resolution number of the Resolution signed by the Sanggunian? We are sure that you will be including the said resolution in your report and with this meeting definitely you now have the signed resolution	Resolution will be included in our EIS report as may be required during the Technical Scoping but this will come later.
Mr. Bert C. Ordiales UNIFIED	Clarification on the effect to the Social Aspect. What you are presenting here is all theoretical, not actual. There are no more fish in Manila Bay. I am a bonafide resident who grew up in this City. There were no floods in the old days. But since the reclamation, there is flooding in Baclaran. For simple logic, what will happen if you put soil in a basin full of water, of course water will spill out.	DENR will check everything. They will make sure that our submission and studies are correct and in balance with the environment. The proposed project will cover very small portion of Manila Bay only. It will not cause flooding. Overflow from the reclaimed land is minimal compared to the volume of the Manila Bay. In addition, we are not talking Manila Bay only as this is connected to the South China Sea, which is even larger. Furthermore, preferred source of fill material is within Manila Bay also (SNS), hence, the water that will be lost with the creation of land (by reclamation,) will be compensated/balanced by a similar volume of water that will be created due to the dredging at the source.
Ms. Alma Ferrer (SDCC)	What if we are not in favor of the reclamation? Because it will affect our lives and livelihood. You should also consider us.	DENR will decide as to issuance or non-issuance of the ECC. Barangays or impact barangays will be included in our study, in fact, this meeting is part of our initial communication with you.

Name	Issues/Concerns Raised	Response
Mr. Jimmy Ferrero (OIC of Brgy San Dionision)	Stop the reclamation of Manila Bay, it will give danger to our constituents. This is an added insult to Parañaque	Noted
Mr. Jon Salvador	Bacause of the reclamation, there are no more fishes and fishermen's livelihood was affected. We do not get any single penny from the PRA. San Dionisio will be damaged because of this project. Before, we still had enough space to swim in our bay.	Noted
	The project covers portion of Las Piñas not only Parañaque	Project is in Parañaque.
San Dionisio Credit Cooperative Representative	Project covers only Barangay Tambo, not San Dionisio, why is it that we never heard any statement from Barangay Tambo?	Noted
	We will send position paper of Dr. Kelvin Rodolfo and Engr. Tapang to you. We know you are already aware of this papers Dr. Alabastro. This paper reflect reasons why we are not in favor of reclamation	Noted Ma'am. Suggest you submit your position paper to the DENR formally so it will be properly recorded and transmitted to us.
	You mentioned Dr. Alabastro, that you have a team of Social Experts who will review the study, hope they will see the effect of this reclamation to us	Social Experts are from DENR/EMB. They will be part of the Environmental Impact Assessment Review Committee Members (EIARC) who will conduct thorough review of our submitted study.

Name	Issues/Concerns Raised	Response
Mr. Jimmy Ferrero (OIC of Brgy San Dionision)	Why are you telling us to send our position letter to the DENR? Its DENR who needs us not us who needs them.	Noted
San Dionisio Credit Cooperative Representative	Can we request on the next meeting, inform us early or at least a week before. So we can also be prepared. And send us formal notice.	We will inform you formally on the next meeting with sufficient time for notice.
Ms. Shannin Olivares	You must get a resolution from the barangay, bakit hindi ito pre-requisite sa ECC?	Noted
	Include in your research or study the barangays to protect and balance the ecology and environment as well as the interest of our constituent. Focus not only on the financial and economic aspects but also on environment and ecology. Balance social corporate responsibility because REAL people are to be affected.	
Mr. Jimmy Ferrero (OIC of Brgy San Dionision)	Never by-pass the Council and the barangay	Noted po
San Dionisio Credit Cooperative Representative	Provide us with the copy of the minutes today as well as with the previous meeting in Sto. Niño (for 300 hectares)	Will be sending the EIAMD and EMB copy of the Pre-IEC Report.

Name	Issues/Concerns Raised	Response
Mr. Jimmy Ferrero (OIC of Brgy San Dionision)	Kindly confirm what barangay is covered, is it Tambo or San Dionisio? Who's jurisdiction is it?	To date, we cover as impact areas all the barangays situated along the coastal area of Parañaque, i.e., Baclaran, Tambo, Sto Niño, Vitales, Don Galo, San Dionisio, La Huerta, and Moonwalk. These 8 barangays will be part of our studies.
Ms. Ning Eusebio	Please invite BFAR and Department of Agriculture on the next meeting. They should be here.	Noted po. Will invite them
Mr. Jimmy Ferrero (OIC of Brgy San Dionision)	I am registering now my opposition to this reclamation project. This project has an ill motive. Negosyo ito. Hindi ito para sa tao	Noted
Kap. Michael Factor (Don Galo)	As Chairman of Don Galo, I am happy to see may constituents here attending this activity. I am still in the middle of decision making. We have to do further studies. We have to be balanced with respect to economic returns as well as the livelihood and safety of our people and the environment. It is a fact that population and development continue to grow, and this leads to demand for land, sumisikip na po tayo. I've been to Singapore and Hongkong, people there claims that half part of their countries are reclamation areas. Suggest, kindly include in your studies, how these countries make their reclamation successful, what possible methods do they apply e.g. on their drainage system, etc. Give us idea or knowledge.	Noted

PERCEPTION SURVEY

Perceived Positive and Negative Impacts of the Proposed Project

The respondents perceive benefits from the proposed project are:

1. Livelihood and business opportunities
2. Improvement of roads and other infrastructure
3. Land Taxes
4. Improvement of government services
5. Improvement of Water Services

On the other hand, the perceived negative effects of the project to the community are:

1. Increased traffic
2. Flooding
3. Health and safety hazard
4. Air, water and land pollution
5. Generation of wastes
6. Loss of plants, trees and other infrastructures

ISSUES AND CONCERNS

STAKEHOLDER/ PARTICIPANT	ISSUES/CONCERNS/ QUESTIONS	PROPONENT'S/EIA PREPARER'S RESPONSE

THANK YOU!

FOR MORE INFO:

ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman Q.C.
(02) 9202240-41
www.eia.emb.gov.ph

PROPONENT:
PARANAQUE CITY GOVERNMENT
San Antonio Ave., San Antonio, Parañaque, Metro Manila
02 (826-8244)

EIA Preparer:
TECHNOTRIX CONSULTANCY SERVICES, INC.
Unit 305 FMSG Bldg., #9 Balete Drive, Cor. 3rd St. Barangay Mariana, New Manila, Quezon City
Email: technotrixinc@gmail.com
Tel no: (02)416-4625

ANNEX 6.0
SUMMARY MATRIX FORMAT OF ISSUES AND CONCERNS RAISED DURING THE PUBLIC SCOPING

PUBLIC SCOPING LIST OF ISSUES

Project Name	**Proposed 286.86 Hectare Paranaque Reclamation Project**	Project Location	Municipality/City: Paranaque City Province
Proponent Name	**City Government of Paranaque**	Proponent Address	Paranaque City
Proponent Contact Person	**Mr. Fernando Soriano** **OIC - City Administrator**	Proponent Means of Contact	Landline No Mobile No : Fax No. : Email :
EIA Consultant	**Technotrix Consultancy Services, Inc.**	Consultant Address	Suite 305 FMSG Building #9 Balete Drive, New Manila Quezon City
EIA Consultant Contact Person	**E.G. Alabastro, Ph.D.**	Consultant Means of Contact	Landline No: (632) 416-4625 Fax No.: (632) 416-4625 Mobile No : 0917.8255203 Email : technotrixinc@gmail.com
EMB/DENR Scoping Representatives	**Engr. Carlo Vic Arida** **Mr. Carl Louie Santiago** **EIAMD Central Office**	Place of Public Scoping	San Dionisio Sports Complex Paranaque City
		Date of Public Scoping	27 February 2019

Stakeholder	Issue/Concern/Suggestion	Response(s)
Fr. Herman Abcede CVPS/Marville Paranaque	Eto ay public scoping diba? May posibilidad ba na ang resulta neto ay hindi maapproved? Tapos bigyan nyo nga po kame ng isang halimbawa na nangyare na, na katulad ng project na hindi naapprove ng DENR. Meron ba? Kung meron po pakisabi sa amin para naman kame ay may hope kung kame ay against kung kame ay positive or kame ay negative, at least mapapakingan talga yung aming mga hinaing hindi yung gagamitin lang kame para sabihin na nugpublic hearing kayo, isa sa requirement yun wala namang ano kung negative sila. Although, eventually public hearing lang ang kailangan hindi pala kailangan yung opposition	Carlo: Isang good example which is ako din yung naghandle although mining sya, eto yung sa lobo batangas na Gold mining projects. So based dun sa nagather naming na info at based dun sa assessment nung committee hindi po naissue yung ECC nya kung baga nacancel. Kaya diniscuss ko kanina yung tungkol sa DAO 2017-15 mas pinaigting natin yung involvement ng public, kase para mas marinig naming kung ano talga yung hinaing ng mga maapektuhan. Carl: Sir, to add po. Public Scoping palang po tayo ngayon Babalik po tayo dito sa public hearing kapag pormal na po naming tinangap yung kanilang ECC application para iproseso. Wala pa po kase silang ginagawang study ngayon, wala pa po silang ginagawang EIA report o Environmental Impact Assessment. Pagbalik po natin dito sa public hearing yun po yung kanilang ididiscuss sa atin at malaman kung ang mga issues and concern nyo ay naiclude po sa kanilang study.
Ellan Pailan BRHI	Gusto ko lang po malinawan kung saan mismo yung project location. Pwede po bang Makita ulit yung mapa? Gusto ko lang malaman asan po ang Solaire kumpara po doon sa project site? So wala sya sa tapat ng Solaire? Ang tanong ko lang po, kase merong current national trust po ang government to rehabilitate manila bay. Wala po bang inconsistency yung plans natin to have the reclamation. Palagay ko po wala pang assessment talaga yung DENR to rehabilitate manila bay tapos mag kakaroon	Jean: So eto pung island na 286.86 hectare, eto po yugn boong entertainment city. So eto po yung Okada at ayun si Solaire. Jean: Medyo malayo po. Carlo: May bago kaseng lumabas na EO nung Feb. 01 2019, let's just wait for the IOR. Basta yung DENR will prioritize to protect ang environment and to check yung balance between economic relations, well yung reclamation will bring a lot of economic benefits dun sa mga stakeholders. So we

Stakeholder	Issue/Concern/Suggestion	Response(s)
	tayo ng reclamation	have to check and balance.
	The DENR should take Mandamus issue into consideration before approving any reclamation project.	Carlo: Sir as to now wala pang approved na area clearance. Sa office pinag uusapan namin yan on how to deal with the reclamation projects. There's a PRA kase, kaya binubuo yan for the reclamation project. Kaya hindi natin pwede basta-basta sabihin na no to reclamation. We're thinking of policies. Yung mga USEC naming nag uusap yan like almost weekly on how to deal with the projects.
	Ako basically against ako sa any kind of reclamation, I think it's too much na, and anyway that's a personal view.	
	Ang LPPCHEA is that area diba? I think there's also a writ of kalikasan issue to the LPPCHEA are also a concern.	Carlo: Well doon nga sa extended NIPAS it is declared as a protected area.
	Well kung dun nga sya sa tapat ng LPPCHEA there's also a concern sa effect nya on LPPCHEA	Carlo: Kaya nga kame sa EMB, we gather facts, para we have strong basis.
	Would you know if naapprove na yung ibang ECC sa ibang reclamation?	Carlo: Yes may mga naapproved na mga ECC's before. Sa Manila and Pasay. Sa Paranaque First application palang.
	Second concern would be the traffic that the project might produce. Nasabi nga kanina na in 5-10 years magkakaroon ng problema sa traffic kase magkakaroon ng ibang island so I think mag kecreate din ito ng traffic.	Atty. Soriano: be assured that we are looking forward to ease the issue on traffic in the area. But in so far, the present or the current situation is much much better than the traffic in the rest of metropolis.
	The next concern would be the effect of	Atty. Soriano: I would also like to add that

Stakeholder	Issue/Concern/Suggestion	Response(s)
	development on the property prices in the area, real-estate prices. Kase yung ibang ares jan na date ay water front hindi na sila magiging water front. Yun yung concern nung mga property owners along the area.	that is correct. There would be an island, but the location is somewhere on the right most area. The reclamation is in front of solaire but having a minimum of 200 meters distance from the front of your area to the site location. That is the approved joint venture agreement that was entered into by the city and the private sector. Therefore, on the issue of water front of that area, I would say that there is still water area with a minimum of 200 meters.
Dr. Cariteo Alliance for stewardship progress/ Paranaque Foundation Incorporated	When the resolution was approved by the LGU? It seems that we were not also part of the consultative process when this was brought about, and the LGU will be a proponent for this reclamation. Because, we are also questioning about the objectives the city for the reclamation if it is for the wellbeing for commercial, etc. how we wish our group would be furnish copies, since we already have experience of reclamation in the city. How true are these objectives? So that it will be facts based. For example that there is no cost, but the environment is already a heavy cost. Secondly, on the PRA. Because its reclamation, when is it valid to have a reclamation? Guidelines kumbaga. Kase last time na nagkaroon ng ganitong public hearing about 5 years ago, the only thing na sinabi is kapag mababaw. Mababaw sa manila bay, parang mura for reclamation. But for the purpose of the reclamation for what and reclamation for whom hindi naaanswer. And marami na tayong reclamation projects, also for the DENR parang every now and then, paulit ulit itong process na ganito. Parang walang guidelines. Parang walang buhay ang earth.	Carl: So ayun po inonote po muna naming yung iba, yung sa mga furnishing po, we can furnish you with a copy. Yung ibang documents po siguro kapag nag public hearing nap o kame kase may draft environmental impact study na po tayo noon and then executive summary.

Stakeholder	Issue/Concern/Suggestion	Response(s)
	Tapos you will come kung paano lang I rereclaim and everything. Halos sampung taon na kaming nag momonitor. Sa dami ng inattendan naming ganitong scoping parang walang data and DENR, tapos di naming alam kung ano ang stand ng DENR. Parang matter of death lang to, kame sa public hindi educated. Kung ganito yan eto lang yan. Dapat visually and intellectually alam naming na eto ang mamamatay. Pero hinde eh. So who speaks for the earth? Tapos PRA ang mag aassess tapos derect na sa office of the President. Parang wow approve na agad pag ganyan. For Technotrix, dahil kayo yung nandito can you lay down yung mga credentials ninyo, ano ba yung mga nagagawa nyo na. Where you ever part of any reclamation project? Or ever be part of any clear assessment ng mga reclamation Project? Baka yun din kailangan nyong ilahad sa mamamayan. Kase lagi na naming kaying nakikita throughout manila bay eh. And there was a stupid remark na wala ng isda sa area ng reclamation. I think that was also on the record no? So ibigay nyo sa akin yung credentials nyo para alam naming mamaya itong study nato is also BIAS towards reclamation.	
Atty Army Corpus Office of Senator Cynthia Villar	Correction lang na this is the first application of the city of Paranaque, there were previous during nung previous administration kay Mayor Bernabe. One of which is yung ALTEC Project na finalan naming ng writ of kalikasan case, it involves 600+ hectares portion of which is Las Pinas which I am a resident and portion of which is from Paranaque. We file the case but then during the cause of the pendency of the case the ECC expired and former Sec. Gina	Jean: Dito po yung ALTEC katabi po yung LPPCHEA

Stakeholder	Issue/Concern/Suggestion	Response(s)
	Lopez also issued the cancellation of the ECC. So ito bang 286.86 may overlap ba doon sa previous since kayo naman technotrix and proponent noon. Sabi po kanina ni Atty. Ditto po natin malalaman kung I aaprove ang ECC application. Kase po ang treatment po ng DENR sa ECC is a planning tool at ang EMB ay parang guidance lang pero narinig nyo na sa proponent na you could make a no reclamation as an alternative, because every time we confirm with DENR-EMB na si Sen Cynthia Villar po ang chairman on committee on environment which is not being said. So ayan coming from the representative of the city of Paranaque siguro you should take note that a no reclamation is could be an alternative, so it's not just a planning tool. And it was mention from the representative from Solaire kanina that there is a Manila Bay clean up it's very much publicized. Almost every day we heard about news on manila Bay. Since this is a public Scoping, we should include on public scoping the 13 mandamus agencies. Ibig sabihin na everytime na meron tayong mga pagtitipon na ganito 13 mandated government agencies shold also be included. Kase baka sabihin naman nila na kame nagpapakahirap na tuparin yung mandato na linisin ang Manila Bay and then here comes a proponent or a city na tatabunan lang yung mga efforts naming, so I am appealing to DENR-EMB to include the 13 mandated government agencies on any public scoping that you would conduct. At matagal ko nang sinasabi to every time na magkikita tayo sa mga ganitong mga pagtitipon	Carlo: Ok maam Noted po lahat. Well some of the 13 mandamus are part of the committee na, and also they are invited naman sa scoping's at sa hearings. Yung iba maam kasama sa list na nirerequire ng DENR na mag submit ng letter of no objection. Tapos yung BNB is part of the review committee of the EMB per memo of the DENR naman. Yung Effects sa LPPCHEA which NIPAS declared it as protected area. Carlo: Yung sa online na website naman. Well mabagal kase yung internet connection natin and we need yung service na malalaki. The volume per project is so high, siguro on the near future magagawa natin yan. Kung

Stakeholder	Issue/Concern/Suggestion	Response(s)
	na sana naman magkaroon kayo ng website kung saan makikita naming yung mga schedules mga posting na magkakaroon ng mga ganitong activity. So we could have copies ng mga project like this	gusto nyo maka access sa files naming. We have print out copy sa office saka sa regional offices namin yung mga iniissue naming na ECC and sa mga ibang government agencies nag bibigay kame once na may ma issue na copy. Carl: to add po, since you mentioned po yung mga dapat isama sa invitation. Actually we send also invitations from Cavite to Navotas. Actually some of them are here. Titignan pa po naming kung maextend naming maam yung invitation sa public scoping natin and yung sa materials po siguro eia.emb.gov.ph you can access our website page to see the posted documents, so meron po ditong tatlong sections Notice of Public Hearing, Notice of Public Scoping and EIA report for public. Unang una po yung Notice of public scoping kung saan po yung venue and date and usually naglalagay napo kame ng Project Description since wala pa po kame project document. Naka post po sa website yung schedules ng public scoping at hearing kasama ang PDR. So makikita nyo naka post last February 13 pa yung Paranaque 286.86, minimum of 10 days po ang posting that's on Dao 2017-15.
Pearly Galdo MPC ng Bulungan	Kung sakali pong matabunan po yun, marami po kaming members na may tahungan po diyan. Ano po yung plano po nyo para sa kanila? Kase Malaki po yung magiging capital, mula dun sa pagkuha hangang doon sa paglinis hangang sa production.	Jean: ngayon po hindi pa po tayo nagcoconduct ng marine study doon sa area na yon. Pero kung maroon po, iinventaryuhin po yun tapos po makikipag usap po yung proponent sa LGU pati napo pati nap o ang mapipili nilang partner makikipagusap po doon sa organisasyon o doon sa mga tao kung papaano magkakasundo kung papaanong paraan

<table>
<tr><th colspan="2">Stakeholder</th><th>Issue/Concern/Suggestion</th><th>Response(s)</th></tr>
<tr><td colspan="2"></td><td></td><td>ang alternatibo. Sa ngayon po kase hindi pa natin alam o kung sino sino pero kakausapin din po syempre kung sino-sino, hindi lang po yung taong involve. Hindi lang po isa, dalawa o bente pati na rin po yung samahan.

Atty Soriano: the consideration of all this will be a concern. Not just that we are here or in the public hearing on the level of the compliance. And that’s why I am here to hear that, because on the end of the day that would be our concern. This would be dependent on the issue on whether or not only.</td></tr>
<tr><td colspan="2">Mabel Marie Barba
PDFI</td><td>Kapag po ganitong mga activities at forum kailangan po napaka extensive ng mga pagbibigay ng mga invitasyon. Kagaya po ngayon hindi kop o alam kung member ng pamalakaya or mga home owners. Meron silang kanikanilang concern. Kase sila yung mga affected, parang binabaliwala natin sila. Kaya maaari ban a kapag nag bibigay tayo ng mga invitation ay isama naman natin sila. It’s a Public hearing or public forum and where is the public?</td><td>Carlo: with regards to the invitation kase, we have guidelines on how to assess who are the stakeholder’s nyo. I can say na lahat naman doon ay nabigyan ng invitations. Well di natin alam kung bakit hindi sila nakapunta. Last year noong IEC naman mas maraming umattend and they have raised their issues naman. I assure po ma’am na sa public hearing iiinvite po ulit natin sila and we are hoping na umattend sila, kase sila nga po yung maaapektuhan</td></tr>
<tr><td>Atty. Maria Filipina Lucero
Quinto law Office</td><td>We have R1 Consortium which is the largest tax payer on the city of Paranaque.

Lastly is the overlapping of the 600+ reclamation to this 286.86 reclamation.</td><td>Carl: Sa study, we will have to double check. Pero nabangit kanina ni ma’am overlapping. Pero it is not overlapping but magkatabi sya.

Carlo: we will check the coordinates to verify.

Jean: Maaaring magkatabi pero hindi overlapping. Pero at this point hindi kita masasagot ng precise kung ano yung distansya pero aalamin ko po yan pagkatapos natin. Pero magkatabi hindi lang natin alam yung distansya.</td><td></td></tr>
</table>

Stakeholder		Issue/Concern/Suggestion	Response(s)
		Carlo: For your position paper lang paki bigyan kame ng details. You need to submit din sa amin. Formal submission	
John Dioquino Entertainment city	Sana mainvite lahat na nasa Entertainment city, ayala solaire and Pagcor which holds our company and many more.	Carl: Noted po	
Fr. Herman Abcede CVPS/Marville Paranaque	Mas maganda sana na kapag nag dedecide ang LGU masama din sana kame, lalo na yung mga poor. Kase marame sa atin nakatira dito within this area kase sila siguradong babahain sila kase malaking area yun eh. Pangalawa is livelihood, yung malalapit lang yung makakapakinabang pero eventually sisirain nyo din yung livelihood nila. Madidisturb yung environment, una may mga fisherman dyan. Hindi na sila makakapangisda dyaan kase baka may mga guard pa dyan nag may mga mayari ng island at hindi sila papayagang mangisda within a designated area. Tapos pag binaha dyaan bibigyan ng tig 20,000 halimbawa ang kada pamilya para lang makapagpatuloy ng buhay forever na silang babahain pagkatapos	Carlo: We will consider syempre sa studies natin yung kanilang livelihood.	

REPRESENTATIVE OF THE PROJECT PROPONENT

MR. FERNANDO SORIANO
OIC - CITY ADMINISTRATOR
(By Virtue of the Authority of the Mayor, Attached)

Signature over Printed name

EIA CONSULTANT

Edgardo G. Alabastro, Ph. D.
Technotrix Consultancy Services, Inc.
Signature over Printed name

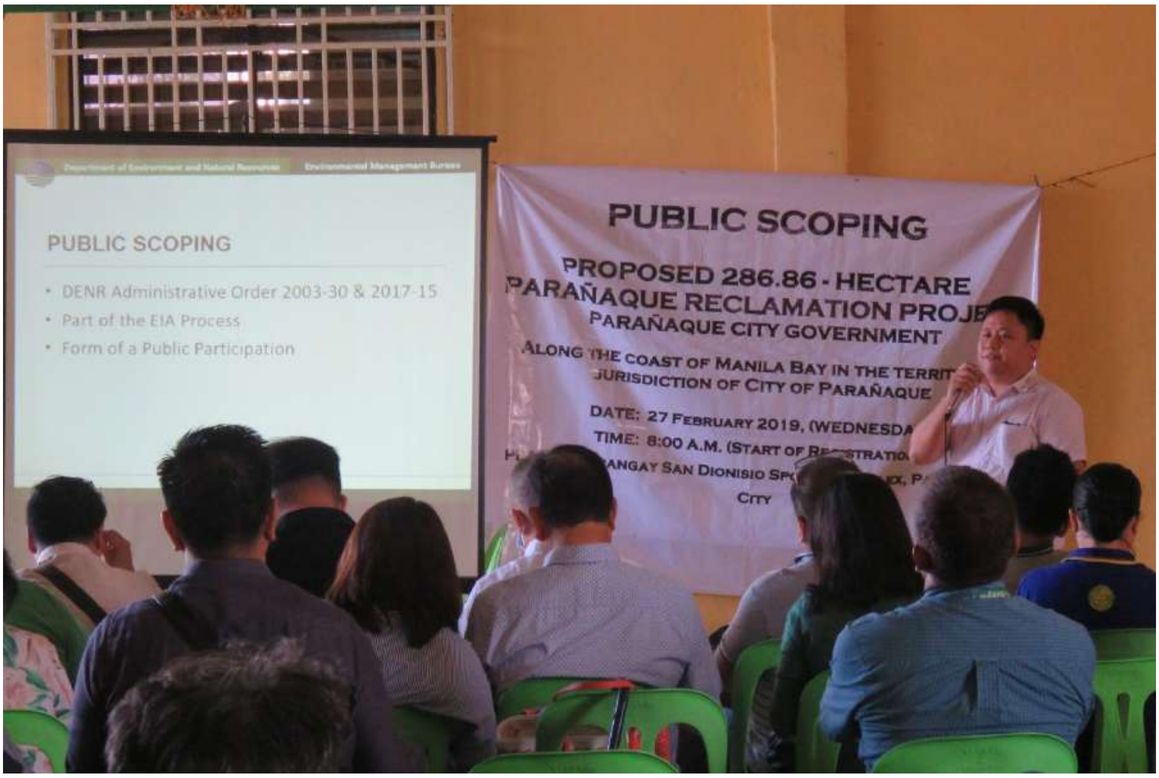
DENR REPRESENTATIVE/S

DENR EMB-CENTRAL	**DENR EMB-CENTRAL**

ANNEX 7.0
PHOTOGRAPHS DURING THE PUBLIC SCOPING ACTIVITY

REGISTRATION PHOTOS

SIR. CARLO VIC ARIDA - PRESENTATION OF EMB GUIDELINES



WELCOME REMARKS FROM ATTY. FERNANDO SORIANO- CITY ADMINISTRATOR

PROJECT PRESENTATION BY JEAN RAVELO

FR. HERMAN ABCEDE

ELLAN PAILAN

DR. CARITEO

ATTY. ARMY CORPUS

PEARLY GALDO


MABEL MARIE BALBA


ATTY. MA. FILIPINA LUCERO

JOHN DIOQUINO

PORTION OF PARTICIPANTS

Republic of the Philippines
Department of Agriculture
BUREAU OF FISHERIES AND AQUATIC RESOURCES
3rd Floor, PCA Building, Elliptical Road, Diliman, Quezon City
Tel. Nos. 929-9597, 929-8074, 426-6532
Fax Nos. 929-8074, 426-6532

September 18, 2019

HON. EDWIN L. OLIVAREZ
Municipal Mayor
City of Parañaque

Subject: Request for No Opposition/Objection on Proposed 286.86 Hectare Parañaque Reclamation Project

Dear Mayor Olivarez:

This refers to your letter-request for a certification interposing no objection to the proposed reclamation project of Century Peak Corporation within the waters of Manila Bay in the Territorial Jurisdiction of Parañaque City.

Upon review and evaluation of the documents submitted; 1. Basic City Fisheries Ordinance; 2. Draft Parañaque City Comprehensive Sea Use Plan; 3. Environmental assessment mitigation study with recommended mitigation measures; and 4. Financial package for affected fisherfolk to make up for their loss of livelihood, the following are our observations and recommendations, to wit:

1. Pursuant to the Municipal Ordinance No. 131, series of 1992, that you shall protect the right of subsistence fishermen to the preferential use of the communal marine and fishing resources both inland and offshore, we highly recommend to secure and prioritize the welfare of the possibly affected or displaced fisherfolks by the project, particularly, in the provision of employment not just for the construction but for the whole duration of the project;

ANNEX ES-D

2. Pursuant to the Municipal Ordinance No. 06-02, series of 2005, Section 8, Division and Classification of City Waters – as soon as possible, the Office of the City Mayor shall create a special body to provide the classification and zoning of fishing areas. The areas so classified shall be properly delineated and marked with buoys. Provided, that if classification were not yet determined or established, the Sangguniang Panglungsod with the recommendation of CFARMC may designate temporary areas for exclusive fishery operation. And, attached to the documents submitted to this office is a draft or unapproved Comprehensive Sea Use and Marine Spatial Plan. Hence, we recommend that the LGU shall come up with an official documents and cause for immediate submission to this Office;

BFAR has been identified as one of the national government agencies with the continuing mandamus order by the Supreme Court to clean up Manila Bay, specifically restore and revitalize marine life. Relative to this, we interpose no objection to the above-mentioned reclamation project on condition that your office will ensure compliance to the above findings and recommendations, hence, our office will close monitor and assess in this respect.

Very truly yours,

EDUARDO B. GONGONA
Director/Undersecretary for Fisheries

Republic of the Philippines
OFFICE OF THE PRESIDENT
PHILIPPINE RECLAMATION AUTHORITY
7th floor, Legaspi Towers 200 Bldg., 107 Paseo De Roxas St., Legaspi Village, 1226 City of Makati
Tel. No.: (02) 459-5000 • Facsimile No.: (02) 815-2662
Website: www.pea.gov.ph • Email: info@pea.gov.ph

18 September 2019

OFF...
PA...
DATE & TIME: 9.24.19 / 9:45
RECEIVED BY: NWA

HON. EDWIN L. OLIVAREZ
Mayor
City of Parañaque
Office of the Mayor, Parañaque City Hall
San Antonio Avenue, Parañaque City
1700 Metro Manila.

Attention: **MR. FERNANDO C. SORIANO**
OIC – City Administrator

Dear **Mayor Olivarez:**

This refers to the application of the City Government of Parañaque to reclaim 286.86 hectares along the City's coastal area for mix-used development.

We note that the project will be implemented through a joint venture with Century Peak Corporation (CPC) selected through the City's Public Private Partneship (PPP) Code. We also acknowledge the receipt of the following documents submitted by the City for said project:

(1) Feasibility Study;
(2) Geological Site Scoping Report;
(3) Certification dated 06 March 2019 issued by the DENR-NCR on the classification of the area adjacent to the project; and
(4) Sangguniang Panlalawigan Resolution No. 19-017 regarding the authority of the Parañaque City Mayor to sign the Joint Venture Agreement (JVA) with CPC.

May we furnish you with copies of related laws and issuances for the City's guidance:

(1) Executive Order (EO) No. 74 s2019 (**Annex A**);
(2) PRA Administrative Order (AO) No. 2019-4 (**Annex B**);
(3) EO No. 543 s2006 (**Annex C**); and
(4) PRA AO No. 2007-2 (**Annex D**).

In order for PRA to assess whether the project will be covered by the Transitory Provision of EO No. 74 s.2019, may we respectfully request the City to furnish this Office with a copy of its JVA with CPC.

Thank you.

Very truly yours,

ATTY. JANILO E. RUBIATO
General Manager and CEO

PHILIPPINE RECLAMATION AUTHORITY
09-141-2019.0243
106544900608
September 23, 2019 08:35:27

Republic of the Philippines
PHILIPPINE RECLAMATION AUTHORITY
7th floor, Legaspi Towers 200 Bldg., 107 Paseo de Roxas St., Legaspi Village, 1226 City of Makati
Tel. No.: (02) 459-5000 • Facsimile No.: (02) 815-2662
Website: www.pea.gov.ph • Email: info@pea.gov.ph

17 October 2018

HON. EDWIN L. OLIVAREZ
Mayor
City of Parañaque
Office of the Mayor
San Antonio Avenue, San Antonio
Parañaque City

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

Dear **Mayor Olivarez**:

This refers to the letters of the Honorable Mayor dated 17 September 2018 and 2 October 2018 requesting for PRA's "no objection" on the application of the City with the Department of Environment and Natural Resources (DENR) for issuance of Area Clearance relative to the City's proposed 286.86-hectare reclamation project in Manila Bay.

Relative thereto, this Office interposes "no objection" on the City's application for an Area Clearance.

We would like to clarify and emphasize, however, that this "no objection" clearance is **NOT** equivalent to the "Reclamation Permit" and "Notice to Proceed" required by this Agency prior to the conduct of actual reclamation works. This "no objection" should not be construed as PRA's approval of said reclamation project pursuant to Executive Order (EO) No. 146 series of 2013.

Please be guided accordingly. Thank you.

Very truly yours,

ATTY. JANILO E. RUBIATO
General Manager and CEO

10-22-18
NOVA 11:35

PHILIPPINE RECLAMATION AUTHORITY
10-135-2018.0339
61370851532O
October 22, 2018 07:50:23

Republic of the Philippines
DEPARTMENT OF ENERGY

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

CNO-2019-03-001

CERTIFICATE OF NO OPPOSITION/OBJECTION
5 March 2019

The Department of Energy hereby issues this Certificate of No Opposition/Objection to the proposed reclamation project of Century Peak Corporation within the waters of Manila Bay in the Territorial Jurisdiction of Parañaque City, municipal waters of Cavite City, Noveleta and Rosario all within the Jurisdiction of the Province of Cavite.

Provided, that the Century Peak Corporation shall comply with the provisions of Republic Act No.9136 (Electric Power Industry Reform Act of 2001), its Implementing Rules and Regulation (IRR), Philippine Grid Code, and Philippine Distribution Code, including any amendments thereto; policies of the Department of Energy and the Department of Environment and Natural Resources pertaining to Administrative Order No. 2018-14, otherwise known as the *"Guidelines on the Issuance of Area Clearance for Reclamation Projects and Proclamation/Special Patents over Reclaimed Lands"*; policies of other relevant government agencies; and internal requirements of the National Grid Corporation of the Philippines and the Manila Electric Company.

MARIO C. MARASIGAN, CESO III
Director IV
Officer-in-Charge
Electric Power Industry Management Bureau

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

January 09, 2019

CITY OF PARANAQUE
Paranaque City Hall
San Antonio Ave., San Antonio
Paranaque City

ATTENTION : MR. FERNANDO C. SORIANO
OIC – City Administrator

Gentlemen:

Greetings from the Department of Information and Communications Technology (DICT)!

This refers to your letter dated 15 October 2018 (copy received on 18 December 2018) addressed to the undersigned requesting for a resolution expressing that the DICT is interposing no objection to the proposed reclamation project of Century Peak Corporation within the waters of Manila Bay in the Territorial Jurisdiction of Paranaque City.

In this regard, please be advised that the DICT interposes no objection to said proposed reclamation project. However, the DICT would like to request that it be included in the appropriate negotiation for the laying of ducts and subducts for the installation of optic fiber cables.

Thank you very much.

Sincerely yours,

ELISEO M. RIO, JR.
Acting Secretary

TANGGAPAN NG KOMANDANTE
(OFFICE OF THE COMMANDANT)
PAMBANSANG PUNONGHIMPILAN TANOD BAYBAYIN NG PILIPINAS
(National Headquarters Philippine Coast Guard)
139 25th Street, Port Area
1018 Manila

19 MAR 2019

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

HONORABLE EDWIN L OLIVAREZ
Mayor
City of Parañaque
Parañaque City Hall, San Antonio Valley-1
Barangay San Antonio, Parañaque City

Attention: MR FERNANDO C SORIANO
OIC, City Administrator

Dear **MAYOR OLIVAREZ**:

This has reference to your letter regarding the proposal of Century Peak Corporation (CPC) for land reclamation project in Parañaque City.

The proposed reclamation area is clear from any established traffic separation scheme (TSS) or any port facilities. Morever, in the environmental impact assessment study submitted by CPC, the site is about two (2) kilometers away from the Las Piñas – Parañaque Critical Habitat and Eco-Tourism Area, declared as a protected area by the National Integrated Protected Areas System (NIPAS).

In this regard, the Philippine Coast Guard (PCG) poses **No Objection** on the proposed 286.86 hectare reclamation project of CPC within the waters of Manila Bay and territorial jurisdiction of Parañaque. It is prudent for the project proponent to ensure that applicable PCG regulations and other international and local laws are observed prior and during the implementation of the project, particularly in ensuring the safety of navigating vessels and prevention of marine pollution in the reclamation area.

Rest assured of our continued support to the development of the City of Parañaque and on matters of mutual concern.

Truly yours,

ELSON E HERMOGINO
ADM PCG

OFFICE OF THE CITY ADMINISTRATOR
RECEIVED
O. AMAMID
3/20.19
10:05 AM

"Serving our Nation by Ensuring Safe, Clean and Secure Maritime Environment"

FLAG OFFICER IN COMMAND
PHILIPPINE NAVY
Naval Station Jose Andrada
2335 Roxas Boulevard, Manila

22 JAN 2019

Mayor EDWIN L. OLIVAREZ
Office of the Mayor of Parañaque
San Antonio Avenue, Parañaque City
Metro Manila

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

Dear Mayor Olivarez:

This pertains to your request for the Philippine Navy's (PN's) clearance on the proposed reclamation of 286.86 hectare Parañaque Reclamation Project within the waters of Manila Bay in the territorial jurisdiction of Parañaque City.

The PN has no objection on the reclamation of 286.86 hectare Parañaque Reclamation Project provided that the following are being considered for the PN's possible operations:

a. Comply with governing rules and regulations implemented by the Philippine Reclamation Authority (PRA) per Executive Order Nr 525;
b. Installation of Aids to navigation facilities (i.e Light Houses, Light Buoys, etc.) in the vicinity of project site before, during and after reclamation activity to ensure safety for all sea crafts and floating vessels that will pass through the area;
c. Safe passage of PN's watercrafts/vessels on the channels in between the proposed reclaimed areas;
d. Clearance for PN vessels to dock alongside the wharf or pier to be developed in case of security or emergency purposes; and
e. Provide the PN a copy of site development map or chart indicating the official delineation/boundaries of the reclamation project for the purpose of new navigational route planning/programming of our vessel.

For your reference and information.

Sincerely,

ROBERT A EMPEDRAD
Vice Admiral, AFP

Office of the Flag Officer in Command, PN
FOI C 60786
IN TRACKING PLEASE CITE BARCODE NUMBER

PHILIPPINE
PORTS
AUTHORITY

20 February 2019

MAYOR EDWIN L. OLIVAREZ
Office of the Mayor
City of Parañaque
San Antonio Ave., San Antonio
Parañaque City

CERTIFIED TRUE COPY

FERNANDO C. SORIANO
OIC CITY ADMINISTRATOR

Dear Mayor Olivarez:

This refers to your letter dated October 15, 2018 requesting from the Philippine Ports Authority (PPA) a resolution interposing no opposition or objection relative to the proposed 286.86 hectares reclamation project of Century Peak Corporation within the waters of Manila Bay as part of the requirement for Area Clearance application with the Department of Environment and Natural Resources (DENR).

The location of the proposed reclamation project is not within the port zone delineation under the jurisdiction of the PPA, hence, PPA interposes no objection to the above-mentioned reclamation project but subject to the following conditions:

1. The proposed reclamation project shall at all times be compliant with the Supreme Court Writ of Mandamus on the clean-up of Manila Bay;

2. The proposed reclamation project shall neither obstruct anchorage operations in the Manila Bay nor block the entrance navigational channels, fairways, and berths of South Harbor, North Harbor, Manila International Container Terminal nor impair the existing breakwater;

3. The port components of the proposed reclamation project, if any, shall be subject to the written consent of the Authority and the detailed feasibility study and plans shall be submitted to the Authority for approval prior to implementation;

4. Environmental issues and concerns related to the reclamation project shall be governed by the rules and regulations of the DENR, Philippine Coast Guard (PCG), the Authority and other concerned agencies; and

5. Suitable dredged materials shall be used as fill materials, as far as practicable for the reclamation project.

Sincerely,

JAY DANIEL R. SANTIAGO
General Manager

cc: The AGM for Engineering
The AGM for Operations
The Manager, POSD
The Manager, PPDD
The Port Manager, PMO NCR South
The Acting Corporate Board Secretary

OFFICE OF THE MAYOR
PARAÑAQUE CITY
DATE&TIME: 2.22.19
RECEIVED BY: NINA 1:35

A. Bonifacio Drive, South Harbor, Port Area, Manila 1018 Philippines
P.O. Box 436 Manila, Philippines
Tel. No. (+632) 527-8356 to 83 Fax No. (+632) 527-4855
Website: www.ppa.com.ph

20190222023

030075
2.21.19 - 1601

technotrîx consultancy servîces, înc.
Suite 305 FMSG Building #9 Balete Drive, New Manila Quezon City
Telefax No. (+632)416.4625 * Email: alabastro3@hotmail.com * technotrixinc@gmail.com

27 June 2019

MS. JACQUELINE A. CAANCAN, CESO V
OIC, Regional Director
DENR-National Capital Region
Nursery Compound, North Avenue, Diliman, Quezon City

Subject : **Area Clearance for the PROPOSED 286.86 HECTARE LAND RECLAMATION PROJECT of the City of Parañaque**

Dear RED CAANCAN:

For and In behalf of the City Paranaque as its Environmental Impact Assessment (EIA) Preparer we wish to submit herewith our application for **Area Clearance** for the above-captioned Project incorporating all the requirements as prescribed under DAO 2018-14.

Thank you.

Sincerely yours,

E. G. Alabastro, Ph.D.
Chief Executive

*Cc:: **HON. EDWIN O. OLIVAREZ***
City Mayor
City of Paranaque

DENR-NCR
ADMINISTRATIVE RECORDS SECTION

REF. CODE	
RECEIVED	RELEASED
BY: SARINA	BY:
DATE: 6/28	DATE:
TIME:	TIME:

ANNEX 1

PROJECT DESCRIPTION REPORT

PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION PROJECT

Along Coast of Manila Bay in the territorial jurisdiction of the City of Parañaque

Reference: DAO 2018-14 dated 10 July 2018

Section 8. Application Requirements. The following documents shall accompany and be attached to the application for a reclamation permit:

8.1 Project Description, to include the following:

a. Proposed dimension, location and sketch plan, configuration and technical description;

The proposed project will occupy an area of **286.86 hectares** of reclaimed land and will be located within the coast of Manila Bay in the territorial jurisdiction of the City of Paranaque. The site is approximately situated at a distance of 3.0 kilometer from the nearest corner of the reclamation layout to the nearest shoreline of Manila Bay.

Provided in **Figure A.1** is the Google earth satellite map of the proposed project site. The territorial boundaries of the City of Paranaque are also therein indicated and the identified impact barangays which are the identified host and impact barangays for the proposed project are **Barangays Baclaran, Tambo, Don Galo, La Huerta, San Dionisio, Moonwalk, Sto Nino and Vitalez.** The coordinates of the site are shown in **Table A1.**

Figure A.1 Google Earth Map indicating the Proposed Project

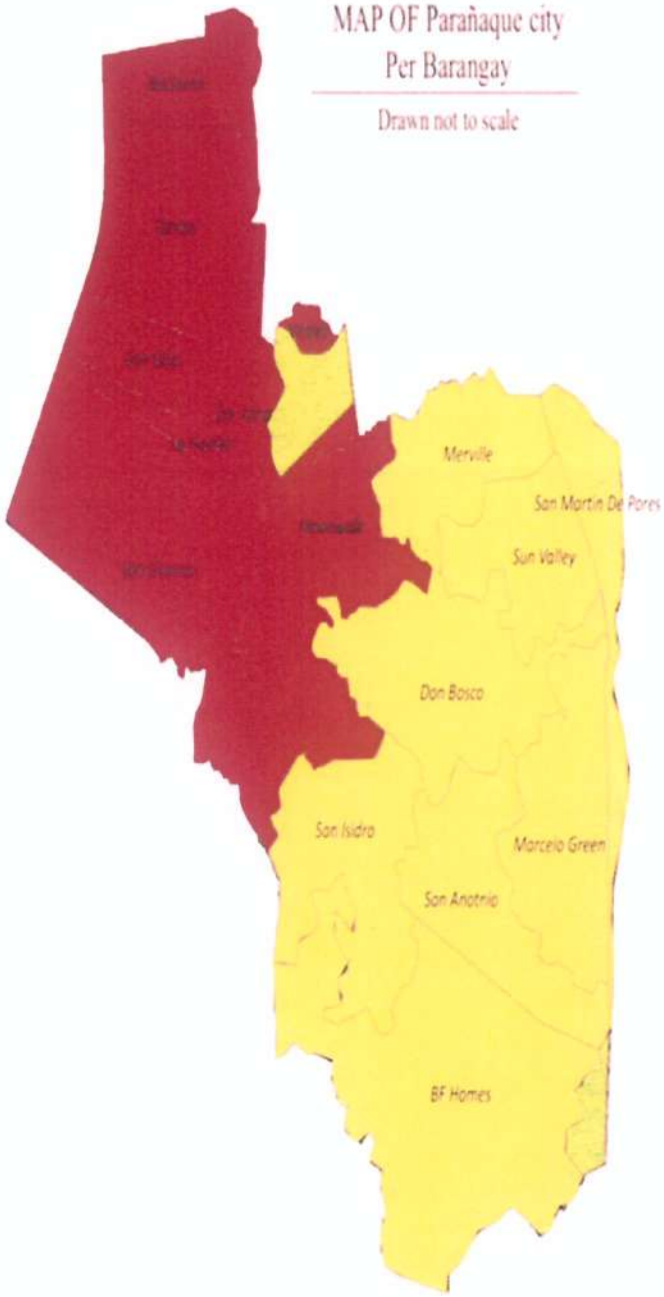


Figure A.2 Map Showing the Impact Barangays indicating the Proposed Project

Table A.1 Coordinates of the Project

GRID COORDINATES (PRS 92)			GEOGRAPHIC COORDINATES (WGS)	
POINT ID	EASTING	NORTHING	LAT	LONG
1	496188.05649	1604920.68486	14 30 41.2244 N	120 57 57.5846 E
2	495751.21640	1604084.05940	14 30 13.9995 N	120 57 42.9999 E
3	495631.43130	1603991.88370	14 30 10.9995 N	120 57 38.9999 E
4	495002.63360	1603899.81820	14 30 07.9995 N	120 57 17.9999 E
5	494951.78876	1603875.52536	14 30 07.2087 N	120 57 16.3020 E
6	494906.97118	1603852.36564	14 30 06.4548 N	120 57 14.8053 E
7	494869.26262	1603826.73547	14 30 05.6206 N	120 57 13.5461 E
8	494826.61067	1603792.02693	14 30 04.4909 N	120 57 12.1219 E
9	494799.77889	1603762.08708	14 30 03.5165 N	120 57 11.2260 E
10	494773.64410	1603727.96967	14 30 02.4062 N	120 57 10.3534 E
11	494757.61470	1603696.28907	14 30 01.3752 N	120 57 09.8183 E
12	494740.95466	1603662.56471	14 30 00.2778 N	120 57 09.2622 E
13	494712.98916	1603636.86063	14 29 59.4412 N	120 57 08.3284 E
14	494670.48172	1603615.62680	14 29 58.7500 N	120 57 06.9089 E
15	494626.29613	1603605.56865	14 29 58.4223 N	120 57 05.4333 E
16	494574.83983	1603607.24501	14 29 58.4765 N	120 57 03.7148 E
17	494523.49580	1603623.33270	14 29 58.9995 N	120 57 01.9999 E
18	**494316.55137**	**1603775.13642**	**14 30 03.9373 N**	**120 56 55.0871 E**
19	**494301.92729**	**1603790.51999**	**14 30 04.4377 N**	**120 56 54.5986 E**
20	**494293.57450**	**1603810.03278**	**14 30 05.07255 N**	**120 56 54.3195 E**
21	**493790.43266**	**1605991.77665**	**14 31 16.0581 N**	**120 56 37.4955 E**
22	**493797.09869**	**1606035.53866**	**14 31 17.4821 N**	**120 56 37.7178 E**
23	**493836.52983**	**1606063.97101**	**14 31 18.4076 N**	**120 56 39.0346 E**
24	**493880.15711**	**1606056.47365**	**14 31 18.1640 N**	**120 56 40.4918 E**
25	**494587.64180**	**1605624.65323**	**14 31 04.1193 N**	**120 57 04.1260 E**
26	**494610.26819**	**1605529.82796**	**14 31 03.3117 N**	**120 57 04.8819 E**
27	**494616.00679**	**1605566.73240**	**14 31 02.2349 N**	**120 57 05.0739 E**
28	**494605.94077**	**1605477.24497**	**14 30 59.3231 N**	**120 57 04.7384 E**
29	**494612.24294**	**1605418.75491**	**14 30 57.4200 N**	**120 57 04.9493 E**
30	**494630.97737**	**1605362.98910**	**14 31 55.6056 N**	**120 57 05.5755 E**
31	**494661.26720**	**1605312.55765**	**14 30 53.9649 N**	**120 57 06.5876 E**
32	**494701.69472**	**1605269.82101**	**14 30 52.5746 N**	**120 57 07.9382E**
33	**494750.36772**	**1605236.77946**	**14 30 51.4999 N**	**120 57 09.5642 E**
34	**494805.00807**	**1605214.97952**	**14 30 50.7910 N**	**120 57 11.3893 E**
35	**494863.05831**	**1605205.44151**	**14 30 50.4811 N**	**120 57 13.3282 E**
36	**494921.80143**	**1605208.61188**	**14 30 50.5847 N**	**120 57 15.2902 E**
37	**494978.48794**	**1605224.34223**	**14 30 51.0969 N**	**120 57 17.1834 E**
38	**495030.46465**	**1605251.89631**	**14 30 51.9939 N**	**120 57 18.9192 E**
39	**495076.35491**	**1605290.98507**	**14 30 53.2661 N**	**120 57 20.4517 E**
40	**495110.20682**	**1605306.96960**	**14 30 53.7864 N**	**120 57 21.5822 E**
41	**495146.94512**	**1605299.77554**	**14 30 53.5526 N**	**120 57 22.8093 E**

GRID COORDINATES (PRS 92)			GEOGRAPHIC COORDINATES (WGS)	
POINT ID	EASTING	NORTHING	LAT	LONG
42	495753.41681	1604960.03471	14 30 42.5022 N	120 57 43.0677 E
43	495970.73823	1605042.40496	14 30 45.1837 N	120 57 50.3256 E

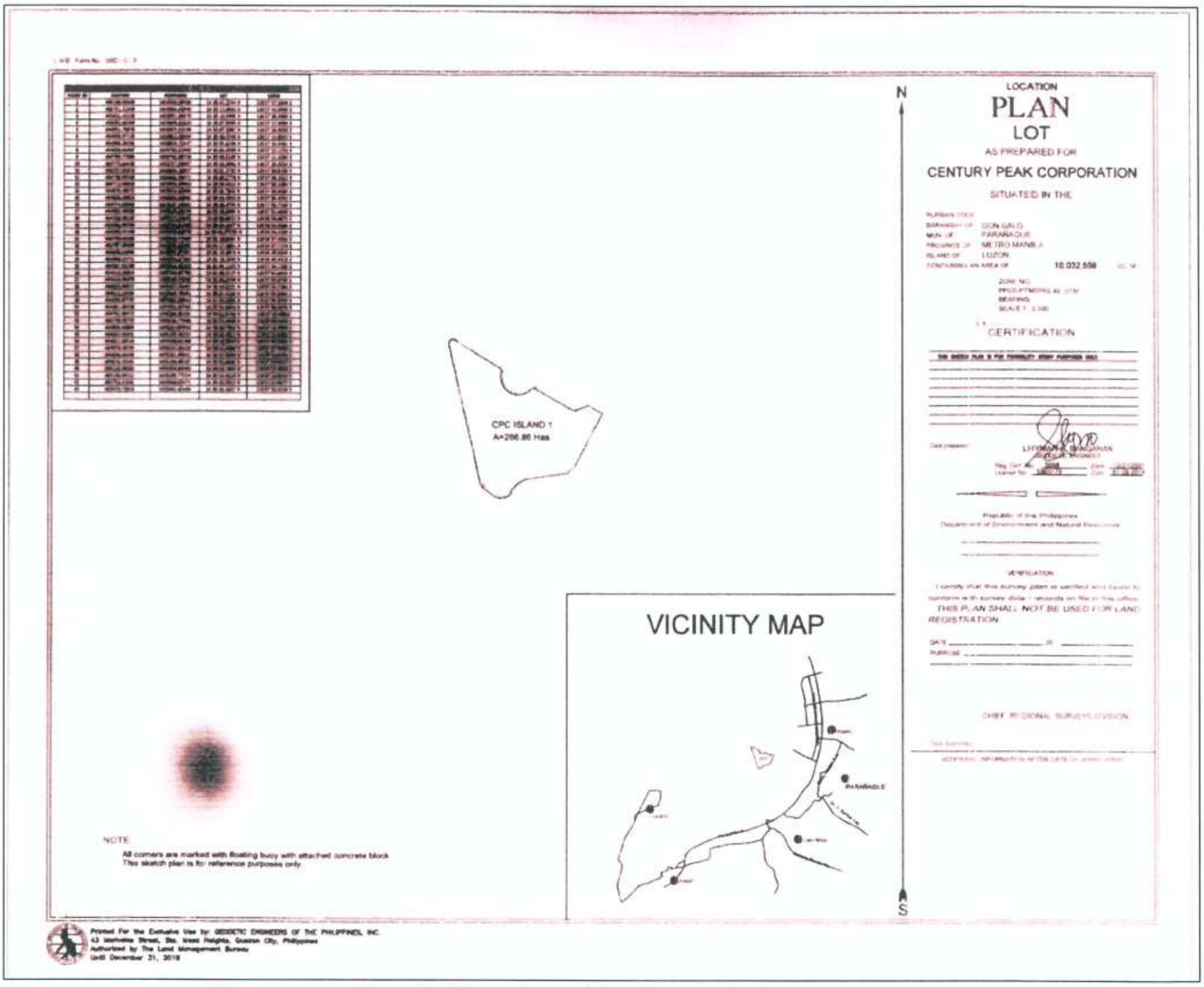


Figure A.1. Sketch Plan signed by Geodetic Engineer

L.M.B. Form No. GSD - C - 3

CPC ISLAND 1 (AREA=286.86 Has.)		
	GEOGRAPHIC COORDINATES (WGS)	
POINT ID	LAT	LONG
1	14 30 41.2244 N	120 57 57.5846 E
2	14 30 13.9995 N	120 57 42.9999 E
3	14 30 10.9995 N	120 57 38.9999 E
4	14 30 07.9995 N	120 57 17.9999 E
5	14 30 07.2087 N	120 57 16.3020 E
6	14 30 06.4548 N	120 57 14.8053 E
7	14 30 05.6206 N	120 57 13.5461 E
8	14 30 04.4909 N	120 57 12.1219 E
9	14 30 03.5165 N	120 57 11.2260 E
10	14 30 02.4062 N	120 57 10.3534 E
11	14 30 01.3752 N	120 57 09.8183 E
12	14 30 00.2778 N	120 57 09.2622 E
13	14 29 59.4412 N	120 57 08.3284 E
14	14 29 58.7500 N	120 57 06.9089 E
15	14 29 58.4223 N	120 57 05.4333 E
16	14 29 58.4765 N	120 57 03.7148 E
17	14 29 58.9995 N	120 57 01.9999 E
18	14 30 03.9373 N	120 56 55.0871 E
19	14 30 04.4377 N	120 56 54.5986 E
20	14 30 05.07255 N	120 56 54.3195 E
21	14 31 16.0581 N	120 56 37.4955 E
22	14 31 17.4821 N	120 56 37.7178 E
23	14 31 18.4076 N	120 56 39.0346 E
24	14 31 18.1640 N	120 56 40.4918 E
25	14 31 04.1193 N	120 57 04.1260 E
26	14 31 03.3117 N	120 57 04.8819 E
27	14 31 02.2349 N	120 57 05.0739 E
28	14 30 59.3231 N	120 57 04.7384 E
29	14 30 57.4200 N	120 57 04.9493 E
30	14 31 55.6056 N	120 57 05.5755 E
31	14 30 53.9649 N	120 57 06.5876 E
32	14 30 52.5746 N	120 57 07.9382E
33	14 30 51.4999 N	120 57 09.5642 E
34	14 30 50.7910 N	120 57 11.3893 E
35	14 30 50.4811 N	120 57 13.3282 E
36	14 30 50.5847 N	120 57 15.2902 E
37	14 30 51.0969 N	120 57 17.1834 E
38	14 30 51.9939 N	120 57 18.9192 E
39	14 30 53.2661 N	120 57 20.4517 E
40	14 30 53.7864 N	120 57 21.5822 E
41	14 30 53.5526 N	120 57 22.8093 E
42	14 30 42.5022 N	120 57 43.0677 E
43	14 30 45.1837 N	120 57 50.3256 E

All corners are marked with floating buoy with attached concrete block.
This sketch plan is for reference purposes only.

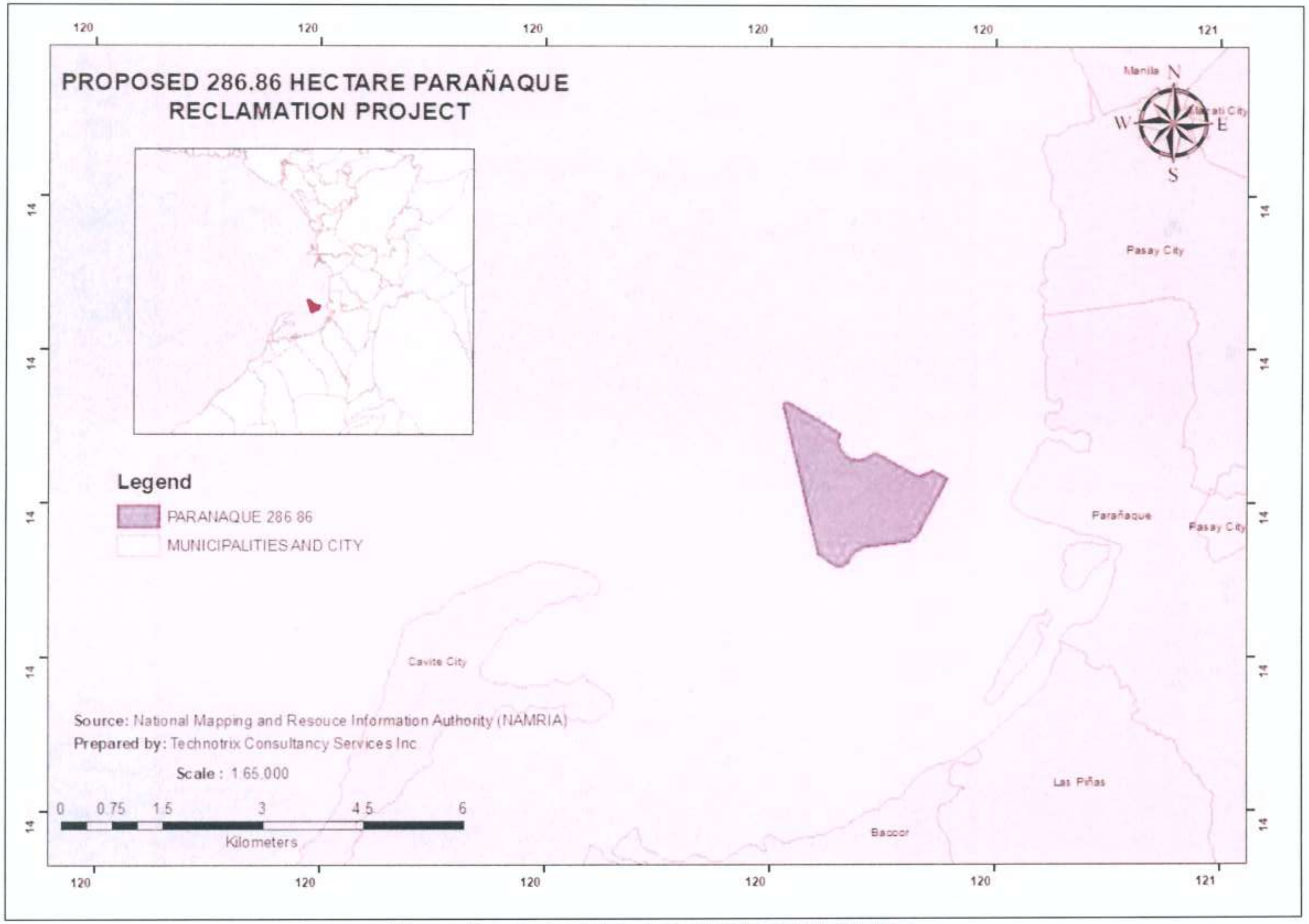


Figure A.4 Project Site Location in NAMRIA Map

Figure A.5 Vicinity Map and other Important Landmarks indicating the Proposed Project Site

b. Site development plan to state the usage/purpose of the area, including buffer zone, mini park development, road side tree planting or conceptual development plan and land use plan including site of identified sources at appropriate scale indicating relative distance to project;

The firm/final plan shall be undertaken by a Master Plan Consultant and will necessarily **require the inputs from the conditions to be attached to the ECC being applied for.**

The details such as but not limited to the buffer zone, mini park development, road side tree planting, etc. shall be known during the review of the EIS draft being submitted to the Environmental Management Bureau.

Source of Fill Materials

The source of fill materials/borrows will be as prescribed by the Philippine Reclamation Authority which assumed to be San Nicolas Shoal. The availability of supply is guaranteed by the PRA and in fact their master plan for the reclamation projects for Manila Bay is anchored on having adequate supply of fill materials. The source will be a significant factor in the selection by the reclamation/dredging contractor of the specific equipment, e.g. dredging barges that will be used for the Project.

General Specifications for the Fill Materials (Preliminary)

- All materials used for fill shall be free of rock boulders, wood, scrap materials, and refuse.
- These should not have high organic content.
- Not more than 10 percent (10%) by weight shall pass the No. 200 sieve (75 microns). Maximum particle size shall not exceed to100 mm diameter.
- Maximum particle size shall not exceed 75 mm.
- Shall be capable of being compacted in the manner and to the density of not less than 95 %.
- Shall have a plasticity index of not more than 6 as determined by AASHTO T 90.
- Shall have a soaked CBR value of not less than 25 % as determined by AASHTO T 193.

Estimated requirements = **74 million cu.m.**

General Specifications for Rocks (Preliminary)

- Rocks should be angular, hard, durable and not likely to disintegrate in seawater,
- Minimum unit weight is 2,650 kg/cu.m. on dry basis
- Rocks of the primary cover layer should be sound durable and hard and should be fee from laminations, weak cleavages and undesirable weathering.
- Following test designations should be complied with
  Apparent Specific Gravity ASTM C-127
  Abrasion ASTM C-131

The firm requirements for the quantity and specifications will be made after the final reclamation methodology and contractor shall have been selected.

Initially the alternatives considered for making the best source options are:

- **San Nicholas Shoal (SNS)**
  - Since materials also coming from Manila Bay characteristics relatively similar to the sea bed at project site, minimizing introduction of foreign materials.
  - Closest to project site
  - Cost considerations
- Dredging at SNS already covered by an EIS by PRA, ECC under processing. Other sites to be yet studied and apply for ECC.

- **"Lahar" from Mt. Pinatubo**
  - Suitability with respect to quality still to be evaluated
  - Transport considerations.

- Cost considerations.
- Permitting/Clearances consideration still to be established.

- **Others**
  E.g. Dredging of river in Pampanga.
  To be evaluated

Supply sustainability will not be an issue since this will be contracted out prior to the start of the reclamation works.

- **Rocks**

The various options are to be evaluated and the appropriate selection will depend partly on

(a) The filling requirements based on the final engineering works
(b) Cost
(c) Transport consideration and
(d) Permitting/clearances requirements.

Supply sustainability will not be an issue since this will be contracted out prior to the start of the reclamation works.

Figure A.6 The distance of the site to the SNS shoal (20.9 km) which the TSHD will travel through

Figure A.6 Location of anticipated source of filling materials (San Nicholas Shoal)

c. Description of the reclamation site – Average depth, boundaries, immediate vicinity, distance from shoreline, existing roads/access/ egress and ingress, available infrastructure facilities, utilities e.g. source of power, water and telecommunication, 5-year LGU infrastructure program which will enhance viability of proposed reclamation;

Initial data on the reclamation site are as follows:

Average Depth : -4 AMSL to -6 AMSL eastside; -16 AMSL to – 20 AMSL westside

Geographical Boundaries : These may be seen in **Figure A.1**

Immediate vicinity : This may be seen in the vicinity map in **Figure A.7:**

Figure A.7 Vicinity Map

The proposed road network system shown in **Figure A.8**

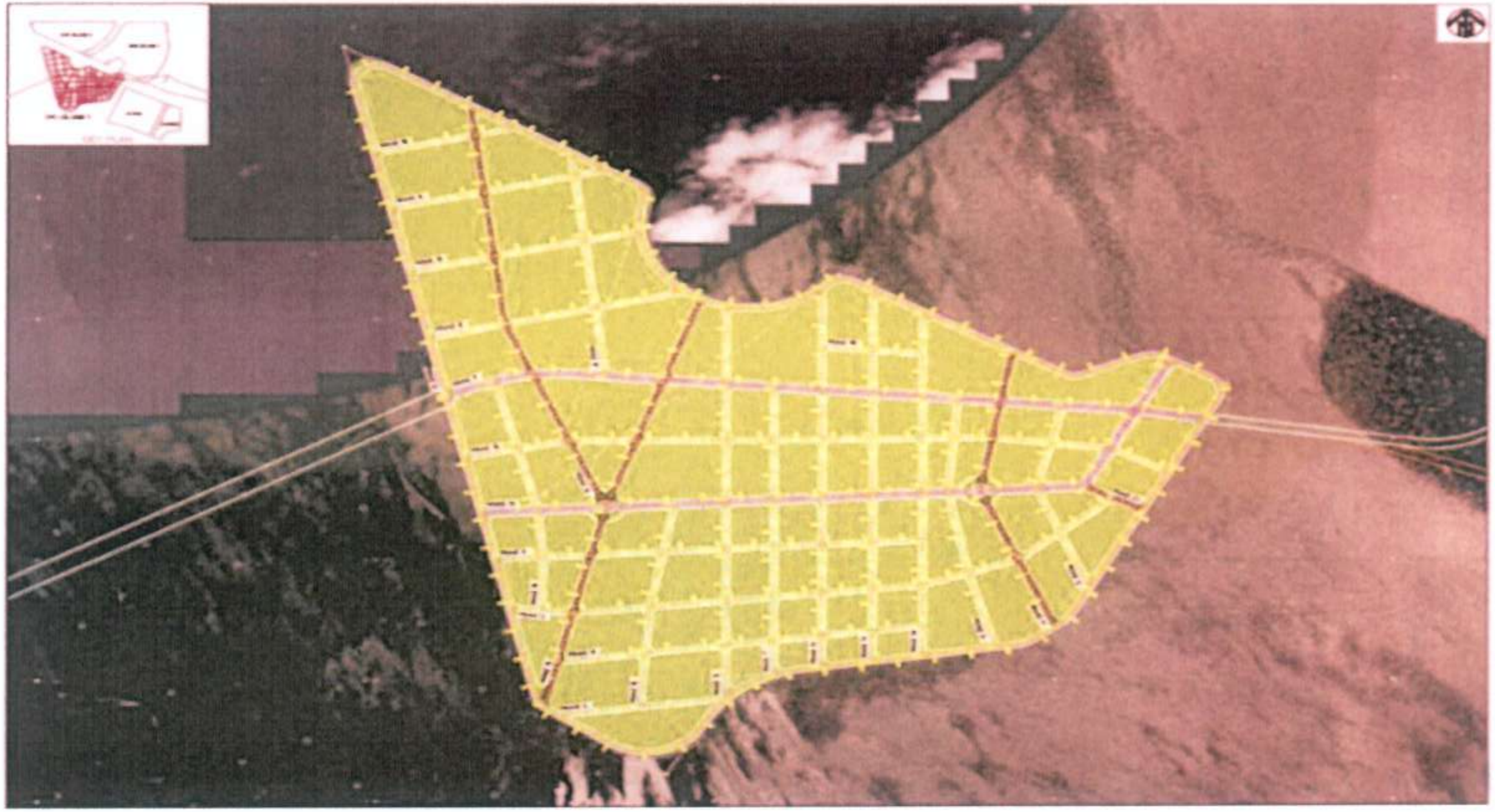


Figure A.8 The Proposed Road Network System

Distance (straightline) from the shoreline: The proposed land reclamation project shall be provided with main access system through the construction of Elevated Access Road or Viaduct to be connected to the existing Radial Road R1 or Manila Cavite Expressway Project or Pacific Avenue inside the Marina Baytown. The proposed main access system shall consist of 3.00 km viaduct and an interchange which shall interface with the Manila Paranaque Expressway Project to provide all directional traffic movements from the existing roadway to the proposed reclamation project area and vice versa.
As seen in **Figure A.8** there will be an unobstructed access to the project site through a viaduct connecting the shore to the nearest point of the Island.

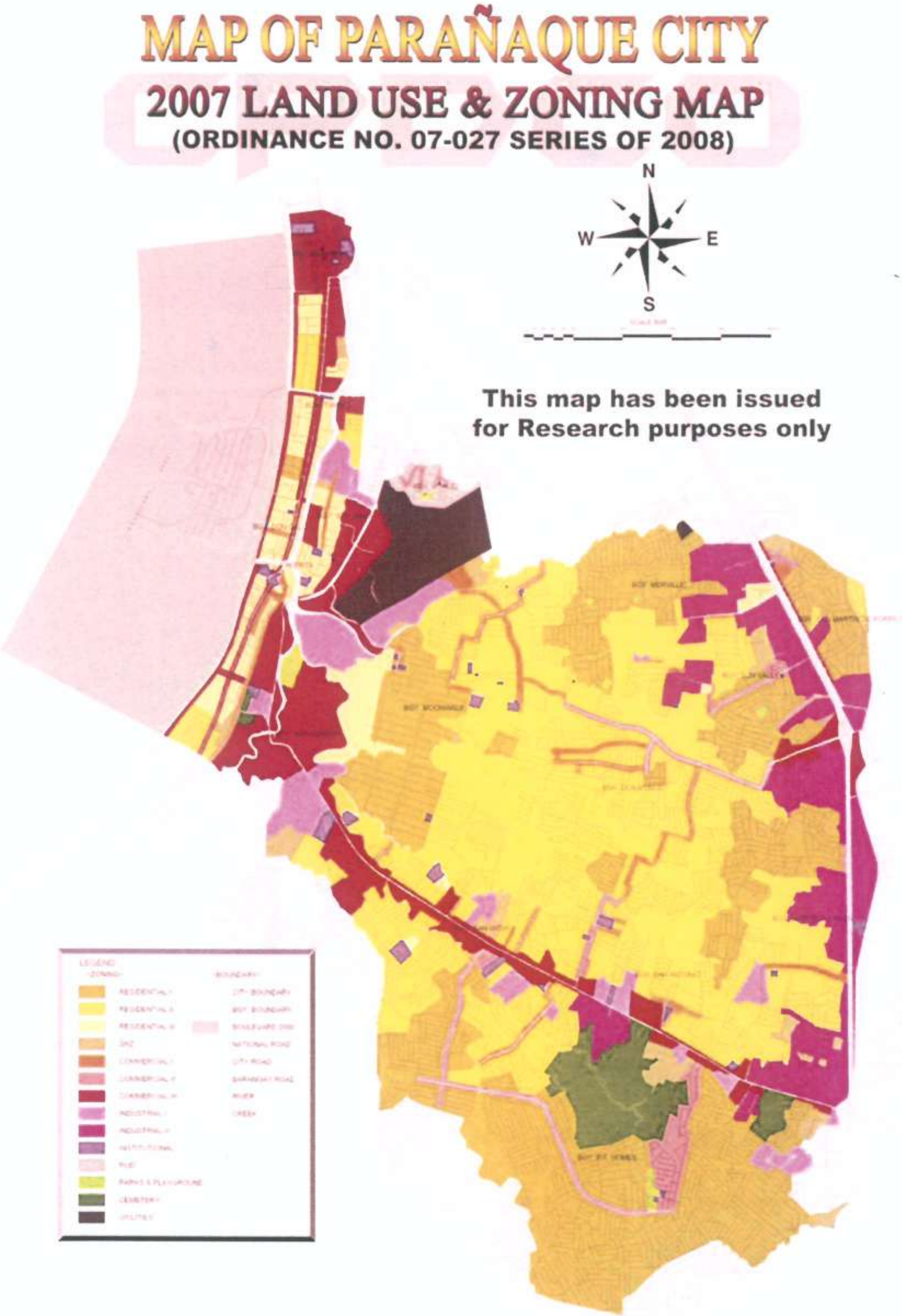
Available infrastructure facilities :These are shown below.

Infrastructure Facilities	During Reclamation/Construction Phase	During Operations Phase
Power	Gensets On Board Vessels	Manila Electric Company Solar Units
Water	On Board Vessels	Maynilad Water Company
Communications providers:	Radio/Mobile Units	Various services PLDT, Bayantel, Smart Communications, Globe Telecom

It is thus noted from the above that the vital infrastructure facilities are readily available at the construction sites and at the reclaimed land and therefore there will be no resource competition for these facilities.

5-year LGU infrastructure program which will enhance viability of proposed reclamation;

The official 5-year infrastructure program is still for finalization. However, the project is clearly included in the Land Use Plan of the City as reflected in **Figure A.9.** Figure A.10 shows the conceptual land use plan of the proposed project.



SOURCE: Parañaque Comprehensive Land Use Plan and Zoning Ordinance (2005-2020): City Planning and Development Office

Figure A.9. The City of Paranaque's Zoning Map

Assigned Land Use	Land Area (sqm)	Percent-age	Hectares (has.)
mixed use	908,269.84	0.32	90.83
open space	213,646.64	0.07	21.36
commercial	406,155.44	0.14	40.62
trans/utility	156,794.51	0.05	15.68
government share	551,686.11	0.19	55.17
RROWs	632,119.51	0.22	63.21
Residual			
Total	**2,868,672.05**	**1.00**	**286.87**

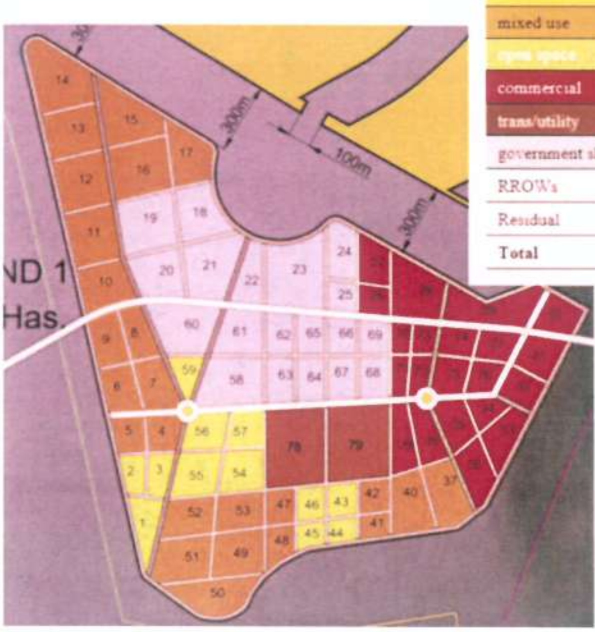


Figure A.10 Conceptual Land Use PLan

d. For marine barrow areas, preliminary investigation result/report;

Please refer to Item b above, "Source of Fill Materials". Following additional information are provided:

Volume and Properties of the SNS sands

The expressed intention by PRA for the SNS Quarry Project is to provide the various reclamation projects in Manila Bay with most suitable fill materials.

Volume of Reserves Per Area

Area	Size of Area (Hectares)	Volume Reserve (Cubic Meters)
1	4,393.60	337,266,377
2	5,606.40	849,399,596
3	10,000	822,670,624
Total Reserve		**2,009,336,597**

It may therefore be concluded that the 286.86 Paranaque reclamation Project can well be provided by SNS with the required fill materials (of approximately 74 M cu.m.)

Key environmental parameters of the SNS fill materials relevant to the Paranaque Project

Any and all materials that will be introduced to the reclamation area will be subject to pre screening to ensure that the reclamation site will not be contaminated with undesirable elements or substances.

Metallic elements are the key environmental parameters because these cannot be destroyed. It is notable that based on the information for SNS fills shown hereunder the metallic elements are present in minimal concentrations.

Summary of Concentrations of Selected Heavy Metals in the PRA GSQP

Sample	Cr, mg/Kg	Cd, mg/Kg	As, mg/Kg	Pb, mg/Kg	Hg, mg/Kg
1	4.50	4.65	36.84	9.10	<.004
2	12	6.08	75.28	10.09	<0.004
3	2	6.88	54.84	3.75	<0.004
4	1.5	5	17.92	22.28	<0.004
5	3.75	4.55	15.38	18.9	<0.004
6	4	6.53	47.76	7.73	<0.004
Dutch Intervention Values	380	12	55	530	10
Dutch Target Values	100	0.8	29	85	0.3

Soil remediation intervention values (Ref: email communications with LLDA)

The TARGET VALUE is the baseline concentration value below which compounds and/or elements are known or assumed not to affect the natural properties of the soil.

The INTERVENTION VALUE is the maximum tolerable concentration above which remediation is required. This occurs if one or more compounds in concentrations equal to or higher than the intervention value is found in more than 25 m^3 of soil or 1000 m^3 of ground water.

From the above is deduced that

- **The SNS fills will not contaminate the reclamation project area**
- **There is no need for any intervention related to the quality of the fill materials.**

e. Reclamation Methodology – Estimate of volume of fill materials, type and sources, containment/retention wall and consolidation, type of materials, procedures/techniques;

Details of the methodology shall be determined when the award is made to the Reclamation Contractor. Bidding and award will necessarily have to await for the issuance of the ECC.

For purposes of an Area Clearance application following is herein submitted.

Introductory Notes/Basic Definition of Terms (*Reference: PRA July 2017 Summit on Reclamation*)

> ***What is Reclamation?***
> *Reclamation is a deliberate process of converting foreshore land, submerged areas or bodies of water into land by filling or other means using dredge fill and other suitable materials for specific purpose(s)*
> *Land reclamation is of two different types. One involves a change from an area's natural state, the other restoring an area to a more natural state. The first one can refer to creating dry land from an area covered by water, such as a sea, lake or swamp, while the second one can refer to bringing the land, damaged from natural or human causes, back into use for growing trees or agricultural crops.*
>
> ***What is dredging?***
> *Dredging is a process of excavating materials underwater. It is used to deepen waterways, harbors, and docks and for mining alluvial mineral deposits, including tin, gold, diamonds and marine sand for reclamation purpose.*

In an excavation activity usually carried out underwater, in shallow seas or freshwater areas with the purpose of gathering up bottom sediments and disposing of them at a different location.

The specific methodology for the dredging and reclamation works to be applied will depend on major factors such as:

- The Contractor to be selected noting that each Contractor may possess different equipment and technologies
- The result of the geotechnical and soil investigations which will be undertaken to serve as inputs to the Design and Engineering Details (DED) post ECC.
- Presence, if any, of significant environmental resources to which damage or disturbance should be avoided, e.g. corals, sea grasses, etc.
- The source and properties of the filling materials.
- The volume and properties of the sub seabed soil at the reclamation site.
- The requirements for protection against natural hazards as well as for compliance with the PRA guidelines prior to securing of the Notice to Proceed (NT), e.g. width of channels, platform elevation, etc.

For illustrative purposes, the "process" involved is shown in **Figure A.11**

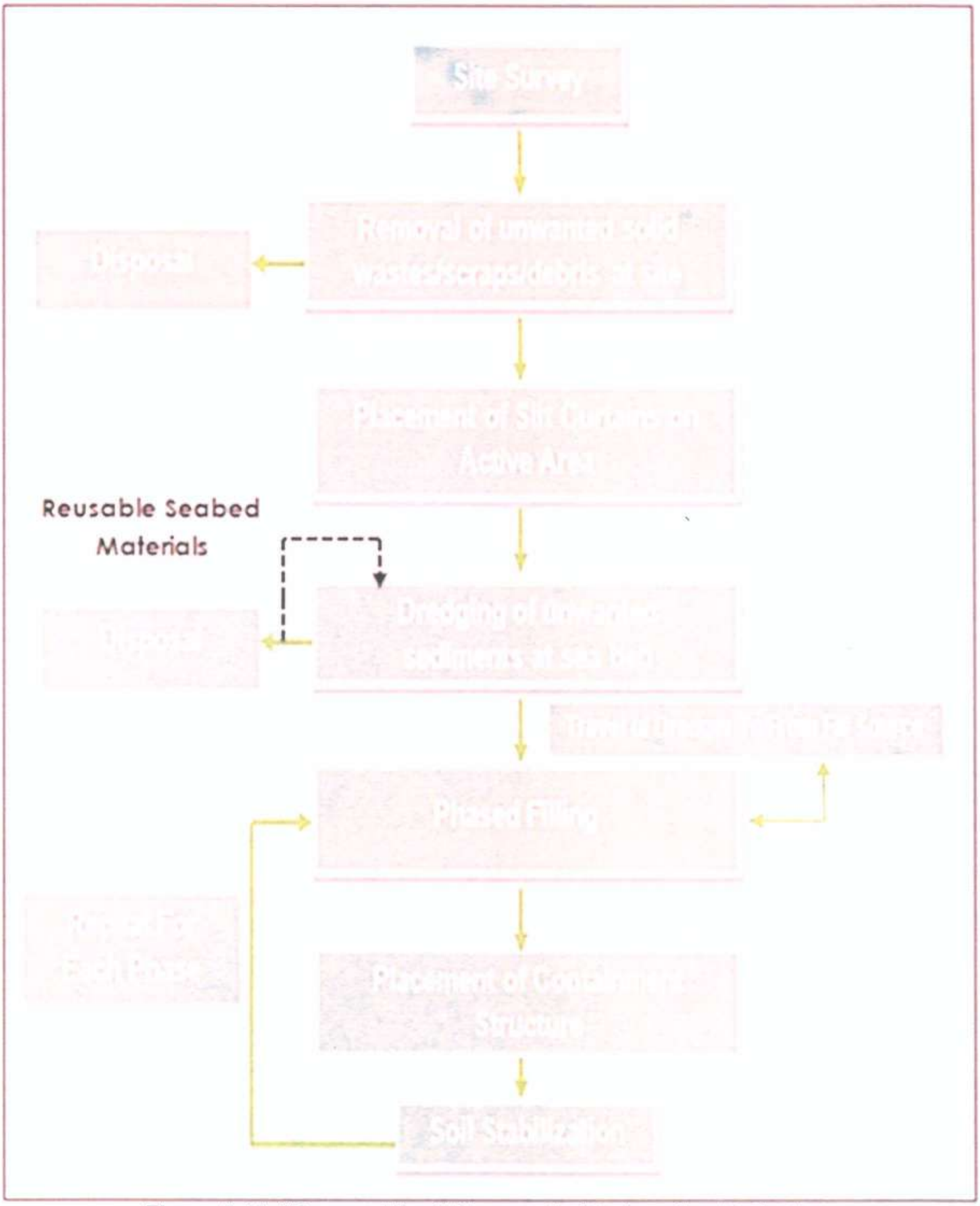


Figure A.11. "Process Flow" Diagram for Reclamation Projects

The major activities or aspects of the reclamation works are:

1. **Clearing of the site of debris, scraps, plastic wastes and silts.**

The solid wastes will be collected and disposed on shore through a third-party disposal entity.

Silts are accumulated soil wastes discharged with storm water from onshore and are not natural components of the sea bed. Depending on the reclamation technology these will most likely be disposed outside of the reclamation site and in likelihood in an approved dump site on shore.

2. Dredging at the Reclamation Site to remove unwanted sea bed materials and prepare the sea bed for filling.

The initial layer of sub seabed of up to approximately 5 meters is composed mainly of soft clayey fine soils which by themselves may not be suitable but which in combination with the SNS sands may be fitted for re use as reclamation fills. The re use or alternately the disposal would depend on the technology to be used by the prospective reclamation Contractor. If not suitable these layers would be disposed outside of the reclamation site which based on actual experience by a previous dredging contractor could be at a site in Manila Bay with depths of at least 20 meters. The designation of this disposal site is subject to approval/permits from government entities i.e. the Philippine Coast Guard, the City of Manila and the DENR through the Manila Bay Coordinating Office (MBCO).

The dredging operation could be undertaken either hydraulically or mechanically and the former method may likely be adopted. Hydraulic dredging is a floating dredge or pump by which water and soil, sediment, or seabed are pumped on board they are discharged overboard to an approved disposal site.

Hydraulic digging makes use of the erosive working of a water flow. For instance, a water flow generated by a dredge pump is lead via suction mouth over a sand bed. The flow will erode the sand bed and forms a sand-water mixture before it enters the suction pipe. Hydraulic digging is mostly done in cohesion less soils such as silt, sand and gravel. A hydraulic dredger is shown in **Plate A.1** for illustration purposes.

Plate A.1. An Illustration of a Typical Hydraulic Dredger

3. Filling Operation

Main roads, reclamation area, access road, cofferdam, and other project areas require filling materials with total volume of around 74,000,000 cu.m. The conveyance of dredged soil materials farther than 6 km will be done by using 2- or 3-layers relay pumps. Further, it could be necessary to use 2 to 3 sets of dredging equipment to reduce reclamation period or duration.

Silt curtains (an illustration shown in **Plate A.2**) will be placed along the perimeter of the area in order to contain potential dispersion of silt materials.

Plate A.2 Illustration of Silt Curtain

Prior to filling, the work area will be dredged beyond the soft/clayey layer to allow the fill materials to replace a large volume of the sea bed thus further ensuring integrity of the land to be created.

Transport of Fill Materials From Source (SNS)

This will be undertaken using a Trailer Suction Header Dredger (TSHD) Illustrated in **Plate A.3**. which will travel between the site and the SNS; dredge the fill at SNS and discharging it at the site. **Figure A.6** is the map showing the straight distance to the SNS.

Plate A.3 A Typical Trailer Suction Header Dredger (For Illustration Only)

A TSHD trails its suction pipe located at the bottom of the vessel which is fitted with a dredge drag head, then loads the dredged fill materials into one or more hoppers in the vessel. When the hoppers are full, the TSHD sails to the reclamation area and dumps the fill material through either doors in the hull or pumps the material out of the hoppers.

Typical specification of a TSHD is given in **Table A.3.**

Table A.3 Typical Specification of a TSHD

Specification	Typical Values
Hopper Capacity	16,500 cu.m.
Deadweight	26,650 tons
Length/Breadth	157.5m/27.8m
Max. Dredging depth	40.6-54.5m
Pump Power (trailing)	2x2,250 kW
Pump Power (Discharging)	9,500 kW
Propulsion Power	2x8,400 kW
Total Installed Diesel Power	6.330 kW- 17,880 kW
Speed	12.6 km – 15.7 km
Accommodation	17- 42

Deposition of the fill materials at the reclamation site can be done in simple ways by opening the grab, turning the bucket or opening the bottom doors in a ship. Hydraulic deposition happens when the mixture is flowing over the reclamation area. The sand will settle while the water flows back to sea or river.

Dredging equipment can have these functions integrated or separated. The choice of the dredger for executing a dredging operation depends not only on the above mentioned functions but also from other conditions such as the accessibility to the site, weather and wave conditions, anchoring conditions, required accuracy and other consideration such as economics.

4. Creation of Land

In general terms the activities involved through the the finished platform elevation are:

Filling with suitable burrows/materials (Sands from SNS)

The estimated required volume is 74 Million Cubic Meters

General/Typical Specifications for the Fill Materials (Preliminary) is stated on page 10.

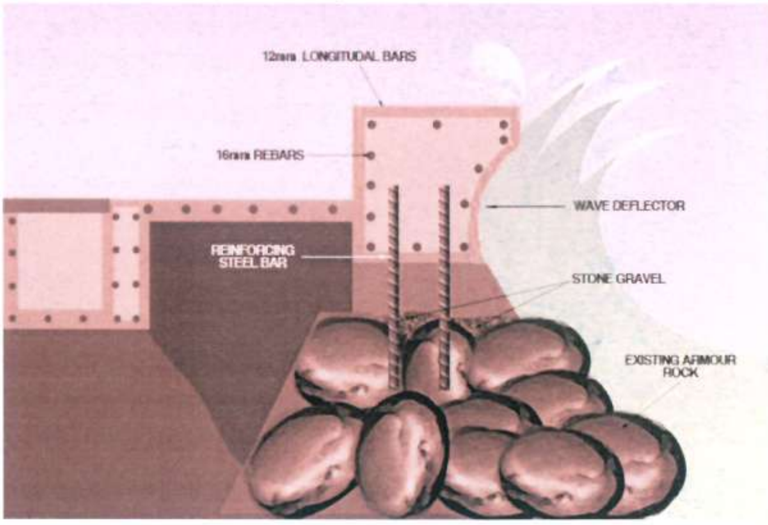
Filling with rock mounds

Construction of Containment Structures

This may likely be made of sheet piles

5. Installation of Support Structures

Wave Deflectors : Typical Conceptual Design shown below.



Piles Driving will most like be undertaken for sections in the reclaimed land which will carry heavy loads.

6. Soil Stabilization

The newly reclaimed area needs to be compacted and consolidated to a speciied strength so that it can support the roads, infrastructure, utilities, and buildings.

Several stabilization methods are available but the most common is the paper wick drain with surcharge method. This method can accomplish the compaction process within a year or less.

Options for Soil Stabilization

Following are the acceptable methods:

1. **Embankment or Surcharge Methods**

   A volume of soil is placed over the reclaimed land to be improved. The weight of the surcharge will force out the escape of the entrapped water within the voids of the saturated underground soft soil thereby inducing settlement at an accelerated rate.

2. **Sand Drain Piles Plus Surcharge**

   This method involves the construction of vertical sand piles at certain spacing down to the bottom of the soft soil layer in question to allow the drainage of pore waters when the weight of the surcharge is imposed over the subject area. With the accelerated escape of the water from the voids within the soils, settlement is induced at a very much faster rate that if surcharge is used only without providing vertical drainage pathways. The subject area can therefore be made usable at a very much earlier date.

3. **Sand Composer Piles Plus Surcharge**

   This method functions very much similar to the sand drains except that the composer piles can also serve later as vertical columns that will allow the stabilized land to support bigger loads. In the construction process, the sand composer piles are compacted vertically and laterally. Because of the later compaction that will be induced on the adjacent soft soils, pore water pressures will be increased accordingly. When the surcharge is finally placed over the subject area, the pore waters will be forced out to escape through the voids of the sand composer piles thus accelerating the settlement very much faster than the natural consolidation process.

4. **Well Point Plus Sand Drain Piles**

   This is the use of well point equipment to dewater the soil down to the desired depths. The series of riser pipes are installed down to the reach of the pipes around the perimeter of the area to be stabilized. These risers are then connected to the horizontal head piles attached to a powerful pump that will drain out all the water within the soil. Continuous pumping is required to maintain the drawdown of the underground water level. For very impervious soils, the provision of sand drain piles is also necessary to shorten the time of area is no longer necessary since the dried soil serves as the surcharge for the underlying soft soil layers.

5. **Dynamic Compaction**

   This method involves the use of huge weights to be dropped by a crane over the area to be improved. The impact transmitted to the underlying soft soils builds up the pore water pressures within them and thus forces out the escape of the pore water to the surface.

6. **Vertical Drains Plus Surcharge**

   This method functions exactly the same as the Sand Drains Plus Surcharge Method. The only difference is that with this system, the sand drain piles are replaced with the vertical drains which are manufactured for the purpose in the form of wicks or strips and made of non-degradable materials. The core consists of ducts where water can flow upwards and wrapped around with very porous sheeting through which water can enter the core. The wick comes in various trademarks and designs but more or less uniform in the overall dimensions. For ease in handling and installation, the wick comes in coils.

All the above-described methods are to be first evaluated on the basis of technical considerations such as applicability to the project area with the type of soils as to be determined during the final geotechnical investigation, available equipment required, particularly the type and capacity and the characteristics of the newly reclaimed land as to load carrying capacity prior to stabilization. Cost and timetable factors will necessarily be considered also.

A comparative evaluation of the above methodologies is as follows:

1. **Embankment or Surcharge Method** – Preliminary estimations on approximately 5-meter high embankment indicated approximately 5 years to attain full consolidation. This is too long a period of time to wait for the utilization and disposal of buildable areas not

taking into account yet the length of construction time required for the development of the site in terms of provision of roads, utilities, etc.

2. **Sand Drain Piles Plus Surcharge** – Under this method, the sand drain piles may not be continuous if improperly installed in addition to the fact that they are very much susceptible to shear failure during the planning of the surcharges. Further, the equipment required is usually heavy and require good construction surface which is not available yet on a newly reclaimed land. This was demonstrated by the experience of PNCC during the ground improvement of the Financial Center Area in MCCRRP.

3. **Sand Composer Piles Plus Surcharge** – The system is vulnerable to the same problems as the sand drain piles. In addition, during the process of compacting the piles vertically and laterally, they can easily be clogged with fine within the soil. Should this happen, resistance to flow of pore waters can become high thus requiring higher surcharge or embankment.

4. **Well Point System Plus Sand Drain Piles** – In addition to having the same problems as the sand drain piles, the presence of soil-laden water with high salinity is a potential source of problem for maintenance of the equipment.

5. **Dynamic Compaction** – The equipment required are huge and heavy that the newly reclaimed unconsolidated ground may not be able to support. Provision of matting and grillages is costly and very inconvenient every time equipment position transfer is executed. The methods are not very effective as proven by the test conducted by the PNCC for stabilization of the First Neighborhood Unit.

6. **Vertical Drains Plus Surcharge** – Under this method, the vertical drains have high breaking strength and reinforce the soil in tension. Various types of drains are commercially available that a specific type of drain can be chosen to be exactly consistent with the actual permeability of the soil. Equipment required to install the drain is very light and can easily be supported by the newly reclaimed land. The rate of flow within the drain is higher, thus less height of surcharge is required. From the economic viewpoint, the surcharge can be eliminated if good dredge fill materials are available. Upon completion of the reclamation, the dredge fill itself will function as the surcharge

Removal of water in the interstices of the fills

Trapped water could weaken the integrity of the reclaimed land and therefore should be removed. An acceptable method for removal of water is by the use of wick drains.

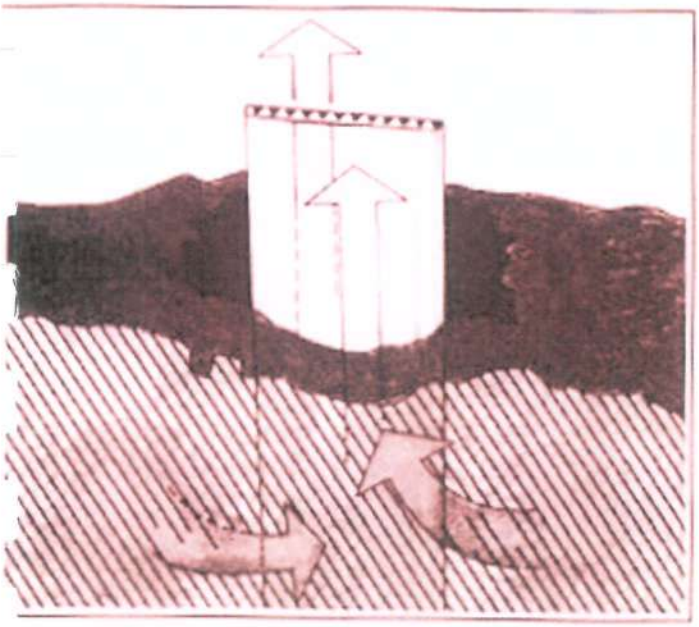
Wick Drains

In order to accelerate the consolidation of the underlying strata at the platform, and hence the use of the reclaimed areas for final structures in a short period of time, it is foreseen to install vertical wick drains over the total area.

Wick Drains are artificial drainage paths consisting of central core which functions as a free-draining water channel, surround by geosynthetics filter jacket. With the drainage of water consolidation of soils is expedited and long-term settlement is limited.

Plate A.4 is an illustration of the concept of wick drains.

Plate A.4. Illustration of the Principle of Wick Drains



re water flows laterally to the wick drains and is carried
rtically up to the ground surface

7. Pollution Control Facilities

Waste water in combination with accidental oil leaks will be collected in the bilge of the vessel and treated.

Bilge Water Treatment- As per USEPA, Bilge water can be managed by either retaining it onboard the vessel in the holding tank and later discharging it to an accredited third-party waste treater on shore. On board treatment may also be undertaken as an option.

Oil which represents a significant portion of the bilge water falling in the category of "hazardous" wastes may be treated in Oily Water Separators (OWS). Current regulations of oily bilge water discharge from vessels is based on Annex I of the International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78). Under MARPOL to wit...

....all ships over 400 gross tons (GT) are required to have equipment installed onboard that limits the discharge of oil into the oceans to 15 ppm when a ship is en route. All vessels over 400 GT are also required to have an oil content monitor (OCM), including a bilge alarm, integrated into the piping system to detect whether the treated bilge water that is being discharged from the bilge...

The bilge separators are treatment systems that combine a gravity oil-water separator (OWS) or centrifuge with one or more additional unit operations that "polish" the bilge water effluent to reduce concentrations of emulsified oil.

A typical OWS is illustrated in **Figure A.12.**

Figure A.12 Illustration of a Typical Bilge OWS

General Principle of Operations

Stage 1 Separation Unit- This unit consists of catch plates inside a coarse separating compartment and an oil collecting chamber. The oil having a density lower than that of the water, rises into the oil collecting compartment. The rest of the non-flowing oil mixture settles down into fine settling compartment after passing between the catch plates.

Stage 2 Filtration Unit- The discharge from the first stage is passed through a 3-stage filtration system (a) the filter stage (b) coalescer stage and finally (c) collecting chamber. The impurities and particles are separated by the filter and settle at the bottom for removal. Oil coalescing substances may be added to enhance the growth of oil molecules thereby facilitating their removal. The oil molecules rise above the mixture in the collecting chamber and are removed when required.

To ensure the continued efficiency of the OWS an Oil Content Monitor and Control System is installed.

8. Navigational and Safety Facilities

Navigational Aids complying with international maritime standards and the Philippine Coast Guard will be maintained on board vessels.

Oil Spill Contingency Plans and Oil Spill Containment and Recovery Systems will be organized and be in effect at all times.

f. Estimated cost of reclamation and Land development including supporting data (i.e. existing labor force, structure and average cost and available equipment and average cost/rental rates);

At this stage of the project cycle only estimates are available which are based from engineering estimates based on similar works. The structure and average cost of available equipment, equipment rental and labor force are to be determined when the bidding shall be conducted. The bidding will necessarily await for the ECC so that the conditions to be imposed in the ECC can be integrated in the Terms of Reference. Further, if biddings are conducted ahead of the ECC, the costs of the work may not be valid by the time the work order shall be placed, such work order also dependent on the issuance of the ECC.

With the above clarifications, the best estimates at this time are as follows:

Basis of Project Cost Estimates

Project Size	286.86 hectares
Platform Elevation	platform elevation from minimum of +4.0 meters above Mean Lower Low Water (MLLW).

The construction of the different components of the Project shall entail a total Initial Project Cost of about **PhP79.29B** (the "Estimated Project Cost")

g. Proposed funding/financing of the project;

The total funding/financing will be provided by the private sector Project Developer, hence no funding/financing required from the government entities, the PRA or the City of Paranaque

h. Proposed project timetable - reclamation, land development and other related activities;

The estimated timetable will cover a period of **3-5** years up to the rendering of the reclaimed land ready for the next phase involving vertical developmental works.

i. **Prevailing market land values of types/uses similar to the proposed land use(s) within immediate vicinity duly certified by local assessor(s) and based on Bureau of Internal Revenue (BIR) zonal valuations; and;**

   Annex 8.1A

j. Other documents, data and information pertinent to the proposed reclamation.

Other pertinent documents will be as required in the preparation of the Environmental Impact Statement (EIS) in accordance with the protocol under Department of Environment Administrative Order 03-30.

ANNEX 8.1A

BIR ZONAL VALUE

Republic of the Philippines

DEPARTMENT OF FINANCE

Manila

DEPARTMENT ORDER NO. 009-2018

January 29, 2018

BUREAU OF INTERNAL REVENUE

SCHEDULE OF RECOMMENDED ZONAL VALUES OF REAL PROPERTIES

REVENUE REGION NO.08-MAKATI CITY

REVENUE DISTRICT NO. 52-PARANAQUE CITY

		D.O. No.	**009-2018**
BARANGAY : BACLARAN		Effectivity Date	**March 4, 2018**

STREET/SUBDIVISION/CONDOMINIUM	VICINITY	CLASSIFICATION	8TH REV. ZV/SQ.M
AGUARRA		RR	23,000.00
		CR	35,000.00
		X	32,500.00
A SANCHEZ (SANCHEZ)		RR	18,500.00
		CR	23,000.00
AIRPORT ROAD	ROXAS BLVD	RR	72,500.00
		CR	92,500.00
ARAGON	QUIRINO AVE	RR	15,500.00
ASEANA BUSINESS PARK / BLVD 2000		CR	175,000.00
BAGONG BUHAY ST		RR	18,000.00
BAYMONT SUITE & RESIDENCES		RC	85,000.00
		CC	100,000.00
		PS	70,000.00
CHATEAU DE BAIE		RC	75,000.00
		CC	90,000.00
		PS	62,500.00
CROWN BAY TOWERS		RC	85,000.00
		CC	102,000.00
		PS	73,000.00
MONARK PARKSUITES		RC	75,000.00
		CC	90,000.00
		PS	62,500.00
SOLEMARE PARKSUITES CONDO		RC	110,000.00
		CC	130,000.0

BARANGAY : DON BOSCO

D.O. No. **009-2018**

Effectivity Date **March 4, 2018**

STREET/SUBDIVISION/CONDOMINIUM	VICINITY	CLASSIFICATION	8TH REV. ZV/SQ.M.
AEROPARK SUBD		RR	12,000.00
ALSEA		RR	12,000.00
BAMBOO GROOVE		RR	12,000.00
BETTER LIVING ALL ANNEXES		RR	15,000.00
		CR	20,000.00
		X	15,000.00
BETTER LIVING -MAIN		RR	20,000.00
		CR	40,000.00
		X	30,000.00
CAMELLA HOMES III & IV		RR	12,000.00
		CR	20,000.00
		X	16,000.00
CHATEU VILLAGE		RR	12,000.00
DOMINIC SAVIO ST.		RR	13,500.00
		CR	22,500.00
		X	16,000.00
DON BOSCO VILLAGE		RR	12,000.00
		CR	25,000.00
		X	16,000.00
DONA SOLEDAD AVENUE	RUSSIA TO SM BICUTAN	RR	35,000.00
		CR	50,000.00
		X	30,000.00
DONA SOLEDAD AVE EXT		RR	20,000.00
		CR	30,000.00
EL DORADO HOMES		RR	12,000.00
FRANCE ST.		RR	20,000.00
		CR	25,000.00
INA EXECUTIVE HOMES		RR	12,000.00
JAPAN ST		RR	16,000.00
		CR	20,000.00
		X	18,500.00
LEVITOWN (EXECUTIVE) SUBD		RR	12,000.00

RDO 52 Parañaque City per IS records

MARYANN G. ZAMUCO
GROUP SUPERVISOR
04/26/19
DATE:

BUWIS RENTAS INTERNAS REPUBLIKA NG PILIPINAS DS 2018 35677202 15 PISO DOKUMENTARYO

BUWIS RENTAS INTERNAS REPUBLIKA NG PILIPINAS DS 2018 35677212 15 PISO DOKUMENTARYO

		D.O. No.	009-2018
BARANGAY: DON GALO		Effectivity Date	**March 4, 2018**
STREET/SUBDIVISION/CONDOMINIUM	VICINITY	CLASSIFICATION	8TH REV. ZV/SQ.M.
189 6TH STREET*		RR	7,000.00
		CR	23,500.00
A MABINI ST (MABINI ST)		RR	15,000.00
		CR	24,000.00
		X	20,500.00
AGUINALDO HIWAY		CR	50,000.00
BUENSUCESO ST		RR	10,000.00
D CAMPO ST*		RR	7,000.00
DR J GABRIEL (JUAN GABRIEL)		RR	18,000.00
		CR	32,500.00
F BALAGTAS (BALAGTAS)		RR	15,000.00
GEN LUNA ST*		RR	7,000.00
J.W. DIOKNO		CR	175,000.00
MACAPAGAL BLVD/ HIGH-WAY		CR	225,000.00
MA. DIMATIMBANGAN ST		RR	20,000.00
		CR	32,500.00
MALVAR ST		RR	10,000.00
MARINA SUBDIVISION		RR	115,000.00
N MAYUGA ST*		RR	7,000.00
PACIFIC AVE-ATLANTIC AVE		CR	100,000.00
		I	100,000.00
QUIRINO AVE		RR	60,000.00
		CR	115,000.00
		X	80,000.00
REGALADO ST*		RR	7,000.00
SANTA MONICA		RR	10,000.00
		CR	40,000.00
		X	25,500.00

CONDOMINIUMS:

		D.O. No.	009-2018
BARANGAY : LA HUERTA		Effectivity Date	**March 4, 2018**

STREET/SUBDIVISION/CONDO MINIUM	VICINITY	CLASSI-FICATION	8TH REV. ZV/SQ.M
A BONIFACIO ST		RR	10,000.00
AGUINALDO HIGHWAY		CR	50,000.00
B AQUINO (N. AQUINO)		RR	40,000.00
		CR	60,000.00
ESPIRITU ST*		RR	7,000.00
		CR	20,000.00
ISAGANI		RR	10,000.00
J DE LEON		RR	10,000.00
		CR	20,000.00
J. FERRER ST		RR	10,000.00
J RIZAL*		RR	7,000.00
JUAN LUNA ST		RR	10,000.00
		CR	20,000.00
KAPT FLAVIANO*		RR	7,000.00
		CR	20,000.00
KAPT. PATRICIO ST		RR	10,000.00
		CR	20,000.00
KAPT TINOY*		RR	7,000.00
		CR	20,000.00
M H DEL PILAR	DANDAN DOMINGO	RR	12,500.00
		CR	25,000.00
		X	20,000.00
MA CLARA		RR	10,000.00
N DE LEON		RR	10,000.00
N DOMINGO		RR	10,000.00
N RODRIGUEZ*		RR	7,000.00
NAZARENO ST		RR	10,000.00
P BURGOS		RR	10,000.00
P DANDAN		RR	10,000.00
P GOMEZ*		RR	7,000.00
PARANCILLO*		RR	7,000.00

RD052 Parañaque City
per LTS Records
MARYANN G. ZAMUCO
GROUP SUPERVISOR
DATE: 04/16/19

BUWIS RENTAS INTERNAS DS 2018 35677204 15 PISO DOKUMENTARYO REPUBLIKA NG PILIPINAS

BUWIS RENTAS INTERNAS DS 2018 35677214 15 PISO DOKUMENTARYO REPUBLIKA NG PILIPINAS

		D.O. No.	009-2018
BARANGAY: MOONWALK		Effectivity Date	**March 4, 2018**
-	-	-	-
STREET/SUBDIVISION/CONDOMINIUM	VICINITY	CLASSIFICATION	8TH REV. ZV/SQ.M.
-	-	-	
AIRPORT VIEW SUBD		RR	12,000.00
AIRPORT VILLAGE		RR	12,000.00
		CR	15,000.00
	ARANDIA ACADEMY	X	15,000.00
ARMSTRONG AVE		RR	15,000.00
		CR	20,000.00
ARMSTRONG VILLAS		RR	13,000.00
		CR	15,000.00
BRENTWOOD HEIGHTS		RR	12,000.00
		CR	15,000.00
		X	15,000.00
BRICKTOWN SUBDIVISION:			
ALL STREETS		RR	10,000.00
		CR	15,000.00
C-5 EXTENSION	HOMEWORLD WAREHOUSE/SM WAREHOUSE	CR	30,000.00
		I	30,000.00
CECILIA VILLAGE		RR	10,000.00
		CR	15,000.00
CHRISTINA VILLAGE			
ALL STREETS		RR	12,000.00
		CR	15,000.00
CHRISTINA VILLAGE II:			
ALL STREETS		RR	12,000.00
		CR	15,000.00
CR MUTINATIONAL VILLAGE		RR	12,000.00
		CR	15,000.00
		X	15,000.00
DAANG BATANG		RR	13,000.00
		CR	20,000.00
DONNAS VILLE SUBD		RR	11,000.00
		CR	15,000.00

THIS REVISION

		D.O. No.	**009-2018**
BARANGAY : SAN DIONISIO (continuation)		Effectivity Date	**March 4, 2018**

STREET/SUBDIVISION/CONDOMINIUM	VICINITY	CLASSIFICATION	8TH REV. ZV/SQ.M.
WAKAS		RR	10,000.00
		CR	25,000.00
		X	20,000.00
ALL OTHER STREETS		RR	10,000.00
		CR	20,000.00
		I	20,000.00
		X	20,000.00
CONDOMINIUMS:			
AMVEL MANSION CONDO		RC	70,000.00
		CC	80,000.00
		PS	60,000.00
AVIDA TOWER SUCAT CONDO		RC	100,000.00
		CC	120,000.00
		PS	80,000.00
OLIVAREZ CONDO		RC	60,000.00
		CC	70,000.00
		PS	50,000.00
SM FIELD RESIDENCE CONDO		RC	75,000.00
		CC	95,000.00
		PS	65,000.00

*ALL OTHER STREETS -GP value was deleted because all land use have already been classified depending on actual use, ex. RR, CR, I & X.

Matatdo Street was deleted because it is under Barangay San Isidro.

NOTE:-ANY UNIT IN A PURELY RESIDENTIAL CONDOMINIUM (RC) PROJECT FOUND TO BE USED IN BUSINESS SHALL BE CLASSIFIED AS
BE CLASSIFIED AS COMMERCIAL CONDOMINIUM (CC) AND TWENTY PERCENT (20%) OF THE ESTABLISHED VALUE SHALL
BE ADDED THERETO.

-CONDOMINIUM UNITS LOCATED ON THE GROUND FLOOR SUBJECT TO ADDITIONAL 20% OF THE ASSIGNED ZONAL VALUE

-DEVELOPERS/OWNERS OF CONDOMINIUM PROJECTS IN THIS BARANGAY BUILT AFTER THE EFFECTIVITY OF THIS REVISION
SHALL REQUEST FOR AN ASSIGNMENT OF ZONAL VALUES (ZVs) FROM THE TECHNCIAL COMMITTEE ON REAL PROPERTY
VALUATION (TCRPV) CHAIRED BY THE ASSISTANT REGIONAL DIRECTOR OF THIS REGION.

	CR	15,000.00
MIHARA HOMES	RR	13,000.00
NAPOLEON COMPOUND	RR	13,000.00
NERSAN COMPOUND	RR	15,000.00
PASCUAL COMPOUND	RR	15,000.00
	CR	18,000.00
	X	16,000.00
PRIMAVERA HOMES	RR	13,000.00
RAINBOW VILLAGE	RR	15,000.00
RAINBOW VILLAGE 2	RR	15,000.00
RAMOS APARTMENT	RR	15,000.00
SALVADOR ESTATE	RR	15,000.00
SAN ANTONIO VALLEY (PH. 2, 6, 12, 13, 14 & 15)	RR	13,000.00
	CR	21,000.00
	X	20,000.00

RDO 52 Parañaque city per ITS Records

MARYANN G. ZAMUCO
GROUP SUPERVISOR

04/26/19

DATE:

SANTA AGUEDA ST	RR	18,000.00
SANTA ANA COMPOUND	RR	12,000.00
SANTO NINO SUBD	RR	12,000.00
	CR	16,000.00
SITIO LIBJO (FORMERLY LIBJO ST.)	RR	12,000.00
ROSAL	RR	12,000.00
WAWA	RR	12,000.00
	CR	16,000.00
VALENZUELA COMPOUND	RR	12,000.00
VERONICA DE LEON	RR	12,000.00
YOHAN	RR	12,000.00
ALL OTHER STREETS	RR	12,000.00
	CR	16,000.00
	I	16,000.00
	X	16,000.00
	D.O. No.	**009-2018**

CONDOMINIUM:

ARISTA PLACE	RC	60,000.00
	CC	75,000.00
	PS	50,000.00

*Alley 1-6 was removed from the street names as recommended by Engr. Villamayor -representative of the Asst. Assessor / Assessor of Parañaque
*GP value was deleted because all land use have already been classified depending on actual use, ex. RR, CR, I & X.
*BULI STREET WAS DELISTED BECAUSE ITS IS NO LONGER EXISTING.

NOTE:-ANY UNIT IN A PURELY RESIDENTIAL CONDOMINIUM (RC) PROJECT FOUND TO BE USED IN BUSINESS SHALL BE CLASSIFIED AS

BE CLASSIFIED AS COMMERCIAL CONDOMINIUM (CC) AND TWENTY PERCENT (20%) OF THE ESTABLISHED VALUE SHALL

BE ADDED THERETO.

-CONDOMINIUM UNITS LOCATED ON THE GROUND FLOOR SUBJECT TO ADDITIONAL 20% OF THE ASSIGNED ZONAL VALUE

-DEVELOPERS/OWNERS OF CONDOMINIUM PROJECTS IN THIS BARANGAY BUILT AFTER THE EFFECTIVITY OF THIS REVISION

SHALL REQUEST FOR AN ASSIGNMENT OF ZONAL VALUES (ZVs) FROM THE TECHNCIAL COMMITTEE ON REAL PROPERTY

VALUATION (TCRPV) CHAIRED BY THE ASSISTANT REGIONAL DIRECTOR OF THIS REGION.

RDO 52 Parañaque city for its records

MARYANN G. ZAMUCO
GROUP SUPERVISOR
DATE: 04/26/19

BUWIS RENTAS INTERNAS
DST2018
35677208
15 PISO DOKUMENTARYO

BUWIS RENTAS INTERNAS
DST2018
35677218
15 PISO DOKUMENTARYO

			30,000.00
JALANDONI ST		RR	17,000.00
JUAN FERMIN ST*		RR	13,000.00
J.W. DIOKNO		CR	175,000.00
KABESANG CILIO ST*		RR	16,000.00
KATIGBAK DRIVE		RR	20,000.00
		CR	35,000.00
L AVELINO (LIBRADA AVELINO)		RR	25,000.00
		CR	40,000.00
LEDESMA		RR	17,000.00
	INTERIOR	RR	15,000.00
LOPEZ DE LEON ST		RR	17,000.00
MACAPAGAL AVE		CR	150,000.00
		I	100,000.00
MARINA AVE		RR	100,000.00
		CR	140,000.00
MARINA SUBD (EAST & WEST)		RR	70,000.00
MARTYRS*		RR	14,000.00
P. MAYUGA (MAYUGA)		RR	18,000.00
		CR	60,000.00

D.O. No.	**009-2018**
Effectivity Date	**March 4, 2018**

BARANGAY : TAMBO (continuation)

STREET/SUBDIVISION/CONDOMINIUM	VICINITY	CLASSIFICATION	8TH REV. ZV/SQ.M.
MCDONOUGH ROAD		RR	16,000.00
MENDOZA ST.		RR	14,000.00
MERALCO*		RR	28,000.00
MIA ROAD		CR	130,000.00
		X	120,000.00
PAULINO ST*		RR	14,000.00
PILDERA (MIA)		RR	24,000.00
PINAGLABANAN ST		RR	15,000.00
P DE LEON ST*		RR	15,000.00

RDO 52 Parañaque City
Per its records
MARYANN G. ZAMUCO
GROUP SUPERVISOR
04/24/19

BUWIS RENTAS INTERNAS DOKUMENTARYO DST2018 35677209 15 PISO
BUWIS RENTAS INTERNAS DOKUMENTARYO DST2018 35677219 15 PISO

CONDOMINIUMS:

BAYVIEW INT'L TOWERS	RC	60,000.00
	CC	75,000.00
	PS	55,000.00
COMMUNITY MORTGAGE PROG	RC	42,000.00
	CC	48,000.00
	PS	38,000.00
EDUAROSA TOWER	RC	60,000.00
	CC	90,000.00
	PS	55,000.00
NAIA GARDEN RESIDENCES	RC	85,000.00
	CC	105,000.00
	PS	70,000.00
PACIFIC COAST PLAZA	RC	58,000.00
	CC	90,000.00
	PS	55,000.00
SENTOSIA CONDOMINIUM	RC	60,000.00
	CC	70,000.00
	PS	50,000.00

* no residential lot in macapagal

** no general purpose property in macapagal

***MARINA SUBD. (NORTH & SOUTH) - consolidated under marina subdivision

*GP value was deleted because all land use have already been classified depending on actual use, ex. RR, CR, I & X.

*Dr. A Santos Ave. was deleted because it is located in another barangay.

*Alley was removed from the street names because this is no longer used per advice of Engr. Nelson Villamor -

representative of the Asst. Assessor / Assessor of Parañaque

*J Fernand was deleted, this is the same with Juan Fermin St.

*Bayview was deleted, this is within Bayview Drive/Bayview Village.

*ASEANA Business Park Residential Regular (RR) was deleted beacause is purely commercial

NOTE:-ANY UNIT IN A PURELY RESIDENTIAL CONDOMINIUM (RC) PROJECT FOUND TO BE USED IN BUSINESS SHALL BE CLASSIFIED AS

BE CLASSIFIED AS COMMERCIAL CONDOMINIUM (CC) AND TWENTY PERCENT (20%) OF THE ESTABLISHED VALUE SHALL

BE ADDED THERETO.

-CONDOMINIUM UNITS LOCATED ON THE GROUND FLOOR SUBJECT TO ADDITIONAL 20% OF THE ASSIGNED ZONAL VALUE

-DEVELOPERS/OWNERS OF CONDOMINIUM PROJECTS IN THIS BARANGAY BUILT AFTER THE EFFECTIVITY OF THIS REVISION

SHALL REQUEST FOR AN ASSIGNMENT OF ZONAL VALUES (ZVs) FROM THE TECHNCIAL COMMITTEE ON REAL PROPERTY

VALUATION (TCRPV) CHAIRED BY THE ASSISTANT REGIONAL DIRECTOR OF THIS REGION.

BUWIS SA RENTAS INTERNAS DSJ2018 35677210

BUWIS SA RENTAS INTERNAS DSJ2018 35677220

RDO52 Parañaque City
Per ITS Records

MARYANN G. ZAMUCO
GROUP SUPERVISOR
06/26/19

ANNEX 8. 2

8.2 Preliminary Geo-hazard Assessment of the Area;

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. IV (CALABARZON)
8TH Floor, DENR by the Bay Bldg, Roxas Boulevard
Ermita, Manila, Philippines
Telefax. No. (+632) 310-88-97 E-mail: mgbcalabarzon@gmail.com
Website: region4a.mgb.gov.ph

ISO 9001 Registered Quality Management
UKAS MANAGEMENT SYSTEMS
Certificate No. 66832
EAC Code: 36

January 24, 2019

MR. FERNANDO C. SORIANO
OIC, City Administrator
PARAÑAQUE CITY HALL
San Antonio Avenue, Parañaque City

Dear Mr. Soriano:

We are pleased to transmit to you herewith a copy of the report entitled "***Geological Site Scoping Report (GSSR) of the Proposed 286.86 Hectares Parañaque Reclamation Project Located At the Coast of Manila Bay Within the Territorial Jurisdiction of the City of Parañaque, Metro Manila"*** prepared by personnel of this Office. The survey was undertaken last January 23, 2019 and was paid under Official Receipt No. 6702734 U dated January 21, 2019.

The GSSR contains the scope of identified geological issues and geohazards that needs to be addressed in the corresponding Engineering Geological and Geohazard Assessment Report (EGGAR) to be submitted to this Office for appropriate review pursuant to DENR Administrative Order No. 2000-28 and MGB Memorandum Circular No. 2000-33.

Please be reminded that upon submission of the corresponding EGGAR and prior to official review by this Office, a review fee of Php 9,000.00 should be paid to our Cashier's Office.

Should you have any queries with regard to this matter, please contact our Office at telephone numbers 310-8781 and 310-8897.

Very truly yours,

SAMUEL T. PARAGAS, CESO IV
Regional Director-CALABARZON

Department of Environment and Natural Resources
Mines and Geosciences Bureau
Region IV CALABARZON
Office of the Regional Director
012419-R04A-3229
11:07 AM LETTER 01/24/19

"MINING SHALL BE PRO-PEOPLE AND PRO-ENVIRONMENT IN SUSTAINING WEALTH CREATION AND IMPROVED QUALITY OF LIFE"

GSD-019-090

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. IV (CALABARZON)
8TH Floor, DENR by the Bay Bldg, Roxas Boulevard
Ermita, Manila, Philippines
Telefax. No. (+632) 310-88-97 **E-mail:** mgbcalabarzon@gmail.com
Website: region4a.mgb.gov.ph

January 24, 2019

MEMORANDUM

FOR	:	**THE REGIONAL DIRECTOR** 1-24-19 Mines and Geosciences Bureau Regional Office No. IV CALABARZON
THRU	:	**THE OFFICER-IN-CHARGE** 1-24 Geosciences Division
FROM	:	**ROMALI S. UMALI** Supervising Geologist
SUBJECT	:	***Geological Site Scoping Report (GSSR) of the Proposed 286.86 Hectares Parañaque Reclamation Project Located At the Coast of Manila Bay Within the Territorial Jurisdiction of the City of Parañaque, Metro Manila***

INTRODUCTION

The geological site scoping for the proposed Parañaque Reclamation Project located within the territorial jurisdiction of the City of Parañaque was conducted by the undersigned last January 23, 2019 in response to the official request Mr. Fernando C. Soriano, OIC – City Administrator of Parañaque City, under Official Receipt No. 6702734 U dated January 21, 2019 in the amount of Six Thousand Pesos (Php 6,000.00).

The geological site scoping is pursuant to the provisions of Department of Environment and Natural Resources Administrative Order (DAO) No. 2000-28: "Implementing Guidelines on Engineering Geological and Geohazard Assessment as Additional Requirement for ECC Applications covering Subdivision, Housing and other Land Development and Infrastructure Projects".

PROJECT DESCRIPTION

The proposed Parañaque Reclamation Project has an area of approximately 286.86 hectares. The project consists of reclamation of 286.86 hectares of Manila Bay offshore (Figure 1).

LOCATION AND ACCESSIBILITY

The proposed Parañaque Reclamation Project is located along the coastal areas Parañaque (Figure 2). It is bounded on all sides by Manila Bay since it would be approximately four (4) kilometers offshore of Diosdado Macapagal Boulevard.

Accessed to the reclamation project would be via viaduct that would be built by the project proponent from either Diosdado Macapagal Boulevard in Manila and it would interconnect the reclaimed land to Parañaque City, Pasay City and Las Piñas City.

TOPOGRAPHY AND DRAINAGE

The project site is currently under water in Manila Bay. However, based on the project description provided by the Technotrix Consultancy Services, Inc., the reclamation platform level is at least +4.0 meters as per the PRA requirement.

The project site is situated in Manila Bay, which is the main drainage that could affect the project site.

LOCAL GEOLOGY

The project area although underwater, is most probably underlain by alluvial deposits of the Quaternary Alluvium. Based on the published Geological Map of Manila and Quezon City Quadrangle by the Mines and Geosciences Bureau, Quaternary Alluvium (QAl) deposits underlie the coastal areas of Manila Bay. It includes the detrital deposits, mostly and, silt and gravel (Figure 3).

IDENTIFIED GEOHAZARDS

Fault-related/Seismic Hazards

The project site is in proximity of seismically active geologic structures. The closes of these is the West Valley Fault found about 12.5 kilometers to the east. The Manila Trench is around 190 km west of the project site. The proximity of these active geological structures makes the project area and vicinities at risk to ground shaking, differential settlement, and liquefaction as well as tsunami hazards. These hazards should be seriously considered and included in the corresponding EGGA report.

Mass Movement Hazards

The project site being reclaimed area will be prone to subsidence and settlement hazards.

Coastal Hazard

The project site is susceptible to storm surge brought about by typhoons and southwest monsoon or "Habagat" and sea level rise.

Settlement and Foundation Hazards

Since the project site is located in an alluvial area and will consists of fill materials, an engineering geological and hazards classification of the underlying deposits should be made in terms of:

a. potential for liquefaction/differential settlement; and
b. potential for long term consolidation/settlement (subsidence)

CONCLUSIONS AND RECCOMENDATIONS

In summary, based on the geological site scoping survey, the area is susceptible to seismic hazards, mass movement, coastal and foundation hazards.

Due to the area's proximity to active faults, specifically the Manila Trench and the Valley Fault System, the proponent must give attention to hazards associated with earthquakes, such as ground shaking, differential settlement, liquefaction and tsunami. The EGGAR should discuss the behavior of the underlying materials in response to ground acceleration. The peak ground acceleration or "g" factor must also be computed using the Fukushima and Tanaka equation (1990).

A certification from PHIVOLCS must be obtained to determine the distance of the project site to the active faults and the susceptibility of the project to different seismic hazards. The certified distance should be used to calculate the PGA or "g" value.

The project site is also prone to mass movement, coastal and foundation hazards.

The final platform or ground level of the reclamation area should be higher than the highest storm surge experienced in the project site.

In view of the above findings, it is therefore recommended that the proponent must submit an Engineering Geological and Geohazard Assessment Report (EGGAR) duly signed by a qualified preparer. The EGGAR should not be limited to the identified geohazards but also to all other hazards applicable. It should contain recommendations that are necessary and appropriate to mitigate the identified hazards that could possibly affect the proposed building structures that would be built on the project site.

Lastly, the EGGAR should conform to the format stipulated in MGB Memorandum Circular No. 2000-33 and a copy must be submitted to this Office for review.

ROMALI S. UMALI

ANNEX 8. 3

8.3 Certification on the status of the area and the land classification of the of the adjacent land by the CENRO;

Department of Environment and Natural Resources
NATIONAL CAPITAL REGION
National Ecology Center, East Avenue, Diliman, Quezon City

CERTIFICATION

TO WHOM IT MAY CONCERN:

This is to certify that upon verification by the Land Evaluation Survey Section, Surveys and Mapping Division of the area for the Proposed Parañaque Reclamation Project containing an approximate area of Two Million Eight Hundred Sixty Eight Thousand Six Hundred (2,868,600) square meters located in Parañaque City, Metro Manila, it falls adjacent to Parañaque Cadastre, Cad-299, C.M. 14° 30' N. 120° 59' E. Sec. 1-C, as shown and described in the reverse side hereof, and is designated and described as **alienable and disposable land** under Project No. 25 of the Bureau of Forestry Map LC - 2623, classified and certified dated January 3, 1968 and pursuant to Forestry Administrative Order No. 4-1141 approved on even date.

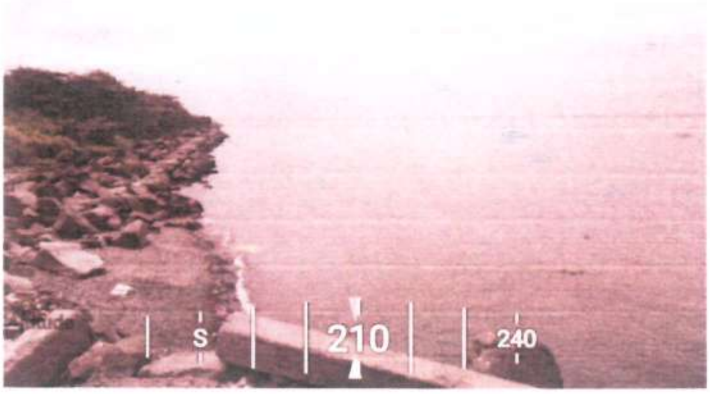
This certification is issued to City Mayor Edwin L. Olivarez of City of Parañaque per letter request dated 15 August 2018 and pursuant to DENR Administrative Order 2007-20 for whatever legal purpose it may serve, without prejudice to other documentary requirements or qualifications needed of an applicant for titling purposes.

Issued this ____day of MAR 0 6 2019. The required verification fee of Fifty Pesos (Php 50.00) for the subject parcels of land has been paid under O.R. No. 5497237 Y dated February 4, 2019.

JACQUELINE A. CAANCAN, *CESO V*
Regional Executive Director

DENR - NATIONAL CAPITAL REGION
A&D20190306-1565

GEO-TAGGED PHOTOGRAPHS



CERTIFICATION

This is to certify that the geo-tagged photos above represent portion of adjacent land area of the Proposed 286.86 Hectares Paranaque Reclamation Project covered by Paranaque Cadastre Cad-299, C.M. 14° 30' N. 120° 59' E. Sec. 1-C being requested by Fernando C. Soriano, OIC-City Administrator, in behalf of City Mayor Edwin L. Olivarez for certification of land classification status of adjacent land area situated in Paranaque City, Metro Manila, pursuant to DENR Administrative Order No. 2016-22.

HENRY Z. ABONITALLA, JR.	**SATURNINO C. DANGANAN, JR.**
Engineer II, Land Evaluation Survey Section	Forester II, Land Evaluation Survey Section

SUBSCRIBED AND SWORN TO BEFORE ME, this 19th day of Feb. 2019 at the National Ecology Center, DENR-NCR, East Avenue, Quezon City

ABNER R. REMOLAR
Chief, Land Evaluation Survey Section

ANNEX 4

8.4. Panoramic view of the land and adjoining areas, including existing landmarks and identifying features;

Various photographs of the project site and adjoining areas are shown hereunder

ANNEX 8.5

8.5 *Sanggunian* Resolution authorizing the conduct of the reclamation in case of LGU and;

ANNEX 6

8.6 Clearances from concerned government agencies such as PRA (in case applicant is other than PRA), PPA (in areas under their jurisdiction), DOT (in areas declared as tourist zone), BFAR, DOE (for submarine pipelines and power cable connections), concerned LGU (if the area is within municipal waters and the project is not LGU-initiated), DPWH, and others, whenever necessary.

Republic of the Philippines
PHILIPPINE RECLAMATION AUTHORITY
7th floor, Legaspi Towers 200 Bldg., 107 Paseo de Roxas St., Legaspi Village, 1226 City of Makati
Tel. No.: (02) 459-5000 • Facsimile No.: (02) 815-2662
Website: www.pea.gov.ph • Email: info@pea.gov.ph

17 October 2018

HON. EDWIN L. OLIVAREZ
Mayor
City of Parañaque
Office of the Mayor
San Antonio Avenue, San Antonio
Parañaque City

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

Dear **Mayor Olivarez:**

This refers to the letters of the Honorable Mayor dated 17 September 2018 and 2 October 2018 requesting for PRA's "no objection" on the application of the City with the Department of Environment and Natural Resources (DENR) for issuance of Area Clearance relative to the City's proposed 286.86-hectare reclamation project in Manila Bay.

Relative thereto, this Office interposes "no objection" on the City's application for an Area Clearance.

We would like to clarify and emphasize, however, that this "no objection" clearance is **NOT** equivalent to the "Reclamation Permit" and "Notice to Proceed" required by this Agency prior to the conduct of actual reclamation works. This "no objection" should not be construed as PRA's approval of said reclamation project pursuant to Executive Order (EO) No. 146 series of 2013.

Please be guided accordingly. Thank you.

Very truly yours,

ATTY. JANILO E. RUBIATO
General Manager and CEO

10-22-18
NEVA 11:35

PHILIPPINE RECLAMATION AUTHORITY
10-135-2018.0339
613708515320
October 22, 2018 07:50:23

Republic of the Philippines

CERTIFIED TRUE COPY

FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

CNO-2019-03-001

CERTIFICATE OF NO OPPOSITION/OBJECTION

5 March 2019

The Department of Energy hereby issues this Certificate of No Opposition/Objection to the proposed reclamation project of Century Peak Corporation within the waters of Manila Bay in the Territorial Jurisdiction of Parañaque City, municipal waters of Cavite City, Noveleta and Rosario, all within the Jurisdiction of the Province of Cavite.

Provided, that the Century Peak Corporation shall comply with the provisions of Republic Act No.9136 (Electric Power Industry Reform Act of 2001), its Implementing Rules and Regulation (IRR), Philippine Grid Code, and Philippine Distribution Code, including any amendments thereto; policies of the Department of Energy and the Department of Environment and Natural Resources pertaining to Administrative Order No. 2018-14, otherwise known as the *"Guidelines on the Issuance of Area Clearance for Reclamation Projects and Proclamation/Special Patents over Reclaimed Lands"*; policies of other relevant government agencies; and internal requirements of the National Grid Corporation of the Philippines and the Manila Electric Company.

MARIO C. MARASIGAN, CESO III
Director IV
Officer-in-Charge
Electric Power Industry Management Bureau

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF INFORMATION AND
COMMUNICATIONS TECHNOLOGY

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

January 09, 2019

CITY OF PARANAQUE
Paranaque City Hall
San Antonio Ave., San Antonio
Paranaque City

ATTENTION: **MR. FERNANDO C. SORIANO**
OIC – City Administrator

Gentlemen:

Greetings from the Department of Information and Communications Technology (DICT)!

This refers to your letter dated 15 October 2018 (copy received on 18 December 2018) addressed to the undersigned requesting for a resolution expressing that the DICT is interposing no objection to the proposed reclamation project of Century Peak Corporation within the waters of Manila Bay in the Territorial Jurisdiction of Paranaque City.

In this regard, please be advised that the DICT interposes no objection to said proposed reclamation project. However, the DICT would like to request that it be included in the appropriate negotiation for the laying of ducts and subducts for the installation of optic fiber cables.

Thank you very much.

Sincerely yours,

ELISEO M. RIO, JR.
Acting Secretary

TANGGAPAN NG KOMANDANTE
(OFFICE OF THE COMMANDANT)
PAMBANSANG PUNONGHIMPILAN TANOD BAYBAYIN NG PILIPINAS
(National Headquarters Philippine Coast Guard)
139 25th Street, Port Area
1018 Manila

19 MAR 2019

HONORABLE EDWIN L OLIVAREZ
Mayor
City of Parañaque
Parañaque City Hall, San Antonio Valley-1
Barangay San Antonio, Parañaque City

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

Attention: MR FERNANDO C SORIANO
OIC, City Administrator

Dear **MAYOR OLIVAREZ**:

This has reference to your letter regarding the proposal of Century Peak Corporation (CPC) for land reclamation project in Parañaque City.

The proposed reclamation area is clear from any established traffic separation scheme (TSS) or any port facilities. Morever, in the environmental impact assessment study submitted by CPC, the site is about two (2) kilometers away from the Las Piñas – Parañaque Critical Habitat and Eco-Tourism Area, declared as a protected area by the National Integrated Protected Areas System (NIPAS).

In this regard, the Philippine Coast Guard (PCG) poses **No Objection** on the proposed 286.86 hectare reclamation project of CPC within the waters of Manila Bay and territorial jurisdiction of Parañaque. It is prudent for the project proponent to ensure that applicable PCG regulations and other international and local laws are observed prior and during the implementation of the project, particularly in ensuring the safety of navigating vessels and prevention of marine pollution in the reclamation area.

Rest assured of our continued support to the development of the City of Parañaque and on matters of mutual concern.

Truly yours,

ELSON E HERMOGINO
ADM PCG

RECEIVED
O. AMAMIO
3/20.19
10:05 AM

"Serving our Nation by Ensuring Safe, Clean and Secure Maritime Environment"

FLAG OFFICER IN COMMAND
PHILIPPINE NAVY
Naval Station Jose Andrada
2335 Roxas Boulevard, Manila

22 JAN 2019

Mayor EDWIN L. OLIVAREZ
Office of the Mayor of Parañaque
San Antonio Avenue Parañaque City
Metro Manila

CERTIFIED TRUE COPY
FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

Dear Mayor Olivarez

This pertains to your request for the Philippine Navy's (PN's) clearance on the proposed reclamation of 286.86 hectare Parañaque Reclamation Project within the waters of Manila Bay in the territorial jurisdiction of Parañaque City.

The PN has no objection on the reclamation of 286.86 hectare Parañaque Reclamation Project provided that the following are being considered for the PN's possible operations:

a. Comply with governing rules and regulations implemented by the Philippine Reclamation Authority (PRA) per Executive Order Nr 525;
b. Installation of Aids to navigation facilities (i.e Light Houses, Light Buoys, etc.) in the vicinity of project site before, during and after reclamation activity to ensure safety for all sea crafts and floating vessels that will pass through the area;
c. Safe passage of PN's watercrafts/vessels on the channels in between the proposed reclaimed areas;
d. Clearance for PN vessels to dock alongside the wharf or pier to be developed in case of security or emergency purposes; and
e. Provide the PN a copy of site development map or chart indicating the official delineation/boundaries of the reclamation project for the purpose of new navigational route planning/programming of our vessel.

For your reference and information.

Sincerely,

ROBERT A EMPEDRAD
Vice Admiral, AFP

Office of the Flag Officer in Command,PN
FOI C 60786
IN TRACKING PLEASE CITE BARCODE NUMBER

PHILIPPINE
PORTS
AUTHORITY

20 February 2019

CERTIFIED TRUE COPY

FERNANDO C. SORIANO
OIC-CITY ADMINISTRATOR

MAYOR EDWIN L. OLIVAREZ
Office of the Mayor
City of Parañaque
San Antonio Ave., San Antonio
Parañaque City

Dear Mayor Olivarez:

This refers to your letter dated October 15, 2018 requesting from the Philippine Ports Authority (PPA) a resolution interposing no opposition or objection relative to the proposed 286.86 hectares reclamation project of Century Peak Corporation within the waters of Manila Bay as part of the requirement for Area Clearance application with the Department of Environment and Natural Resources (DENR).

The location of the proposed reclamation project is not within the port zone delineation under the jurisdiction of the PPA, hence, PPA interposes no objection to the above-mentioned reclamation project but subject to the following conditions:

1. The proposed reclamation project shall at all times be compliant with the Supreme Court Writ of Mandamus on the clean-up of Manila Bay;

2. The proposed reclamation project shall neither obstruct anchorage operations in the Manila Bay nor block the entrance navigational channels, fairways, and berths of South Harbor, North Harbor, Manila International Container Terminal nor impair the existing breakwater;

3. The port components of the proposed reclamation project, if any, shall be subject to the written consent of the Authority and the detailed feasibility study and plans shall be submitted to the Authority for approval prior to implementation;

4. Environmental issues and concerns related to the reclamation project shall be governed by the rules and regulations of the DENR, Philippine Coast Guard (PCG), the Authority and other concerned agencies; and

5. Suitable dredged materials shall be used as fill materials, as far as practicable for the reclamation project.

Sincerely,

JAY DANIEL R. SANTIAGO
General Manager

OFFICE OF THE MAYOR
PARAÑAQUE CITY
DATE & TIME: 2.22.19 1:35
RECEIVED BY: NINA

cc: The AGM for Engineering
The AGM for Operations
The Manager, POSD
The Manager, PPDD
The Port Manager, PMO NCR South
The Acting Corporate Board Secretary

20190222023

030075
2.21.19-1601

Department of Environment and Natural Resources
National Capital Region

ENVIRONMENTAL MANAGEMENT BUREAU
RECORDS SECTION / CENTRAL OFFICE
DEC 04 2019
RECEIVED
By: [signature] Time: 3'am

DEC 0 3 2019

MEMORANDUM

FOR : **THE OIC, DIRECTOR**
ENVIRONMENTAL MANAGEMENT BUREAU

FROM : **THE REGIONAL EXECUTIVE DIRECTOR**

SUBJECT : **NOTICE TO PROCEED TO CONDUCT THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED 286.86 HECTARE PARAÑAQUE RECLAMATION AND DEVELOPMENT PROJECT**

This pertains to the application for Area Clearance of the Local Government Unit - City of Parañaque for the proposed Parañaque 286.86 Hectare Reclamation and Development Project filed in this Office.

Please be informed that Mayor Edwin L. Olivarez of the City of Parañaque is requesting from this Office the issuance of Notice to Proceed to the conduct of Environmental Impact Assessment (EIA) while they are still complying with the other requirements that need to be submitted.

In view hereof, we are notifying your Office to proceed with the facilitation of the conduct of Environmental Impact Assessment (EIA)/Environmental Impact Assessment (EIA) application process in accordance with the existing rules and regulations of Presidential Decree (PD) No. 1586, *Establishing an Environmental Impact Statement System, including Other Environmental Management Related Measures and for Other Purposes.*

For your information, consideration, and appropriate action.

JACQUELINE A. CAANCAN, *CESO V*

DENR - NATIONAL CAPITAL REGION
MEM20191203-10982

Copy furnished:
HON. EDWIN L. OLIVAREZ
City Mayor
Parañaque City Hall
San Antonio Avenue, San Antonio
Parañaque City

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. IV (CALABARZON)
8TH Floor, DENR by the Bay Bldg, Roxas Boulevard
Ermita, Manila, Philippines
Telefax. No. (+632) 310-88-97 **E-mail:** mgbcalabarzon@gmail.com
Website: region4a.mgb.gov.ph

January 24, 2019

MR. FERNANDO C. SORIANO
OIC, City Administrator
PARAÑAQUE CITY HALL
San Antonio Avenue, Parañaque City

Dear Mr. Soriano:

We are pleased to transmit to you herewith a copy of the report entitled "***Geological Site Scoping Report (GSSR) of the Proposed 286.86 Hectares Parañaque Reclamation Project Located At the Coast of Manila Bay Within the Territorial Jurisdiction of the City of Parañaque, Metro Manila"*** prepared by personnel of this Office. The survey was undertaken last January 23, 2019 and was paid under Official Receipt No. 6702734 U dated January 21, 2019.

The GSSR contains the scope of identified geological issues and geohazards that needs to be addressed in the corresponding Engineering Geological and Geohazard Assessment Report (EGGAR) to be submitted to this Office for appropriate review pursuant to DENR Administrative Order No. 2000-28 and MGB Memorandum Circular No. 2000-33.

Please be reminded that upon submission of the corresponding EGGAR and prior to official review by this Office, a review fee of Php 9,000.00 should be paid to our Cashier's Office.

Should you have any queries with regard to this matter, please contact our Office at telephone numbers 310-8781 and 310-8897.

Very truly yours,

SAMUEL T. PARAGAS, CESO IV
Regional Director-CALABARZON

Department of Environment and Natural Resources
Mines and Geosciences Bureau
Region IV CALABARZON
Office of the Regional Director
012419-R04A-3229
11:07 AM LETTER 01/24/19

GSD-019-040

January 24, 2019

MEMORANDUM

FOR : **THE REGIONAL DIRECTOR** 1-24-19
Mines and Geosciences Bureau
Regional Office No. IV CALABARZON

THRU : **THE OFFICER-IN-CHARGE** 1-24
Geosciences Division

FROM : **ROMALI S. UMALI**
Supervising Geologist

SUBJECT : ***Geological Site Scoping Report (GSSR) of the Proposed 286.86 Hectares Parañaque Reclamation Project Located At the Coast of Manila Bay Within the Territorial Jurisdiction of the City of Parañaque, Metro Manila***

INTRODUCTION

The geological site scoping for the proposed Parañaque Reclamation Project located within the territorial jurisdiction of the City of Parañaque was conducted by the undersigned last January 23, 2019 in response to the official request Mr. Fernando C. Soriano, OIC – City Administrator of Parañaque City, under Official Receipt No. 6702734 U dated January 21, 2019 in the amount of Six Thousand Pesos (Php 6,000.00).

The geological site scoping is pursuant to the provisions of Department of Environment and Natural Resources Administrative Order (DAO) No. 2000-28: "Implementing Guidelines on Engineering Geological and Geohazard Assessment as Additional Requirement for ECC Applications covering Subdivision, Housing and other Land Development and Infrastructure Projects".

PROJECT DESCRIPTION

The proposed Parañaque Reclamation Project has an area of approximately 286.86 hectares. The project consists of reclamation of 286.86 hectares of Manila Bay offshore (Figure 1).

LOCATION AND ACCESSIBILITY

The proposed Parañaque Reclamation Project is located along the coastal areas Parañaque (Figure 2). It is bounded on all sides by Manila Bay since it would be approximately four (4) kilometers offshore of Diosdado Macapagal Boulevard.

Accessed to the reclamation project would be via viaduct that would be built by the project proponent from either Diosdado Macapagal Boulevard in Manila and it would interconnect the reclaimed land to Parañaque City, Pasay City and Las Piñas City.

TOPOGRAPHY AND DRAINAGE

The project site is currently under water in Manila Bay. However, based on the project description provided by the Technotrix Consultancy Services, Inc., the reclamation platform level is at least +4.0 meters as per the PRA requirement.

The project site is situated in Manila Bay, which is the main drainage that could affect the project site.

LOCAL GEOLOGY

The project area although underwater, is most probably underlain by alluvial deposits of the Quaternary Alluvium. Based on the published Geological Map of Manila and Quezon City Quadrangle by the Mines and Geosciences Bureau, Quaternary Alluvium (QAl) deposits underlie the coastal areas of Manila Bay. It includes the detrital deposits, mostly and, silt and gravel (Figure 3).

IDENTIFIED GEOHAZARDS

Fault-related/Seismic Hazards

The project site is in proximity of seismically active geologic structures. The closes of these is the West Valley Fault found about 12.5 kilometers to the east. The Manila Trench is around 190 km west of the project site. The proximity of these active geological structures makes the project area and vicinities at risk to ground shaking, differential settlement, and liquefaction as well as tsunami hazards. These hazards should be seriously considered and included in the corresponding EGGA report.

Mass Movement Hazards

The project site being reclaimed area will be prone to subsidence and settlement hazards.

Coastal Hazard

The project site is susceptible to storm surge brought about by typhoons and southwest monsoon or "Habagat" and sea level rise.

Settlement and Foundation Hazards

Since the project site is located in an alluvial area and will consists of fill materials, an engineering geological and hazards classification of the underlying deposits should be made in terms of:

a. potential for liquefaction/differential settlement; and
b. potential for long term consolidation/settlement (subsidence)

CONCLUSIONS AND RECCOMENDATIONS

In summary, based on the geological site scoping survey, the area is susceptible to seismic hazards, mass movement, coastal and foundation hazards.

Due to the area's proximity to active faults, specifically the Manila Trench and the Valley Fault System, the proponent must give attention to hazards associated with earthquakes, such as ground shaking, differential settlement, liquefaction and tsunami. The EGGAR should discuss the behavior of the underlying materials in response to ground acceleration. The peak ground acceleration or "g" factor must also be computed using the Fukushima and Tanaka equation (1990).

A certification from PHIVOLCS must be obtained to determine the distance of the project site to the active faults and the susceptibility of the project to different seismic hazards. The certified distance should be used to calculate the PGA or "g" value.

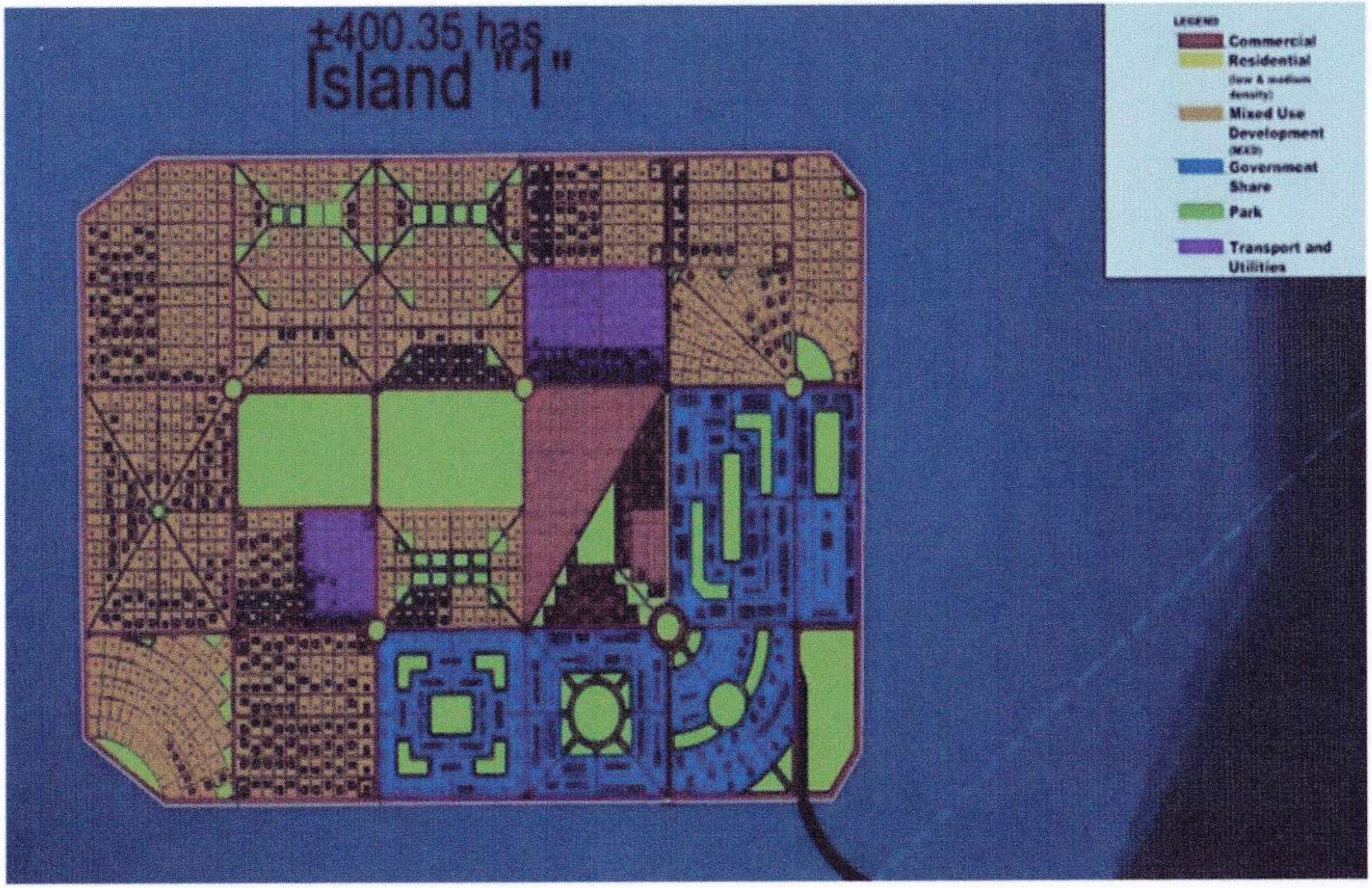
The project site is also prone to mass movement, coastal and foundation hazards.

The final platform or ground level of the reclamation area should be higher than the highest storm surge experienced in the project site.

In view of the above findings, it is therefore recommended that the proponent must submit an Engineering Geological and Geohazard Assessment Report (EGGAR) duly signed by a qualified preparer. The EGGAR should not be limited to the identified geohazards but also to all other hazards applicable. It should contain recommendations that are necessary and appropriate to mitigate the identified hazards that could possibly affect the proposed building structures that would be built on the project site.

Lastly, the EGGAR should conform to the format stipulated in MGB Memorandum Circular No. 2000-33 and a copy must be submitted to this Office for review.

ROMALI S. UMALI



Source: Technotrix Consultancy Services, Inc.

Site development plan of the Parañaque Reclamation Project

Figure 1

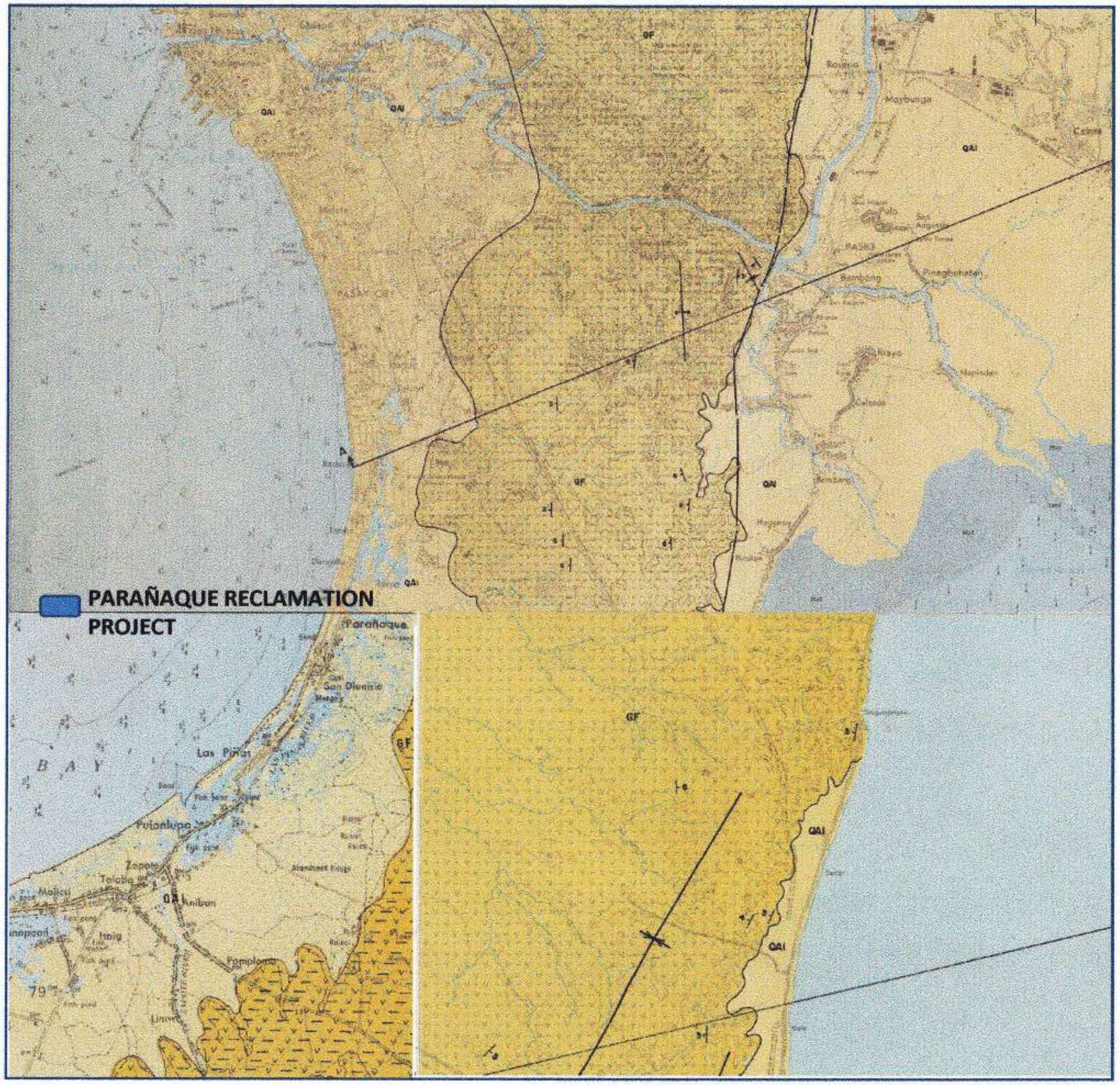
Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. IV-A (CALABARZON)
1515 Roxas Blvd., Ermita, Manila

Location map of the proposed Parañaque Reclamation Project

Figure 2

Figure 3

GEOLOGICAL MAP OF PARAÑAQUE CITY AND VICINITIES



Source: Geological maps of San Pedro, Cavite and Manila & Quezon City Quadrangles

EXPLANATION

QAl

QUATERNARY ALLUVIUM

Detrital deposits, mostly silt, sand and gravel

GF

GUADALUPE FORMATION

The upper member (Diliman Tuff) is thin- to medium-bedded, fine-grained vitric tuffs and welded volcanic breccias with subordinate amount of tuffaceous, fine- to medium-grained sandstone

3 Strike and dip of bed

PARAÑAQUE RECLAMATION PROJECT

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. IV-A (CALABARZON)

Republic of the Philippines
Department of Environment and Natural Resources
MINES AND GEOSCIENCES BUREAU
Regional Office No. IV (CALABARZON)
8TH Floor, DENR by the Bay Bldg, Roxas Boulevard
Ermita, Manila, Philippines
Telefax. No. (+632) 310-88-97 **E-mail:** region4a@mgb.gov.ph
Website: region4a.mgb.gov.ph

nqa ISO 9001 Registered Quality Management
UKAS MANAGEMENT SYSTEMS 015
Certificate No. 66832
EAC Code: 36

MEMORANDUM

FOR	:	**THE REGIONAL DIRECTOR** Environmental Management Bureau National Capital Region
FROM	:	**THE OIC, REGIONAL DIRECTOR** Mines and Geosciences Bureau Regional Office No. IV-A (CALABARZON)
DATE	:	**September 24, 2019**
SUBJECT	:	**Geological Review Report (GRR) of the Engineering Geological and Geohazard Assessment Report (EGGAR) on the Proposed Parañaque 286.86 Hectare Reclamation Project Located in Manila Bay, Parañaque City, Metro Manila**

After diligent review by this Office of the Engineering Geological and Geohazard Assessment Report (EGGAR) on the proposed **Parañaque 286.86 Hectare Reclamation Project Located in Manila Bay, Parañaque City, Metro Manila**, we are endorsing herewith the said EGGAR.

In this respect, the Century Peak Corporation and the City Government of Parañaque, proponents of the Parañaque 286.86 Hectare Reclamation Project, is hereby advised to strictly follow all the recommendations in the EGGAR and the geotechnical study. Likewise, project land development and construction phase should be strictly monitored.

For your information.

DONDI M. SARMIENTO
OIC, Office of the Regional Director

Department of Environment and Natural Resources
Mines and Geosciences Bureau
Region IV CALABARZON
Office of the Regional Direcor
092519-R04A-4668
3:40 PM 09/25/19

ANNEX 1-A

ENGINEERING GEOLOGICAL AND GEOHAZARD ASSESSMENT REPORT

OF THE PROPOSED

PARAÑAQUE 286.86-HECTARE RECLAMATION PROJECT

City Government of Parañaque
July 2019

Table of Contents

List of Figures

List of Tables

INTRODUCTION

This study is a preliminary engineering geological and geohazard hazard assessment of the proposed Parañaque 286.86-Hectare Reclamation Project being applied for by the Parañaque City Government.

The provisions of the DENR Administrative Order (DAO) No. 2000-28, otherwise known as the "Implementing Guidelines on Engineering Geological and Geohazard Assessment (EGGA) as Additional Requirement for ECC Applications covering Subdivision, Housing and other Land Development and Infrastructure Projects" requires the public and private developers to submit an Engineering Geological and Geohazard Assessment Report (EGGAR). In compliance with the said order and as per recommendations made after the conduct of Geohazard Identification Survey (GIR) by the Mines and Geosciences Bureau Region 4A with accompanying Geological Site Scoping Report (GSSR) dated January 24, 2019, a Geohazard Assessment Survey was done for the project site and within its immediate vicinities.

The objective of the geohazard assessment is to investigate the geologic features and the susceptibility of the proposed site and immediate vicinities to different geologic and hydrologic hazards. These geologic features include lithology, presence of geologic structures (e.g., faults, bedding planes, joints, etc.). It also aims to provide the structural, earthworks engineers with vital information for consideration in the structural, foundation, grading and earthworks designs during the construction.

This report is prepared and submitted to the Department of Environment and Natural Resources (DENR) Reginal Office IV-A in partial fulfilment of the requirements for an Area Clearance for the Project. This Report draws information primarily from the EIS Report for the Project and from relevant recent materials on the subject.

1.0 GENERAL INFORMATION
1.1 Project Description

The proposed project will involve the reclamation, that is, land development of 286.86 hectares in a nearshore portion of Manila Bay within the jurisdiction of Parañaque City. The reclamation project will mainly be the development of one island. Other project components include: construction of internal roads; external access way/s; electricity; water supply; communications; storm surge protection; sewer and drainage system. (**Figure 1**) Once completed, it shall be ready for the development and construction of various structures such as commercial, industrial, institutional and residential buildings.

1.2 Location and Accessibility

The Parañaque 286.86-ha Reclamation Project is to be located offshore along the coast of Manila Bay within the territorial jurisdiction of Parañaque City **(Figure 1)**. The proposed landform is to be defined by the following geographic coordinates:

Table 1. Technical Description (WGS 84)

CORNER	LATITUDE	LONGITUDE
1	14 30 41.2244 N	120 57 57.5846 E
2	14 30 13.9995 N	120 57 42.9999 E
3	14 30 10.9995 N	120 57 38.9999 E
4	14 30 07.9995 N	120 57 17.9999 E
5	14 30 07.2087 N	120 57 16.3020 E

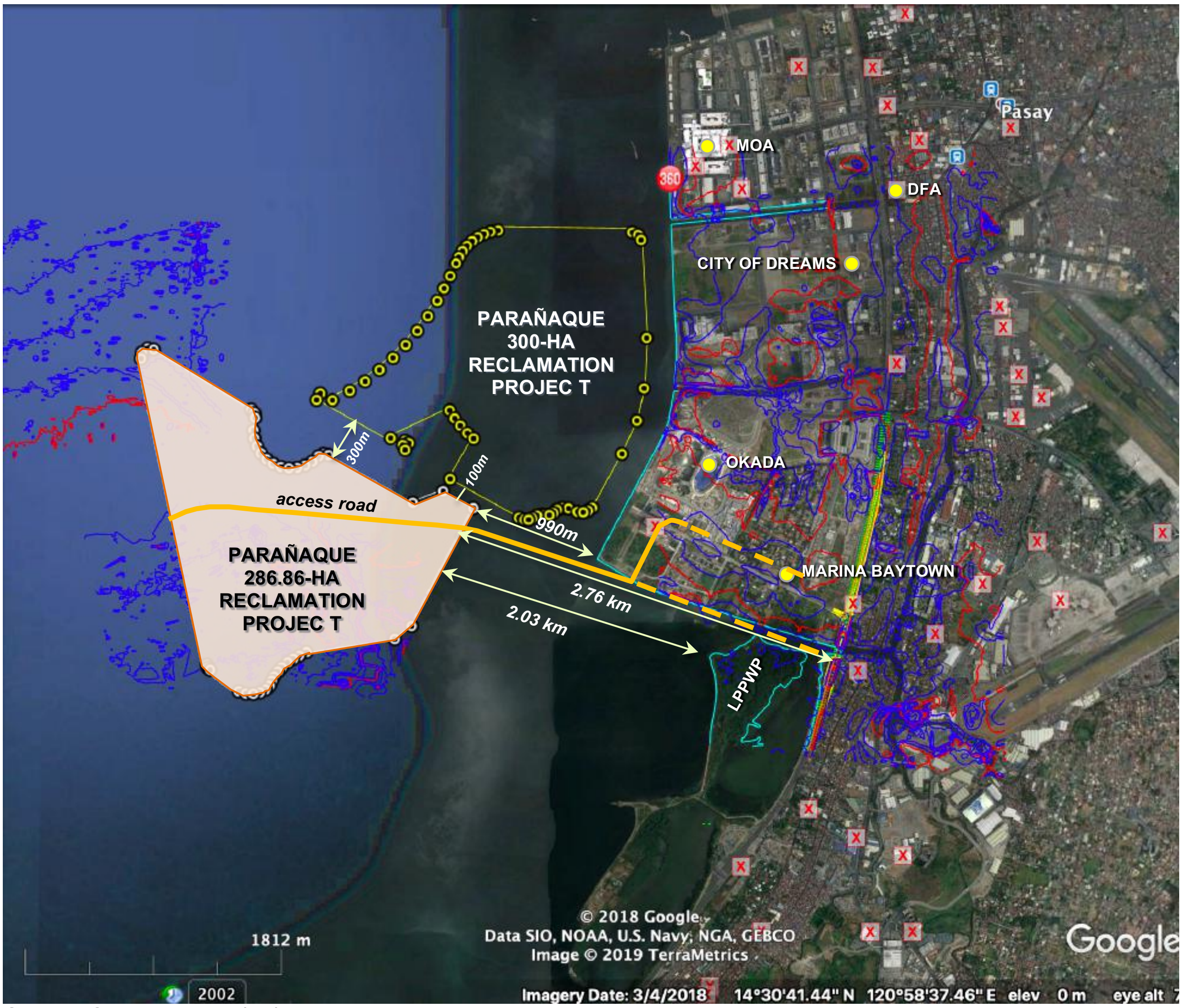
CORNER	LATITUDE	LONGITUDE
6	14 30 06.4548 N	120 57 14.8053 E
7	14 30 05.6206 N	120 57 13.5461 E
8	14 30 04.4909 N	120 57 12.1219 E
9	14 30 03.5165 N	120 57 11.2260 E
10	14 30 02.4062 N	120 57 10.3534 E
11	14 30 01.3752 N	120 57 09.8183 E
12	14 30 00.2778 N	120 57 09.2622 E
13	14 29 59.4412 N	120 57 08.3284 E
14	14 29 58.7500 N	120 57 06.9089 E
15	14 29 58.4223 N	120 57 05.4333 E
16	14 29 58.4765 N	120 57 03.7148 E
17	14 29 58.9995 N	120 57 01.9999 E
18	14 30 03.9373 N	120 56 55.0871 E
19	14 30 04.4377 N	120 56 54.5986 E
20	14 30 05.07255 N	120 56 54.3195 E
21	14 31 16.0581 N	120 56 37.4955 E
22	14 31 17.4821 N	120 56 37.7178 E
23	14 31 18.4076 N	120 56 39.0346 E
24	14 31 18.1640 N	120 56 40.4918 E
25	14 31 04.1193 N	120 57 04.1260 E
26	14 31 03.3117 N	120 57 04.8819 E
27	14 31 02.2349 N	120 57 05.0739 E
28	14 30 59.3231 N	120 57 04.7384 E
29	14 30 57.4200 N	120 57 04.9493 E
30	14 30 55.6056 N	120 57 05.5755 E
31	14 30 53.9649 N	120 57 06.5876 E
32	14 30 52.5746 N	120 57 07.9382E
33	14 30 51.4999 N	120 57 09.5642 E
34	14 30 50.7910 N	120 57 11.3893 E
35	14 30 50.4811 N	120 57 13.3282 E
36	14 30 50.5847 N	120 57 15.2902 E
37	14 30 51.0969 N	120 57 17.1834 E
38	14 30 51.9939 N	120 57 18.9192 E
39	14 30 53.2661 N	120 57 20.4517 E
40	14 30 53.7864 N	120 57 21.5822 E
41	14 30 53.5526 N	120 57 22.8093 E
42	14 30 42.5022 N	120 57 43.0677 E
43	14 30 45.1837 N	120 57 50.3256 E

The nearest existing major road to the proposed project site is Roxas Boulevard at a straight distance of 2.76 km. From the edge of the existing reclamation area, Its farthest corner is 3.56km while the nearest is 990m.

Access ways will be built to connect to the reclamation island, being initially considered at this time is an Elevated Access Road or viaduct to be connected to the existing Radial Road R1 or Manila Cavite Expressway Project or Pacific Avenue inside the Marina Baytown. Based on the future plans of the LGU, this project will be adjacent to another reclamation project of the City located NE of the site. If this materializes, these islands shall be separated by a channel about 100m and 300m wide. A bridge may be built to link the two islands. (**Figure 1**).

Also shown in **Figure 1** are some of the important landmarks adjacent to the project site such as: the SM Mall of Asia, City of Dreams Manila, Department of Foreign Affairs, Okada Manila, Marina Baytown, and etc.

Slight changes in the landform may be made based on the final Design and Engineering Design (DED) and the prospective requirements from the Philippine Reclamation Authority (PRA). Nevertheless, the area of the project and its location in the territorial jurisdiction of Parañaque City will remain unchanged.



Source: Google Earth 3/24/2018

Figure 1. Project Site Location and Vicinity Map

1.3 Methodology

The geological assessment consists of collation and interpretation of existing geologic reports and literature of the project area, including topographic, geologic, and other thematic maps. These data and reports are predominantly from concerned government agencies and academic institutions such as: Department of Environment and Natural Resources-Mines and Geosciences Bureau (DENR-MGB), Department of Science and Technology-Philippine Institute of Volcanology and Seismology (DOST-PHIVOLCS), and the University of the Philippines Nationwide Operational Assessment of Hazards (UP-*NOAH*), previously DOST-Project NOAH.

Geotechnical borehole drilling and laboratory testing were done on December 2017 to February 2018 with internal factual report submitted on February 2018.

The internal reports by AMH Philippines, Inc. for Geotechnical Engineering dated December 12, 2018 and for Coastal Engineering dated October 31, 2018 were used freely in the preparation of this report.

The report content is based on the directions issued in the article "Engineering Geological and Geohazard Assessment (EGGA) system for sustainable infrastructure development: the Philippine experience" written by M.A. Aurelio.

1.4 Nature/Source of Information

The geological assessment commenced with literature research of all available geological, seismological, hydrological and hydrographical reports and maps covering the project area previously conducted at the Mines and Geo-Sciences Bureau (MGB), the Philippine Institute of Volcanology and Seismology (PHIVOLCS), the University of the Philippines-National Institute of Geological Sciences (UP-NIGS), UP-NOAH, and National Water Resources Bureau (NWRB). Topographic maps covering Metro Manila and vicinity were acquired from the National Mapping and Resource Information Agency (NAMRIA). Climatological data was gathered from the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA).

2.0 REGIONAL SETTING

2.1 Geologic Setting

2.1.1 Tectonic Setting

The Philippine Islands is generally interpreted as a collage of insular arcs, ophiolitic suites and continental rocks of Eurasian affinity. The formation of this belt is controlled by subductions, collisions and major strike-slip faults. (Aurelio and Peña, 2002). It has evolved from the collision between the Eurasian Plate, South China Sea Plate, the Philippine Sea Plate, and the Pacific Plate. The collision resulted to several subduction zones marked by oceanic trenches. The development of the archipelago was caused by the active squeezing and magma rise producing a chain of volcanoes from the remelting of the subducting lithosphere.

The Phillipine Mobile Belt (PMB) is surrounded by subduction zones moving in opposing directions simultaneously On the western side, the Eurasian Plate (or South China Plate) subducts eastward beneath Luzon Island along the Manila Trench. On the eastern side, the Philippine Sea Plate subducts westward along the East Luzon Trench. This results to an actively deforming zone in between 2 active subduction systems as manifested by high seismic activity. (Aurelio and Peña, 2002).

Philippine Fault Zone

The 1,600 km-long Philippine Fault Zone (PFZ), a major strike-slip fault extending from Lingayen to Davao, lies parallel to the subduction trenches. The PFZ is assumed to release the shear stress caused by the oblique subduction of the ocean plates. On the southwest, the seafloor of the Sulu Plate subducts near the west side of Negros Island along the Negros Trench and along Sulu Trench near the northwest side of Zamboanga. The Celebes Sea Plate subducts near the west side of Central Mindanao along the Cotabato Trench and in Davao Gulf along the Davao Trench. (**Figure 2).**

Metro Manila lies on the western central part of the island of Luzon within the PMB. About one-third of the destructive earthquakes that have affected Metro Manila and vicinity were generated from the PFZ. The movement of the PFZ produced the majority of the most devastating earthquakes in the Philippine history including the 16 July 1990 earthquake event. The 1990 earthquake generated from the PFZ's northern segment, the Digdig Fault, was recorded at Ms 7.8. A seismic gap along this fault located about 80-kilometers east of Manila can produce a future earthquake in the order of at least magnitude 7 is highly possible (upon the release of large stresses stored along the locked portion). Its nearest segment (Infanta) is about 75-kilometers east of the project site.

Valley Fault System

Many faults are identified around Metro Manila and vicinities. The Valley Fault System (VFS) consists of two northeast-trending structures that bound the Marikina Valley: the West Valley Fault (WVF) on the west and on the east, the East Valley Fault (EVF). The EVF was traced for 38 kilometers from San Rafael, Rodriguez (Montalban) in the north to the Pasig City area. However, LANDSAT imagery shows that it extends farther to the northeast. However, PHIVOLCS (2000) reported that EVF is ~10 km long. It is located approximately 30 km northeast from the project site.

The WVF, on the other hand, stretches out north of Rodriguez in western Rizal province, passes east of Metro Manila and possibly extends as far as the Batangas-Cavite boundary at Tagaytay Ridge in the south. It is ~90 km long (PHIVOLCS, 2000; READY, 2008; JSP & MLPM, 2009). This is a geomorphologically active fault that is thought to pose the greatest threat to Metropolitan Manila and vicinityies due to their proximity. Recent investigation by PHIVOLCS along the Sucat-Muntinlupa-Alabang stretch have confirmed the existence of creep (active fault movement) along what is believed to be a step-over segment of the fault there (Rimando et al, 1995). With regards to recorded events, the WVF moved 4 times in the past 1,400 years, hence PHIVOLCS places its movement interval to ~ 400 years (Solidum, 2013). The southern end of this fault traverses the municipalities of Carmona, General Mariano Alvarez and Silang of Cavite Province.

The project site is found about 9.4km west of the WVF and 28km southwest of the EVF.

Lubang Fault

Lubang Fault is considered to play a significant role in the transition from subduction along the Manila Trench to collision in the Mindoro-Palawan-Panay area (Aurelio and Pena, 2004). It is an active strike-slip fault that has also been the site of large earthquakes in the past, notably that of 1852 and 1972 (Daligdig and Besana, 1993). The most recent one was the 1994 earthquake in Mindoro, which registered a seismic magnitude of 7. It is located about 97km south of the project site.

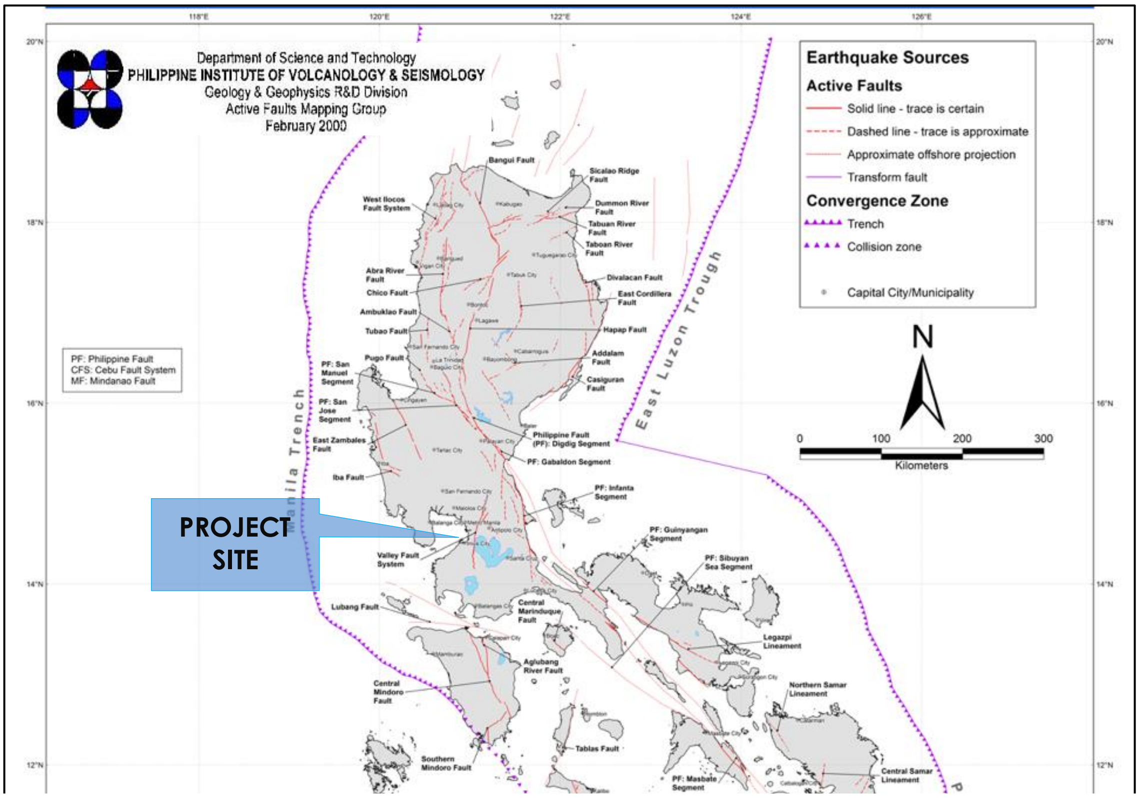
Manila Trench

Manila Trench, found about 200km west of the project site, is a 1,100-km long trench system, which extends from south of Taiwan to west of Mindoro Island in Southwest Luzon (Bautista, 1999). The Manila Trench represents the morphologic expression of the subduction of the oceanic crust of the South China Sea under the Luzon Arc (Karig, 1973; Cardwell and others, 1980). It is an elongated bathymetric depression that reaches depths of 5,100 m in the latitude of Manila (Ludwig and others, 1967).

Bautista et al. (2001) describe the Manila Trench as a straight line from 13-18°N which swerves abruptly to ESE at latitudes lower than 13°N because of a collision of micro-continental fragments with Mindoro and Panay islands. Hayes and Lewis (1984) state that the rate of subduction along the northern Manila Trench is probably not extended so far south.

Macolod Corridor

The Macolod Corridor is an approximately 40 km wide zone located in southwestern Luzon and pervaded by active intense Quaternary volcanism, faulting, and crustal thinning. It perpendicularly crosses Luzon in a NE-SW direction (Förster et al., 1990). The alignment of the corridor is at a right angle to the Manila Trench; and is distinguished from other active volcanic areas of Luzon, which are aligned in one or two chains parallel to the Manila Trench (Yueh et al., 2009). According to Defant et al., (1988) the corridor is a northeast-southwest trending pull-apart rift zone that includes directional lineaments (northeast trending fracture lineaments) and volcanic centers. The NE-trending Tagaytay Ridge is the corridor's northern structural boundary.



Source: PHIVOLCS, February 2000

Figure 2. Distribution of Active Faults and Trenches in the Philippines

2.1.2 Stratigraphy

The most dominant rock formation in the area is the Guadalupe Formation (Pleistocene Age). It consists of an upper member, the Diliman Tuff, and a lower member, the Alat Conglomerate. Diliman Tuff, the most widespread rock in the area, is generally flat-lying (dips generally ranging from 3° to 10°) and medium to thin bedded. It is composed of thin- to medium-bedded, fine-grained vitric tuffs and welded pyroclastic breccias with minor fine- to medium-grained tuffaceous sandstone. The tuff varies from well lithified and massive to loosely-bedded. (Aurelio and Peña, 2002)

The Alat Conglomerate is a sequence of conglomerate, sandstone and mudstones. The conglomerate, which is the most predominant rock type, is massive, poorly sorted with well-rounded pebbles and small boulders of underlying rocks cemented by coarse grained, calcareous and sandy matrix. The sandstone is tuffaceous, fine to medium grained, loosely cemented and friable. The mudstone is soft, sticky, silty and tuffaceous. (Aurelio and Peña, 2002)

Conformably overlying the Guadalupe Formation is the Quaternary Alluvium consisting of unconsolidated deposits of silt, sand and gravel. These are deposited during the Holocene and therefore considered as the younger unit. The alluvium deposits are commonly found along stream channels, flood plains and coastal areas. The project site vicinity is underlain by sand, gravel, cobbles with clay and silt material and falls under this formation.

The offshore area of Manila Bay is underlain by stiff to very dense sandy silt materials. Below this, layers of tuff, tuffaceous sandstone and siltstone of Guadalupe Formation are found.

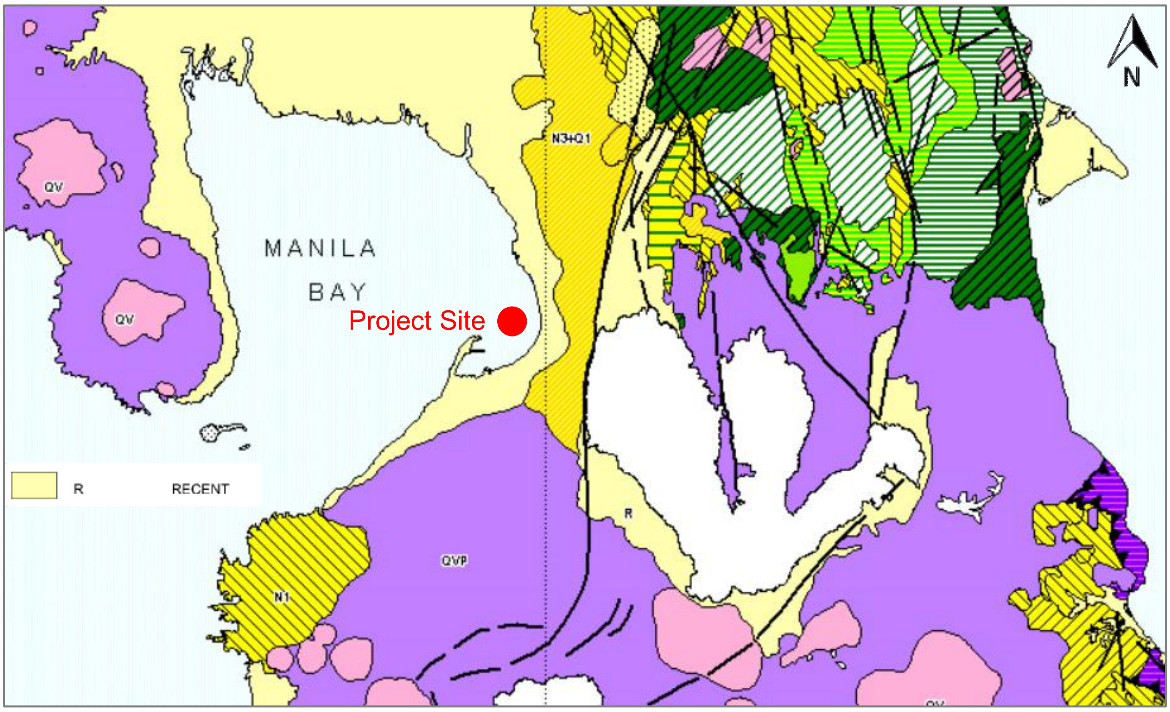
Previous geotechnical studies in nearby reclamation areas, show that soft to very stiff, low to high plasticity clay with seams of sand underlies the proposed project site. The clay layers, in turn, are underlain by tuff, presumably belonging to Guadalupe Formation, which was encountered at depth of about 26 mbsl. The coastal lowland is underlain by abandoned channel deposits, active channel deposits, backswamp deposits, beach sand deposits, tidal flat deposits fill and reclamation materials.

The abandoned channel deposits are mainly fining upward sequence of unconsolidated very poorly sorted very sandy gravel, very gravelly, very coarse to fine sand capped by humic fine sand and silt. The gravel and coarse sand are sub-rounded to well-rounded. The active channel deposits are unconsolidated, very poorly sorted sand, and gravel with size ranging from coarse sand fraction to very coarse gravel. Layers of silt, clay, and mud are also present. Due to the high concentration of hydrocarbons in the polluted waters of these channels, there is a possibility for the presence of fluid mud, composed of dense mass of very plastic layer silt and clay at the bottom of the channels. (LRT Authority, 2008)

Tidal marsh deposits are mainly very humic dark grayish to black silty, clayey fine to medium sand. These deposits are rich with moderately decomposed vegetable remains. Poorly sorted gravelly coarse to medium sand serves as the basement. Beach sand deposits are mainly very loose poorly sorted coarse to medium sand and gravel. Gravel sizes range from fine to coarse fraction, and are either well-rounded or flat. Alternating lenses of gravelly sand and sandy gravel are common. Beach sand deposit inter-tongue with back swamp and tidal flat deposit. Tidal flat deposits are bioturbated, fine and medium sand interlayered with silt and clay concentrated along the seaward side of the strand line. Accretion is mainly caused by deposition of suspended sediments during high tides. (LRT Authority, 2008)

Portions of Manila, Pasay and Parañaque are atop former tidal flats with elevation ranging from 1.8 to 10 masl.

Please refer to **Figure 3** below.



Source: Aurelio and Peña, MGB. 2002

Figure 3. Geologic Map of Metro Manila and vicinities

2.2 Geomorphology

Parañaque City and vicinities belong to the coastal lowlands (**Figures 4** to **5**). It is characterized by a generally flat terrain along the coastal areas in the western portions to gently sloping topography towards the eastern parts. Slopes range from 1-4.

The Coastal Lowland is a flat and low plain facing Manila Bay. Ground elevation ranges from zero on Manila Bay to 5 meters towards the east. The coastal lowland can be subdivided into sand bar, backmarsh including tidal flats, backswamps, beach ridges/coastal dunes, river delta/alluvial fans, reclaimed land. At present, the plain fully developed and highly urbanized, which altered the inherent features.

This land is dissected by drainage systems emptying into the Manila Bay. The nearest natural drainage to the project site includes Parañaque River located 1.8 km to the east. Libertad Channel found 5 km to the northeast, and Pasig River located 10.55 km to the northwest. The project site is to be located on reclaimed land along the Manila Bay. The Parañaque and Las Piñas River, and their tributaries drain from the slopes of the Guadalupe Plateau, which in turn, serve as the catchment areas. The Parañaque River merges with the Las Piñas River before flowing into the Manila Bay in Brgy. La Huerta, Parañaque City. Both rivers drain the western flank of the Guadalupe Plateau.

Within the coastal plain, the river course is morphologically controlled, running parallel to the coastline following the landward boundary of the beach ridges and exhibits a meandering coarse. The flow in the coastal plain is generally sluggish, dominated by standstill water condition. This is mainly caused by the influence of tidal fluctuations and the flat topography with elevation ranging from 2-3 masl.

The overall terrain development occurred during the last sea level regression. Terrestrial sediments delivered by the river systems into the coast where reworked by the coastal dynamics and processes operating along the coastline. These sediments where eventually deposited and reflects their environment of deposition. The continued sedimentary accretion contributed to the seaward progradation of the coastline, synchronous with sea level retreat. (LRT Authority, August 21, 2008)

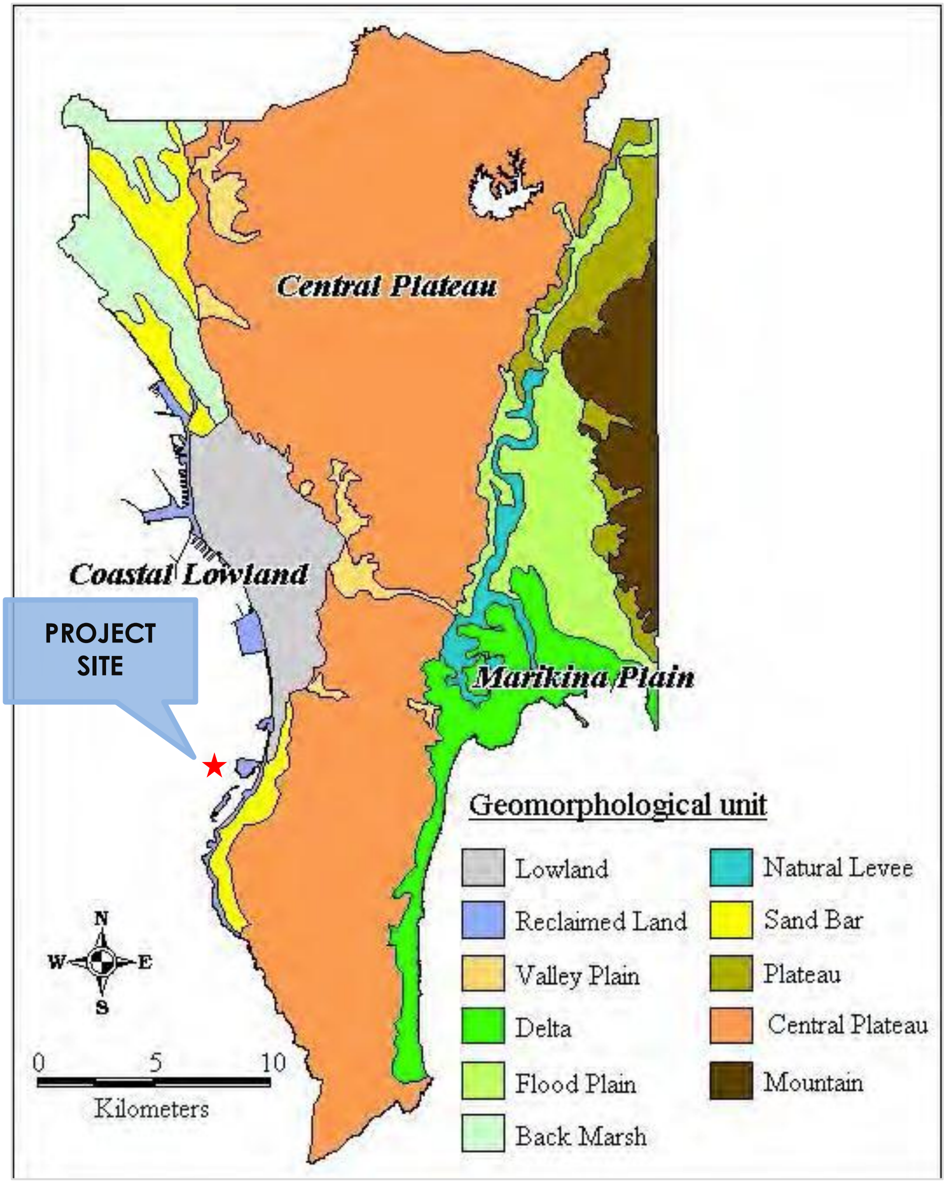
About 1.8 kilometers to the east of the proposed reclamation site is the northern tip of the Las Piñas-Parañaque Critical Habitat and Ecotourism Area (LPPCHEA). This is a 175-hectare coastal wetland composed of two (2) inter-connected reclamation islands formed from reclamation projects of the government from 1973 to 1985. These islands are called Freedom Island (30 ha) and Long Island (32 ha), plus a smaller island to the south. These islands run north to south along the Manila–Cavite Coastal Road from its north end near the mouth of Parañaque River in Brgy. Don Galo through barangays La Huerta, and San Dionisio in Parañaque City and barangays Zapote, Pulanglupa, D. Fajardo, Ilaya, E. Aldana, and Manuyo Uno in Las Piñas City. A narrow landfill connects its southern tip to the mainland and Long Island near the expressway toll barrier. Bgy. San Dionisio, Brgy.,

Its elevation is between 0 to 7 masl. This wetland is composed of: intertidal mudflats; intertidal forested wetlands; intertidal marshes; coastal brackish/saline lagoons/ponds; and estuarine waters. The mudflat covers an area of about 114 hectares, which is adjacent to a densely populated mangrove swamp (36-ha). This serves multiple purposes such as a pollutant “sink” and provide shoreline defense against floods, erosion and storm surges. It is a catchment area for floodwaters.

Figure 5 shows the geomorphologic units of Metro Manila.

Source: NAMRIA 1:50:000, clockwise - 1995 (7172-II), 2001 (3230-III), 2001 (3229-IV),), 2001 (3129-I),

Figure 4. Topographic Map of Metro Manila



Source: PHIVOLCS 2001

Figure 5. Geomorphological Map of Metro Manila

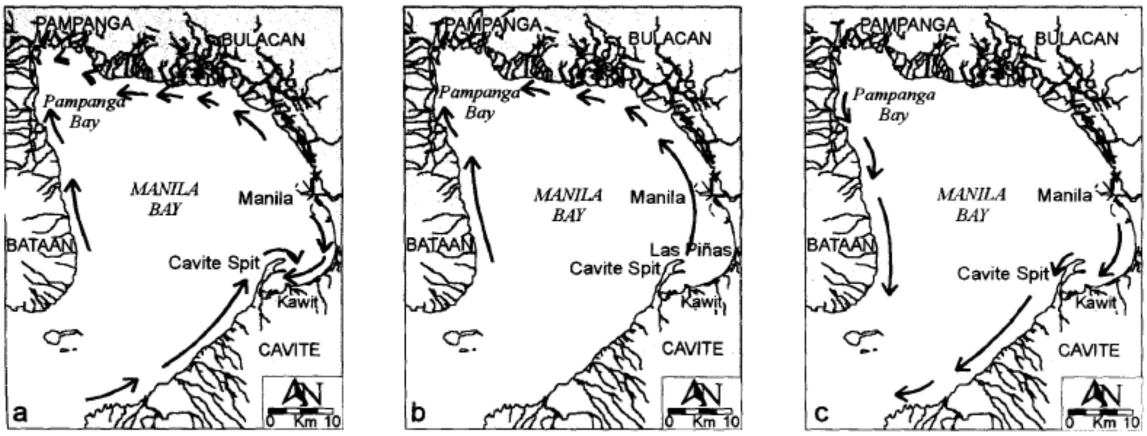
General Profile of Manila Bay

Manila Bay is a semi-enclosed bay facing the South China Sea. It is located on the southwestern part of Luzon Island between latitude 14° 15' - 14° 16' and longitude 120° 35'- 121° 00'. It has a surface area of about 1,800 square kilometers with coastal length of about 190 kilometers (EMB, 1992). The bay width varies from 19 kilometers at its mouth to a maximum of about 60 kilometers. Corregidor and Caballo islands lie at the entrance of the bay. The bay's length is about 52 kilometers with the average depth of 17 meters with a volume of 31 km^3. It has a gently sloping basin with increasing depth at a rate of 1 m/km (PRRP, 1999). Manila Bay's coastal margin is a low-lying flat strip of land with elevations of <5 meters. The catchment area is bounded by the Sierra Madre mountain range to the east, the Caraballo mountains to the north, the Zambales mountains to the northwest and the Bataan mountains to the west (BFAR, 1995). The bay receives discharged water from numerous sources including 26 river catchments (account for about 17,000 km^2).

Different environments characterize the coastal areas. Near the mouth, Cavite and Bataan coastlines are rocky and deeply embayed. Going north towards Bulacan, the coastline is more linear. The 10km-long Cavite Spit is a very prominent feature. The coastal plain of the Manila-Navotas area is marked by a series of beach ridges. In Bulacan, the ridges are sandy but the surrounding fishpond areas are muddy. (Siringan and Ringor, 1997).

Siringan and Ringor (1997) in their report entitled "Predominant Nearshore Sediment Dispersal Pattern in Manila Bay", stated that the wind direction plays an important in the characteristics of sediment dispersal in Manila Bay. Wind-driven currents may amplify the longshore currents and determine the movement of sediments. The southwest and southeast winds with velocities of 5-7 m/s and 3-6 m/s, respectively determine that the sediment movement is to the northeast along the coast of Cavite; to the northwest along the Manila-Pampanga coast; and to the north along the Bataan coast. During rainy days with winds predominantly coming from the southwest, greater input of sediments from rivers flows into the bay, The greater amount of the fine sediment get transported in the northeastern Manila Bay (**Figure 6**).

The Cavite Spit and the wave-dominated deltas in the area point to a northeastward net sediment drift, consistent with the predicted longshore current in this vicinity. Behind this from Zapote to Bacoor, the drift is in an opposite direction, i.e., southwesterly. This may be due to wave defraction at the tip of the spit. The area from Pasig rivermouth to Meycauayan R. is predominated by northwest sediment drift.



Source: Siringan and Ringor, 1997

Figure 6. Longshore currents associated with locally generated waves: a) southwesterlies; b) southeasterlies; c) northeasterlies

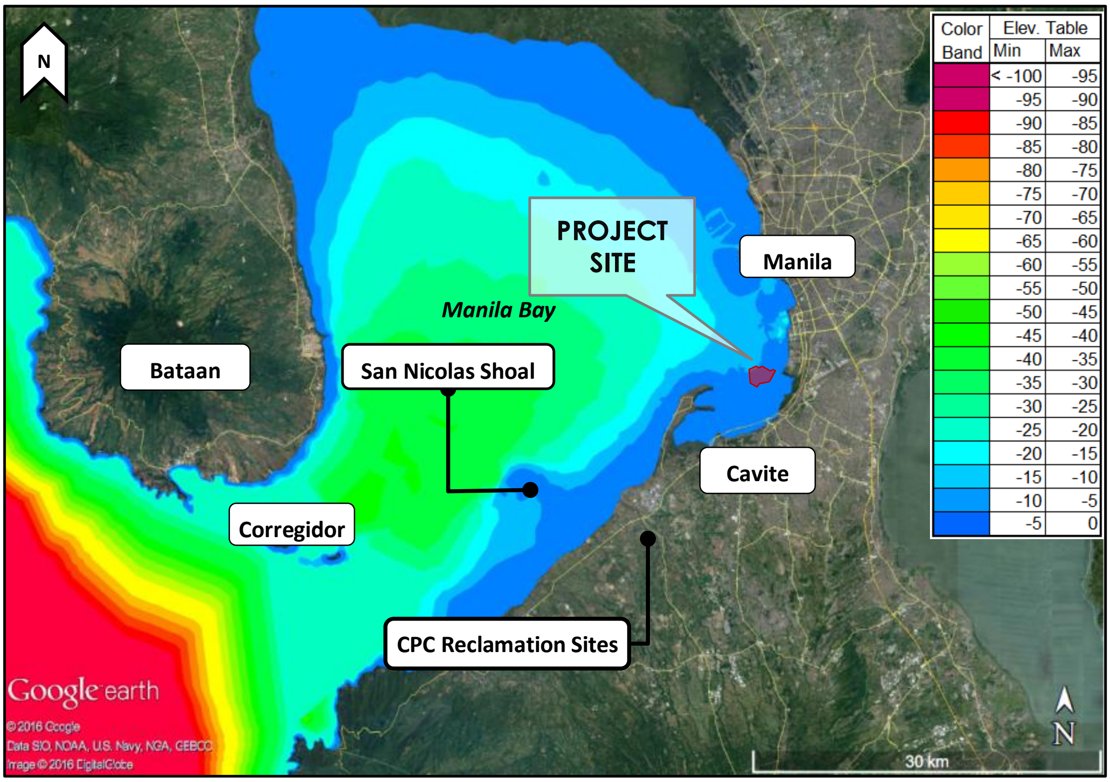
2.3 Coastal Hydraulic Setting

2.3.1 Bathymetry

A topographic or bathymetric map is a graphical representation of the topography of the ground surface or seabed through the use of contour lines corresponding to elevation values to illustrate the locations of vertical depressions and protrusions of the area. These maps are usually measured from the Mean Tide Level (MTL), while depth soundings are measured from Mean Lower Low Water (MLLW). The following charts have been collected:

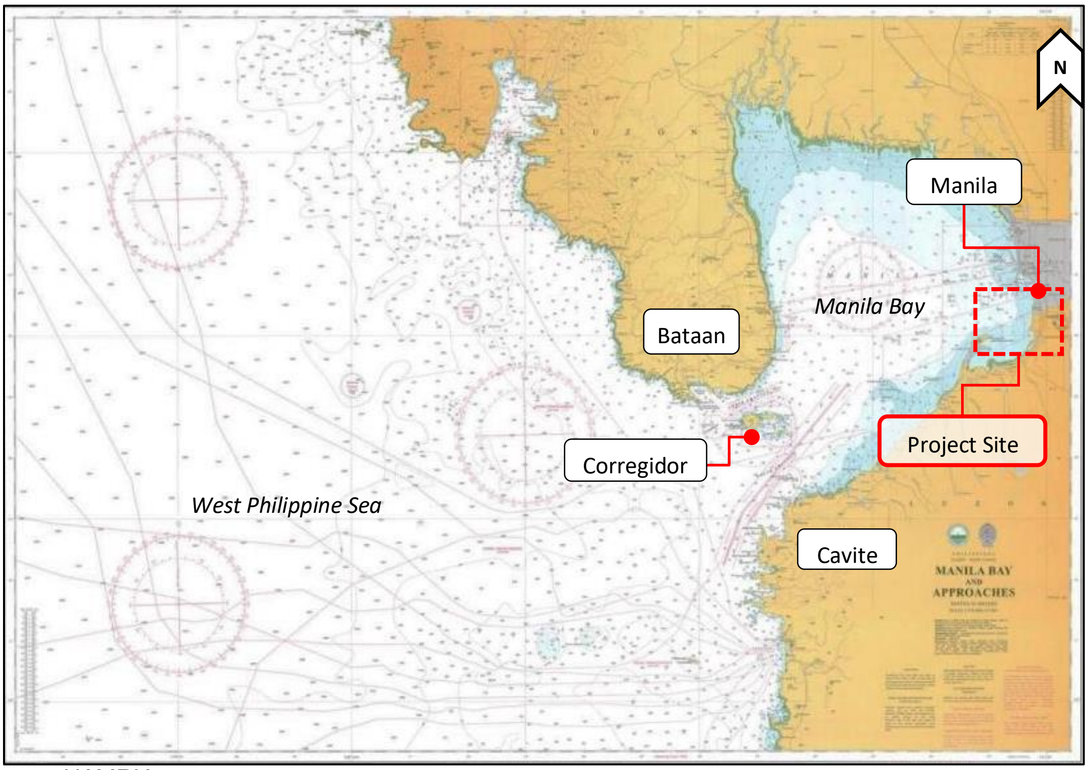
- NAMRIA Nautical Chart 1501 (Manila Bay and Approaches),
- NAMRIA Nautical Chart 4243 (Manila to Cavite),

- NAMRIA Nautical Chart 4236 (Fairways and Anchorages), and
- General Bathymetry Chart of the Oceans (GEBCO) which provides gridded depth points at 30 arc-second intervals (~1 km).



Source: Google Earth and NAMRIA

Figure 7. Digital Elevation Model (DEM) of the bathymetry of Manila Bay

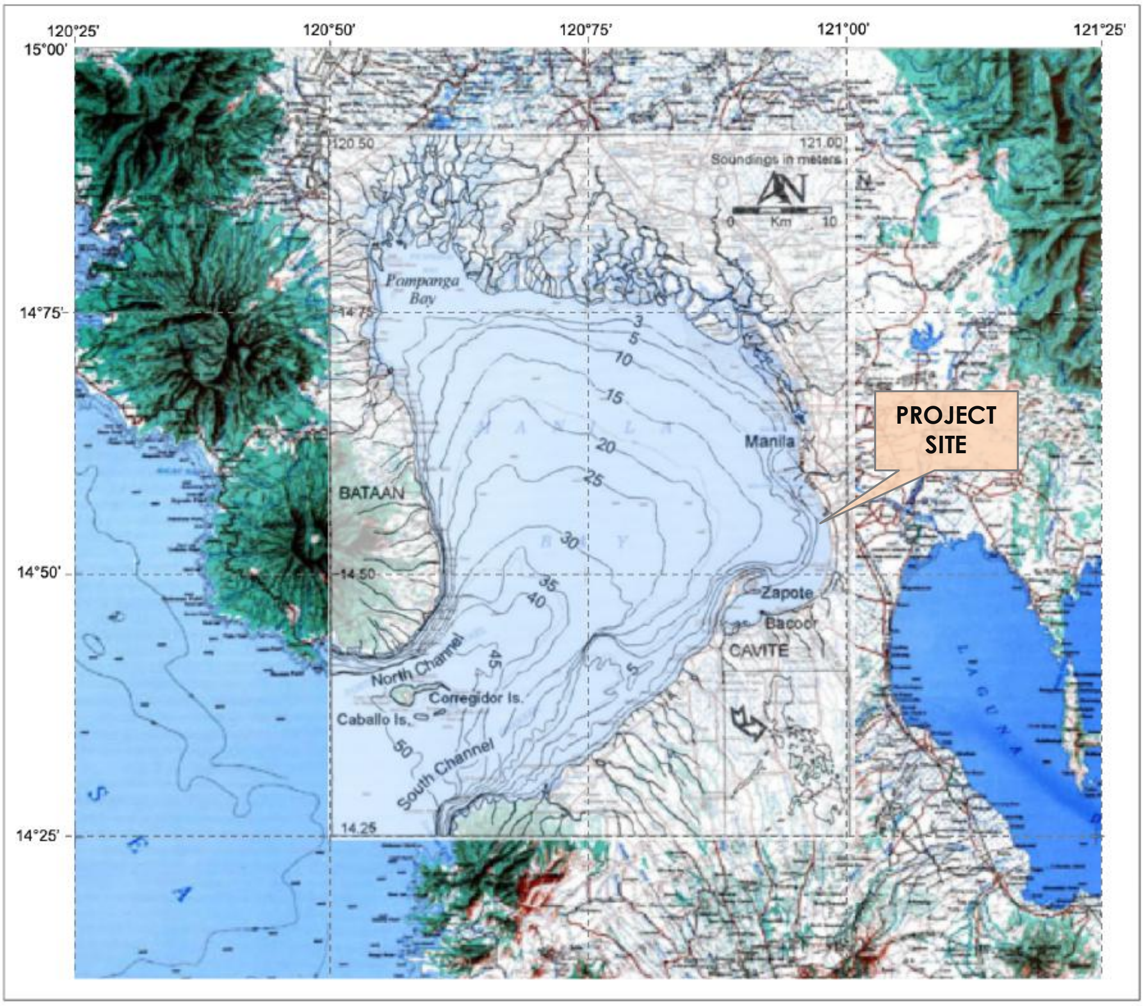


Source: NAMRIA

Figure 8. NAMRIA Nautical Chart - Manila Bay and Approaches (Chart #1501)

Figure 7 shows a Digital Elevation Model (DEM) of the bathymetry in the vicinity of the project area, overlain on Google Earth satellite imagery, derived from various Nautical Charts available for Manila Bay. Based on the NAMRIA topography and nautical map of Manila Bay and Approaches shown in **Figure 8**, the bathymetry of the project site is mild; at one location the depth of only 10m is reached at 2.5 km away from the shore, where at another location the 10m depth only materializes at 5 km from the shore.

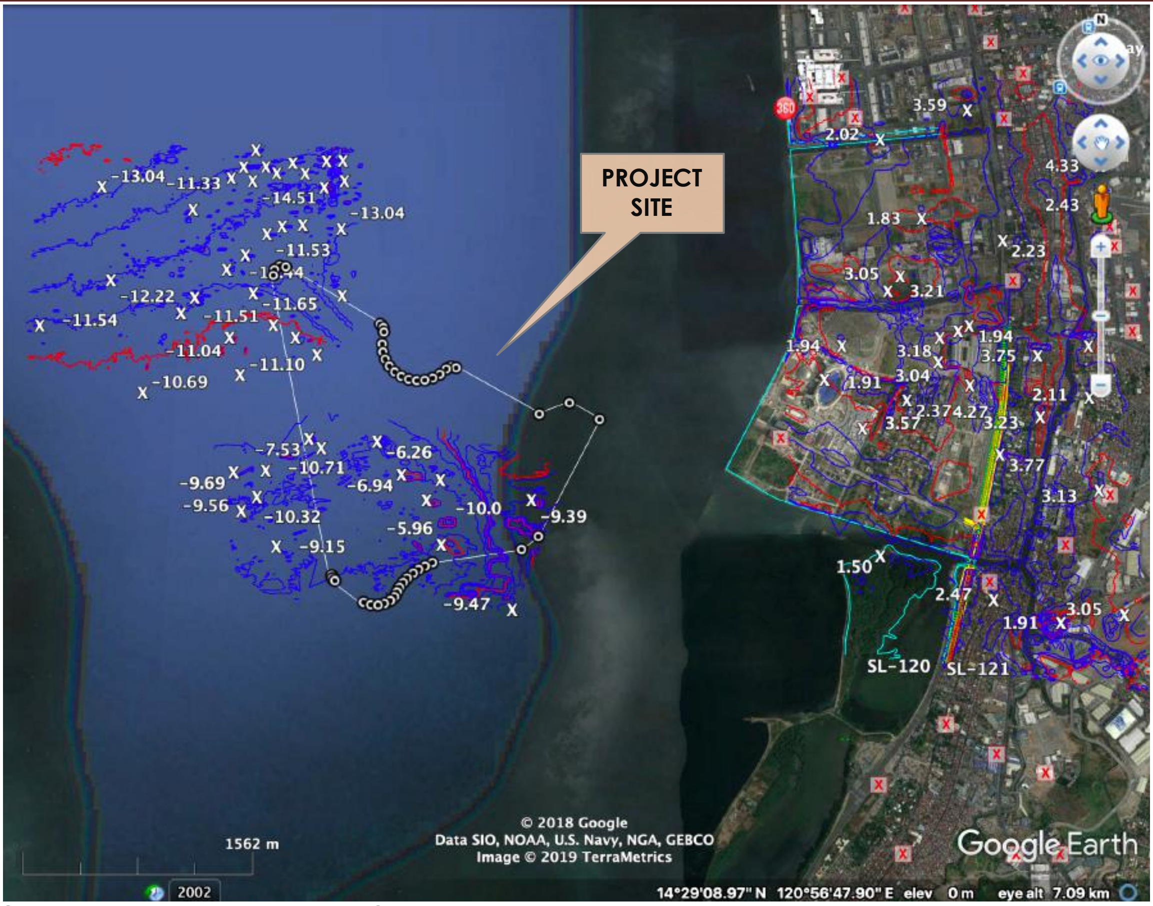
Furthermore, the bathymetric map of Manila Bay by Siringan shows seabed elevation of about 3m near the coast/seawall to about 50m Below Mean Sea Level (BMSL) at the mouth. This map is embedded on a NAMRIA 1:250,000 scale topographic map of Manila Bay as below (**Figure 9**).



Adapted from Siringan and Ringor 1997 and NAMRIA Sheet 2511, 1:250,000 Scale, Dec 1991

Figure 9. Map of General Morphology and Bathymetry of Manila Bay embedded on the NAMRIA Topographic Map of Manila Bay

At the proposed site and vicinities, the results of bathymetric survey conducted by FF Cruz shows a northwest trending ridge. Shallowest portion within the site is -5.96 masl at the mid-southern portion, and deepest is -11.65masl, at the NW corner. See figure below.



Source: Bathymetric survey by FF Cruz, 2017.

Figure 10. Map showing Bathymetry and Point Elevations

2.3.2 Wind

Most data on wind is based on information from PAGASA.

The average wind in Manila Bay is in "A model for the wind driven circulation of Manila Bay" by de las Alas et al.,1985, reported as:

- October to January:
- February to May:
- June to September:

Northeasterly winds with speeds averaging about 5 m/s Southeasterly winds with speeds ranging from 3 m/s to 6 m/s Southwesterly winds with speeds ranging from 5 m/s to 7 m/s

The average annual wind speed in the Philippines is only 3 m/s. The prevailing direction depends upon the dominant air streams: SW monsoon, NE monsoon or easterly trades. The speed and direction are also altered by the passage of tropical cyclones; the wind speed can exceed 50 m/s and at times 75 m/s. During the intensification of monsoons, wind speed can exceed 15 m/s.

PAGASA data of monthly mean wind speed and direction for a measurement station at Sangley Point during a period of 5 years from 2008 to 2012 are given in **Table 2**.

In addition, the monthly maximum gust wind speeds (i.e. short duration wind speeds) and corresponding directions for the same 5 year period are given in **Table 3**.

The gust speed of 54 m/s in July 2010 is found during the passage of the Typhoon Conson.

Table 2. Monthly Mean Wind Speeds and Direction (2008-2012)

Station: Sangley Point, Cavite City **LATITUDE; LONGITUDE** = 14°30'N;120°55'E,
Elevation: 3.0m

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2008	3	3	3	4	3	3	3	3	3	2	3	3	3
2009	3	3	2	2	3	2	3	3	3	4	3	3	3
2010	4	4	4	5	4	3	3	3	2	3	3	3	3
2011	3	4	4	5	3	3	3	3	3	3	3	3	3
2012	3	4	4	4	3	3	3	3	2	3	3	3	3
Direction													
2008	ESE	N	ESE	ESE	SW	ESE	SW	SW	SW	ESE	ESE	ESE	ESE
2009	ESE	ESE	ESE	ESE	ESE	SW	W	W	SW	W	ESE	ESE	ESE
2010	ESE	ESE	ESE	ESE	ESE	S	ESE	SW	W	ESE	ESE	ESE	ESE
2011	ESE	ESE	ESE	SE	SE	SE	W	W	W	SE	ESE	SE	SE
2012	SE	SE	SE	SE	W	W	W	W	W	SE	SE	SE	SE

Source: PAGASA

Table 3. Monthly Maximum Gust Wind Speeds and Direction (2008-2012)

Station: Sangley Point, Cavite City **LATITUDE; LONGITUDE** = 14°30'N;120°55'E,
Elevation: 3.0m

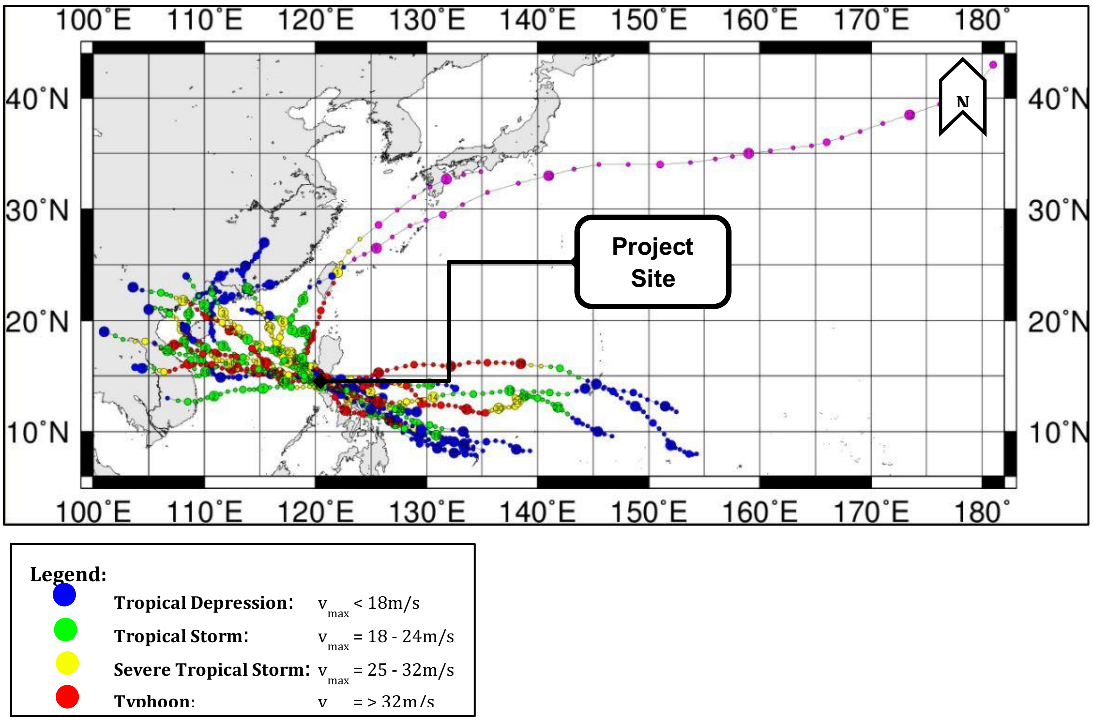
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
2008	14	10	12	11	18	23	18	15	17	11	15	12	14
2009	12	11	10	14	12	20	20	18	20	32	14	13	12
2010	17	13	15	16	12	14	54	19	16	15	13	11	17
2011	14	13	14	14	20	25	15	17	32	18	16	13	14
2012	14	15	15	14	14	17	20	21	15	16	13	15	14
Direction													
2008	ESE	N	ESE	ESE	NE	NW	W	SW	SW	ESE	E	ESE	ESE
2009	ESE	ESE	ESE	SW	SW	SW	SW	W	SW	NW	ESE	ESE	ESE
2010	ESE	ESE	ESE	ESE	W	NNE	E	N	NE	N	NE	ESE	ESE
2011	ESE	ESE	ESE	ESE	NE	SE	W	W	W	W	ESE	SE	ESE
2012	SE	SE	SE	SE	NNE	W	NW	W	W	ESE	SE	SE	SE

2.3.3 Typhoons

Tropical storms and typhoons are caused by large temperature differences between the sea surface and the overlying atmosphere. This can create a large pressure drop in the atmosphere with rotating winds of very large speed around the low pressure. Many tropical storms and typhoons hits the Philippines every year.

In the Philippines classification system, a tropical storm is formed when sustained gust speed reach 61 kph (16.94 mps), and a typhoon when gust speeds reach 117 kph (32.5 mps). Tropical storms and typhoons are thus characterized by a large atmospheric pressure drop (ΔPc), extreme gusts with sustained wind speed (Vmax), and some translational or forward speed of their centers (Vf). The size of typhoons is associated with the radius from the center (Rmax) to where the wind gusts reach their maximum speeds, while the strength of the typhoon is associated with both the maximum wind speed, Vmax, and the cyclone's lifetime.

To determine the potentially critical typhoons which could affect the project site, all typhoons whose tracks passed within a 200 km radius from the site were determined from secondary data (**Figure 11**). From this long list, the top five (5) strongest typhoons in terms of wind speed were further selected, with their properties shown in **Table 4**.



Source: Digital Typhoon

Figure 11. Typhoon Tracks within 200km of Project Site

Table 4. Top 5 Historical Typhoons ranked on basis of maximum wind speed

No.	Typhoon Name	JMA No.	Duration	V_{max} (kph)	R_{max} (nm)	P_{min} (hPa)	Relative Track to the Site
1	Rita / Kading	197826	11 D 18 Hr	203.7	14.42	905	S
2	Georgia / Ruping	198622	4 D 6 Hr	198.57	17.33	920	S
3	Patsy / Yoling	197025	8 D 0 Hr	192.66	18.31	925	S
7	Betty / Herming	198709	8 D 0 Hr	185.20	19.28	930	S
2	Koppu / Lando	201524	7 D 18 Hr	185.2	18.31	925	N

Source: National Institute of Informatics. Digital Typhoon - http://agora.ex.nii.ac.jp/digital-typhoon/summary/wnp/s/198709.html.en

2.3.4 Water Levels

Tidal Level

Tides in the Philippines vary from diurnal (high tide occurs once a day) to semi-diurnal (high tide occurs twice a day), depending on the location and date as illustrated in the figure below. Up to Day Four in the figure, there are two high tides and two low tides per day (semi-diurnal); after which, the tides become diurnal again. The Mean Higher High Water (MHHW) corresponds to the average of all higher high tide (during semi-diurnal seasons) and high tide (during diurnal seasons) levels, while the Mean High Water corresponds to the average of all high tides (including the lower high tide). The corresponding MLLW and MLW follow the same principle.

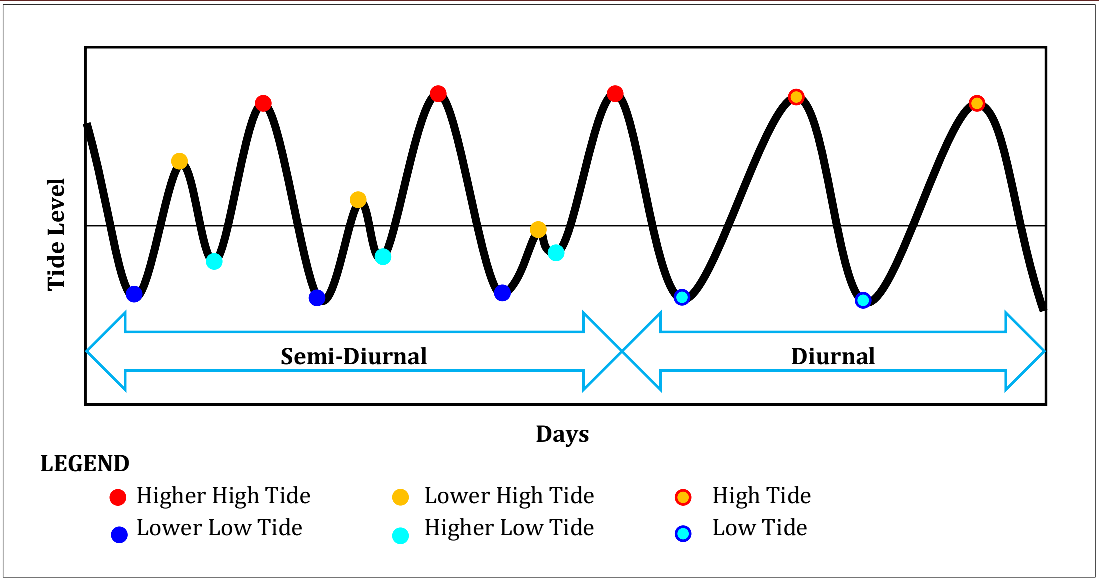


Figure 12. Sample Tide Levels

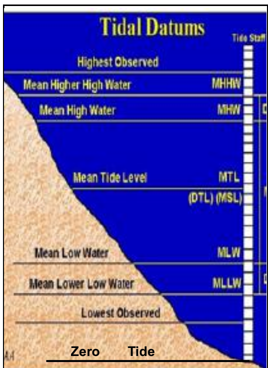
The data of nearby tide stations are shown in **Table 5**. The nearby stations consist of one (1) primary station (Manila South Harbor) and two (2) secondary station (Puerto Azul & Mariveles).

Table 5. Tide Station Information

NAME	TYPE	LAT	LONG	MUNICIPALITY	BM	EL. (MTL)
Manila South Harbor	Primary	14°35'N	120°58'E	South Harbor, Manila	BM 66	1.30
Mariveles Harbor	Secondary	14°26'N	120°30'E	Mariveles, Bataan	BM 1	2.696
Puerto Azul	Secondary	14°47'N	120°41'E	Ternate, Cavite	BM 2A	3.386

Shown in **Table 6** are the tide data recorded and tide statistics in the Manila South Harbor, Mariveles Harbor, and Puerto Azul stations. For every station, tide data indicating the mean, high, and low elevations are presented. The closest tide station to the project site is the Manila South Harbor station, which has a mean tidal range of 1.0m – the difference between the mean higher high water (MHHW) and mean lower low water level (MLLW).

Table 6. Tide Data in Manila Bay



Station	Tide Elevation (m)						
	HHWL Highest Observed	MHHW Mean Higher High Water	MHW Mean High Water	MTL Mean Tide Level	MLW Mean Low Water	MLLW Mean Lower Low Water	LLWL Lowest Observed
Manila South Harbor	1.475	0.51	0.39	0	-0.38	-0.49	-1.635
Mariveles Harbor	1.083	0.50	0.42	0	-0.41	-0.48	-0.977
Puerto Azul	1.293	0.51	0.42	0	-0.42	-0.49	-0.967

Note: All heights are referred to mean tide level (MTL) in meters.

2.3.5 Currents

De las Alas and Sodusta have simulated the response of Manila Bay to the quasi-steady forcing by prevailing winds. They concluded that the individual average wind - blowing at specific periods of the year - controlled the bay's circulated gyres differently:

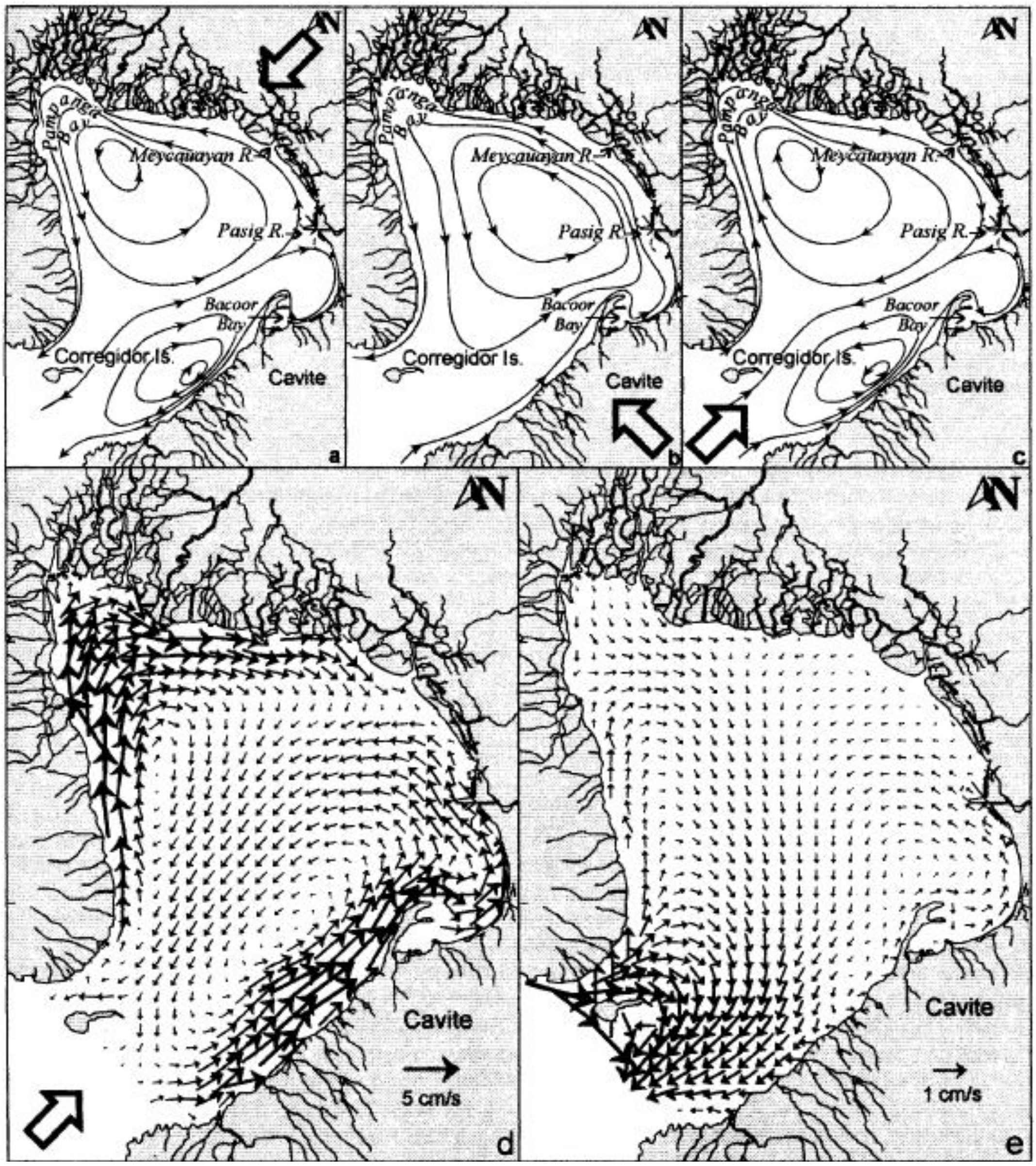
- North-easterly winds, with speeds averaging about 5 m/s from October to January, produce gyres as shown in **Figure 13(a**)
- South-easterly winds, with speeds ranging from 3 to 6 m/s from February to May, produce gyres as shown in **Figure 13 (b)**
- South-westerly winds, with speeds of 5 to 7 m/s from June to September, produce gyres as shown in **Figure 13 (c)**.

Villanoy and Martin modelled the current in Manila Bay from the combined effects of ocean tide and uniform wind. The results of their wind-driven circulation model using South-westerly wind, see **Figure 13**, showed the existence of two asymmetrical counter-clockwise gyres similar to the works of De las Alas and Sodusta, except that the location of convergence deviates a bit to the northwest. Their tidal-driven 2-dimensional hydrodynamic circulation model indicated that the residual tidal velocities are strongest at the mouth where it enters the bay north of Corregidor and exits to the South as shown in Figure 5r (e).

The wind driven current speeds are seen to be strongest in the shallow waters in Pampanga Bay and along the Cavite coast. It is also observed that the magnitude of the wind driven current is still considerable as it passes the Cavite Spit and proceeds into Bacoor Bay. Tidal driven currents are seen to be rather weak in most of Manila Bay.

The study by Villanoy and Martin concluded that the circulation in Manila Bay is essentially dominated by the tides except in some shallow areas adjacent to the coast where wind forcing is greater or at least of the same order of magnitude as the tidal forcing.

The strongest tidal current speeds are found in the bay mouth. In "Sailing Directions (Enroute). Phillipine Islands" (*National Geospatial Intelligence Agency (NGIA), 2011*), the tidal current in South Channel is reported to be semi-diurnal and may attain a rate of 1 knot (0.5 m/s) at springs. The current velocities in North Channel are greater than those in South Channel and may attain a rate of 1.5 (0.8 m/s) knots. Tidal currents are in reported to be negligible (for navigational purposes) in the greater part of Manila Bay. Flow from the Pasig River may locally give rise to large current speeds. *(NGIA) 2011*)



Source: De las Alas & Sodusta, and Villanoy & Martin

Figure 13. Wind driven (a-d) and tide-driven (e) circulation models of Manila Bay

2.3.6 Waves

Quantitative information on wave height data for Manila Bay is not readily available. However, strongest winds are experienced in the bay when a typhoon is near or over the Lingayen Gulf and funnelling winds through the Pampanga Valley to Manila. Due to the relatively short fetch and shallow water depth, the generated waves do not reach more than about 3m in significant height.

The swell coming into the bay from the South China Sea is damped considerably by Corregidor Island which sits in the mouth of the bay. It serves to split the swell and deflect it to either side. The possibility of shoaling (the building in magnitude of waves when the water depth reaches one-half their wavelength) occurs when the deflected swell reaches the shallower portions of the bay.

Waves, generated by the seasonably variable prevailing wind and modified by the morphology of the bay, are driving longshore current with temporally and spatially varying directions.

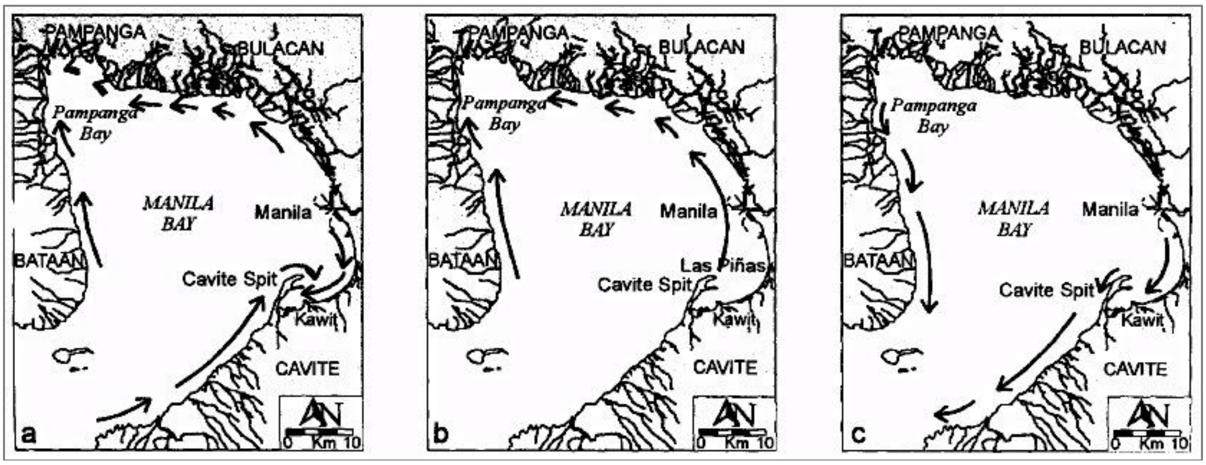
Southwesterly winds produce longshore currents that generally flow up along Bataan and to the northeast along Cavite (see **Figure 14 (a)**). As the local waves reach Manila City, longshore currents are furthermore generated along the Metro Manila coastline and all the way down to Bacoor Bay.

Like in the case of southwesterly winds, northeasterly winds will also generate longshore currents along Metro Manila into the Bacoor Bay area, and continuing along the Cavite coastline (**Figure 14** (c)). Under southeasterly winds, longshore current move towards northwest (**Figure 14** (b)).

Wind-driven currents may amplify the wave-generated longshore currents, especially when wind and longshore current directions coincide – e.g. along the Cavite coast and around the Cavite Spit into the Bacoor Bay area with the southwest winds.

Entering Manila Bay from the South China Sea, the waves would in general produce longshore currents that flow northeastward along the Cavite coast and northward along the Bataan shore. Also, the waves will drive a longshore current from Manila and down to Bacoor Bay.

Waves from the South China Sea may also intensify or degrade locally generated waves. Those waves, generated by southwest and southeast winds, are likely to be intensified whereas those generated by northeast winds should be degraded. The sandy strand-plains, spits and wave dominated deltas along the coast of Cavite attest to the predominance of southwesterly wave and current processes.



Source: Siringan and Ringor, 1997

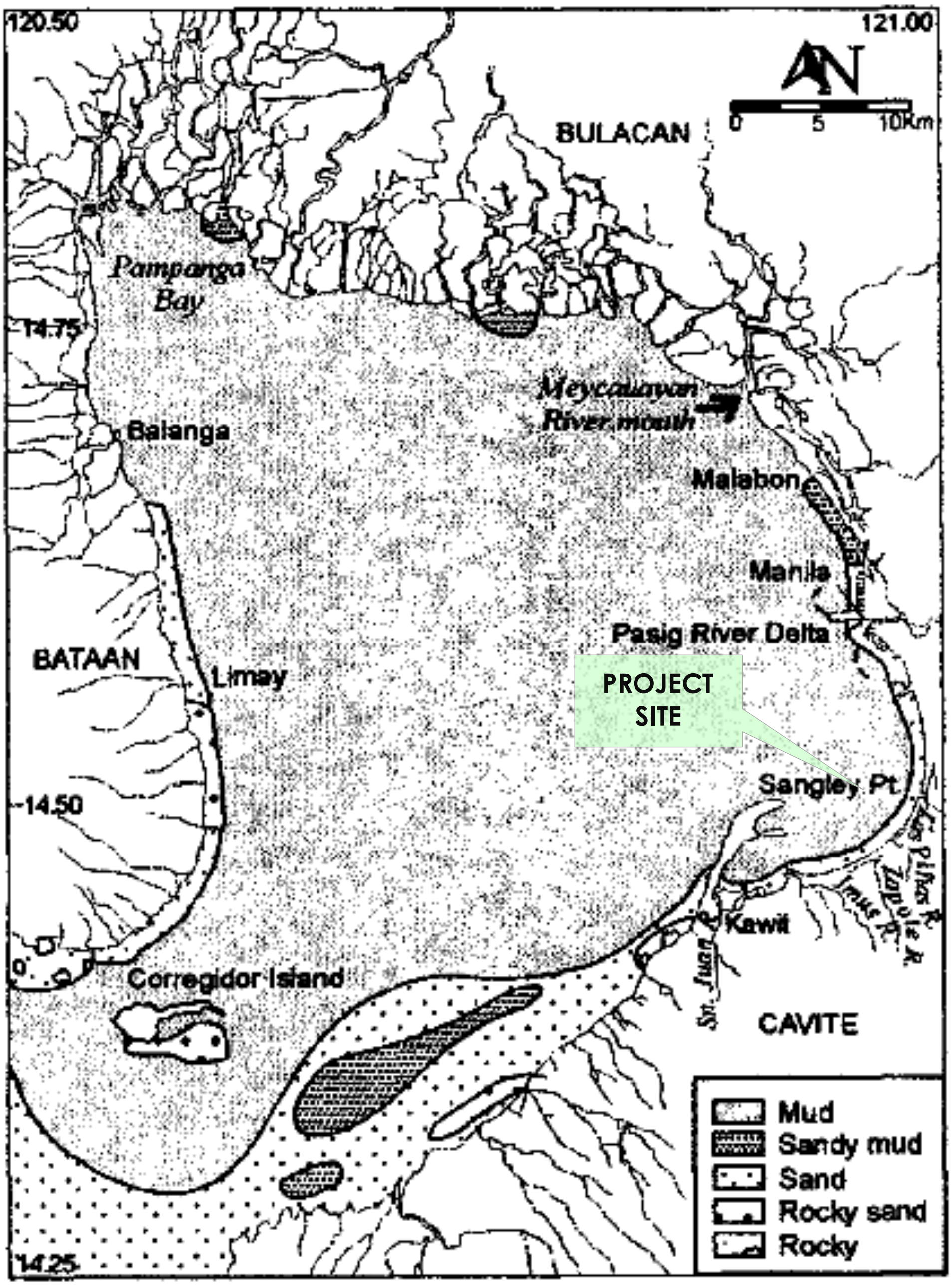
Figure 14. Long-shore currents associated with locally generated waves a) south westerlies; b) south easterlies; c) north easterlies

2.3.7 Morphology and Sediment Transport

Manila Bay is a semi-enclosed water body facing the South China Sea. It has a surface area of about 1,800 square kilometers and coastal length of about 190 kilometers (EMB, 1992). The bay width varies from 19 kilometers at its mouth to a maximum of about 60 kilometers. The bay's length is about 52 kilometers with the average depth of 17 meters with a volume of 31 km^3. It has a gently sloping basin with increasing depth at a rate of 1 m/km (PRRP, 1999). Manila Bay's coastal margin is a low-lying flat strip of land with elevations of <5 meters. The catchment area is bounded by the Sierra Madre mountain range to the east, the Caraballo mountains to the north, the Zambales mountains to the northwest and the Bataan mountains to the west (BFAR, 1995). The bay receives discharged water from numerous sources including 26 river catchments (account for about 17,000 km^2), and domestic and industrial water from Metro Manila and Laguna Bay. See **Figure 9.**

Various sub-environments characterize the coastal areas. Near the mouth, Cavite and Bataan coastlines are rocky and deeply embayed, with local pockets of sand forming thin strips of beach at the head of coves. Going north towards Bulacan, the coastline becomes more linear marked by a series of beach ridges. In Bulacan, the ridges are sandy but the surrounding fishpond areas are muddy. (Siringan and Ringor, 1997)

The combined effects of fluvial, wave and tidal processes creating longshore currents, as well as the morphology of the bay, have influenced the sediment dispersal pattern. The net sediment drift is to the NE along Cavite, to the NW along Manila-Bulacan (from Pasig River mouth to Meycauayan R.), to the SW from Zapote to Bacoor, and to the north along Bataan. Siringan and Ringor (1997) in their report entitled "Predominant Nearshore Sediment Dispersal Pattern in Manila Bay", stated that the wind direction plays an important role in the characteristics of sediment dispersal in Manila Bay. Southwesterly winds produce longshore currents that flow up the bay along Bataan and to the northeast along Cavite. Refraction at the tip of Cavite Spit causes longshore currents along the Las Piñas-Kawit coast. For southeasterly winds, the currents move to the NW along Manila-Pampanga coast and to the north along Bataan. NE winds create currents that move towards the mouth of the bay. During rainy days with winds predominantly coming from the southwest, greater input of sediments from rivers flows into the bay, The greater amount of the fine sediment get transported in the northeastern Manila Bay **(Figure 15)**. (Siringan and Ringor, 1997)



Source: Siringan and Ringor, 1997

Figure 15. Manila Bay Sediment Distribution Map based on NAMRIA Data

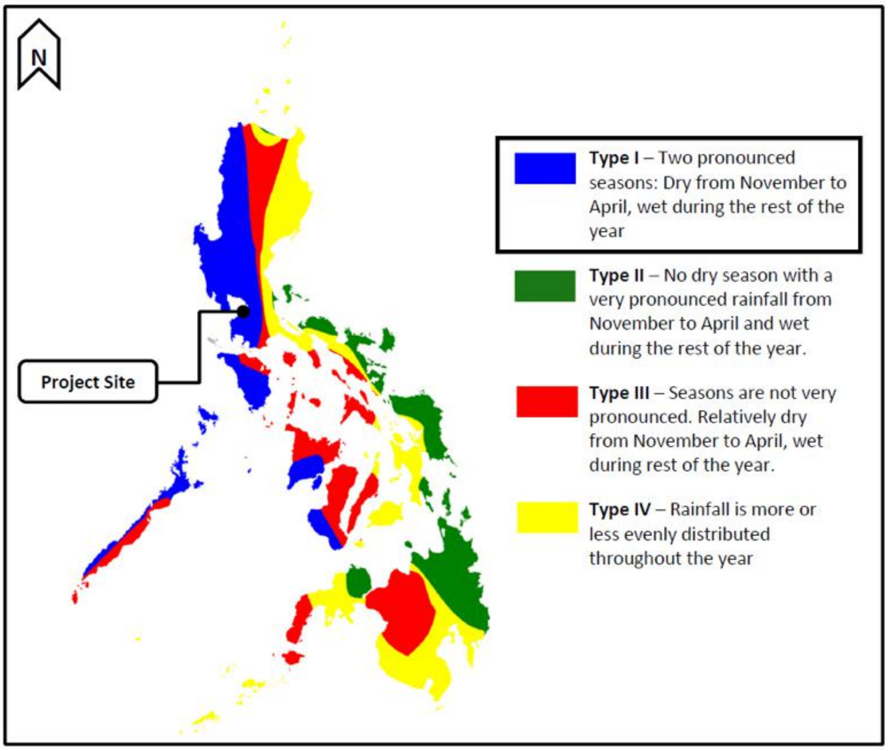
2.3.8 Climate and Vegetation

Parañaque City falls within Type I of climate under the Modified Corona's Classification System as presented by PAGASA (**Figure 16**). This type is marked by two pronounced seasons – dry from November to April and wet during the rest of the year. Data collected from the nearest PAGASA station located at NAIA, Pasay City indicates an annual average rainfall of 1,849.3 mm and annual average of 113 mm on rainy days (**Table 7**). The data derived covers the period 1961-1995. August has the highest mean rainfall with 414.1 mm and February has the least mean rainfall with 2.9 mm. Rains are brought about by the southwest monsoon, the Inter-Tropical Convergence Zone, local thunderstorms and typhoons. The coolest months are from November to February while the hottest months are from April to May.

Table 7. Monthly Rainfall Values (mm)
STATION: 429 NAIA, PASAY CITY; 1961-1995

MONTH	RAINFALL (mm)	Number of Rainy Days
January	6.5	2
February	2.9	1
March	6.2	2
April	13.2	2
May	101.6	7
June	244.5	15
July	363	18
August	414.1	20
September	309	17
October	221.4	13
November	121.2	10
December	43.7	6
TOTAL	1,849.30	113

Source: PAGASA



Source: PAGASA

Figure 16. Climate Map of the Philippines (Modified Coronas Classification)

3.0 SITE SETTING
3.1 Hydrology

Manila Bay receives runoff from approximately 17,000 square kilometers of watershed comprising 26 catchment areas (*DENR-EMB. 1992*).

The two main contributory areas are the basins of the Pampanga River and the Pasig River (see **Figure 17**). The Pampanga River is contributing about 49% of the freshwater influx to Manila Bay while the Pasig River is contributing about 21% of the freshwater influx to Manila Bay. The yearly mean inflow from the Pampanga River is 391 m^3/s, while the yearly mean inflow from the Pasig River is 170 m^3/s (*DENR-EMB. 1992*). The inflow from the rivers is varying throughout the year.

Other smaller river systems contribute with about 26% (mean inflow of 205 m^3/s) while the net precipitation over Manila Bay is responsible for the remaining 4% of the freshwater influx (*DENR-EMB. 1992*)

Parañaque City is dissected by Parañaque River, which runs almost parallel to the coast and empties into Manila Bay. This is the nearest natural river to the project site at 2.82m to the east. Other nearby rivers and/or waterways include Seaside Outfall (1.7km), Redemptorist Outfall (2.5km), both of which are man-made canals, Libertad Channel, Las Piñas R., and Zapote R (3.28km). Please refer to **Figure 18**.

Figure 17. Rivermouths of Pampanga River and Pasig River

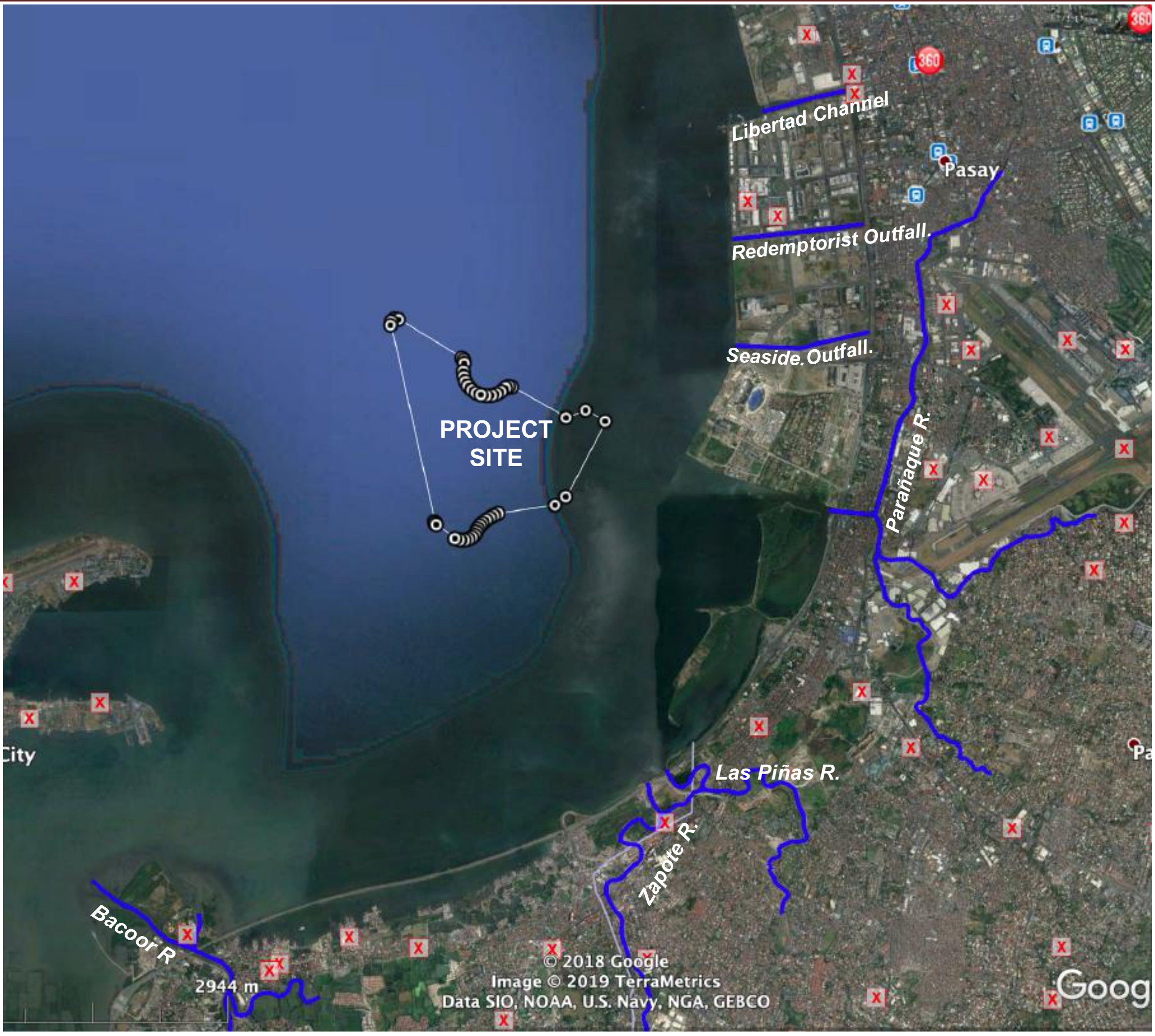
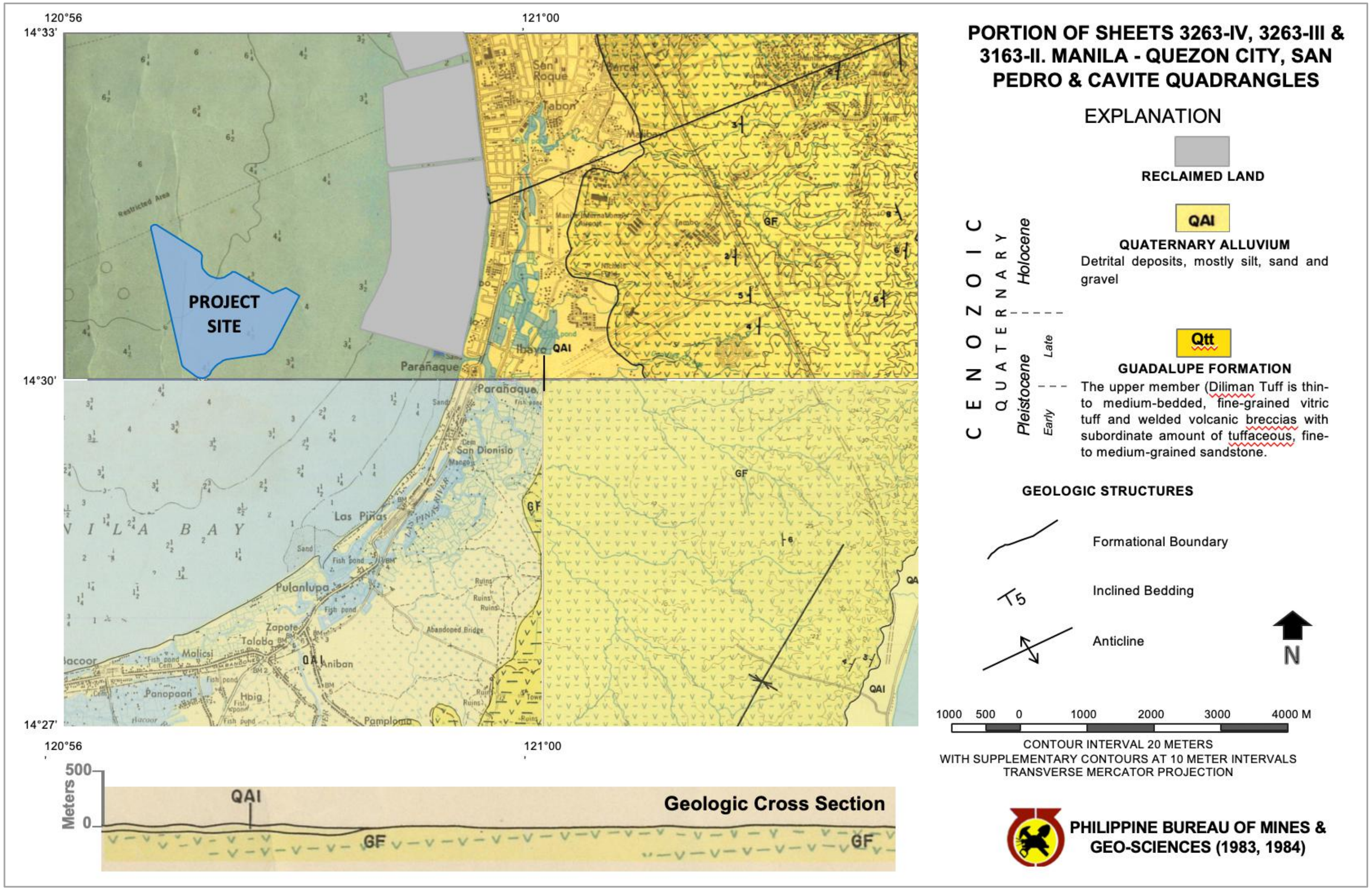


Figure 18. Project Location Relative to Nearby Rivers

3.2 Bedrock Lithology

The coastal area of Parañaque and nearby areas are underlain by alluvial deposits belonging to the Quaternary Alluvium based on the Geological Map of Manila and Quezon City Quadrangle by the DENR-MGB (**Figure 19** below). The reclaimed portions are composed of compact sand fill materials.

The offshore area of Manila Bay is underlain by stiffed to very dense sandy silt materials. Below this, layers of tuff, tuffaceous sandstone and siltstone of Guadalupe Formation are found. On land, the Guadalupe Formation occupies the area in between the western coastal area fronting Manila Bay and the eastern coastal are fronting Laguna Bay.



SOURCE: Geological Map of Manila and Quezon City Quadrangle, MGB, 1983 and 1984

Figure 19. Geological Map of Parañaque-Manila Bay Area and vicinities

3.3 Surficial Deposits

Generally, the upper 4m to 15m of the existing soil layer consists of very soft silts and clays (N-value < 5). It is underlain by 2m to 10m thick layers of stiff to very stiff silts and clays and medium dense sands. These are all underlain by the competent strata consisting of dense to very dense sands and hard clays, encountered at depths of around 10m to 30m.

Geotechnical Soil Investigation

A geotechnical investigation comprising of ten boreholes ranging from 30m to 40m below the seabed was carried out on December 10, 2017 to February 12, 2018 in the proposed project site. The locations of the boreholes are shown below in **Figure 20**. This was done in order to obtain data regarding the stratigraphy and physical properties of the soils underlying the site, particularly their strength and deformation characteristics when subjected to future loads.

The Standard Penetration Test (SPT) was done in accordance with ASTM specifications. For each test, a 2-inch outside diameter Spoon Sampler is driven into the soil 18 inches deep by means of a 140 lb. driving mass free falling from a height of 30 inches. The number of blows needed to drive the sampler 18 inches is recorded and the number of blows needed to drive the last 12 inches is taken as the N-value.

Representative soil samples obtained during drilling were subjected to the following laboratory tests:

- Grain Size Analysis per ASTM D422;
- Determination of Moisture Content per ASTM D2216;
- Atterberg Limit Test per ASTM D4318
- Liquid Limit of Soils; and
- Plastic Limit and Plasticity Index of Soils.

Figure 20. Borehole Location Plan

Subsurface Idealization

Moderately to highly plastic, very soft to very stiff layers of SILT from seabed down to 30m were found at BH-28.

In boreholes BH-24 and BH-27, a layer of very soft to hard, moderately to highly plastic SILT with intermediary layers of soft to hard, moderately to highly plastic CLAY were encountered. Boreholes BH-19 and BH-22 were composed of alternating layers of soft to hard, moderately to highly plastic CLAY and hard, moderately to highly plastic SILT.

Boreholes BH-20, BH-23 and BH-30 the founding soils were very soft to hard, moderately to highly plastic SILTS were recovered from seabed down to depths ranging from 17m to 24m depth, underlain by very stiff to hard CLAY down to 30m.

A layer of dense to very dense fine silty SAND was embedded at deeper depths ranging from -15.0m to 22.50m found in boreholes BH-16 and BH-18, upper layers were composed of very soft to hard, moderately to highly plastic SILT.

Generally, upper layers up to mid layers of SILT and CLAY were greenish gray to dark green in appearance, then in deeper depths SILT and CLAY were grayish and brown to light brown in color. Sand layers appears to be brown to light brown and gray in color.

The study area is divided into a total of 3 zones (**Figure 21**) such that the boreholes located within a zone have similar soil properties and depth of water. The location of these zones is shown in the figure below. The succeeding tables present the subsurface conditions at each zone based on the results of the soil investigation. The upper layer (sand fill) assumes the depth required to reach the pad elevation (+4.0m from MLLW). Engineering parameters were assigned on the following soil profiles necessary for the design of foundations and various geotechnical analysis. **Figures 22-24** show simplified soil profiles of the 3 zones.

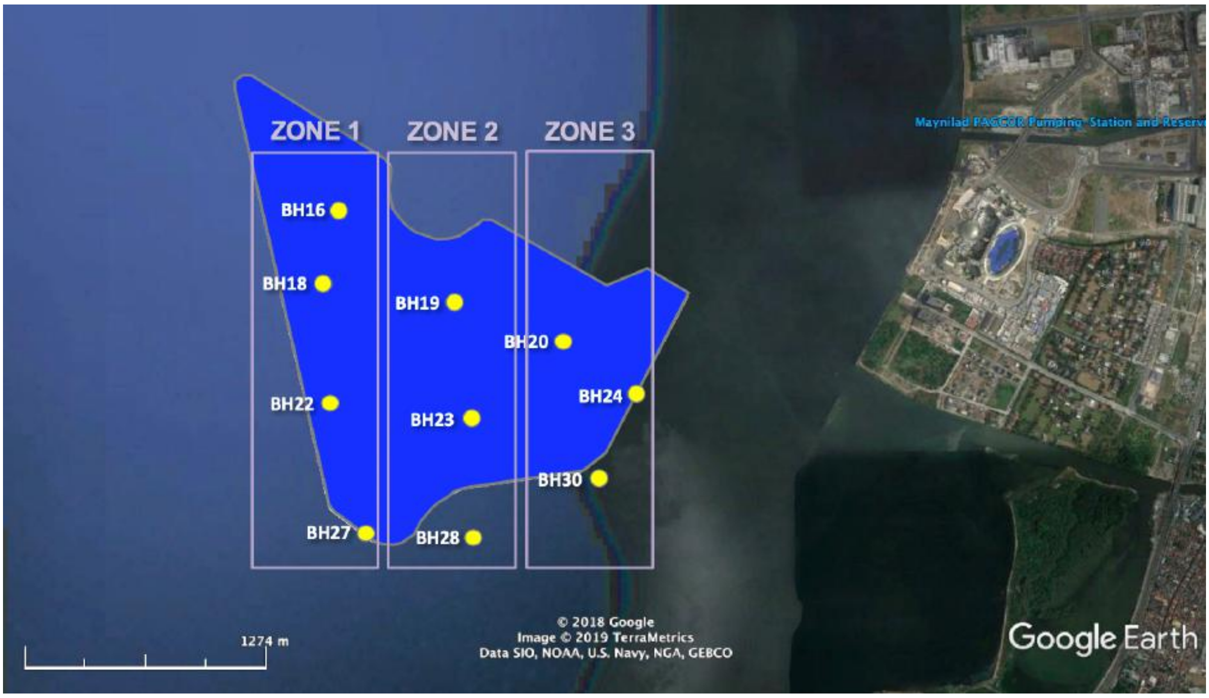


Figure 21. Project Area Subsurface Zoning

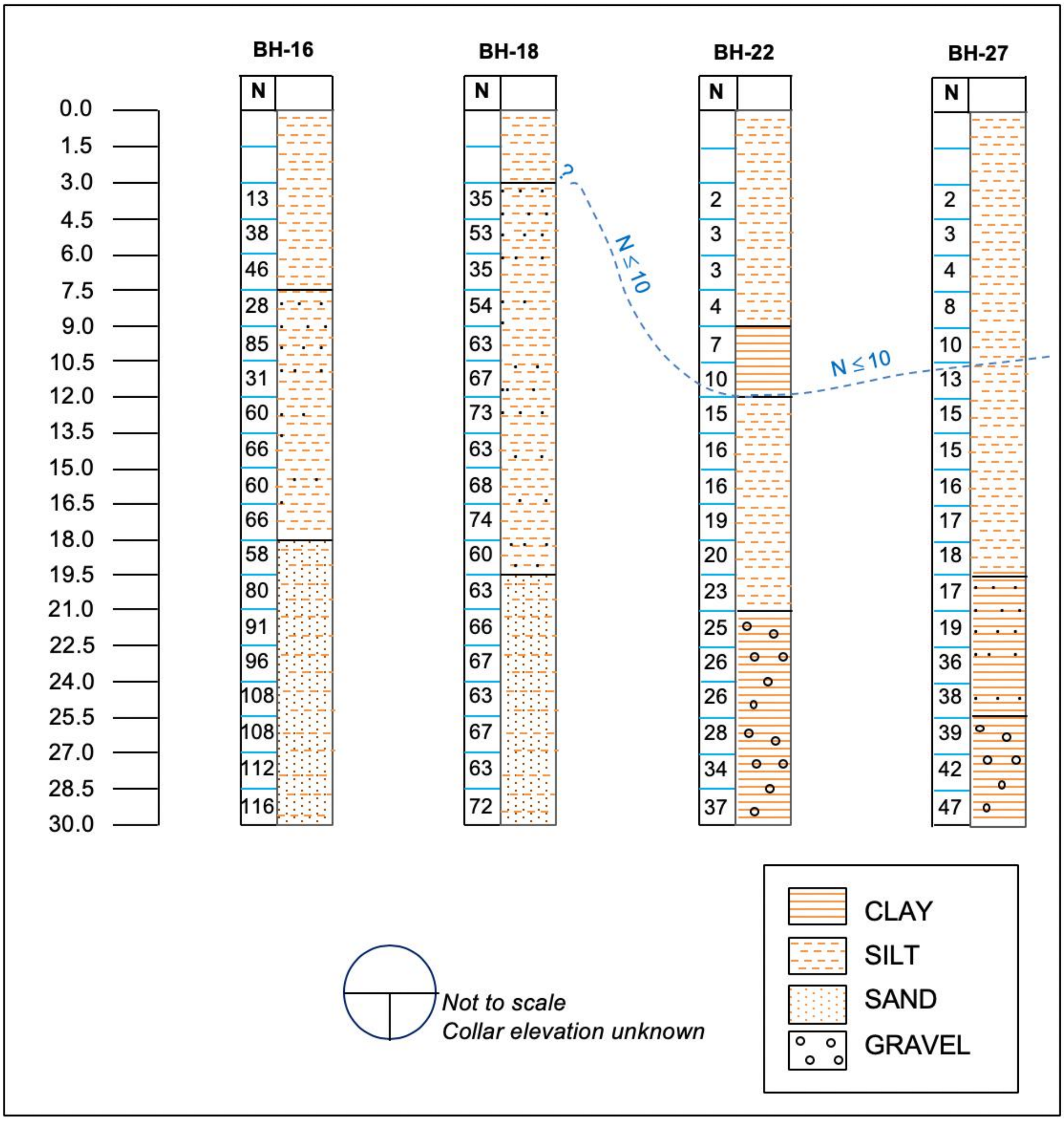


Figure 22. Simplified Soil Profile – Zone 1

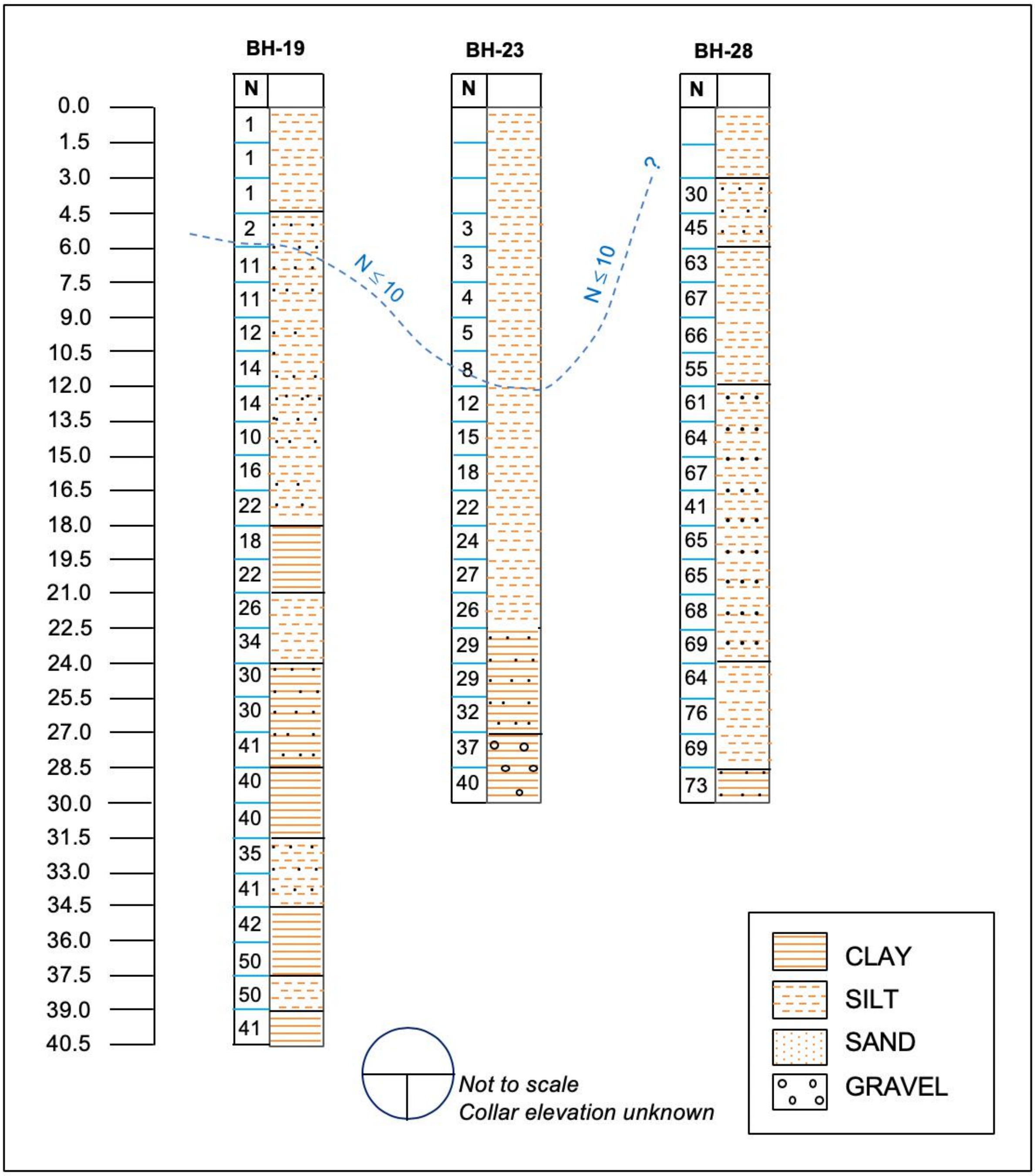


Figure 23. Simplified Soil Profile – Zone 2

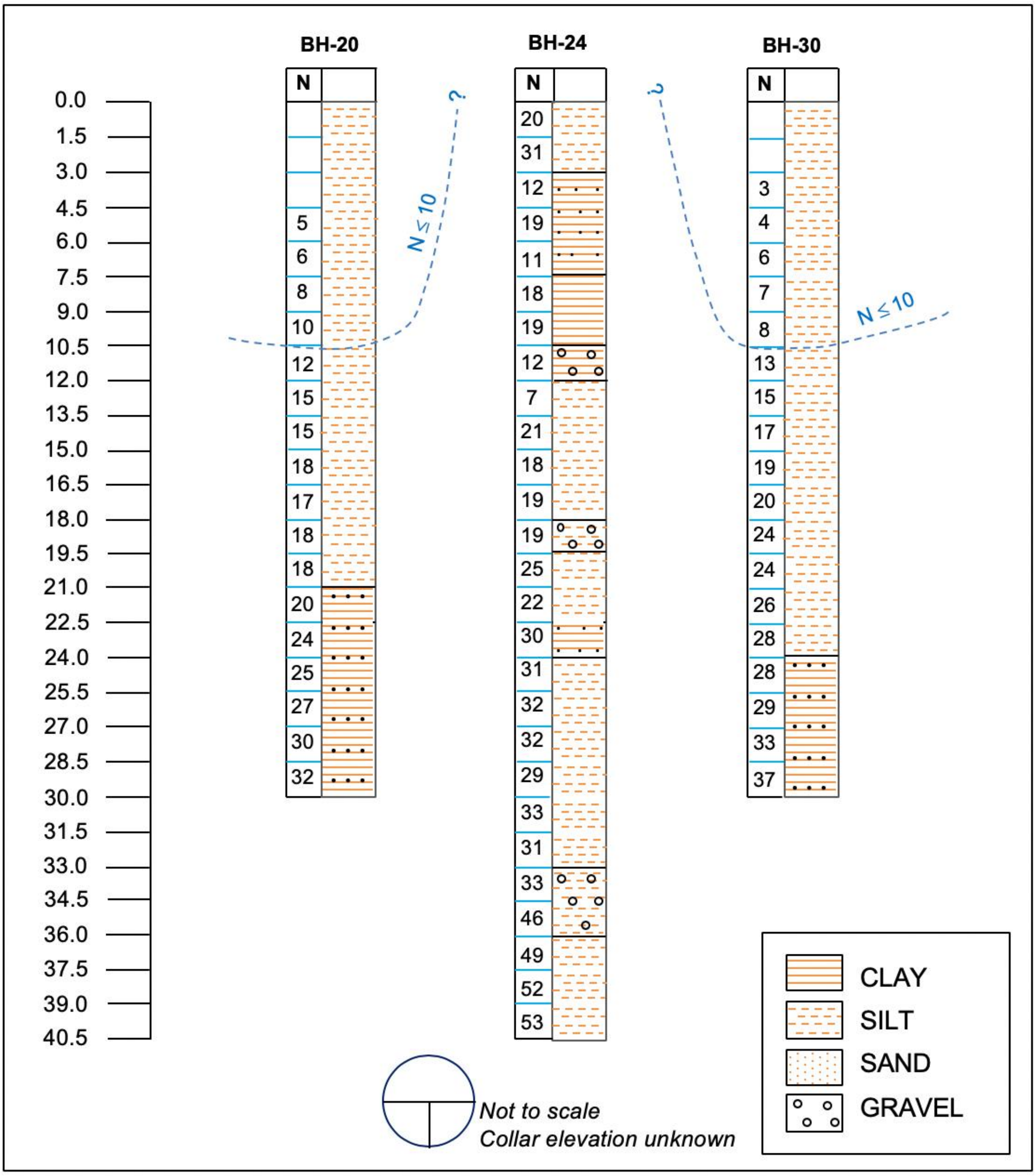


Figure 24. Simplified Soil Profile – Zone 3

From the results of the soil investigation, the site subsurface generally consists of an upper 3m to 12m of very soft silts and clays (N-value < 10). It is underlain by 2m to 10m thick layers of stiff to very stiff silts and clays and medium dense sands. These are all underlain by the competent strata consisting of dense to very dense sands and hard clays, encountered at depths of around 10m to 30m.

Table 8. Geotechnical Parameters for deep foundations: Zone 1

Depth, m	Soil Description	Consistency / Relative Condition	γ (kN/m3)	Parameters		
				c (kPa)	ϕ (o)	kh (kPa/m)
0.0 - 18.5	Sand Fill	Medium Dense (15)	18	0	30	13800/B
18.5 - 22.5	Clay	Very Soft (2)	12	12	0	1400/B
22.5 - 27.5	Clay	Soft (3)	14	12	0	1400/B
27.5 - 29	Clay	Medium Stiff (7)	16	32	0	3800/B
29.0 - 35.0	Clay	Stiff (11)	17	56	0	6700/B
35.0 - 45.5	Clay	Very Stiff (23)	18	140	0	16800/B
45.5 - 48.5	Clay	Hard (34)	20	192	0	23000/B

Table 9. Geotechnical Parameters for deep foundations: Zone 2

Depth, m	Soil Description	Consistency / Relative Condition	γ (kN/m3)	Parameters		
				c (kPa)	ϕ (o)	kh (kPa/m)
0.0 - 12.5	Sand Fill	Medium Dense (15)	18	0	30	9300/B
12.5 - 18.5	Clay	Very Soft (1)	12	12	0	1400/B
18.5 - 29	Clay	Stiff (12)	17	64	0	7600/B
29.0 - 35.0	Clay	Very Stiff (22)	18	132	0	15800/B
35.0 - 53.0	Clay	Hard (39)	20	192	0	23000/B

Table 10. Geotechnical Parameters for deep foundations: Zone 3

Depth, m	Soil Description	Consistency / Relative Condition	γ (kN/m3)	Parameters		
				c (kPa)	ϕ (o)	kh (kPa/m)
0.0 - 17.0	Sand Fill	Medium Dense (15)	18	0	30	12700/B
17.0 - 27.5	Clay	Soft (3)	14	12	0	1400/B
27.5 - 29.0	Clay	Medium Stiff (8)	17	40	0	4800/B
29.0 - 32.0	Clay	Stiff (13)	17	72	0	8600/B
32.0 - 42.5	Clay	Very Stiff (25)	19	155	0	18600/B
42.5 - 47.0	Clay	Hard (35)	20	192	0	23000/B

With a maximum thickness of soft soil at 13.5 meters, the range of depth required to fill the reclamation area up to elevation +4m above Mean Low Low Water (MLLW) is 3.5 to 17.5 meters. Since there are no available data on elevations of the tide and seabed in the area of the project site, it is assumed that the measured water level during drilling is the mean sea level (MSL).

From the Philippine Ports Authority Manual, the nearest port with tide records which shall be used as reference for this project is the Manila South Harbor. It is approximately 8km north of the project site. The recorded MSL is +0.49m (or approx. +0.50m) and MLLW is +0.00m.

3.4 Structural Features

At present, there were no major structures identified in the surveyed area. However, the West Valley Fault lies about 9.4km east of the proposed project site.

4.0 GEOLOGIC HAZARD ASSESSMENT

4.1 Seismic Hazard

Earthquake is the perceptible trembling to violent shaking of ground caused by either tectonic movements or volcanic activity. Areas that are most susceptible to this hazard are those underlain by unconsolidated soils and sediments deposited on the low-lying areas and reclaimed areas.

The area investigated is prone to ground shaking hazards due to the presence of several earthquake generators in the region (Punongbayan, 1989). These possible seismogenic structures include the active Valley Fault System, Lubang Fault, the Philippine Fault and Manila Trench. The site, although considered as of low seismic area, has recorded and experienced intensity VI during the 1990 Luzon Earthquake (**Figure 25**). A record of the recent earthquakes affecting Metro Manila area is shown in **Table 11.**

Table 11. List of Recent Earthquakes of Magnitude 5 and above that Affected Metro Manila (1907-2016)

Date	North Latitude	East Longitude	Depth (km)	MI	Mb	Ms	Intensity Reports RF & PEIS
18 April, 1907	14.000	123.000	033			7.6	
21 March, 1919	13.000	123.000	50			6.5	
03 April, 1922	13.820	119.910	68			5.0	
19 April, 1927	16.000	120.000	100			6.7	
18 July, 1932	14.000	120.000	100			6.0	
03 March, 1933	15.500	120.100	120			6.5	
06 June, 1933	14.000	120.000	33			6.3	
20 September, 1933	13.000	121.000	100			6.5	
31 July, 1934	15.100	119.700	33			5.6	
26 November, 1934	14.200	120.200	33			6.3	
07 February, 1935	13.500	122.700	33			6.0	
20 May, 1936	13.500	121.500	160			6.0	
20 August, 1937	14.500	121.500	33			7.5	
06 May, 1939	13.500	121.300	110			6.5	
28 March, 1940	14.200	120.600	160			6.8	
09 May, 1941	14.200	122.100	33			6.8	
08 April, 1942	13.200	120.600	33			7.7	
22 December, 1953	16.000	119.000	33			5.7	
19 July, 1956	15.100	120.500	033			5.7	
23 October, 1956	13.500	120.500	100			6.7	
24 August, 1958	14.000	121.000	150			5.7	
18 July, 1959	15.500	120.500	150			6.6	
21 May, 1960	15.500	121.500	33		5.0		
19 September, 1960	16.000	120.000	25		5.5		
26 February, 1961	15.500	121.100	32		6.1		
19 June, 1961	13.100	121.500	056		5.7		
15 July, 1961	13.230	120.580	60		5.7		
27 November, 1962	14.900	120.200	45		5.1		
21 December, 1962	15.900	121.800	033		5.0		
25 February, 1963	15.580	121.490	61		5.5		
17 May, 1963	15.690	120.130	99		5.6		
22 June, 1964	13.670	120.550	72		5.1		
09 July, 1964	15.360	119.670	048		5.3		
30 November, 1964	13.800	120.800	207		5.0		
13 August, 1965	13.570	120.060	36		5.2		

Date	North Latitude	East Longitude	Depth (km)	MI	Mb	Ms	Intensity Reports RF & PEIS
10 September, 1965	13.960	120.870	149		5.0		
10 January, 1966	13.810	120.720	133		5.3		
15 August, 1966	13.280	121.360	24		5.5		
28 August, 1966	13.730	120.840	114		5.0		
30 August, 1966	13.400	120.800	86		5.3		
11 October, 1966	13.980	120.740	104		5.1		
20 December, 1966	14.570	122.170	032		5.3		
05 January, 1967	13.780	120.710	170		5.4		
06 June, 1968	14.900	119.900	053		5.3		
12 June, 1968	13.800	120.700	135		5.1		
01 August, 1968	15.770	121.790	33		5.0		
06 August, 1968	15.700	122.000	48		5.3		
09 August, 1968	15.710	121.920	63		5.1		
10 August, 1968	15.410	121.590	86		5.1	5.2	
13 August, 1968	15.620	121.830	042		5.0		
14 August, 1968	15.080	122.510	15		5.5		
23 August, 1968	15.700	121.900	057		5.1		
28 August, 1968	15.550	122.020	42		4.7	6.1	
29 August, 1968	15.510	121.980	39		5.3		
03 September, 1968	15.500	122.200	21		5.0		
19 September, 1968	14.920	120.240	060		5.2		
22 September, 1968	15.720	121.880	47		5.3		
04 November, 1968	13.500	120.500	75		5.0		
22 November, 1968	13.200	122.600	007		5.5		
29 December, 1968	13.600	120.540	46		5.2		
02 March, 1969	13.100	120.800	069		5.0		
02 March, 1969	13.020	120.830	73		5.0		
04 June, 1969	15.200	122.300	29		5.0		
10 June, 1969	13.200	121.500	017		5.1		
25 June, 1969	13.460	120.330	60		5.0		
06 October, 1969	14.990	120.110	66		5.6		
29 March, 1970	13.940	120.670	121		5.3		
06 April, 1970	13.970	120.370	88		5.2		
07 April, 1970	15.780	121.710	40		6.5	7.3	METRO MANILA VII
08 April, 1970	15.400	121.750	7		5.7	6.2	
12 April, 1970	15.080	122.010	025		5.8	7.0	
15 April, 1970	15.110	122.710	50		5.6	6.0	
22 April, 1970	15.370	121.830	046		5.1		
01 May, 1970	15.640	121.780	33		5.3	5.4	
06 May, 1970	15.710	121.760	041		5.1		
16 June, 1970	15.100	122.000	19		5.1		
10 July, 1970	13.930	120.420	89		5.5		
21 November, 1970	15.010	120.130	053		5.5	5.2	
29 April, 1971	13.000	122.300	090		6.0		
04 July, 1971	15.600	121.870	30		5.5	5.1	MANILA INTENSITY V
20 July, 1971	15.270	120.260	33		5.4		
14 January, 1972	13.550	120.870	126		5.1		
16 March, 1972	15.690	121.810	53		5.1		MANILA INFANTA RF1
28 March, 1972	13.520	120.760	165		5.8		
14 April, 1972	14.890	119.740	47		5.0		
25 April, 1972	13.370	120.310	050		7.2		MANILA CAVITE AMBULONG RF5;
26 April, 1972	13.550	120.550	33		5.2		MANILA RF3

Date	North Latitude	East Longitude	Depth (km)	Ml	Mb	Ms	Intensity Reports RF & PEIS
27 April, 1972	13.510	120.680	072		5.4		MANILA RF4
29 April, 1972	13.350	120.640	56		5.2		
30 April, 1972	13.540	120.540	56		5.5		MANILA RF3
01 May, 1972	13.380	120.390	063		5.0		
08 May, 1972	13.410	120.460	53		5.1		
17 May, 1972	13.360	119.880	37		5.7		
26 May, 1972	13.290	120.410	38		5.2		
28 May, 1972	13.370	120.650	46		5.2		
19 June, 1972	13.340	120.340	049		5.3		
03 August, 1972	13.440	120.350	33		5.3		
28 August, 1972	13.270	120.560	62		5.2		
15 March, 1973	13.940	120.360	113		5.2		MANILA RF2 QUEZON CITY RF1
17 March, 1973	13.370	122.790	33		5.6	7.0	INTENSITY VI - MANILA; IV - PASAY CITY; VII MANILA VI
13 May, 1973	13.640	120.750	001		5.3		
18 July, 1973	14.930	119.860	56		5.1		MANILA RF3; QUEZON CITY RF2
25 October, 1973	13.790	120.240	63		5.6		MANILA RF4; AMBULONG RF2
21 November, 1973	13.450	121.020	039		5.1		
09 February, 1974	15.900	119.900	65		5.2		
12 February, 1974	13.600	120.400	88		5.4		
19 February, 1974	14.000	122.200	017		5.7		
16 April, 1974	13.830	120.650	123		5.4		MANILA RF3
22 October, 1974	13.480	120.570	041		5.2		MANILA RF3
03 November, 1974	15.020	122.670	33		5.1		
29 April, 1975	13.700	120.800	33	5.6			
18 June, 1975	13.900	120.600	134	5.4			
04 May, 1976	13.380	120.210	033	5.4			
23 April, 1985	15.300	120.600	188	5.4			RF4-MANILA RF3I- QUEZON CITY
25 April, 1987	15.870	120.220	106	5.5			RF5-MANILA SANGLEY POINT; RF4-QUEZON CITY
05 June, 1987	15.600	121.000	045	5.6			
08 April, 1988	13.300	120.100	61	5.6			RF4-MANILA; RF3-QUEZON CITY
24 March, 1989	14.411	119.698	33	5.5			
May 17, 1990	13.370	121.230	011			5.1	
October 22, 1990	13.740	121.030	033			5.1	
July 16, 1990	15.660	121.180	033			5.2	
November 20, 1990	14.440	121.890	016			5.2	
December 25, 1990	13.590	120.080	010			5.3	
October 7, 1990	13.300	120.170	007			5.5	
December 5, 1990	14.480	121.970	013			5.9	
July 16, 1990	15.680	121.170	025		6.5	7.8	Int VII - MANILA
June 16, 1991	15.150	120.460	009			5.0	
February 23, 1991	15.910	120.840	003			5.1	
June 16, 1991	15.050	120.320	024			5.1	
June 18, 1991	15.220	120.350	011			5.1	
February 7, 1991	13.660	120.670	011			5.2	
June 17, 1991	15.040	120.240	027			5.2	
September 4, 1991	15.150	120.340	048			5.3	
January 19, 1991	15.440	121.210	009			5.4	
October 25, 1991	13.270	120.150	006			5.5	
April 19, 1991	13.800	121.040	186			5.6	
June 16, 1991	15.150	120.270	012			5.8	
July 3, 1991	15.210	120.440	008			5.8	

Date	North Latitude	East Longitude	Depth (km)	Ml	Mb	Ms	Intensity Reports RF & PEIS
May 25, 1992	13.770	119.960	016			5.3	Int IV - MANILA; Int III - QUEZON CITY
October 30, 1993	15.440	121.730	008			5.1	MANILA RF4; QUEZON CITY RF3
March 29, 1993	13.410	120.620	022			5.3	
April 9, 1993	14.950	120.250	014			5.3	Int V - MANILA; Int IV - QC
September 6, 1993	13.730	120.530	120			5.3	
March 29, 1993	13.400	120.580	017			5.4	INT II - QUEZON CITY
November 15, 1994	13.170	121.190	034			5.1	
February 20, 1994	13.730	120.750	185			5.2	
November 15, 1994	13.410	120.630	033			5.3	
April 27, 1994	13.130	119.350	048			5.7	
November 15, 1994	13.700	120.920	070			6.0	
November 14, 1994	13.500	121.090	007		6.1	7.1	Int III - MANILA
February 18, 1996	14.130	120.500	260			5.0	RF2; MANILA
September 25, 1996	13.700	120.330	138			5.0	
July 20, 1996	13.850	120.340	082			5.3	MANILA; RF3; QUEZON CITY RF2 CLARK RF2
July 30, 1996	14.700	119.500	007			5.8	MANILA MAKATI PASIG RF5
July 22, 1997	15.200	122.580	011			5.2	Intensity III - QUEZON CITY
May 5, 1997	15.150	119.920	014			5.5	Int I - QUEZON CITY
March 12, 1997	13.610	121.010	012			5.9	Int II - QUEZON CITY
March 23, 1998	13.120	121.180	003			5.1	
January 4, 1998	14.800	121.940	003			5.4	
August 23, 1998	14.730	119.900	035			6.1	
May 27, 1999	15.360	119.680	057			5.1	Int IV – MANILA; Int II - MAKATI PASAY.
December 11, 1999	15.850	119.670	065			6.8	Int VI – MANILA; Int V - PASIG TAGUIG;
February 3, 2000	13.640	121.480	002	4.7	5.7	5.0	Int III – MANILA; Int II - MAKATI
October 21, 2000	13.714	120.617	130	4.9	5.9	5.3	Int I - QUEZON CITY
June 19, 2000	14.087	120.330	108	5.1	6.0	5.6	Int IV - MANILA; Int II - PASAY
August 1, 2000	15.099	122.305	081	5.2	6.1	5.7	Int IV - MANILA ORTIGAS; Int III - MAKATI
July 8, 2001	13.594	120.835	008			5.0	Int III- MANILA; Int II- TAGUIG
September 3, 2002	13.522	120.649	001	5.1	6.0	5.7	INTENSITY III- MANILA TAGUIG PATEROS; Int II - MAKATI
March 2, 2003	15.420	121.670	005	4.7	5.7	5.0	Int IV - MANILA PASIG & PASAY CITY
October 9, 2003	13.676	119.580	039	5.0	5.8	5.0	MANILA IV; PASIG III
June 12, 2003	13.067	120.244	003	4.8	5.8	5.2	MANILA II
April 12, 2003	13.715	120.467	107	4.9	5.8	5.3	MANILA TAGUIG INTENSITY II
September 15, 2004	14.284	120.166	091	5.5	6.4	6.2	Int IV - MANILA
October 8, 2004	13.815	120.413	094	5.5	6.4	6.2	
December 11, 2005	14.024	120.654	205	4.7	5.7	5.1	
April 3, 2005	13.558	120.584	095	4.9	5.9	5.3	Int II - MANILA PASAY; ALABANG
February 9, 2005	13.699	120.535	089	4.8	5.7	5.4	Int III - PASAY CITY; Int II - MAKATI
October 20, 2006	13.442	121.552	011	4.7	5.7	5.1	
October 20, 2006	13.452	121.544	010	4.8	5.8	5.2	Int IV - MANILA. Int II - MAKATI
October 20, 2006	13.453	121.536	009	4.8	5.7	5.2	Int IV - MANILA. Int III - MAKATI
July 17, 2007	13.522	120.698	104	4.6	5.6	5.0	
June 3, 2007	13.658	122.686	005	4.8	5.8	5.3	
January 9, 2008	15.443	122.735	015	4.6	5.6	5.0	
February 27, 2008	13.134	120.358	032	4.7	5.7	5.2	
June 7, 2008	13.661	120.517	079	4.8	5.7	5.2	
July 6, 2008	15.405	122.386	015	4.8	5.7	5.2	Int III - Parañaque
August 1, 2008	13.601	120.645	117	4.7	5.7	5.3	Int III - MANILA CITY

Date	North Latitude	East Longitude	Depth (km)	Ml	Mb	Ms	Intensity Reports RF & PEIS
September 27, 2008	13.333	120.317	073			5.3	Int IV - MANILA; LAS PINAS; Int III - QUEZON CITY; Int II - MAKATI
October 1, 2008	13.299	120.208	054			5.3	Int II - MAKATI QUEZON CITY
July 6, 2008	15.404	122.381	001	4.9	5.8	5.4	Int III - PARANAQUE;
July 8, 2008	15.425	122.407	003	4.9	5.8	5.4	Int IV - QUEZON CITY; MANILA CITY
September 27, 2008	13.315	120.080	086	5.5	6.4	6.5	
October 31, 2009	15.320	119.934	008	4.6	5.6	5.0	Int II - PASIG CITY HALL
July 4, 2009	13.790	120.518	094	4.7	5.7	5.1	
May 24, 2009	15.127	119.770	001	4.8	5.7	5.2	Int II - QUEZON CITY; ORTIGAS
April 20, 2009	15.266	119.726	014	4.8	5.8	5.3	
October 18, 2009	13.768	120.493	135	5.2	6.1	5.8	Int II - MANILA
January 16, 2010	13.573	120.523	060	4.6	5.6	5.0	Int II - ALABANG MUNTINLUPA
February 1, 2010	13.785	120.511	111	4.7	5.7	5.1	
November 10, 2010	15.115	119.726	016	4.8	5.7	5.2	Int III - PASIG; Int II - MANILA MAKATI
March 25, 2010	13.738	119.727	011	5.4	6.3	6.0	Int V - MANILA; Int IV - MANDALUYONG; MAKATI; PASAY; TAGUIG; PASIG
August 12, 2011	13.434	120.886	142	4.6	5.6	5.0	Int II – PASIG, PASAY, MANILA
November 29, 2011	14.070	119.214	062	4.6	5.6	5.0	
March 10, 2011	13.650	120.360	078	4.5	5.5	5.1	
December 23, 2011	13.074	120.313	022	4.8	5.8	5.3	Int III - MANILA PASIG CITY; Int II - MAKATI; PASAY; MARIKINA
April 8, 2011	13.840	119.790	033	4.9	5.9	5.4	Int III - MANILA; MAKATI
March 21, 2011	13.855	120.230	075	5.1	6.0	5.7	Int IV - MANILA; MARIKINA; Int II - PATEROS
May 22, 2011	13.653	120.712	103	5.1	6.0	5.7	Int III - MALATE MANILA
July 25, 2011	15.070	119.860	037	5.3	6.2	5.9	Int IV - MANILA; Int III - MAKATI; PASIG; TAGUIG; MANDALUYONG; MARIKINA; PATEROS
November 30, 2011	15.465	119.019	016	5.3	6.2	6.0	Intensity II - MANILA MANDALUYONG; ORTIGAS PASIG; MAKATI
August 7, 2012	13.808	119.755	032	4.7	5.7	5.0	Int II - PASAY; SAMPALOC MANILA
November 23, 2012	14.149	120.570	196	4.7	5.7	5.0	
March 8, 2012	13.547	120.320	004	4.8	5.7	5.1	Int IV - MANILA; MUNTINLUPA; MANDALUYONG
July 14, 2012	14.931	119.464	001	4.7	5.7	5.1	
September 29, 2012	13.846	120.538	126	4.8	5.8	5.2	
March 8, 2012	13.507	120.203	005	4.9	5.9	5.3	Int III - MANILA; MUNTINLUPA
October 4, 2012	13.085	120.327	028	4.9	5.8	5.3	Int III - PASAY
June 16, 2012	15.618	119.323	023	5.3	6.3	6.0	Int IV - MAKATI CITY
January 14, 2013	14.988	119.570	014	4.7	5.7	5.0	Int II - PASAY CITY
April 4, 2013	15.859	121.695	025			5.4	Int III - MANDALUYONG; TAGUIG; PASAY; Intensity II- MANILA; MUNTINLUPA; Int I - MAKATI
June 8, 2014	13.154	120.131	001	4.8	5.7	5.1	
December 31, 2014	13.724	120.506	107			5.4	Intensity III - QUEZON CITY
September 3, 2014	15.156	122.428	012			5.5	Int II- MAKATI; TAGUIG; PASAY
June 25, 2014	13.547	120.510	040			5.8	Int III - Parañaque
January 10, 2015	14.740	119.910	48			5.9	Int IV - Parañaque
January 17, 2015	13.885	120.450	128			5.1	Int II – Quezon City
January 18, 2015	13.912	120.492	117			5.0	
February 10, 2015	14.004	120.360	101	4.6	5.6	5.0	Int II - Pasay

Date	North Latitude	East Longitude	Depth (km)	Ml	Mb	Ms	Intensity Reports RF & PEIS
June 13, 2015	13.816	120.489	118			5.0	
August 9, 2015	13.434	120.193	017	4.8	5.7	5.1	
February 5, 2016	13.781	122.279	3	4.8	5.8	5.2	
April 19, 2016	15.589	119.952	33	4.6	5.6	5.0	
April 19, 2016	15.778	119.604	009	4.6	5.6	5.0	
Sept 2, 2016	13.727	120.541	84	4.6	5.6	5.0	
Nov 10, 2016	14.843	121.399	9	4.7	5.6	5.0	Int II - Parañaque

Source: Phivolcs, May 26. 2017
Notes: RF - Rossi-Forel Intensity Scale
PEIS - PHIVOLCS Earthquake Intensity Scale

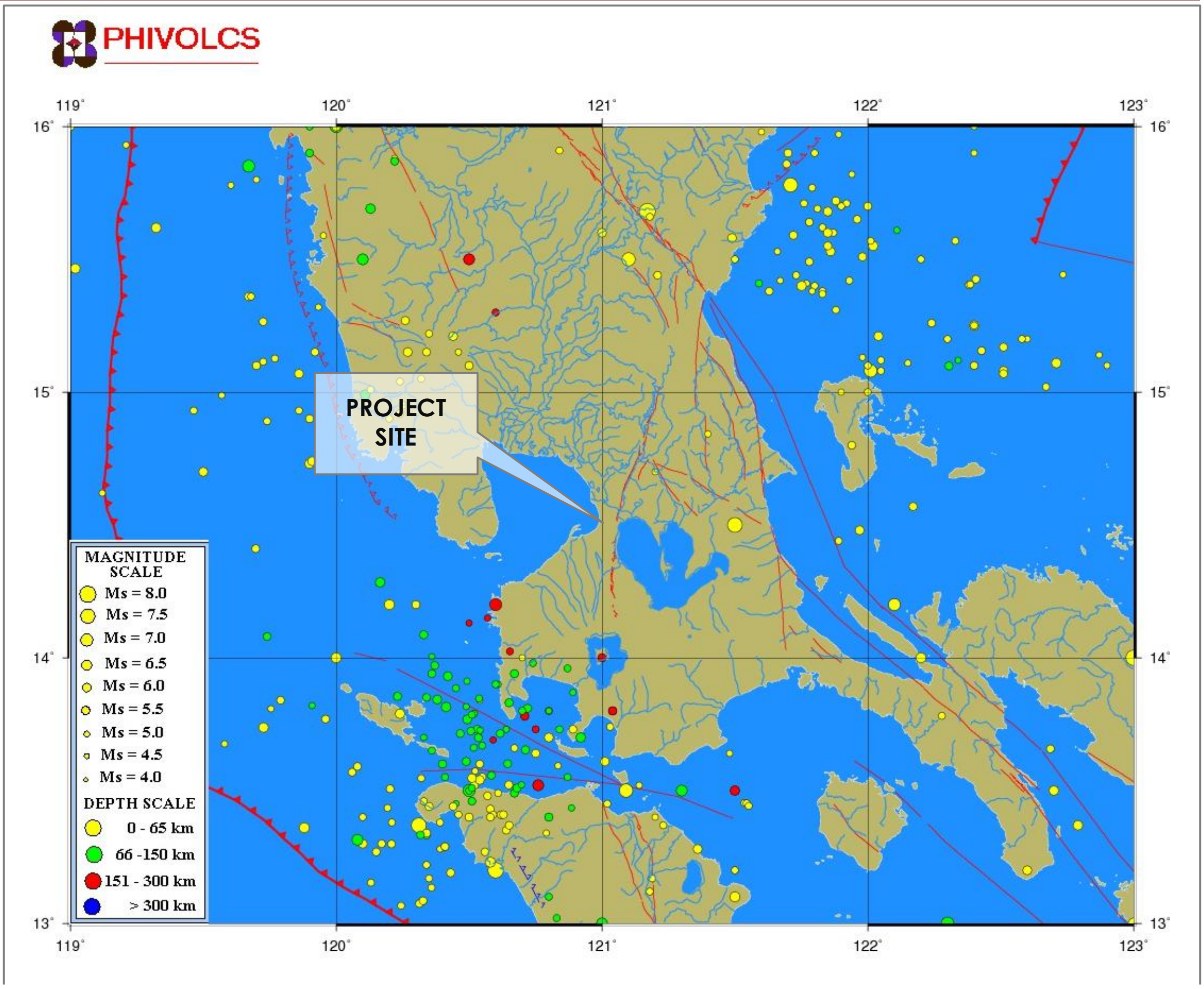
The MMEIRS provided a list of the destructive earthquakes that affected Metro Manila and vicinities. The Southeast Asia Association of Seismology and Earthquake Engineering (SEASEE) lists the historical earthquakes in the Philippines in its report entitled "Series on Seismology, Volume IV – Philippines". From this catalog, the 5 most destructive earthquakes that affected Metro Manila are extracted and shown in **Table 12**. The top three of the list are the 1863 (6.5 Ms; 298.3 PGA gal), 1880 (7.6 Ms, 139.8 PGA gal originating from PFZ: Infanta Segment) and, 1937 (7.5 Ms, 174.7 PGA gal, originating from Laguna-Banahaw Fault) earthquakes.

Table 12. Five Most Destructive Earthquakes that Affected Metro Manila (1608 – 1895)

Date	Generator	Ms	Distance (km)	PGA (gal)
August 19, 1658	West Valley Fault	5.7	12.5	202.6
February 1, 1771	East Valley Fault	5	14.1	113.2
June 3, 1863	Unknown (epicenter at Manila Bay)	6.5	13.1	298.3
July 18, 1880	PFZ: Infanta Segment	7.6	67.8	139.8
August 20, 1937	Laguna-Banahaw Fault	7.5	52.2	174.7

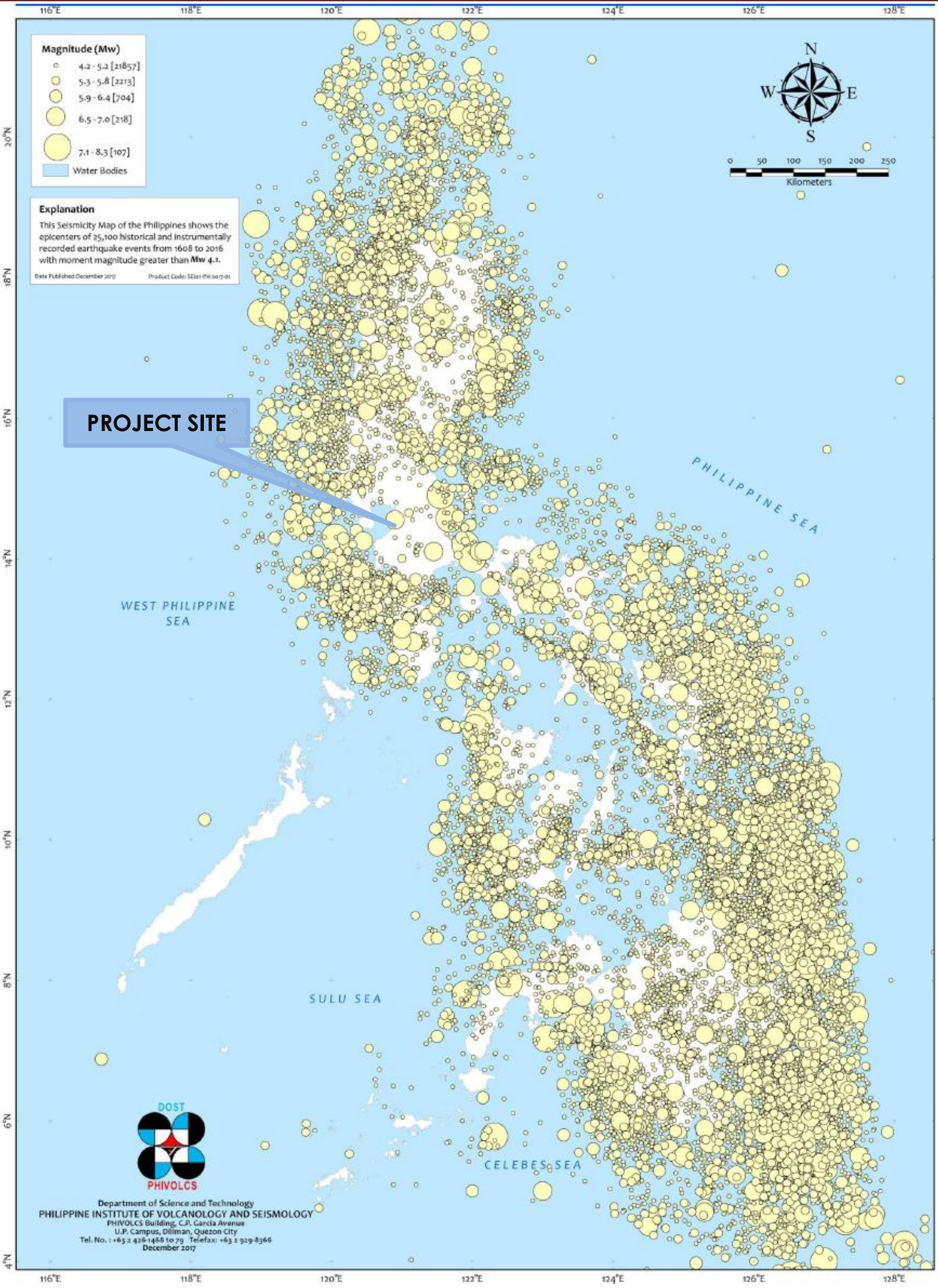
Source: MMEIRS Executive Summary Vol 2

Tables 11 and 12 provide reference information, it does not necessarily follow that the occurrence or not of an earthquake and the magnitude thereof will be necessarily related to recent episodes.



Source: PHIVOLCS, July 2019

Figure 25. Seismicity Map of Metro Manila, Magnitude 5.0 and above (1907-2016)



Source: PHIVOLCS, Dec 2017. The Philippine Earthquake Model

Figure 26. Seismicity Map of the Philippines from 1608 to 2016 with Moment Magnitude Greater Than Mw 4.1 (Historical and Instrumental)

Earthquake-induced Hazards

The attendant hazards attributable to earthquake events include ground rupture, ground shaking, liquefaction, landslide, and tsunami. Landslide hazard in the vicinity is nil as it has a flat to gently rolling topography. Reclaimed lands in general, are considered prone to liquefaction.

PHIVOLCS's Earthquake Hazard Assessment

The PHIVOLCS's hazard assessment specific to the Parañaque 286.86-ha Reclamation Project is presented below. It states that the site is: safe with regards to ground rupture; may be affected by strong ground shaking; susceptible to liquefaction; and prone to tsunami and is within the tsunami inundation zone. Furthermore, the nearest active fault to the project site is the WVF, which is approximately **9.4** km to the east.

Seismic Design Considerations *(by AMH Phils. Inc. 2018)*

The nearest seismic source is the West Valley Fault which is located approximately 9.4km east of the project site. This is classified as Type A Seismic Source Type with distance > 5km.

Table 13. Near Source Factors, Na and Nv (after NSCP)

Seismic Source Type	Closest distance to known seismic source				
	Na		Nv		
	≤5km	≥10km	≤5km	10km	≥15km
A	1.2	1.0 ✓	1.6	1.2 ✓	1.0
B	1.0	1.0	1.2	1.0	1.0
C	1.0	1.0	1.0	1.0	1.0

✓ *recommended factors*

Moreover, a zone factor of 0.4 is recommended, based on the recommendation of the National Structural Code of the Philippines (NSCP). As to the soil type, it will be prudent to consider a soil type SE (Soft soil profile) in the analysis considering the site subsoil conditions.

Lastly, a site specific seismic hazard assessment may be warranted during the Detailed Engineering Design (DED) stage to optimize the design of structures considering seismic loads.

DOST

PHIVOLCS

Republic of the Philippines
Department of Science and Technology
PHILIPPINE INSTITUTE OF VOLCANOLOGY AND SEISMOLOGY

TÜVRheinland CERTIFIED
Management System ISO 9001:2015
www.tuv.com ID 9108634644

HASS-EQ-04

HAS-Feb-19-198

DATE	18 February 2019
FOR	**TECHNOTRIX CONSULTANCY SERVICES, INC.**
REPRESENTED BY	**EDGARDO G. ALABASTRO**
PURPOSE	EIA requirement

EARTHQUAKE HAZARD ASSESSMENT

PROJECT NAME, LOCATION	GROUND RUPTURE	LIQUEFACTION	TSUNAMI	
Proposed Parañaque 286.86 Hectares Reclamation Project; Brgys. Baclaran, Tambo, Tambo Galo, La Huerta, San Dionisio, Sto. Niño, Moonwalk and Vitalez, Parañaque City	**Safe; Approximately 9.4 kilometers west of the West Valley Fault**	**Susceptible**	**Prone; within the tsunami inundation zone**	

EXPLANATION AND RECOMMENDATION

- ✓ All hazard assessments are based on the latest available hazard maps and on the location indicated in the vicinity map provided.
- ✓ Ground rupture hazard assessment is the distance to the nearest known active fault. The recommended buffer zone, or Zone of Avoidance, against ground rupture hazard is at least 5 meters on both sides of the active fault or from its zone of deformation.
- ✓ All sites may be affected by strong ground shaking.
- ✓ Ground shaking and liquefaction hazards can be mitigated by following the provisions of the National Building Code and the Structural Code of the Philippines.
- ✓ Tsunami threat to people's lives can be addressed by community preparedness and tsunami evacuation plan. Advice for tsunami evacuation comes from public agencies and local governments. But more importantly, coastal communities must learn to evacuate themselves when they recognize the three natural signs of tsunami, namely 1) strong ground shaking, 2) unusual rise or fall of sea level, and 3) strong or unusual sound coming from the sea.
- ✓ This hazard assessment supersedes previous assessment made by this office regarding the site.

Assessed by	Daniel Jose L. Buhay	Officer-of-the-Day
Verified by	Mabelline T. Cahulogan	Senior Science Research Specialist
Approved by	**RENATO U. SOLIDUM, JR.**	**Undersecretary for DRR and CC, DOST** *and* **Officer-in-Charge, PHIVOLCS**

V2-2017-05-19

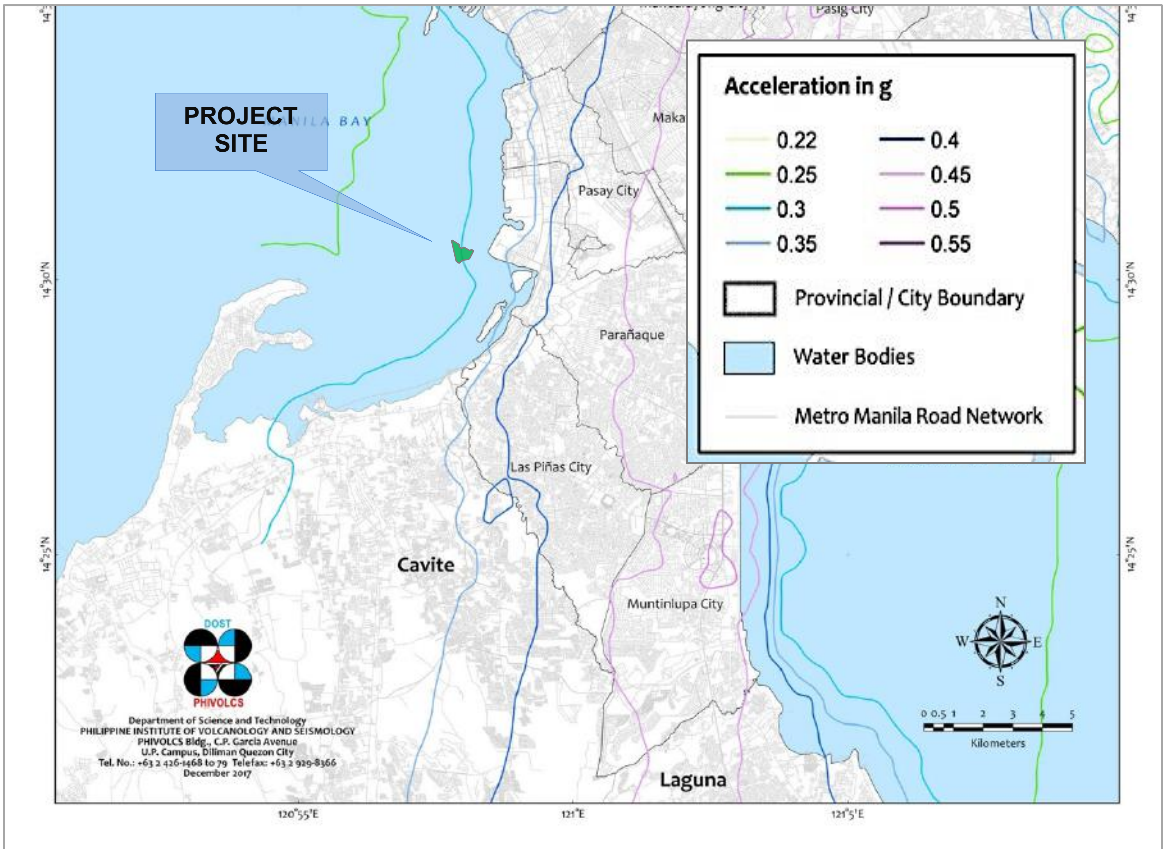
PHIVOLCS Building, C.P. Garcia Avenue, U.P. Campus, Diliman, Quezon City 1101 Philippines
Tel. Nos.: (+632) 426-1468 to 79; (+632) 926-2611 | *Fax Nos.* (+632) 929-8366; (+632) 928-3757
Website: www.phivolcs.dost.gov.ph

4.1.1 Ground Shaking/Acceleration

Most of the known damages incurred during earthquakes are caused by strong ground vibration. This results from the passage of seismic waves from the earthquake source to the ground surface. Ground shaking refers to the actual trembling or jerking motion produced by an earthquake. Seismic magnitude, epicenter distance to earthquake generators and the modifying effects of subsoil conditions mainly influence the intensity of ground vibration in an earthquake. Soil that is thicker, more unconsolidated and water saturated is more prone to ground shaking. It is usually stronger on areas that are filled or underlain by alluvium and colluvium, which may also be considered as soft soil. The proposed project site is underlain by water-saturated alluvium and the future reclamation area shall also be considered as soft soil. The project site may be affected by strong ground shaking.

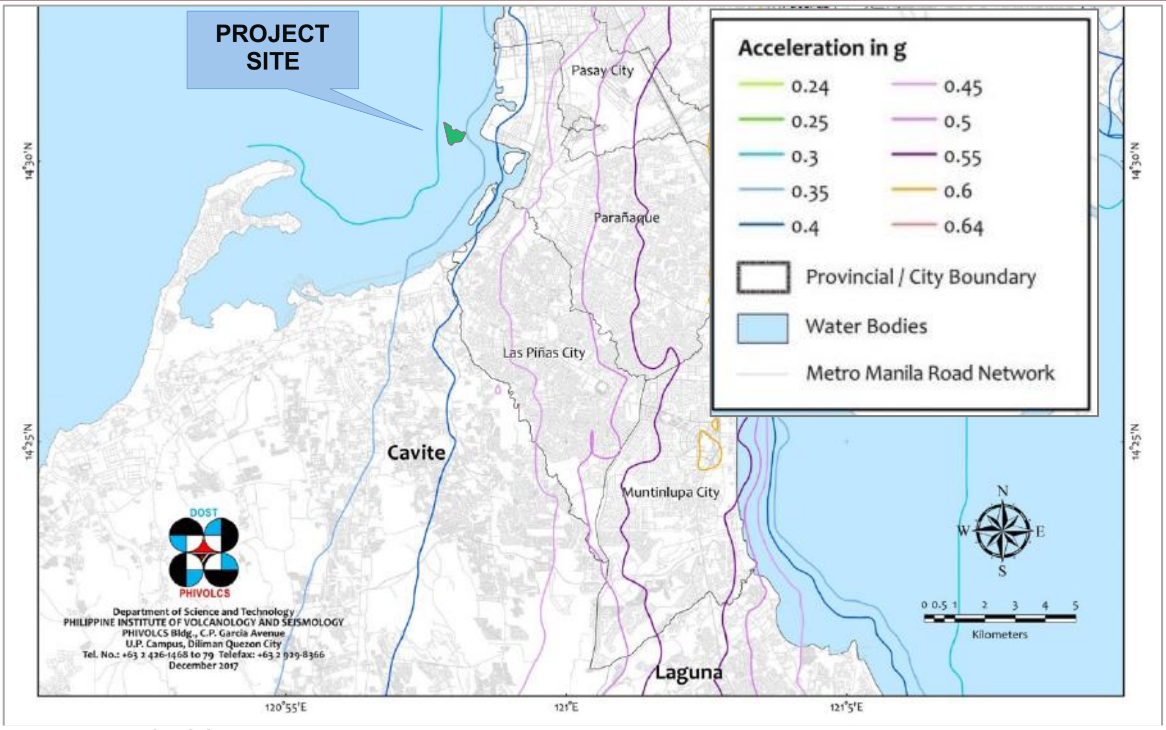
Factors that influence the intensity of ground shaking include the following: magnitude of the earthquake, distance of the site in relation to the earthquake generator, characteristics of the underlying rocks and the soundness of the buildings/structures.

The following PGA maps (**Figures 27 to 29**) from PHIVOLCS's Philippine Earthquake Model – A Probabilistic Seismic Hazard Assessment of the Philippines and of Metro Manila (2017) indicates the maximum site acceleration response from a most probable earthquake. These are based on VS_{30} (shear wave velocity on the upper 30 meters of soil layer) site model. Based on these maps, the ground acceleration for 500 year return period at the project site for Vs_{30} site model is: 0.3g; for 1,000 year return period is: 0.3-0.35g; and for 2,500 year return period is 0.35g.



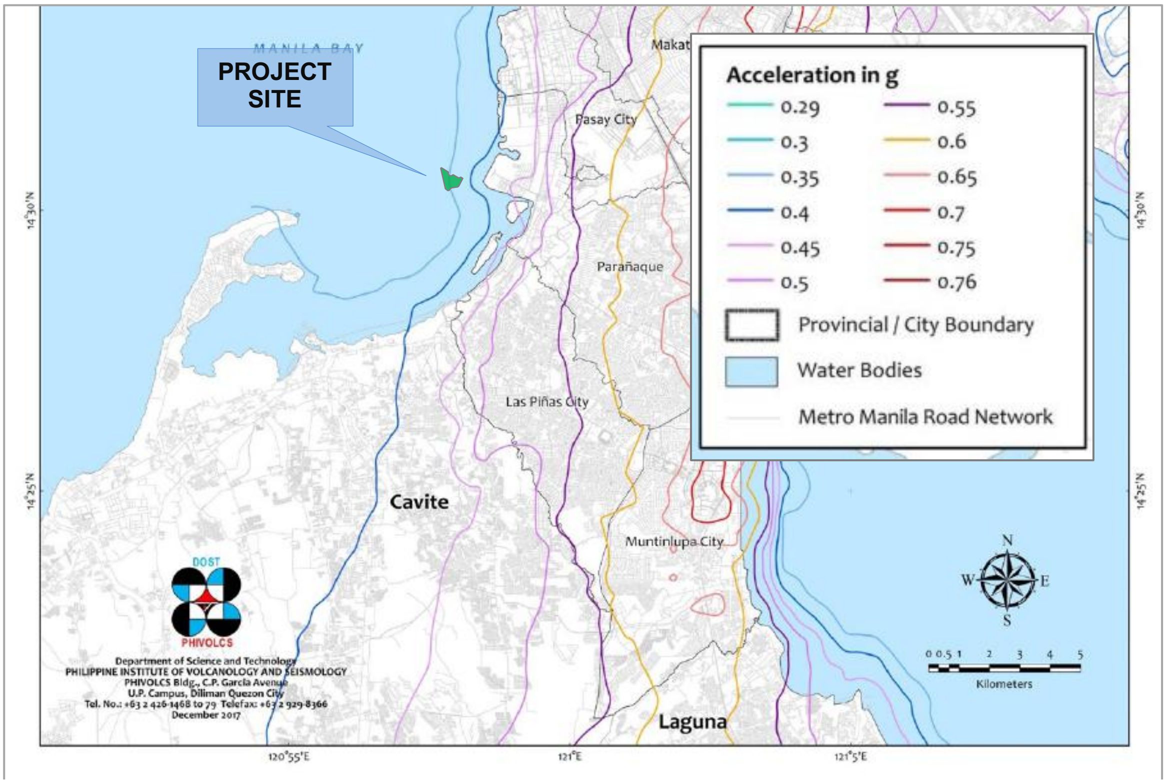
Source: PHIVOLCS 2017. The Philippine Earthquake Model

Figure 27. Peak Ground Acceleration Map of Metro Manila, 500-Year Return Period on VS_{30} Site Model with 10% Probability of Exceedance in 50 Years



Source: PHIVOLCS 2017. The Philippine Earthquake Model

Figure 28. Peak Ground Acceleration Map of Manila, 1,000-Year Return Period on VS_{30} Site Model with 10% Probability of Exceedance in 50 Years

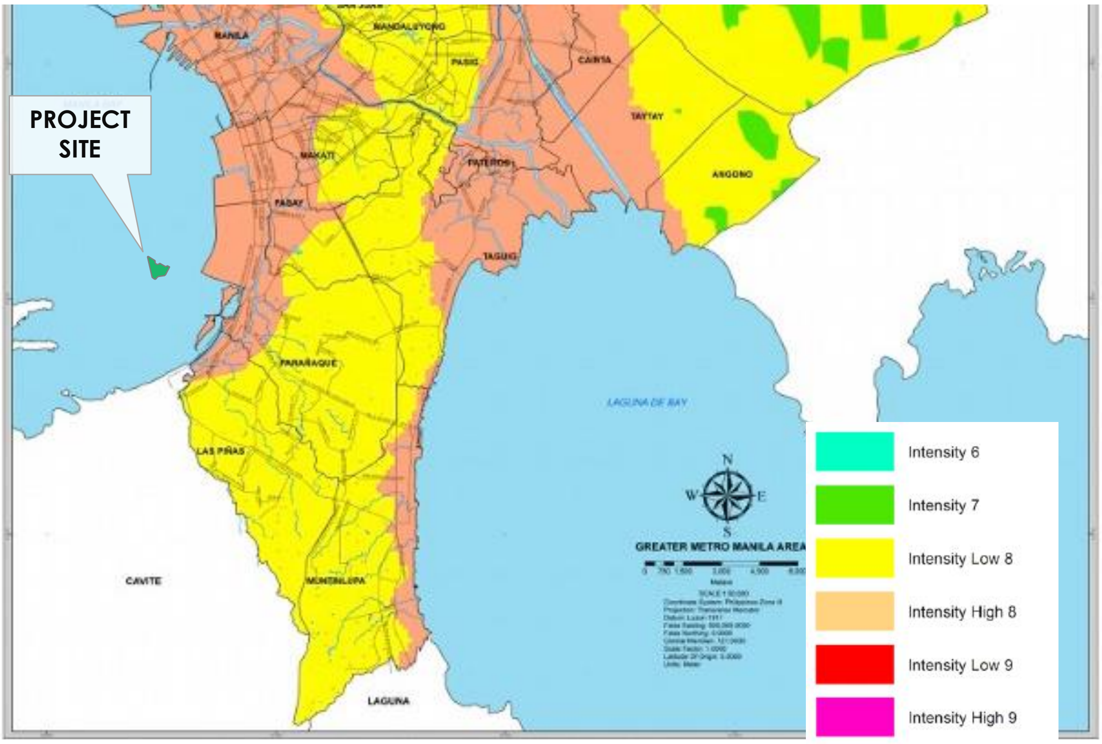


Source: PHIVOLCS 2017. The Philippine Earthquake Model

Figure 29. Peak Ground Acceleration Map of the Philippines, 2,500-Year Return Period on Rock Site with 10% Probability of Exceedance in 50 Years

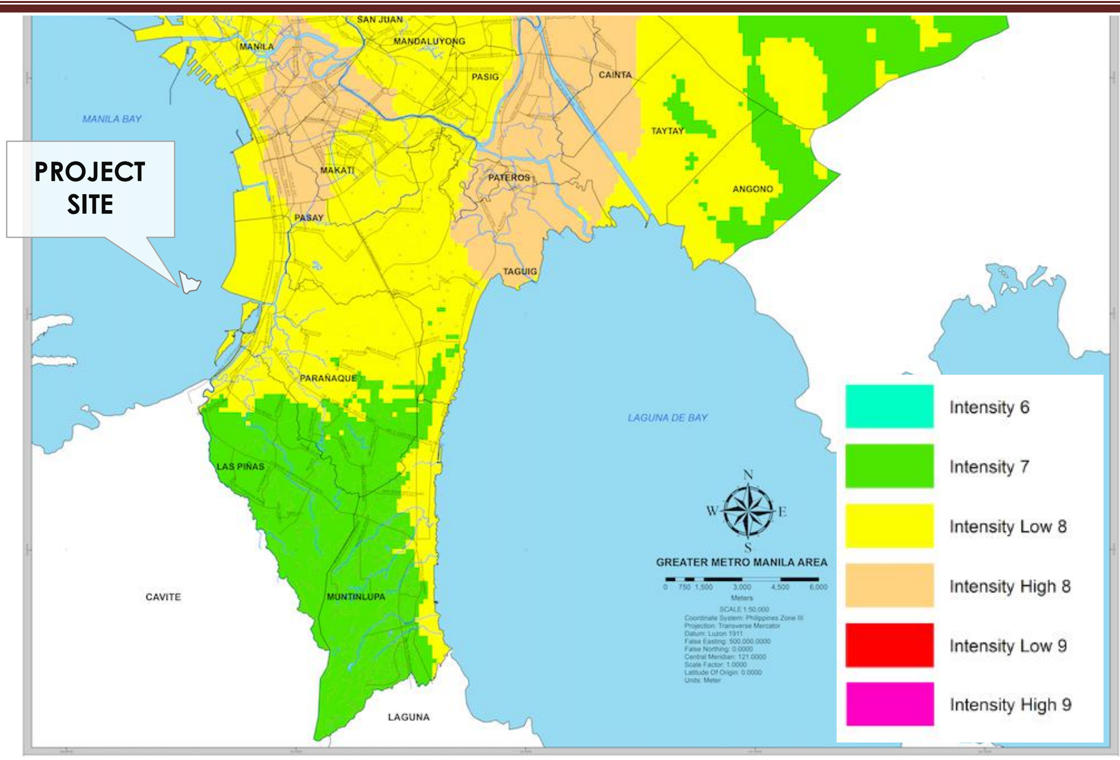
The nearest active fault to the project site is the West Valley Fault found about 9.4km to the east. The paleoseismological studies on this structure by Nelson et al (2000) concluded that the chance of an earthquake larger than *M7* on the two faults of the Valley Fault System is seemingly small. However, in the MMEIRS, a M7.2 earthquake is the estimated largest credible earthquake that can be generated by a movement of the Valley Fault System, based on available geological and seismological data. Earthquakes cannot be predicted. What may be estimated is the return period of this earthquake which is at about 200 -400 years and that no large earthquake has happened in the West Valley Fault since the 1700s. The last significant event was in 1658, almost 360 years ago.

The Ground Shaking Hazard Map released through the Risk Analysis Project in October 2013 shows that the coastal lowlands of Metro Manila underlain by alluvial deposits, including the project site vicinity, is within the Intensity High 8 zone for a M7.2 scenario earthquake (**Figure 30**). On the other hand, for a M6.5 earthquake, the project site is within Intensity Low 8 zone (**Figure 31**).



Source: PHIVOLCS, et.al. Risk Analysis Project. October 2013

Figure 30. Ground Shaking Hazard Map of GMMA, Scenario M: 7.2 along the WVF



Source: PHIVOLCS, et.al. Risk Analysis Project. October 2013

Figure 31. Ground Shaking Hazard Map of GMMA, Scenario M: 6.5 along the WVF

For probabilistic ground acceleration estimates, values derived in a study by Thenhaus, et al. (1994) suffice for preliminary estimates. However, site-specific probabilistic determinations may be performed for projects of major importance such as large dams and bridges, elevated highways, seaports, reclamation and the like.

Estimation of PGA factors using the deterministic method of Tanaka and Fukushima with the following attenuation relation:

$$\mathbf{Log_{10}A = 0.41M - log_{10}(R + 0.032 \times 10^{0.41M}) - 0.0034R + 1.30}$$

Where: A= mean of the peak acceleration from two horizontal components at each site (cm/sec^2)
R= shortest distance between site and fault rupture (km)
M= surface-wave magnitude

Considering an earthquake magnitude of *7.2* and distance of the site of 9.4km to the WVF, the nearest active fault, the following peak ground acceleration (PGA) values of **0.267g**, **0.445g**, and **0.623g** for bedrock, medium soil and soft soil, respectively were computed as shown in the table below. The project site being reclaimed land will fall under the soft soil condition and hence, the recommended 'g' value to be used in seismic load evaluation and building design is **0.623g**.

The table below shows different values of PGA based on assumptions made. The appropriate choice will, be based on several other considerations, including the Codes/Standards of the National Structural Code of the Philippines and the expertise/experiences of the particular design/engineering expert of firm.

Table 14. Computed PGA Values for Different Earthquake Generators

Earthquake Generator	Magnitude	Distance	Calculated PGA (g) Values		
			Bedrock	Medium Soil	Soft Soil
West Valley Fault	7.2	9.4	**0.267**	**0.445**	**0.623**
Manila Trench	7.9	200	0.017	0.029	0.040
PFZ: Infanta Segment	8	75	0.095	0.159	0.222
East Valley Fault	7	28	0.141	0.234	0.328
Lubang Fault	8	97	0.069	0.115	0.161

This is a natural hazard that can occur with or without the project. It can bring damage to the project but the project will not bring aggravating effects on ground acceleration. Ground acceleration caused by earthquakes if not properly addressed in engineering and design may potentially result to great damage and destruction to property and infrastructure and maybe accompanied by loss of life in the reclaimed land itself and vicinities.

There were no major structures identified in the surveyed area. Still, the area and its vicinities is prone to strong ground acceleration due to the WVF.

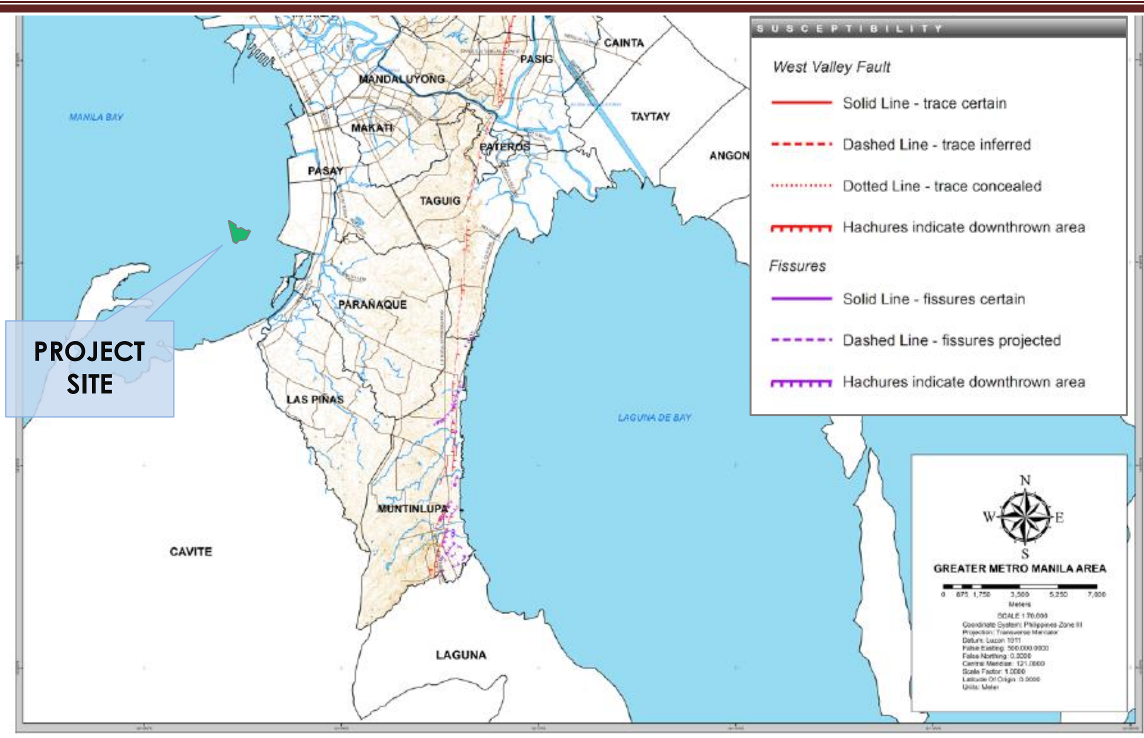
Ground acceleration caused by earthquakes if not properly addressed in engineering and design may potentially result to great damage and destruction to property and infrastructure and maybe accompanied by loss of life.

The buildings, infrastructure, wave deflectors, containment wall and other defense structures that would be constructed on the proposed reclamation site should conform to the National Structural Code of the Philippines. These structures must be able to withstand an earthquake with a magnitude of at least 7.2. The computed “g” values of **0.623g** must be utilized in the design of the structures.

This PGA value should also serve as guide in the degree of soil remediation/compaction.

4.1.2 Ground Rupture

Ground rupture occurs when a new rupture is created or when renewed movement of old fractures takes place (Punongbayan, 1994). PHIVOLCS is recommending a buffer zone at least 5m on both sides of a fault trace or from the edge of deformation zone. This hazard is seemingly absent in the project area since the nearest active fault, the West Valley Fault, is about 9.4 kilometers to the east.



Source: READY for GMMA Project

Figure 32. Preliminary Ground Rupture Hazard Map of Metro Manila

4.1.3 Differential Settlement

Settlement refers to the distortion or disruption of parts of a structure or building due to either; unequal compression of its foundations, shrinkage or by undue loads being applied to the structures/buildings. Differential settlement is the unequal settling of materials; gradual uneven downward movement of foundation due to compression of soil during loading or ground shaking due to earthquake event.

Areas susceptible to liquefaction (discussed below) are likewise susceptible to differential settlement. The proposed reclamation project will undergo backfilling and is considered to be highly susceptible to this hazard. Furthermore, it has been established that the coastal lowlands of Manila, underlain by unconsolidated settlements, is highly susceptible to settlement and subsidence due to both natural (geology and tectonic setting) and anthropogenic (groundwater extraction) causes. The cumulative effects can be very damaging to the project if not properly addressed in the engineering design.

4.1.4 Liquefaction

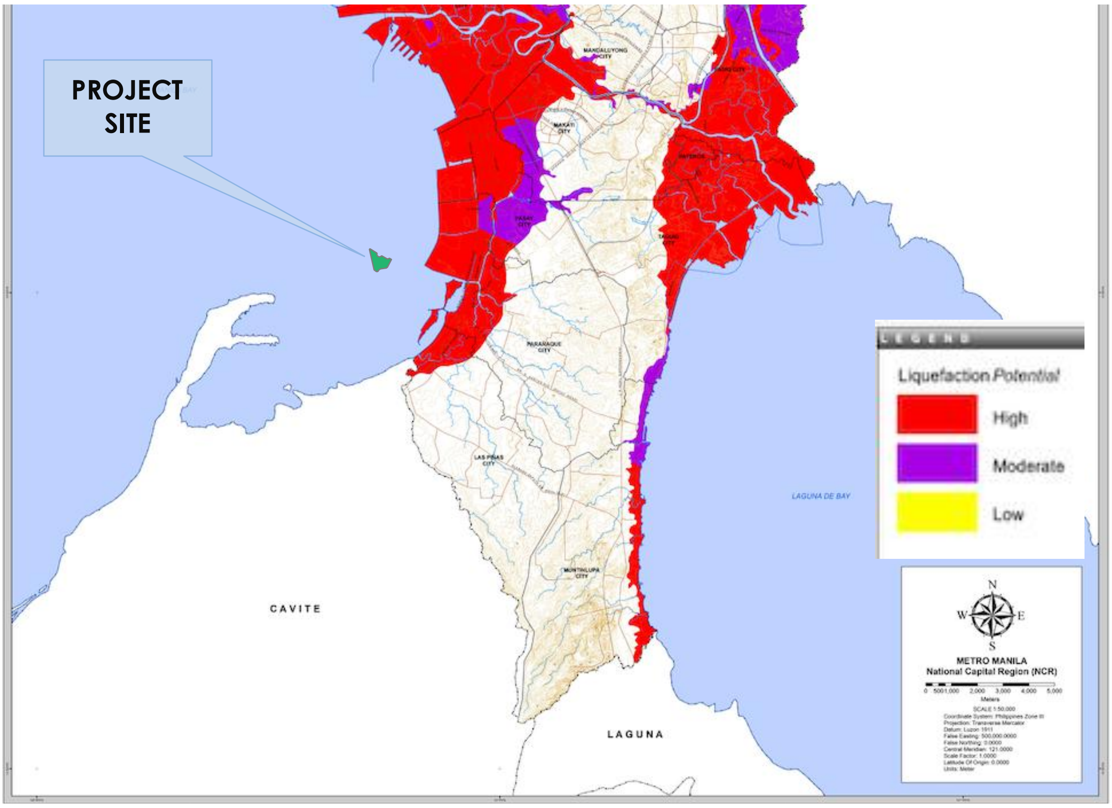
Liquefaction is the process that transforms the behavior of cohesionless water-saturated unconsolidated sediments from a solid to a liquid state usually caused by seismic stresses (Torres et al, 1994) that create ground shaking. Water saturated soils loose strength and liquefy and thus the material tends to flow causing buildings to sink and rotate or lean into the soil (Keller, 1985).

Saturated sandy soil may suddenly change into a liquid-like muddy water when subjected to earthquake shaking. Liquefaction is a phenomenon in which a granular material changes to a liquid state, whether the material is saturated with water or not. When sandy soil deforms due to shear stress caused by vibration during an earthquake, contact between the particles is lost, so that the shear resistance of the soil is lost. Then, the force originally supported in a vertical direction through the contact points is then transmitted through the pore water. The soil will stabilize again when the pore water flows out, but settling (volume decrease) will have occurred. (K. Zen., et.al., 2007. Handbook on Liquefaction Remediation on Reclaimed Land. Edited by: Port & Harbor Research Inst.)

Reyes et al, of UP-Engineering Research and Development Foundation, Inc., in their soil study of areas that liquefy during the 16th July 1990 Luzon earthquake came out with the following soil conditions for the potential liquefiable layers:

- loose soil classification;
- upper layers of the surveyed areas;
- water table near the ground surface;
- N-value of less than 30 using the AASHTO method and less than 35 using the Japan Society of Civil Engineers (JSCE) method; and
- 50% passing (D50) of approximately 0.001-1.8mm.

The vicinity of the proposed project located along the shoreline of the Manila Bay is generally considered susceptible to liquefaction. It falls on the delineated areas of high liquefaction potential (red) (**Figure 33**). Based on the figure below, the areas prone to liquefaction are those underlain by alluvial deposits along the western coastal lowlands (beach deposits and Pasig River deltaic deposits) and the eastern lowlands (Marikina River deltaic deposits and Laguna Bay lacustrine deposits).



Source: READY for GMMA Project, Dec 2014

Figure 33. Liquefaction Hazard Map of Metro Manila

Liquefaction Analysis *(by AMP Philippines, Inc. 2018)*

Soil liquefaction is a phenomenon that occurs mostly in medium to fine-grained sands wherein a mass of soil loses a large percentage of its shear resistance when subjected to monotonic, cyclic or shock loading, and flows in a manner resembling a liquid. Much of the damage on substructures and foundation during earthquake is attributed to this phenomenon.

Liquefaction analysis considering SPT data was undertaken using LiquefyPro software for the ten (10) boreholes within the vicinity of the project site. This is based on the most recent methods recommended by the National Center for Earthquake Engineering Research (NCEER).

The Factor of Safety (FS) for liquefaction potential is calculated as the ratio of the Cyclic Resistance Ratio (CRR) to the Cyclic Stress Ratio (CSR).

$$FS = CRRM / CSRfs$$

From the results of the initial analysis, the upper 10-20m are susceptible to liquefaction considering the thick layers of loose sands. These liquefiable layers may induce settlements ranging from 12mm to 13mm as summarized in the table below.

Table 15. Summary of Liquefaction-induced Settlement

Zone No.	Boreholes included	Liquefiable Layers, m	Average Liquefaction-induced Settlement, cm
1	BH-16, BH-18, BH-22, BH-27	13.5 - 20.0	12.86
2	BH-19, BH-23, BH-28	0.0 - 4.5	12.32
3	BH-20, BH-24, BH-30	6.0 - 10.5; 13.5 - 20.0	13.12

4.1.5 Tsunami

Tsunami, sometimes incorrectly referred to as tidal wave, is a series of huge sea waves brought about by massive underwater disturbances that may be caused by under-the-sea earthquakes, submarine eruptions and undersea landslides (Punongbayan, 1994). Tsunami is considered the most dangerous coastal hazard. It can exceed 25 meters in height. It can occur when the earthquake is shallow-seated and strong enough to displace parts of the seabed and disturb the mass of water over it (PHIVOLCS). The magnitude of earthquake that can cause tsunami usually exceeds 7.0 and earthquakes that had caused tsunami occurred in the shallow parts of the crust and were usually offshore in the deep parts of the ocean (Punongbayan, 1994).

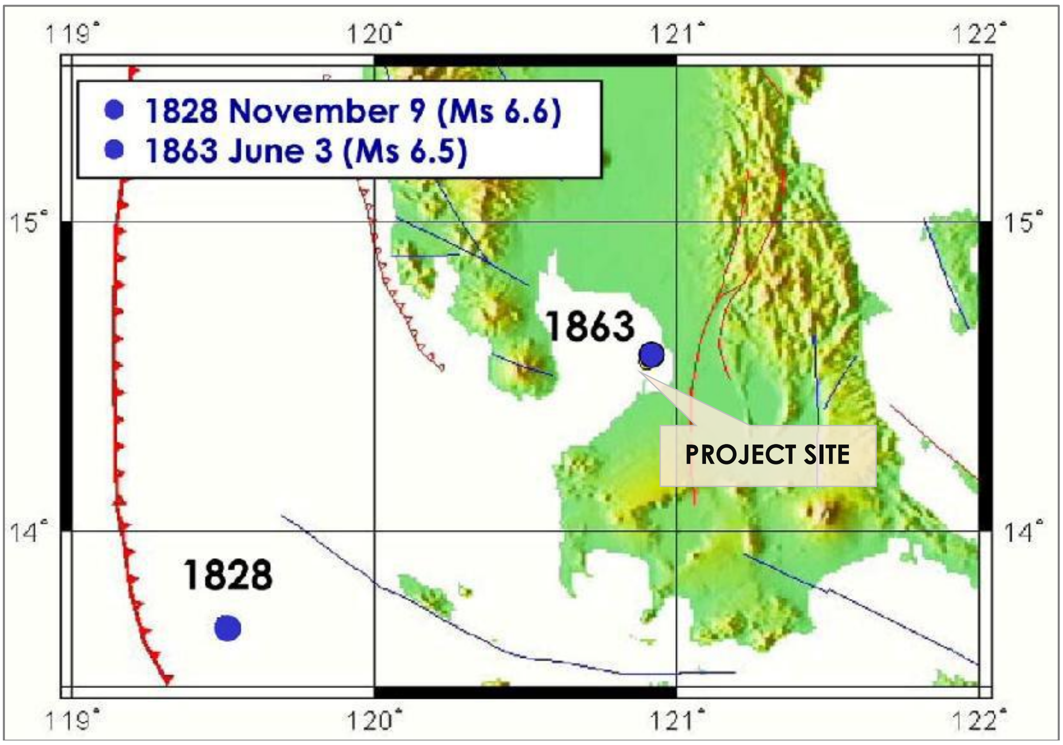
The project site, being located along the coast of Manila Bay, is susceptible to this hazard due to the presence of an active subduction zone – Manila Trench located 200km west of the area and other active faults and or earthquake generators. Another earthquake generator in the region that can generate tsunami that could affect Manila Bay's shoreline is the Lubang Fault.

Manila Bay is at lower risk compared to Pacific coastal areas in the Philippines, but due to population density, a tsunami would be devastating. In a presentation on Tsunami Disaster Management in the Philippines held in Tokyo, Japan in 2016, R.U. Solidum stated that ~90 destructive earthquakes occurred for the past 400 years with ~ 40 tsunamis for the past 400 years – an average of 1 in 10 years. Coastal areas at eastern and western margins fronting major seas and inland seas have been affected by tsunamis.

Overtopping could potentially result in a scenario of high tsunami heights. Manila Bay was affected by storm waves riding atop storm surge. The gentle seabed slopes of the bay mean higher waves can affect the shore.

Historically, there are two earthquakes (1828 and 1863) that are confirmed to have caused tsunamis to occur (figure below). For the November 9, 1828 (Ms 6.6) the estimated tsunami height at the port of Manila is about 1 meter. On the other hand, the tsunami height in the shores of Manila generated during the June 3, 1863 (Ms 6.5) earthquake is estimated to be

1-2 meters. It is one of the most damaging earthquakes that affected Manila, its suburbs and neighboring provinces. (MLP Bautista, et al., 2012). The figure below shows the epicenters of these 2 earthquake events. The 1828 event shows the epicenter near Manila Trench while the 1863 earthquake is in Manila Bay near the mouth of Pasig River.



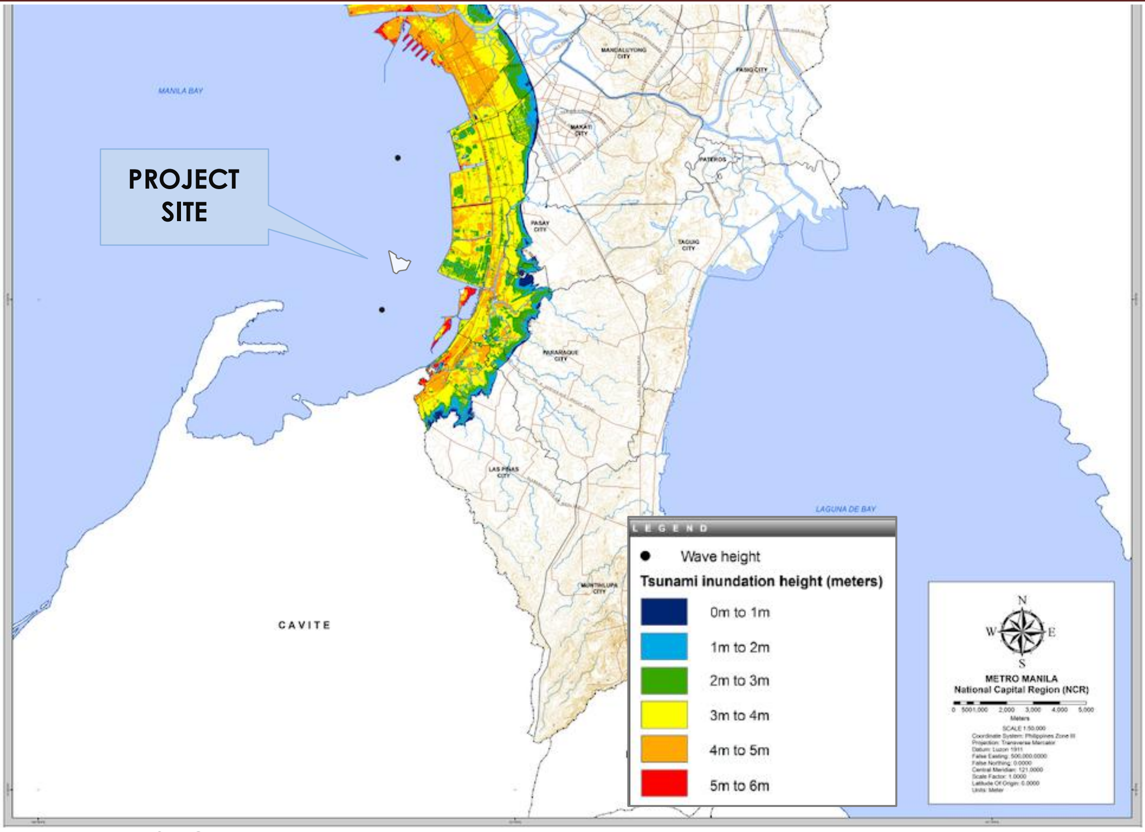
Source: PHIVOLCS. 2012

Figure 34. Tsunamigenic Earthquakes that affected Metro Manila shores

READY's map of tsunami prone areas of Metro Manila (**Figure 35**) shows that the project site, which is located near the shoreline of Manila Bay, is within the tsunami inundation area. The existing reclamation areas in Parañaque shall have inundation heights from 2-3m (green) to 4-5m (orange). The nearby Las Piñas-Parañaque Wetland Park will experience deeper flooding from 3-4m to 5-6m. No wave height is indicated on the map.

According to Renato Solidum, director of PHIVOLCS "Metro Manila and its vicinity will be isolated should the Manila Trench move and cause a tsunamis as high as 5.5 m".

The location of the reclaimed land will be such that it will be the nearest to the waterfront relative to land-based sites. This makes it the most vulnerable to tsunami, storm surge and flooding. At worst case, the project will not increase the effects on land-based structures and facilities as well as on population. In fact, the proposed reclamation project has the potential of sheltering on shore population and structures/properties from tsunamis, storm surges or storm waves.



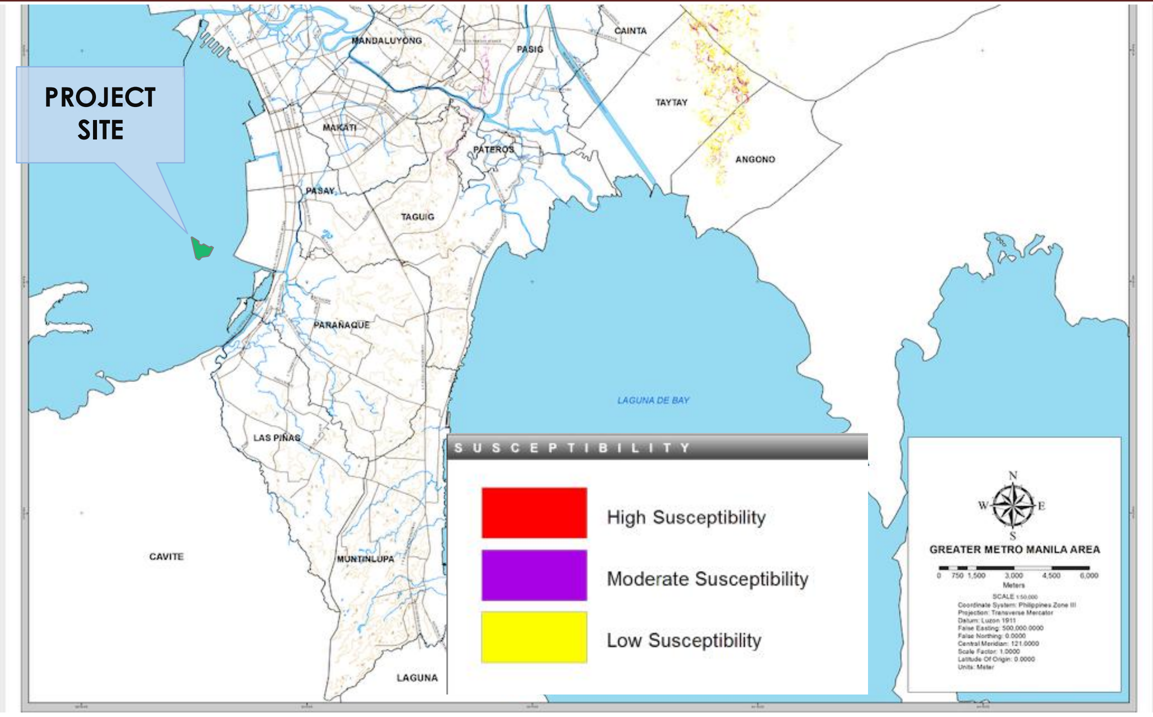
Source: READY for GMMA Project. 2014.

Figure 35. Tsunami Hazard Map of Metro Manila

4.1.6 Landslide

The project site is not susceptible to earthquake-triggered landslides. Due to the generally flat topography in Metro Manila, the earthquake-induced landslide risk is relatively low for the most part. Landslides can also be induced by heavy rains, which add weight and lubricate the soils. They can also be induced by ground shaking from an earthquake. Risk may be increased if an earthquake occurred in the wet season. See **Figure 36** for earthquake-induced landslide susceptibility map.

That said, there is still a remote possibility of collapse of the fill materials in the reclamation area due to engineering/structural failures.



Source: READY for GMMA Project, October 2013

Figure 36. Earthquake Induced Landslide Map of Metro Manila

4.2 Mass Movement

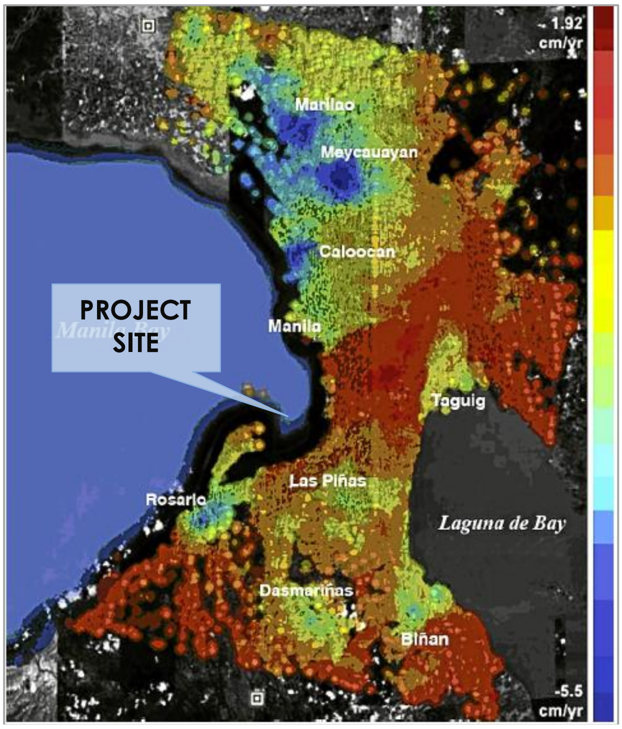
4.2.1 Settlement/Subsidence

Metro Manila's coastal areas are sinking as fast as 9 cm/y (Rodolfo et al. 2003, Siringan and Rodolfo 2003, Rodolfo and Siringan 2006). Accelerating subsidence of the coastal lands bordering the bay is worsening both floods and high-tide invasions. Aggravating factors likewise exist in the area. Siringan and Rodolfo (2003) and Rodolfo and Siringan (2006) have established that accelerated sediment compaction and ground subsidence occur in areas on the north of Manila Bay due to excessive groundwater withdrawal. Before 1991, the area subsides at a rate of 0.16-0.56 cm/yr, 0.36 cm/yr on the average. This natural compaction accounts for 2 to 8 percent of the estimated 2 to 8 cm/yr typical subsidence rates from 1991 – 2001 (Rodolfo and Siringan, 2006). This implies that enhanced dewatering of the upper 30 m of the sediment column can potentially account for almost 98% of the subsidence rates during the past decade. (Soria, et.al., 2005)

Considered as critical areas for subsidence susceptibility in Metro Manila are: 1) Guiguinto 2) Bocaue-Marilao 3) Meycauayan-North Caloocan 4) Navotas-Caloocan-West Quezon City 5) Makati-Mandaluyong-Pasig-Pateros 6) Parañaque-Pasay 7) Las Piñas-Muntinlupa and 8) Dasmariñas, Cavite (NWRB (2004). Hence, according to this ranking, the project site in Parañaque is number 6 most susceptible.

"The Volcano-Tectonics Laboratory at U.P Diliman's National Institute of Geological Sciences (Lagmay 2011, Eco et al. 2013) has analyzed Persistent Scatterer Interferometric Synthetic Aperture Radar data from satellites to verify subsidence over wide areas of Metro Manila, with the proposed reclamation areas experiencing up to 6 cm/y." (Rodolfo. K.S., 2014)

The satellite image of Metro Manila shows movement of the ground. (See figure below.) **Blue** areas correspond to sinking ground with the highest rates of subsidence at 5.5 cm per year. The image was processed by Narod Eco of the DOST project team. Subsidence will aggravate flooding from heavy rainfall and constitute a coastal-dike breach hazard in areas near Manila Bay. (Lagmay, 2011). From the map, it can be seen that subsidence rate within the Parañaque area is from 3 to 3.5 cm/yr. The proposed land reclamation is located at a distance from the critical spots (blue) and therefore, subsidence is expected to be limited.



Source: http://opinion.inquirer.net/12757/large-areas-of-metro-manila-sinking (Lagmay, 2011)

Figure 37. Satellite Image of Metro Manila and Vicinities Showing Ground Movement

According to the report "Sinking Cities, An integrated approach towards solutions" by Deltares - Taskforce Subsidence (October 2013), the mean cumulative subsidence 1900-2013 is 1,500mm, mean current subsidence rate is up to 4.5 cm/yr, maximum is 4.5 cm/yr, estimated additional mean cumulative subsidence until 2025 is 40cm.

Based on the function of the reclamation, a maximum residual and long-term settlement of around 0.15-0.25 m is considered acceptable from handover to the end of the design life. Total calculated settlement shall include settlements developing in the natural subsoil as well as the settlements that develop in the reclamation fill. The project will be developed in different phases, thus a phase specific consolidation scheme can be developed.

A settlement criteria shall be calculated and will include settlements that will develop in the natural subsoil and those that will develop in the reclamation fill from project handover to the end of project life.

Several land remediation methods are available and will be selected in accordance with international standards and suitability to the reclaimed land in terms of type of fill materials and existing ground conditions.

Settlement Analysis *(by AMP Philippines, Inc. 2018)*

The settlement analysis was carried out with the aid of Settle 3D software. Settle 3D is a 3-dimensional program for the analysis of vertical consolidation and settlement under foundations, embankments, and surface loadings.

The subsurface conditions were idealized and the most critical condition, i.e. thickest soft soil layer, was modelled in the analysis. The parameters used in the analysis based on the results of the soil investigation as well as established correlations for settlement parameters are presented in **Table 16**.

Table 16. Geotechnical Parameters for Settlement Analysis

Depth, m (from seabed)	Soil Type	Consistency	γ (kN/m3)	Cc*	Cr*	e0	Cv*
0 – 10.5	Silt	Very Soft	14	0.486	0.0486	0.9	0.0015
10.5 – 30	Clay	Very Stiff	20	-	-	-	-

*Values were correlated from Bowles (1996)

In the analysis, the fill needed to achieve final elevation of +4m was considered as surface loading on top of the existing soil layers. The corresponding surface load for each fill height is summarized in the following table and **Figures 38-41**.

Table 17. Equivalent Surface Load for each Reclamation Fill Height

Thickness of Fill (Seabed to Elev. +4m), m	Surface Load, kPa
4	72
7	126
12	216
18	324

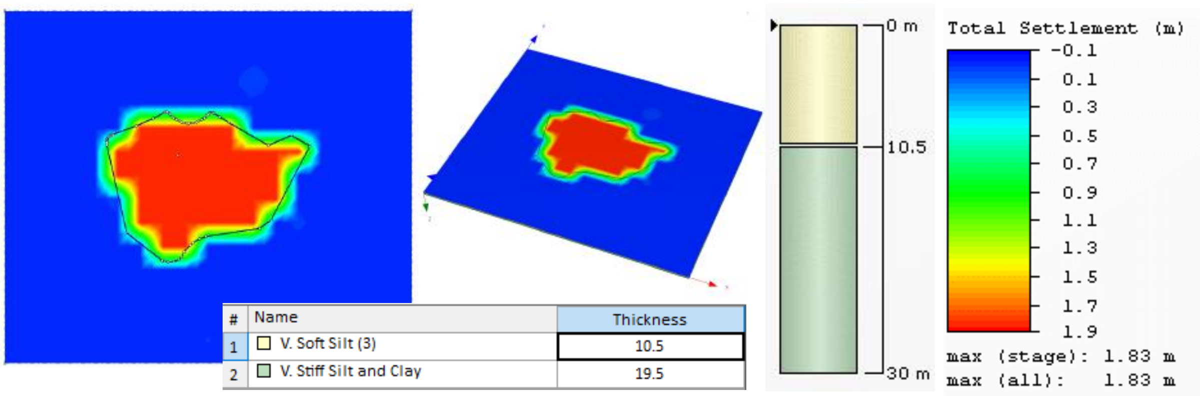


Figure 38. Results for 4m fill height

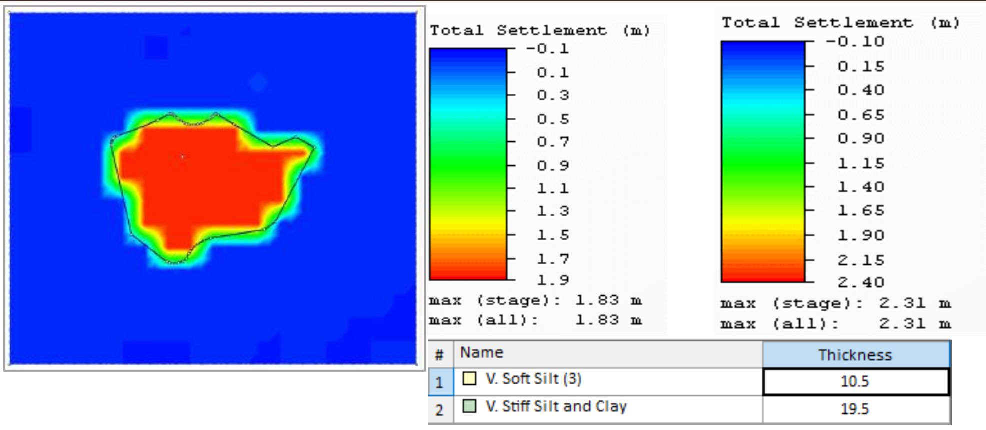


Figure 39. Results for 7m fill height

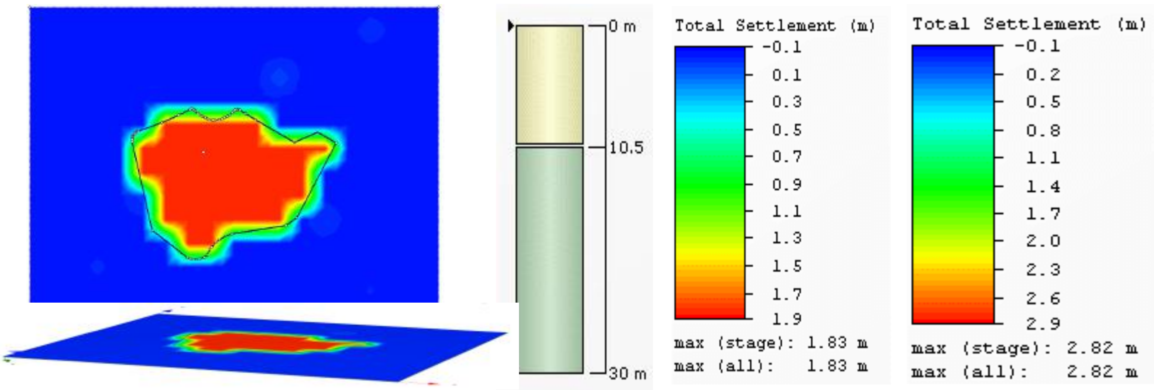


Figure 40. Results for 12m fill height

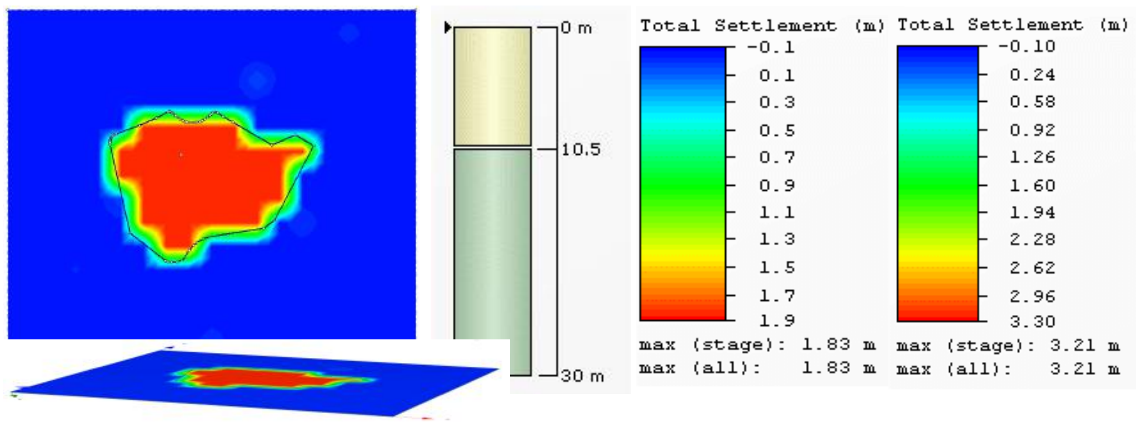


Figure 41. Results for 18m fill height

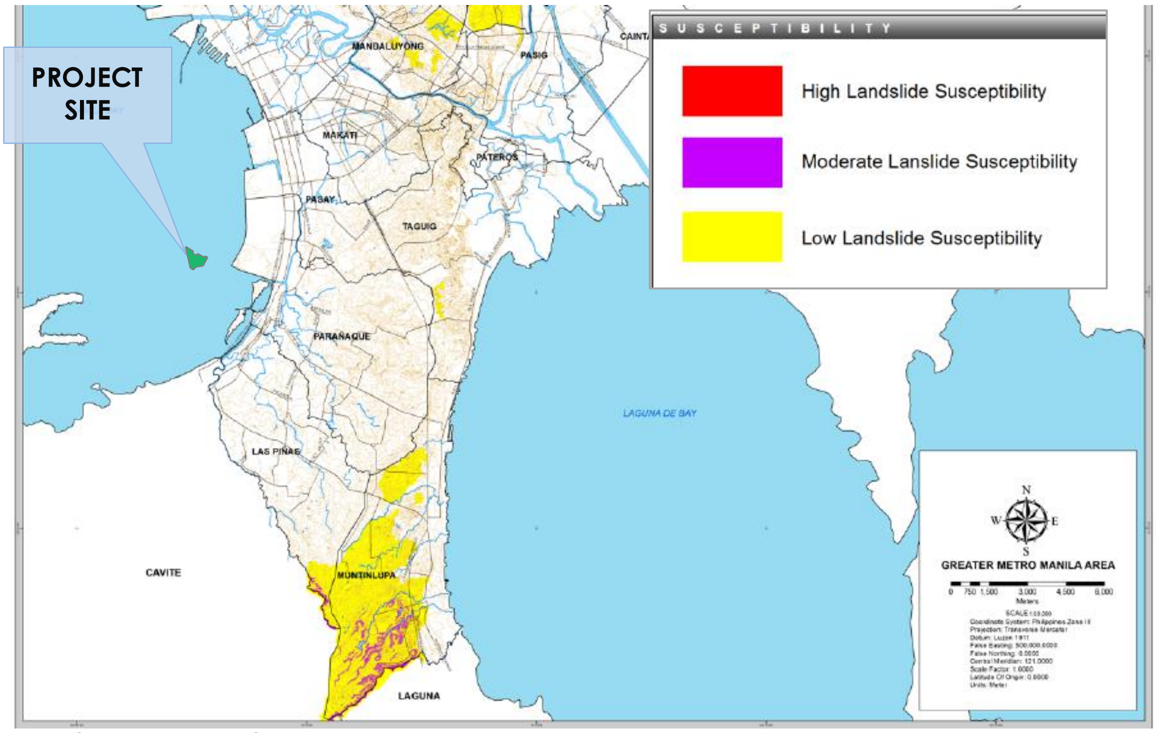
The results of the settlement analysis are presented in the table below. Since the underlying soil layers are mostly silts and clays of varying plasticity, settlements are found to be long-term. The estimated total settlement ranges from 1830mm – 3210mm for a fill height of 4m-18m. Additional fill to account for the settlement of the underlying material shall be considered during construction. Pre-loading with prefabricated vertical drains (PVD) are also recommended to accelerate the consolidation / long-term settlement.

Table 18. Results of Settlement Analysis

Depth of Fill Required for Elev. +4m, m	Immediate Settlement, mm	Consolidation Settlement, mm	Total Settlement, mm	Time to 95% Consolidation, months
4.0	-	1830	1830	64
7.0	-	2310	2310	60
12.0	-	2820	2820	57
18.0	-	3210	3210	54

4.2.2 Landslide

Landslides can be induced by heavy rains, which add weight and lubricate the soils. The project site, which sits on a flat terrain, is not susceptible to rain-induced landslides. See **Figure 42** below. Discussion on earthquake-induced landslides is presented under seismic hazards above.



Source: GMMA READY, Oct 2013.

Figure 42. Rain-Induced Landslide Hazard Map of Metro Manila

The project site is not naturally susceptible to landslides. Nevertheless, there is possibility of collapse of reclamation backfill and its retaining walls if not constructed properly. Below is an engineering analysis for the stability of these walls.

<u>**Stability Analysis of Confinement Walls**</u> *(by AMH Phil, Inc., 2018)*

Two methods were considered as possible confinement measures for the reclamation area: 1) Sand Bag and Rock Dike and 2) Anchored sheet pile wall. In order to establish the stability and adequacy of each method, stability analysis by Limit-Equilibrium Method (LEM) for the

Dike System and Finite Element Analysis (FEM) for the Anchored Sheet Pile Wall is performed.

Sand Bag and Rock Dike (containment structure) - Limit Equilibrium Methods

Typical causes of slope failures are erosion, rainfall, earthquakes, geologic features, and specifically for the project, the induced loads. The analysis of slope stability is done by Limit-Equilibrium Methods. The mass is divided into small slices along an assumed or known failure surface as shown in the figure below. Forces that are acting on each slice such as weight, normal and tangential reactions, and shear forces are determined and by equilibrium conditions, the moment of the driving forces about the center of the failure surface should be equal to the moment of the resisting forces.

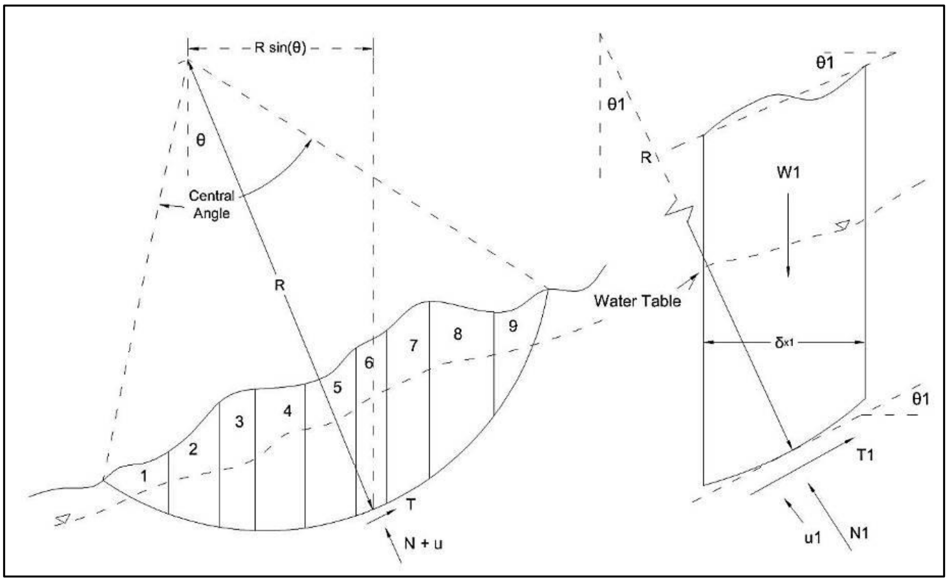


Figure 43. Stability Analysis by Limit-Equilibrium Methods

The Factor of Safety (FS) is expressed as the ratio of resisting forces to the driving or overturning forces.

$$\mathrm{FS} = \frac{\text{Resisting Forces}}{\text{Overturning Forces}}$$

Where

$FS < 1$ indicates an unstable slope
$FS = 1$ indicates a critically stable slope
$FS > 1$ indicates a stable slope

An acceptable factor of safety is based on various considerations such as the recurrent period of heavy rainfall, seismic activity, as well as the assessment of risk or hazard brought about by the slope failure. With these factors considered, recommended factors of safety for static conditions range from 1.2 to 1.5, and a value greater than unity (>1) for earthquake conditions. For this study, the following factors of safety were used:

FS for Static Conditions:	1.5
FS for Pseudo-Static Conditions:	1.1

Rocscience Slide 6.0®, a slope stability computer software, was utilized to facilitate calculations for determining the global stability of the embankments for proposed dike system. This modeling software performs slope stability analysis procedure based on Limit Equilibrium Methods. Several trials were carried out, varying the slip circle coordinates for determining the minimum factor of safety under static and pseudo-static (earthquake) conditions.

Slope Section

An initial analysis is performed for the islands in order to assess and verify the stability of the proposed design for the dike system. The following figure was used as reference in modelling of the slope in Slide 6.0.

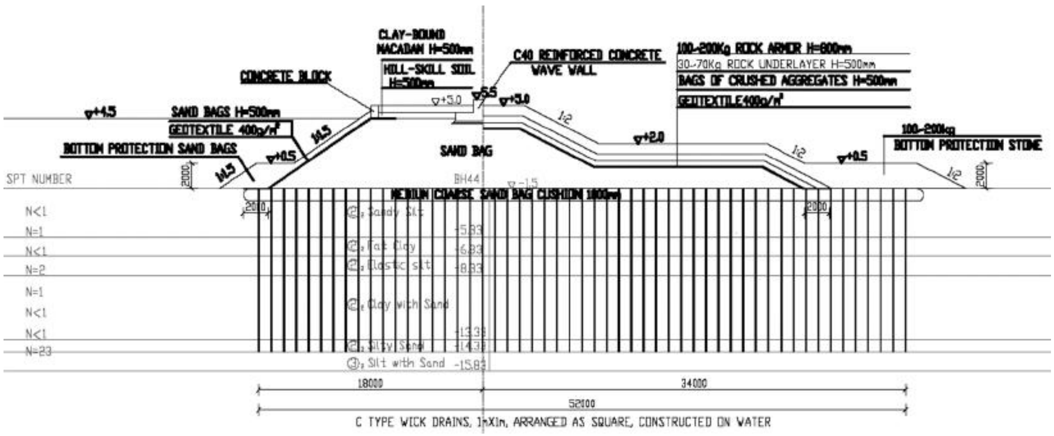


Figure 44. Section of the Island

The following table presents the geotechnical parameters used in the subsequent analyses. BH-25 was used as reference borehole since it has the thickest soft soil layer.

Table 19. Geotechnical parameters for proposed dike

Depth (m)	Soil Type	Relative Density	SPT N-value	Geotechnical Parameters		
				γ(kN/m3)	c (kPa)	ϕ(0)
0.0 - 13.5	Clay	Very Soft	1	11	20	0
> 13.5	Sand	Very Dense	50	20	0	38
Sand Bag				18	5	31
Backfill Sand				18	5	31
Clay-bound Macadam				17	50	0
Hill-skill Soil				18	0	30
Rock Armor / Rock Underlayer				20	50	30
Crushed Aggregates				19	0	35
Concrete				24	150	26
Ground Improvement (Soil Cement Column)				15	250	0

A uniform load of 12.0 kN/m is applied on top of the road for traffic loading. The figure below presents the dike system as modelled in Slide 6.0.

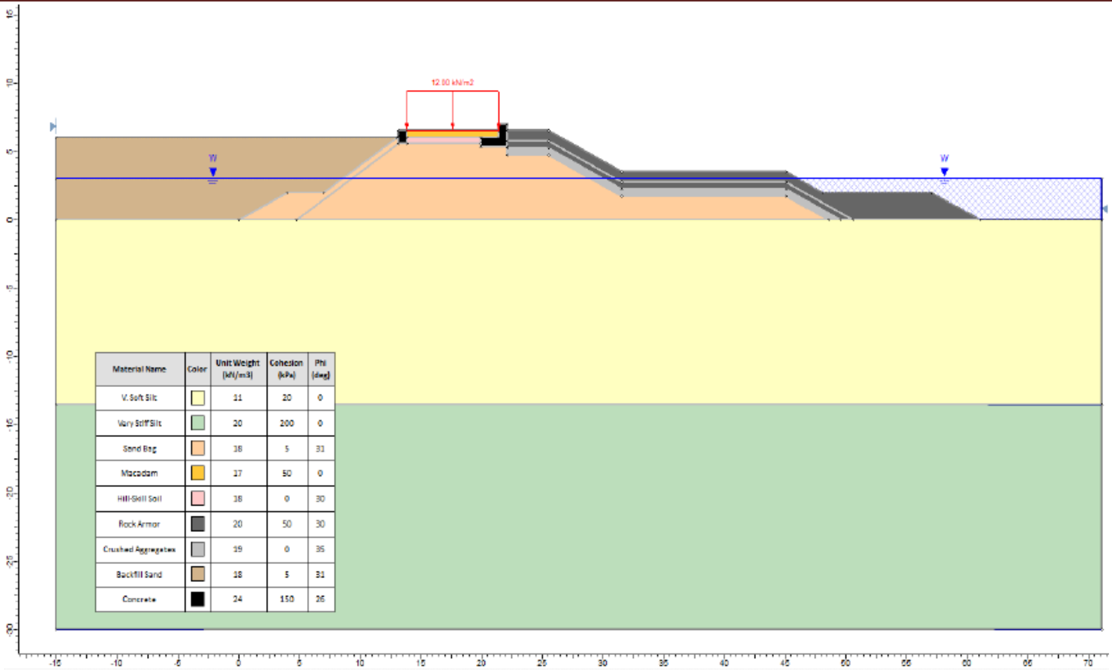


Figure 45. Slope Model of the Dike in Slide 6.0

The following table presents the summary of the results of the slope stability analysis for the Island. The resulting FoS considering static conditions is found to be adequate, however, the FoS considering pseudo-static (earthquake) conditions is below the passing criteria.

As seen in **Figure 46**, the failure plane for the slope is deep-seated in nature and can be mainly attributed to the underlying soft soil layer. Ground improvement may be necessary to improve the strength parameters of the soil and address the slope failure during earthquake conditions.

Table 20. Summary of SSA results

Case No.	Type of Analysis	Seismic Coefficients		Min. FS
		kh (g)	kv (g)	
1	Static	0.00	0.00	1.467 ≈1.5 OK
2	Earthquake	0.20	0.10	0.568 < 1.1

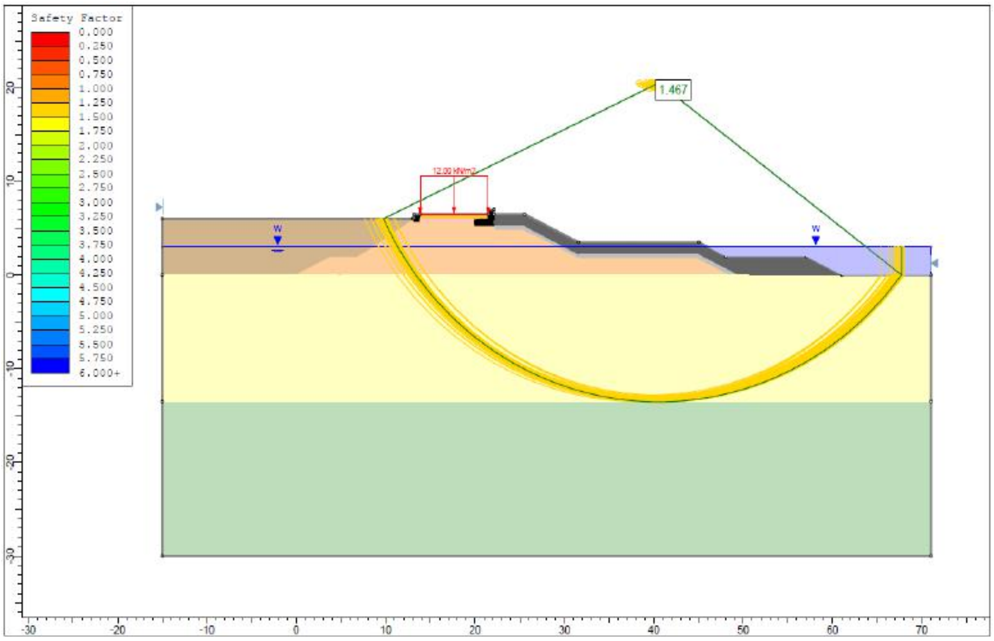


Figure 46. Case 1: Static (FoS=1.467)

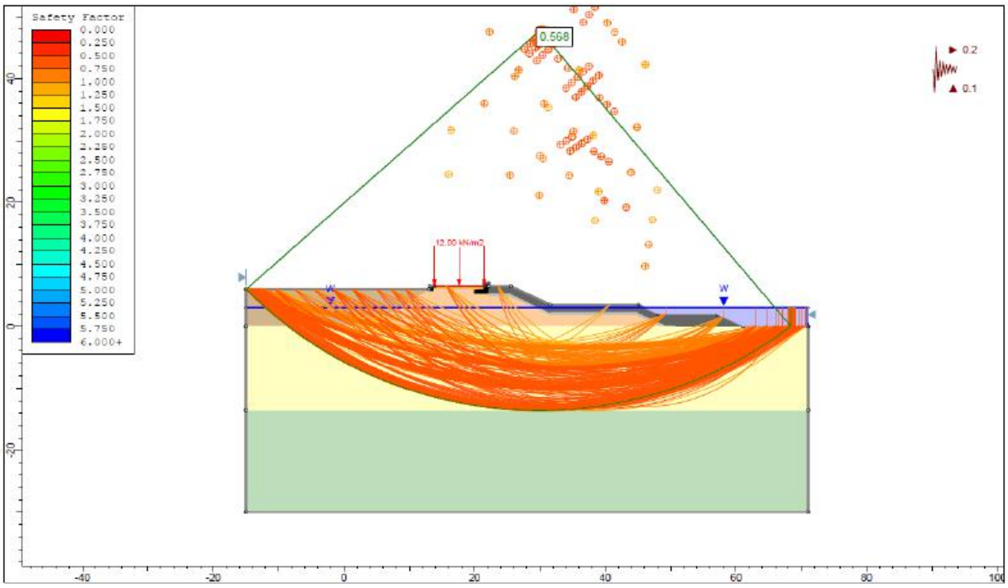


Figure 47. Case 1: Earthquake (FoS=0.568)

Proposed Ground Improvement

One option to mitigate the instability is to improve the underlying soil by soil-cement mixing. In this method, columns of specified spacing made up of a mixture of soil and cement is inserted into the ground by deep mixing method. The columns formed will then increase the shear strength of the underlying soil and improve the overall geotechnical capacity of the ground.

In Slide 6.0, the soil cement column is modelled until the depth of the soft soil layer (13.5m) and as a composite material with cohesion of 250 kPa. The value for cohesion is calculated from the weighted average of the cohesion of the surrounding soft soil and the soil-cement column.

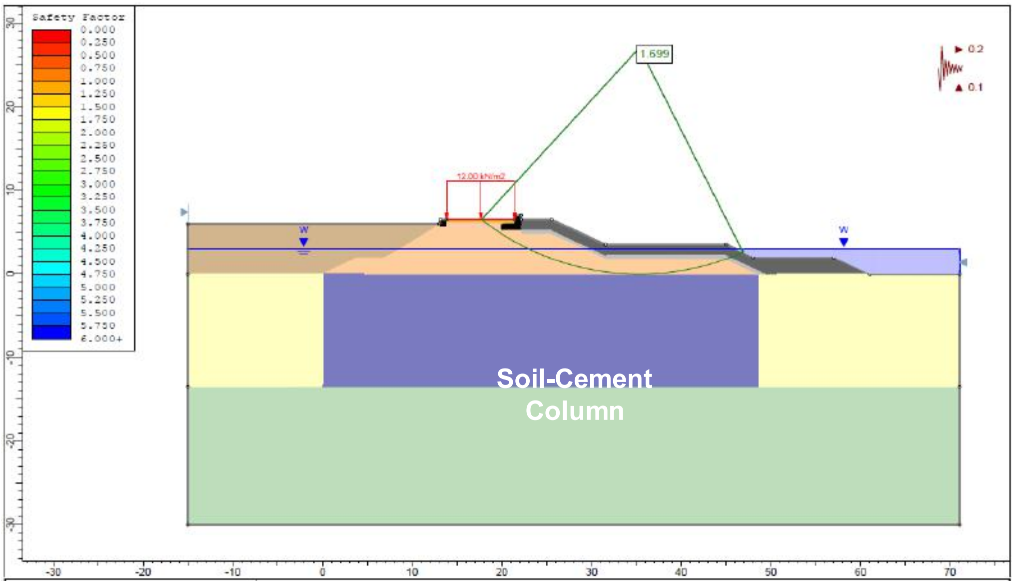


Figure 48. Case 2: Earthquake (FoS=1.699)

From the results of the re-run, the FoS considering earthquake conditions is adequate (1.699 > 1.1). Hence, ground improvement is recommended to mitigate deep-seated slope failures beyond the dike system. Depth of the ground improvement will most likely be equal to the depth of the soft soil layer for each location. Further study should be conducted for the ground improvement.

Anchor Sheet Pile Wall (containment structure) - Finite Element Analysis

For the containment structure of the Parañaque reclamation site, the sheet pile wall were analyzed using finite element model utilizing Plaxis 2D. It is a finite element modeling software capable of two-dimensional analysis of deformation and stability for various problems in geotechnical engineering. It is also capable of creating complex soil and structure interactive models and can constitute nonlinear strength, time dependent and anisotropic behaviors of soils and rocks. It provides more thorough analysis and investigation of the problem using 2D Finite Element Method analysis with more refined soil model. The figure below present the model prepared for the analysis of the island.

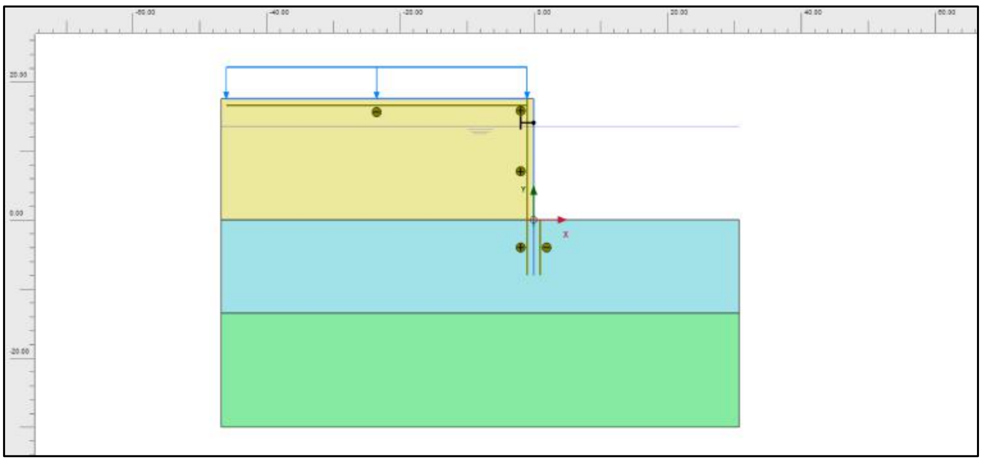


Figure 49. Plaxis Model

The following table summarizes the geotechnical parameters used for the Island while the next table presents the summary of the findings for the island. The succeeding figures contain the screenshot images of the results from Plaxis 2D.

Table 21. Geotechnical Parameters

Depth (m)	Soil Type	Unit Weight (kN/m3)	Cohesion (kPa)	Angle of Friction (deg.)	Elastic Modulus (MPa)	Poisson's Ration (μ)
0.0 – 13.5	Silt	16	30	0	10	0.30
13.5 – 30.0	Silt	20	200	0	40	0.35

Table 22. Plaxis 2D Results

Max. Exposed Height (m)	Anchor Length (m)	Anchor Dia. (mm)	Sheet Pile Type	Max. Disp* (mm)	Max. Moment (kN-m)	Sheet Pile Adequate?	Max. Tensile Force (kN)	Anchor diameter adequate?
17.55	24	65	1000mm dia x 16mm thk	121.9	490	Yes	869.94	Yes

**Displacement after compaction of backfill*

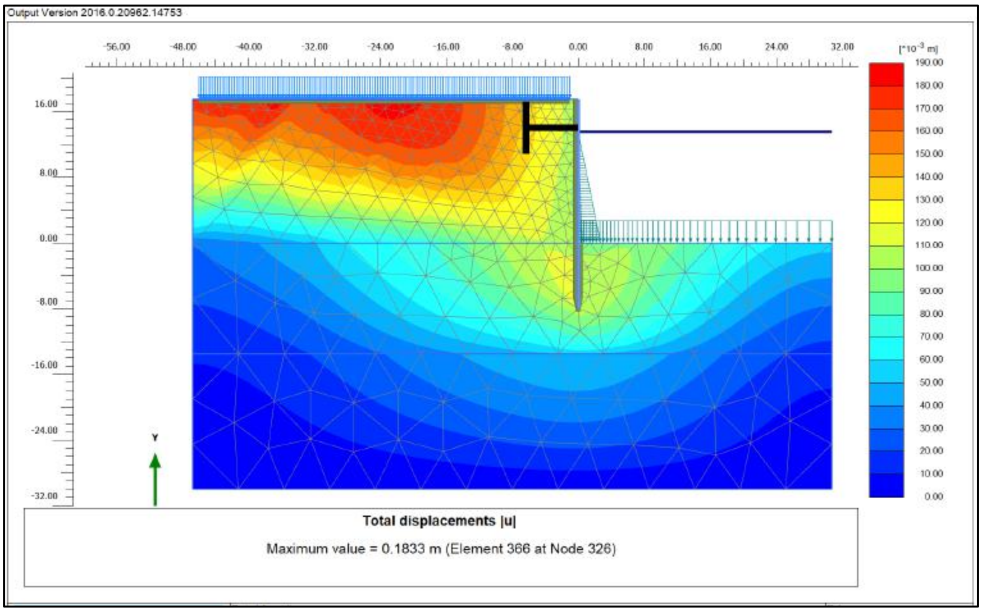


Figure 50. Plaxis Result – Total Displacement

The results of the finite element analysis show that the preliminary design will be able to sustain the loads during construction stage, operation, and during seismic conditions. However, the displacements after compaction of backfill exceeded the tolerable limits.

Design of Retaining Structures

In the stability analysis and design of excavation stabilization structures or retaining walls through the fill material, the following parameters may be used. This generally assumes the parameters of medium dense sands and only considers the reclamation fill material.

Table 23. Geotechnical Parameters

Angle of friction, ϕ	30o
Cohesion, c	2 kPa
Unit Weight, γ	18 kN/m3

Lateral loads due to surcharge, the dynamic thrust in the occurrence of an earthquake, as well as the uplift forces due to the presence of shallow water level shall also be considered in the analysis and design.

4.3 Volcanic Hazards

4.3.1 Ash Fall

The dangers posed by volcanoes are associated with eruption. Hazard from volcanic eruption depends on the magnitude of its explosion. Hazards associated with volcanic eruptions include pyroclastic flows and base surges, lava flows, lahars and the ash or tephra fall.

Probably the greatest threat to the project site is Taal Volcano in Batangas but is unlikely to cause major problems. It is about 54 aerial kilometers to the southeast of the project site. The ash fall may be a nuisance and reduce air quality. Taal Volcano is closely monitored and one would likely receive a few weeks warning of a possible eruption. However, considering the distance of the project site to Taal Volcano, even the far-reaching ash fall/tephra fall hazard has little effect the proposed project.

4.4 Hydrologic Hazard

4.4.1 Flooding

The Philippines lies in the Western Pacific basin, the world's most active typhoon belt. It is visited by an average of 20 typhoons a year. Typhoons and monsoons often bring disasters such as flooding, landslides, and storm surge. Floods usually occur during or after heavy rainfall wherein the river channels are saturated with water resulting to river swelling and overflowing of floodplains. The low-lying areas and those areas with poor drainage system are susceptible to flood hazard.

The land area nearest the proposed project site falls within the delineated low to moderate flood prone areas as shown in all the flood hazard maps (**Figures 51 to 54**). Considering its flat terrain and average elevation of about two (2) masl, the area fronting the project site could experience localized flooding especially if the drainage systems are inadequate. It is likewise noted that the areas that are more susceptible to flooding are those along or near the courses of rivers/waterways.

On August 1, 2012, monsoon surge enhanced by Typhoons Gener and Haiku generated high waves that breached the sea wall along Roxas Boulevard submerging the 7.6-kilometer stretch road in 0.5 m-deep floodwater.

The World Bank study identified Parañaque City as one of the areas in Metro Manila at extreme risk in a "1-in-100-year flood" scenario. Metro Manila has already experienced such a "1-in-100-year flood" from tropical storm Ondoy in 2009. ("Climate Risks and Adaptation in Asian Coastal Megacities: A Synthesis Report,")

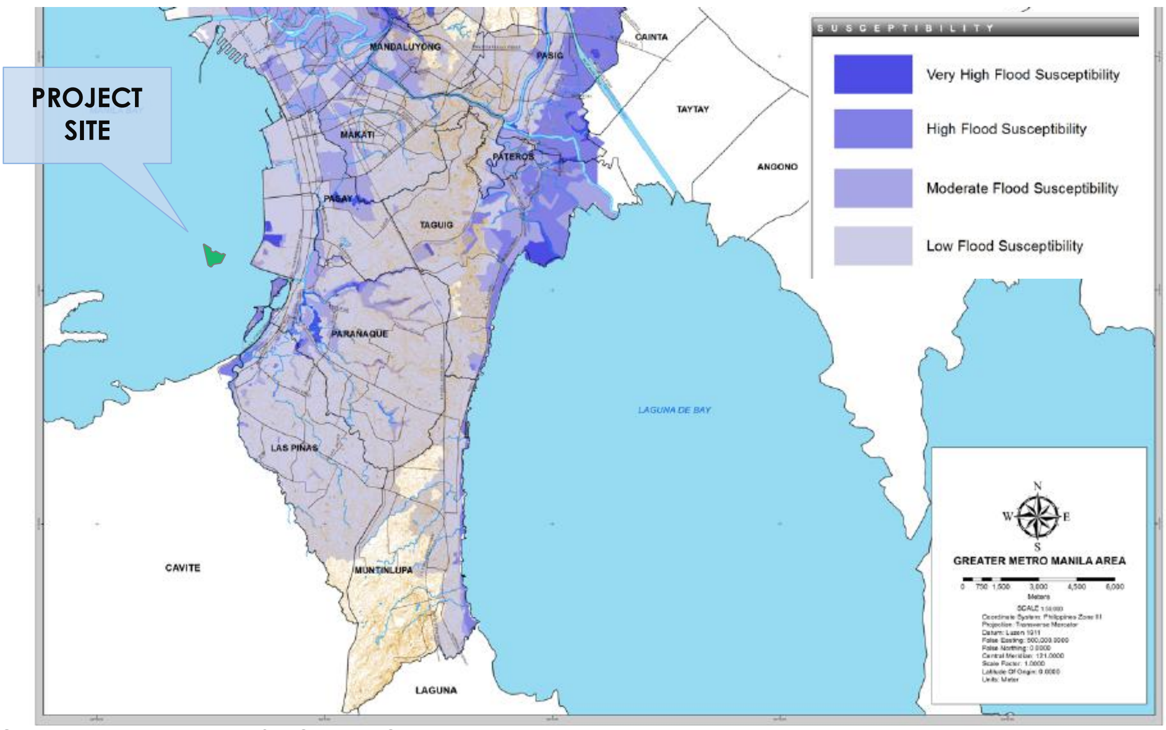
In flood control and drainage study of Metro Manila by JICA in March 1990, the Parañaque-Las Piñas area was identified as a "lowland along the Manila Bay" which "received serious flooding in 1986 due to the inland water as well as the flooding of the river." EIS-LRT

In addition, the metropolis lies sandwiched between the vast Manila Bay to the west and Laguna de Bay to the east. Water drains from Laguna de Bay, which is higher in elevation, to the sea through only one river, the Pasig, and if that is blocked, the city floods. If a storm surge of the Yolanda type comes in from Manila Bay, the lake would have no place to drain and there could be successive high wind-driven waves.

Where land reclamation is known to cause loss of wetlands, floodwater storage is likewise lost or decreased and thus may lead to flooding. For this project, the project site itself is devoid of wetlands or marshes, (the Las Piñas-Parañaque Wetland Park is about 2km to the east) and therefore, it will not aggravate flooding in the area. Further, the project will be set back from the shoreline so as not to affect nearshore sediment transport or the local sediment budget. Hence, it will not cause narrowing of rivermouth of Paranaque River. In effect, the project will not impede discharge of excess rainwater from the river, and hence, will not cause riverine flooding.

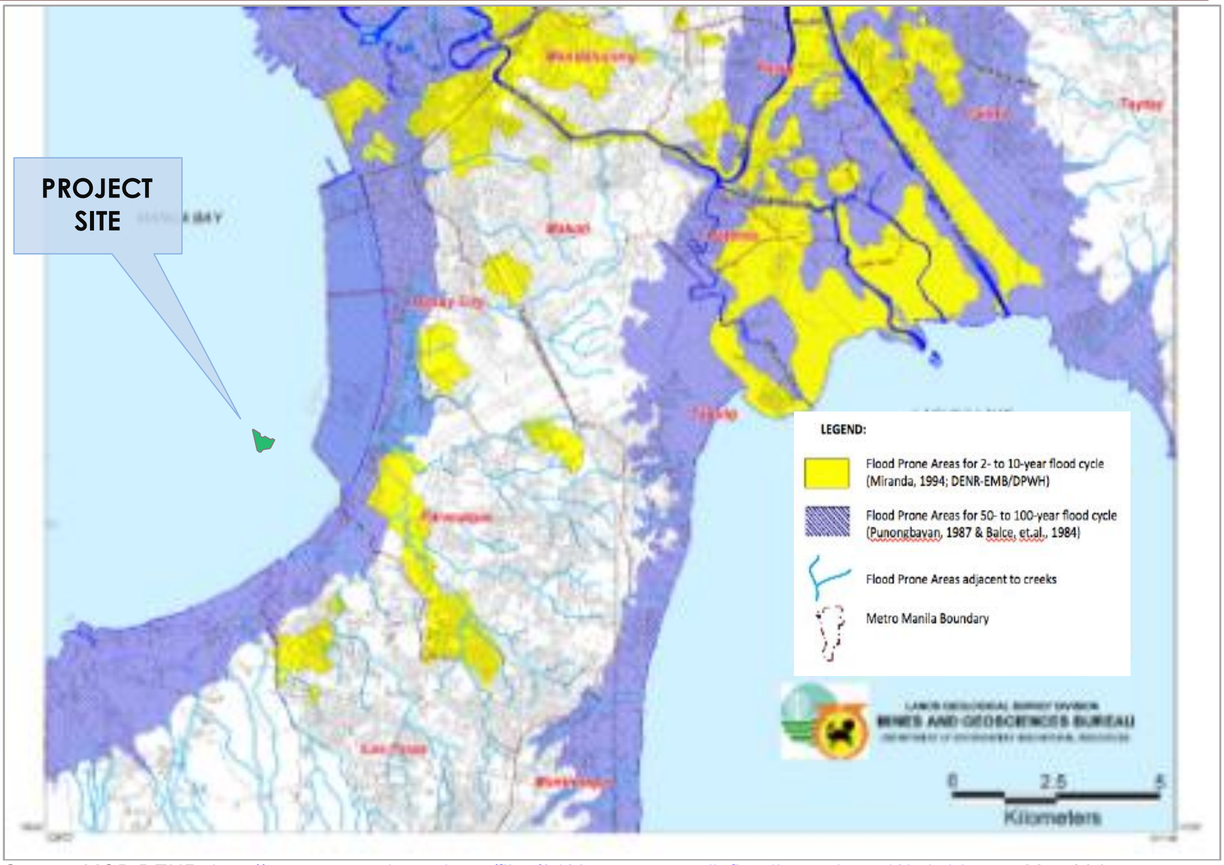
The engineering design of the reclamation should provide for adequate channels, drainages and runoff discharges to the open sea as well as non-blockage of river outfalls and other flood paths.

For flooding mitigation within the reclamation area itself, the design of structural flood defenses should account for possible overtopping but should not be over-estimated as this could also possibly cause trapping of floodwaters. Where flood defenses are breached, it will usually result in sudden flooding with little or no warning and will present a significant hazard and danger to life.



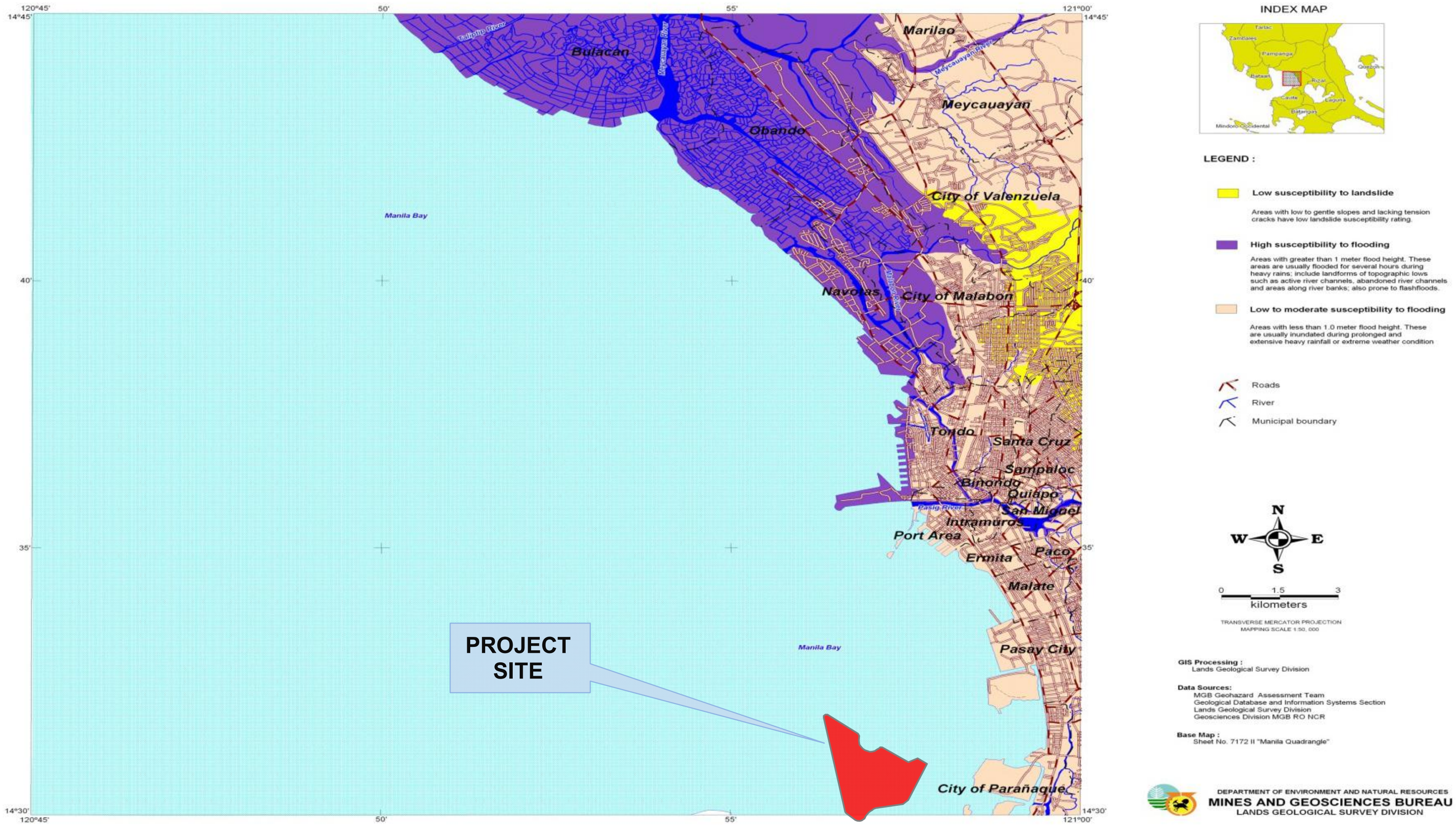
Source: READY Project for GMMA, Oct 2013

Figure 51. Preliminary Flood Hazard Map of Metro Manila



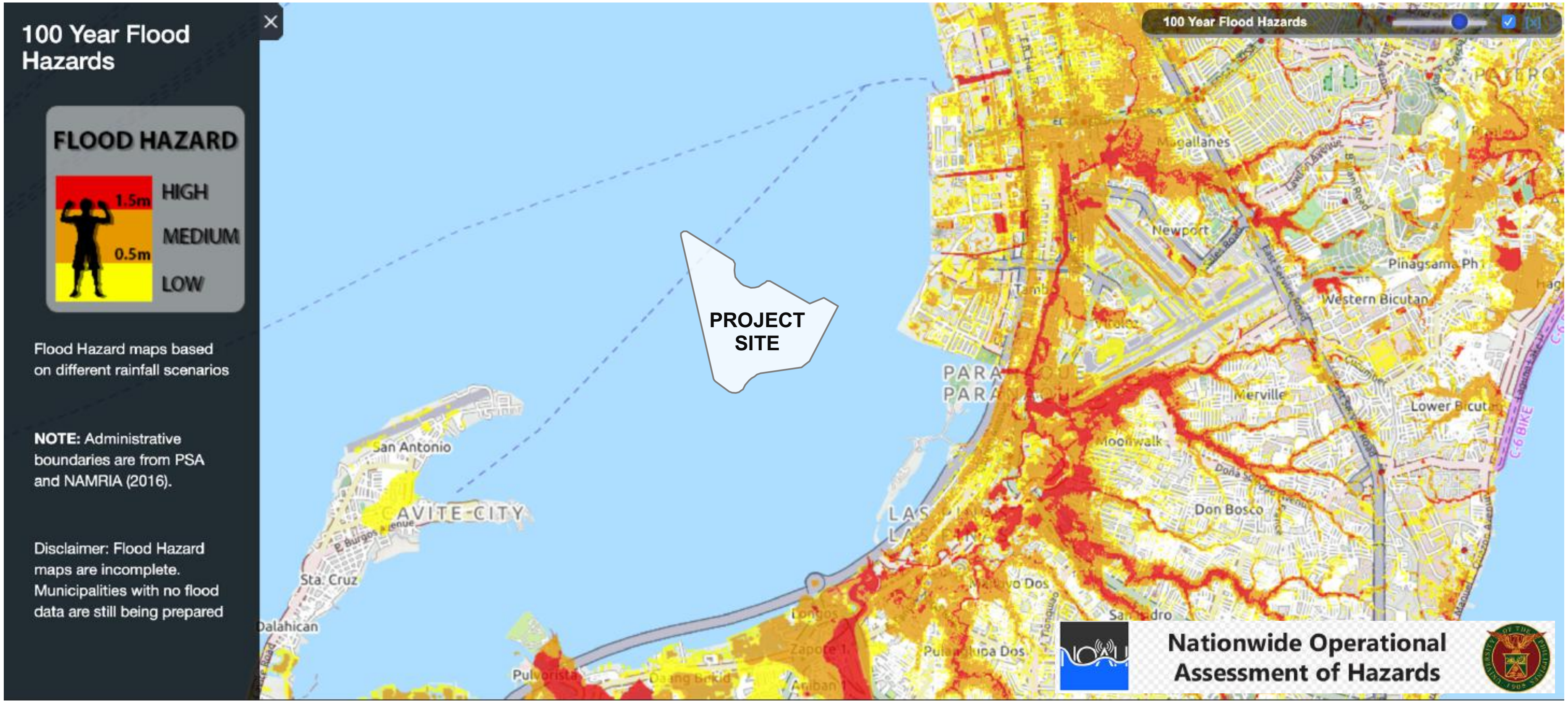
Source: MGB-DENR, http://www.preventionweb.net/files/24897_metromanilafloodhazardmap40kvls1.jpg on May 2017
Note: Yellow areas are the most flood prone, purple less prone.

Figure 52. Flood Hazard Map of Metro Manila



Source: MGB 2010

Figure 53. Landslide and Flood Susceptibility Map of Manila Quadrangle, Metro Manila



Source: UP Project Noah, screen captured on June 2019

Figure 54. 100-Year Flood Hazard Map of Parañaque City and vicinities

4.5 Coastal Hazards
4.5.1 Flooding

This is discussed above.

4.5.2 Storm Surges / Seiches / Storm Waves

Storm surge is an abnormal rapid rise of sea level resulting from strong winds pushing water towards the shore (NOAA, 2013). This can cause severe destruction and damage in its surrounding areas. High winds push the ocean's surface that causes water pile up higher than the ordinary sea level. Storm surges have known to damage nearby coastal structures, resulting from the wave impacts and debris carried by the surge. Other effects include flooding of low-lying coastal areas and intense wave erosion of beaches, dunes and other structures. Based on the meteorological data, Manila Bay is exposed to an average of 5 typhoons in 3 years period vulnerable during the 2nd and 4th quarter of the year.

According to PAGASA, storm surges occurred seven times from 1960–72. **Table 24** below is a list of storm surge events that affected the Manila Bay area. This is taken from the Compilation of Storm Surge Occurrences in the Philippines (Project NOAH, 2014).

On September 26-28, 2011, Typhoon Pedring (international name T. Nesat) hit the country generating storm surge as high as 6 meters in Manila Bay that damaged part of the breakwater and sea wall along Roxas Boulevard resulting to waist-deep flooding of the road and areas along the shoreline and causing millions of damages to properties.

Dr. Mahar Lagmay stated that the 2011 storm surge brought by TS Pedring was actually **1.5m high**, "with splash waves higher than the coconut trees" while Yolanda's surge in Tacloban was 5m.

In 2012, Typhoon Saola (Gener) caused another surge that damaged the seawall and deposited tons of rubbish and filth along Roxas Boulevard.

Table 24. Storm Surges in the Manila Bay Area and Vicinities

No.	Date of Occurrence	Associated Tropical Cyclone	Surge Height (m)	Affected Areas	Casualties	Damage
1	June 29, 1589	Unnamed typhoon		Manila Bay		
2	Aug 29, 1863	Unnamed typhoon		Manila		Destroyed Bagumabayan drive due to inundation, several houses unroofed
3	Sep 20-26, 1867	Unnamed typhoon		Manila Bay		17 ships tossed onto Sta Lucia & Tondo shores
4	Oct 25, 1873	Unnamed typhoon	0.6	Cavite		
5	Nov 19, 1970	Typhoon Yoling (Patsy)	4	Manila Bay, southern coast of Luzon		Destroyed $40M property, sank 21 fishing boats near North Harbor

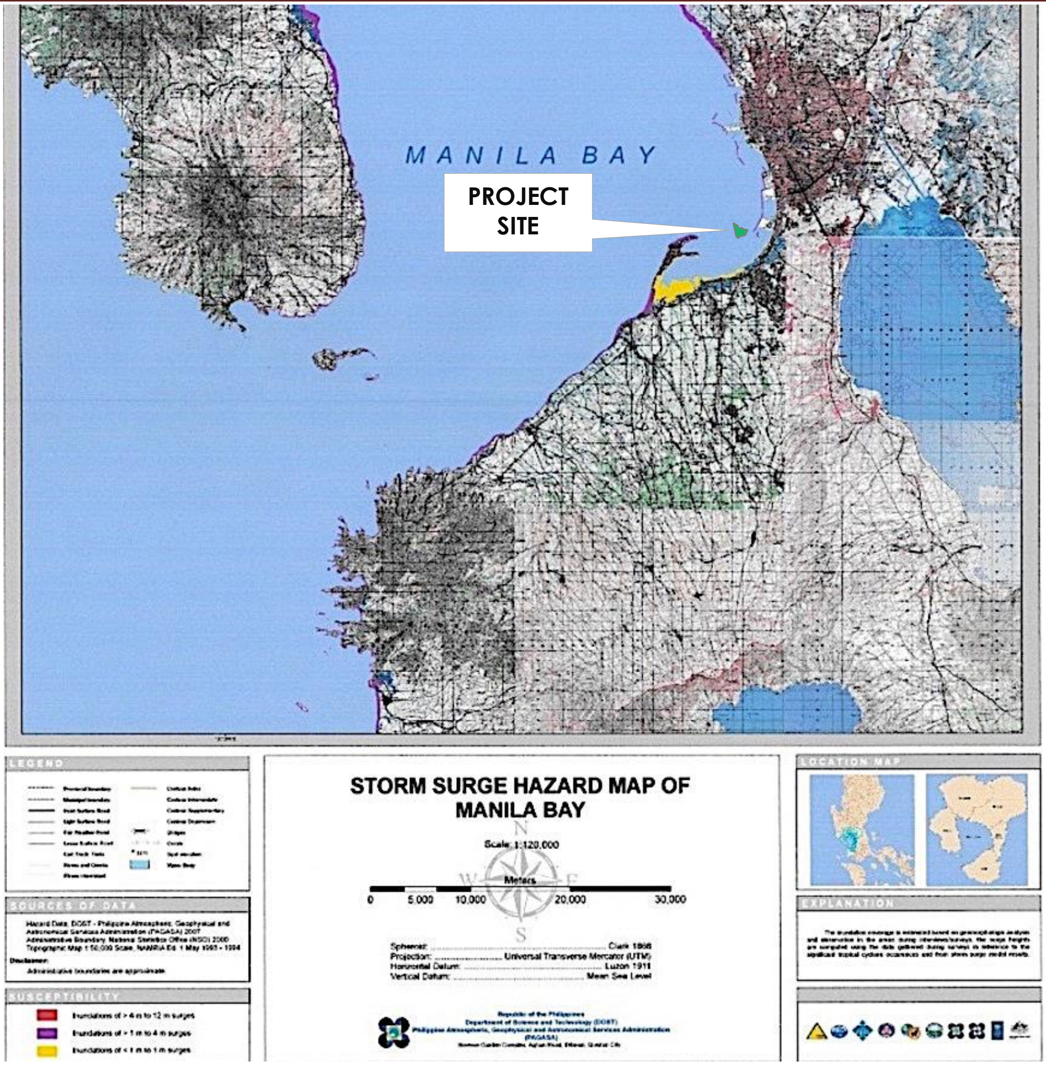
No.	Date of Occurrence	Associated Tropical Cyclone	Surge Height (m)	Affected Areas	Casualties	Damage
6	Jun 23-25, 1972	Typhoon Konsing (Ora)		Manila Bay & Bicol region	1	Several ships washed ashore
7	Jul 2, 1983	Typhoon Bebeng (Vera)	4	Bataan & at least 10 villages in Manila Bay's western banks	182	49,000 houses
8	Sep 26-28, 2011	Typhoon Pedring (Nesat)	6	Coastal areas of Manila Bay, Brgys San Rafael 3 & 4, Cavite, Brgy. Pasungol, Santa, Ilocos Sur & Sta Rita Aplaya, Batangas City	12	Damaged the breakwaters & seawall along Roxas Blvd
9	Jul 30-31, 2012	Typhoon Gener (Saola)		Zamboanga del Norte, Ternate, Cavite, Bulan, Sorsogon, & So. Tinago, Bgy Tibpuan, Lebak, Sultan Kudarat		214 houses
10	Aug 22, 2013	Typhoon Maring (Trami)		Bgy Mabolo, Naic, Cavite & Molo District, Iloilo		14 houses damaged
11	Oct 11, 2013	Typhoon Santi (Nari)		Manila Bay		

Source: Project http://blog.noah.dost.gov.ph/2014/02/04/compilation-of-storm-surgeoccurrences-in-the-philippines/. NOAH Open File Report Vol 2. Pages 7-11, February 2014

The Storm Surge Hazard Map of Manila Bay generated by PAGASA is presented in **Figure 55**, which indicates inundation for surges from 1m to >4m above mean sea level is limited to the edges of the existing reclamation area in Parañaque. This is consistent with the Storm Surge Hazard Map of Metro Manila, which is presented in **Figure 56** (READY Project). **Figure 57** is the storm surge (advisory 2) map by UP NOAH. The advisor level (advisory 2) is based on the maximum storm wave heights (inset map) generated by Lapidez, et al., (2014) based on available records.

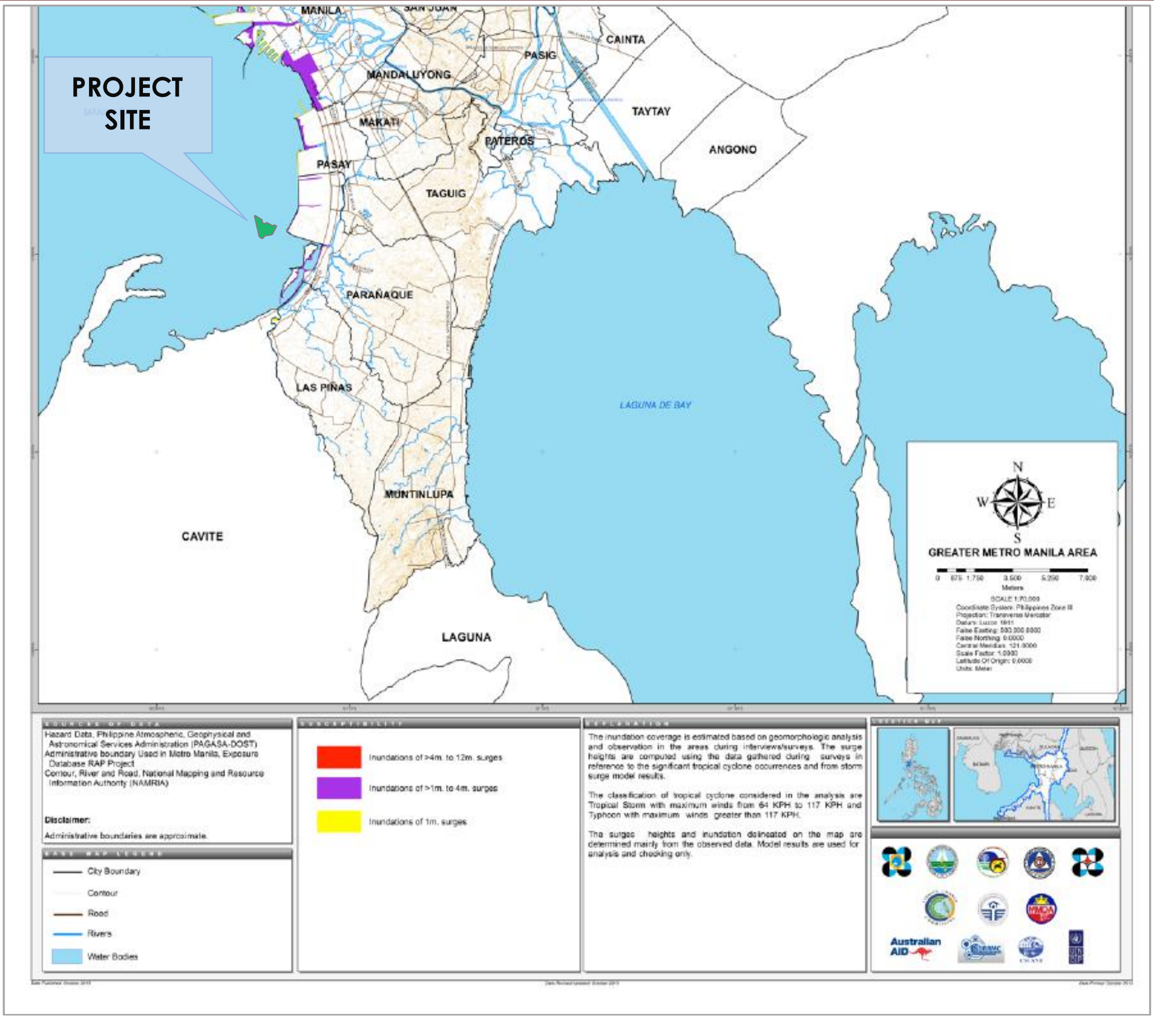
The reclaimed land will be in front of the existing coastline and therefore the reclaimed land will form the new sea front. This makes it most vulnerable to storm surge and flooding from the sea. To prevent flooding, engineering measures will be implemented in project and the sea front will be designed so little flood risk are present.

The proposed reclamation project may potentially shelter the existing coastal areas from direct impact from storm surges (wave impact). The platform level will be above the 100 year RP water level with consideration of sea level rise and/or subsidence. PRA requires a level of minimum +4m MLLW. In addition, there shall be a storm/storm surge protection wall at the edges of the island facing the sea.



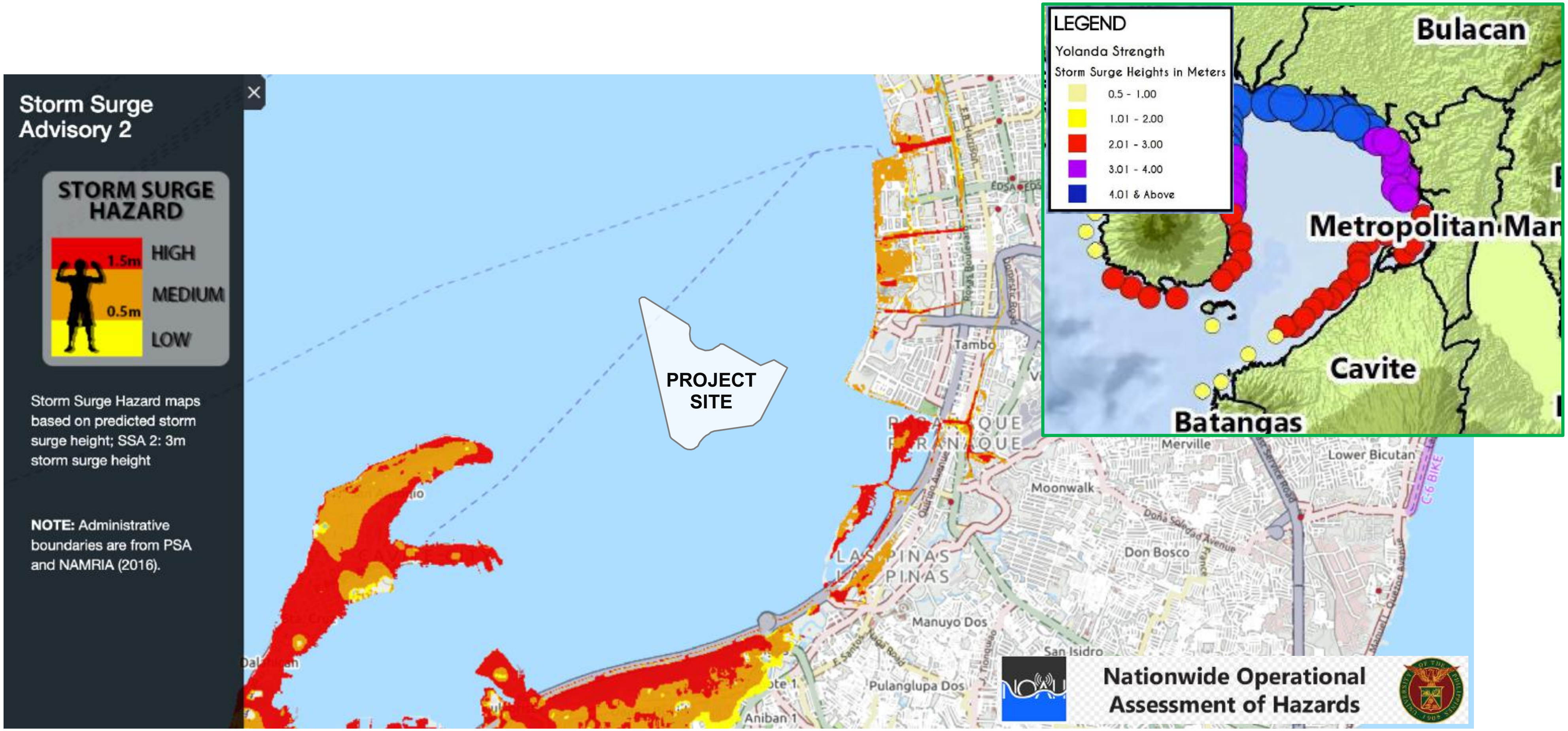
Source: PAGASA
Yellow color indicates inundation for surges up to 1m above mean sea level while purple color indicates inundation for surges up to 4m above mean sea level

Figure 55. Storm Surge Hazard Map of Manila Bay



Source: READY for GMMA Project, Oct 2013

Figure 56. Preliminary Storm Surge Hazard Map of Metro Manila



Source: UP Project Noah, screen captured on October 2017
Lapidez, JP, et.al., DOST Project NOAH, June 2014 for inset map – Maximum Storm Surge Height

Figure 57. Storm Surge Advisory 2 (SSA2) Hazard Map of Parañaque City and vicinities

Synthesis of Storm Waves *(by AMP Philippines, Inc. 2018)*

The surface waves induced by the passage of typhoons were numerically simulated using the spectral-wave module of the hydrodynamic model, with the results shown in **Figures 58** to **60**. This module solves the wave action equation that governs the propagation of the spectral components of storm waves, from which various statistics of wave heights and periods, such as the significant wave and maximum wave, are derived. The forces induced by these extreme wave heights should be considered in the detailed design stage.

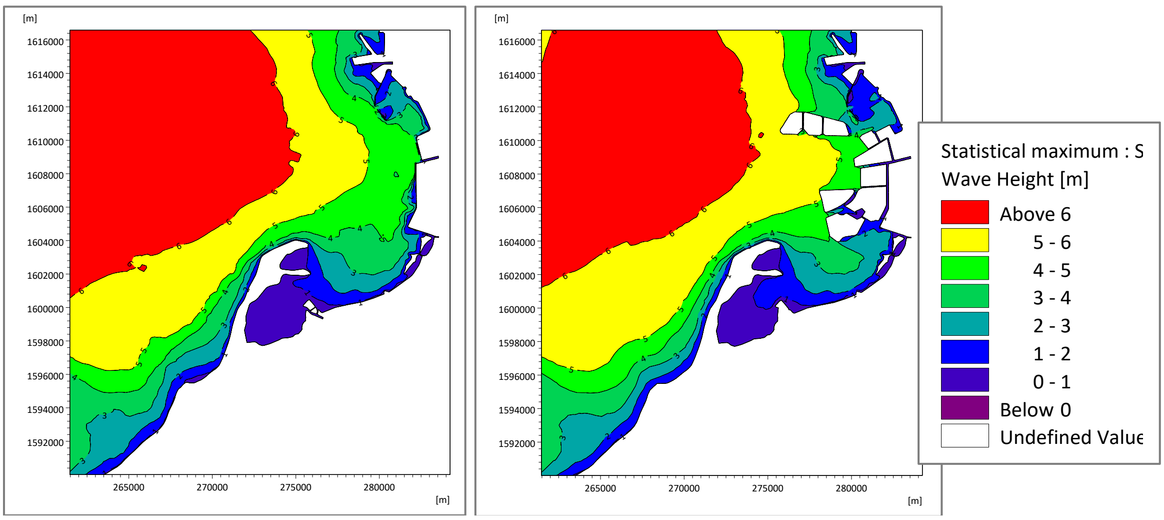
It should be noted that these simulations are based under the assumption that the reclamation enclosure has been properly engineered to minimize the reflection of incoming waves; the wave climate will change significantly if no mitigating measures will be applied to it, potentially locally increasing wave heights at the seaward faces of the enclosures.

From the 5 worst typhoons listed in **Table 4** above, further analyses resulted in the narrowing down to 3 potentially critical typhoons as shown in the table below.

Table 25. Simulated Typhoons at the Project Site

Typhoon	Year	Vmax (kph)	Rmax (km)	Pc (hPa)	Relative Track to the Site
Rita (Kading)	1978	203	14	905	N
Patsy (Yoling)	1970	192	17	920	N
Xangsane (Milenyo)	2006	101	27	980	S

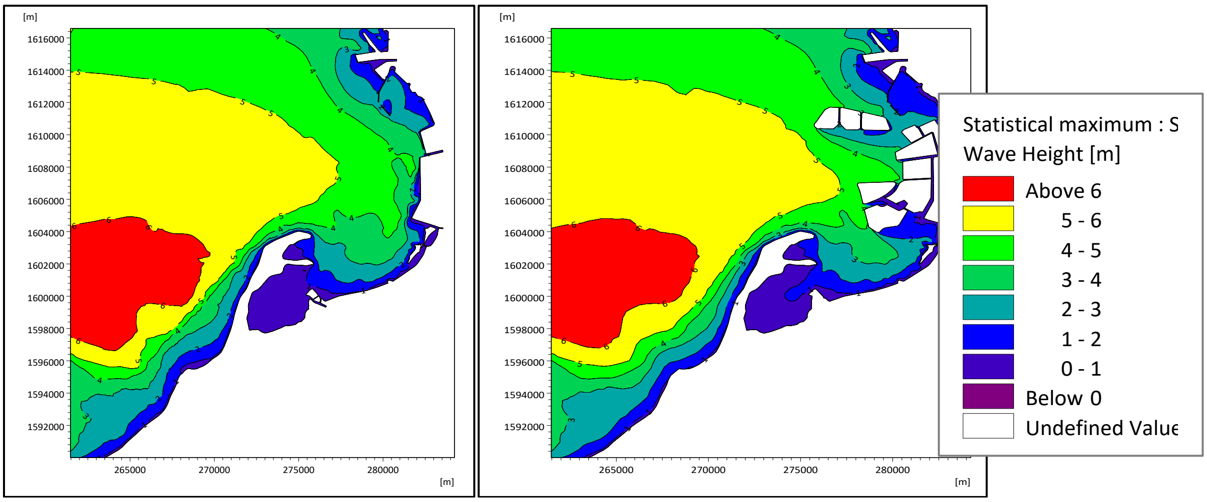
For all these 3 typhoons, it can be seen that the proposed reclamation islands in the post-development scenarios will provide a sheltering effect on all shorelines leeward of the reclamations. For typhoon Rita (**Figure 58**), the wave heights at the leeward side of the Islands have dropped significantly from ~4 m to 2~3m. The seaward faces, on the other hand, experience wave heights as high as **~5m**.



Pre-development *Post Development*

Figure 58. Simulated maximum significant wave heights for Typh. Rita (1978)

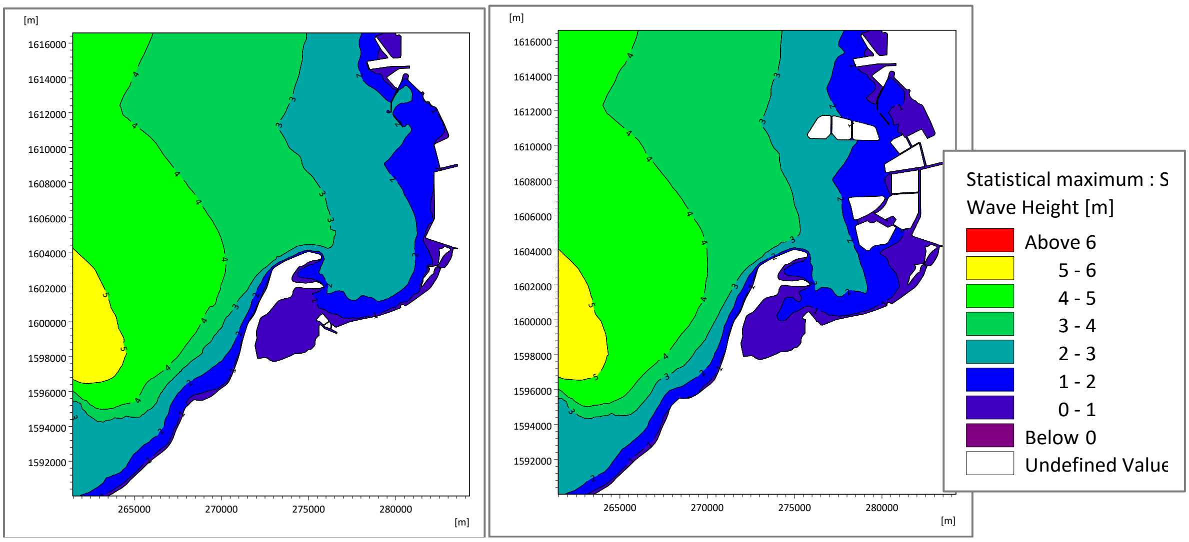
For Typhoon Patsy, the Islands similarly create a sheltering effect for all leeward areas, with wave heights dropping from 3~4 m to only 2~3 m; however, some wave penetration is still evident between the Islands and Cavite Spit. Similar to Typhoon Rita, the site can experience wave heights as high as **~5m**.



Pre-development *Post Development*

Figure 59. Simulated maximum significant wave heights for Typh. Patsy (1970)

The wave climate induced by Typhoon Xangsane is significantly calmer that the previous two typhoons, with the site being exposed to ~2 m high waves. Similar to all previous cases, the Islands significantly reduce the wave heights at their leeside to the east, but with some penetration still evident at the gap between Cavite Spit and the Islands.



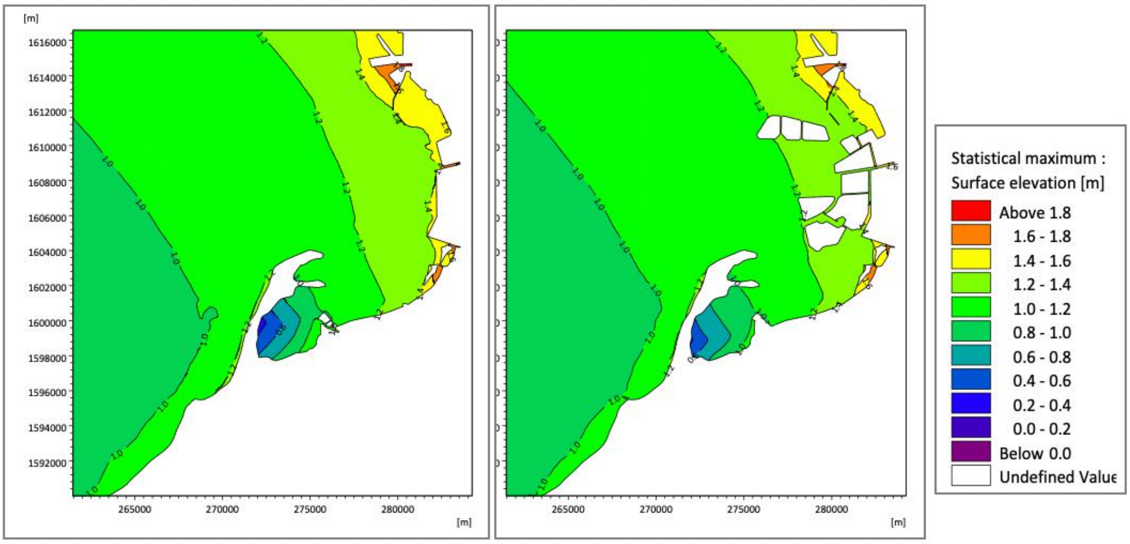
Pre-development *Post Development*

Figure 60. Simulated maximum significant wave heights for Typh. Xangsane (2006)

<u>Synthesis of Storm Tide Levels</u> *(by AMP Philippines, Inc. 2018)*

The following figures (**Figures 61 to 63**) show the maximum storm tide elevation (i.e. astronomic tide plus storm surge) for pre and post-development conditions for all top 3 typhoons.

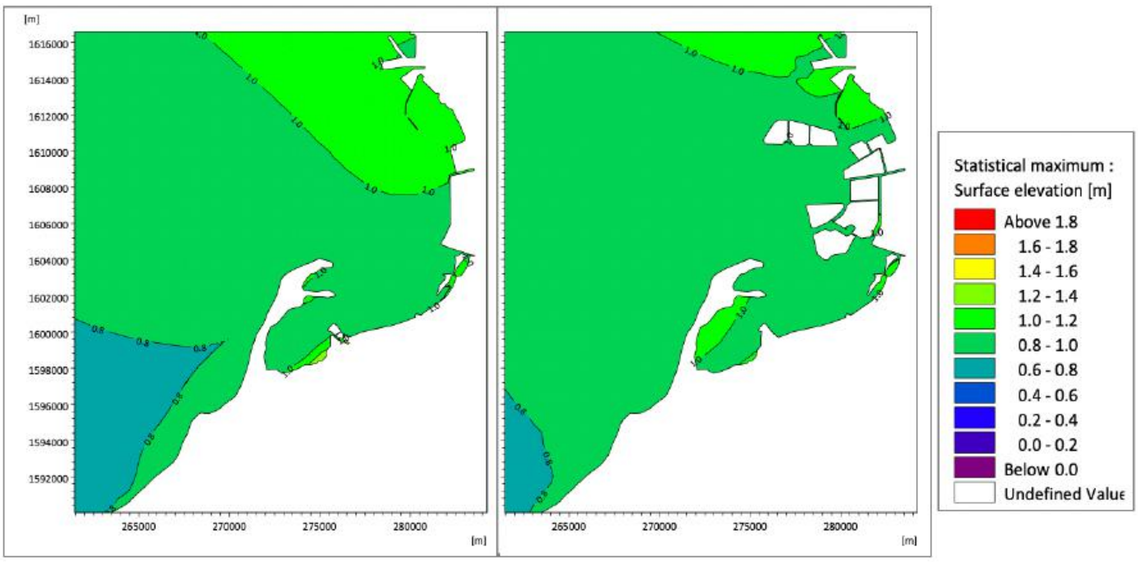
For the pre-development scenario, Typhoon Rita caused a storm tide level of roughly 1.2 m – 1.3 m at the Islands, with the higher storm tides manifesting closer to the shore. This range did not increase significantly for the post-development scenario, except that the spatial coverage of the 1.4 m storm tide level within South Harbor has been reduced.



Pre-development *Post Development*

Figure 61. Simulated storm tide level for Typhoon Rita (1978)

For the pre-development scenario, the storm tide levels generated by Typhoon Patsy (**Figure 62**) average at roughly 1m for all the islands, the storm tide level increasing northward. The post-development scenario shows that the storm tide level (**Figure 63**) within Manila South Harbor is marginally reduced.

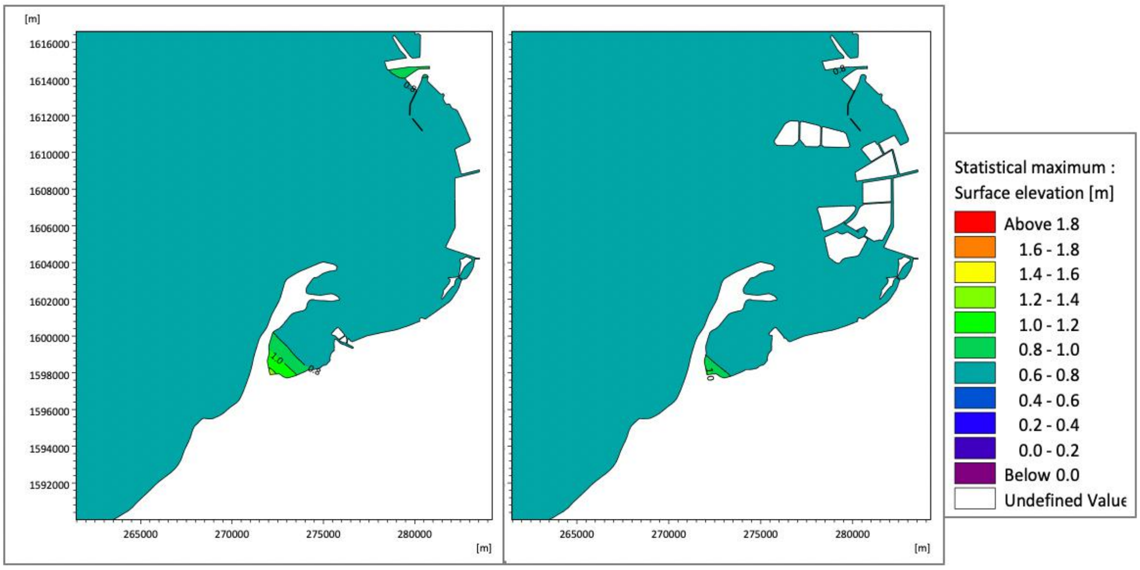


Pre-development *Post Development*

Figure 62. Simulated storm tide level for Typhoon Patsy (1970)

The storm tide for the pre-development scenario caused by Typhoon Xangsane (**Figure 63**) is significantly lower than the previous two typhoons, with the storm tide level averaging

0.8 m for all islands. No significant noticeable difference in the magnitude of the storm tide can be seen within the area of the project.



Pre-development *Post Development*

Figure 63. Simulated storm tide level for Typhoon Xangsane (2006)

<u>Computation of Non-overtopping Crest Elevation</u> *(by AMP Philippines, Inc. 2018)*

Different structures, such as revetments or sea walls, are built to protect coastal areas from flooding or inundation due to high water levels. To ensure water does not inundate into the protected area, the crest of the structure should be sufficiently higher than the highest water level. This height of the structure is known as the non-overtopping crest elevation (NOCE).The NOCE is obtained by adding two components: (1) the still water level (SWL), or the mean water level associated with astronomical tides and storm surges, and (2) the wave runup, which occurs when the wave impinges and breaks on a sloping structure causing water to rise along the slope.

The wave runup for impermeable and permeable slopes are computed as shown below (Delft Hydraulics 1989):

For impermeable slopes:

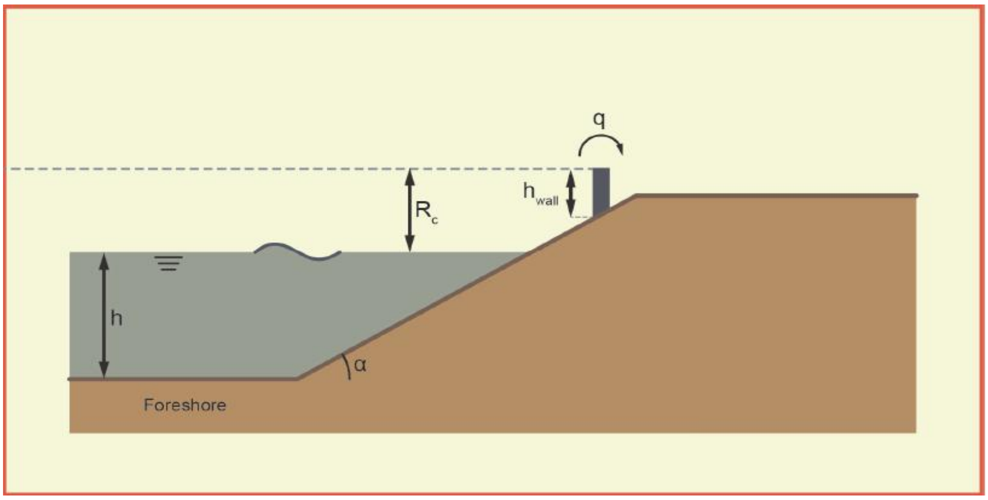
$$\frac{R_u}{H_s} = \begin{cases} A\xi_{om}, & 1 < \xi_{om} \le 1.5 \\ B(\xi_{om})^C, & \xi_{om} > 1.5 \end{cases}$$

For permeable slopes:

$$\frac{R_u}{H_s} = \begin{cases} A\xi_{om}, & 1 < \xi_{om} \le 1.5 \\ B(\xi_{om})^C, & 1.5 < \xi_{om} \le (D/B)^{1/C} \\ D, & (D/B)^{1/C} < \xi_{om} \le 7.5 \end{cases}$$

Due to economical, spatial, and other practical considerations, structures are typically built lower than the NOCE, resulting to the highest runup levels exceeding the provided crest freeboard, and water flowing over the structure or wave overtopping. Overtopping discharge rates for different crest elevations should be used as a design parameter to check if the overtopping values are within allowable limits (EurOtop Manual, 2007).

Overtopping discharge caused by wind-generated waves during a storm is unevenly distributed in time and space, and thus information regarding overtopping discharge is given as the time averaged overtopping discharge in terms of m3/s per linear meter of the structure. In general, the overtopping discharge is a function of the wave characteristics as well as the structure geometry.



Source: EurOtop 2016

Figure 64. Overtopping discharge of a slope with storm wall

For the case of the reclamation, the EurOtop (2007) model was implemented for the computation of the overtopping discharge, which is the most flexible of all the models for it is not restrained to a specific structural geometry. The overtopping discharge, q, is a function of the geometry of the structure, wave and tide characteristics, and a series of reduction factors. It is modeled by the equation below:

$$\frac{q}{\sqrt{g \cdot H_{mo}^3}} = \frac{0.026}{\sqrt{\tan\alpha}} \gamma_b \cdot \xi_{m-1,0} \cdot exp\left[-\left(2.5 \frac{R_c}{\xi_{m-1,0} \cdot H_{m0} \cdot \gamma_b \cdot \gamma_f \cdot \gamma_\beta \cdot \gamma_v}\right)^{1.3}\right] \quad (3)$$

with a maximum of:

$$\frac{q}{\sqrt{g \cdot H_{mo}^3}} = \frac{0.1035}{\sqrt{\tan\alpha}} \cdot exp\left[-\left(1.35 \frac{R_c}{H_{m0} \cdot \gamma_f \cdot \gamma_\beta \cdot \gamma^*}\right)^{1.3}\right] \quad (4)$$

The methodology used for the calculation of the wave runup is based from Delft Hydraulics as presented in the Coastal Engineering Manual (2006), which requires wave characteristics and structural geometry. From the storm condition analysis, two scenarios are considered in determining the NOCE: the first case is when the SWL is at maximum and the corresponding wave characteristics are taken, and the second case is when the wave height is at maximum and the corresponding SWL and other wave characteristics are used for computation. The higher computed NOCE is considered to be the critical value and is used for the determination of the overtopping discharge. For this project, 7 points near the project boundary are taken as points of extraction for the computation of NOCE, as shown in **Figure 65**. The computed NOCEs during maximum tide and maximum wave conditions are presented in the table below.

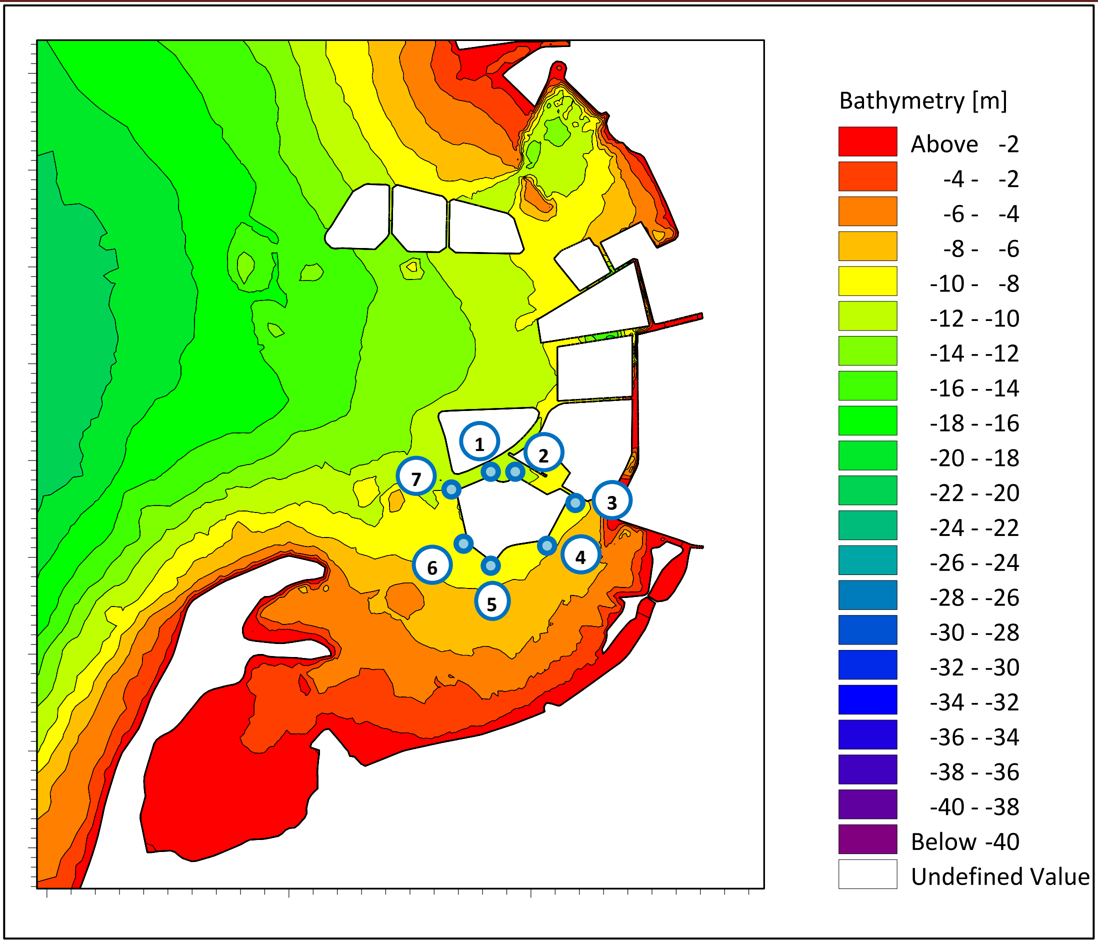


Figure 65. Location of extraction points

Table 26. NOCE Results during Maximum Tide and Wave Conditions

Typhoon	Point	NOCE Result (m)		Governing Case
		Tide$_{max}$	Wave$_{max}$	
Rita	Pt. 1	4.66	4.66	Max Wave Height
	Pt. 2	3.27	3.27	Max Wave Height
	Pt. 3	3.00	2.95	Max Tide
	Pt. 4	3.78	3.78	Max Tide
	Pt. 5	4.50	4.60	Max Wave Height
	Pt. 6	5.71	6.35	Max Wave Height
	Pt. 7	6.53	6.99	Max Wave Height
Patsy	Pt. 1	1.55	2.27	Max Wave Height
	Pt. 2	1.40	1.57	Max Wave Height
	Pt. 3	2.16	1.20	Max Tide
	Pt. 4	2.19	1.26	Max Tide
	Pt. 5	2.31	2.93	Max Wave Height
	Pt. 6	2.55	5.22	Max Wave Height
	Pt. 7	2.61	5.89	Max Wave Height
Xangsane	Pt. 1	1.06	1.40	Max Wave Height
	Pt. 2	0.89	-0.14	Max Tide
	Pt. 3	0.70	1.31	Max Wave Height
	Pt. 4	0.70	1.45	Max Wave Height

Typhoon	Point	NOCE Result (m)		Governing Case
		$Tide_{max}$	$Wave_{max}$	
	Pt. 5	0.94	1.40	Max Wave Height
	Pt. 6	1.15	1.74	Max Wave Height
	Pt. 7	1.29	1.67	Max Wave Height

As shown in the above table, highlighted cells denote the case that governed, i.e. the greater value obtained from the two cases considered. For a 1:2 embankment slope with rock armor, the critical NOCE obtained is 6.99 m based on Typhoon Rita and located on extraction point 7, which is the south-western corner of the CPC reclamation. On the other hand, Typhoon Patsy and Typhoon Xangsane resulted to lower maximum non-overtopping crest elevations of 5.89 meters and 1.74 meters, respectively.

Wave overtopping occurs when the structure crest elevation is lower than the wave runup level. With computed NOCE of 6.99 m, wave overtopping is acceptable because building the required crest elevation would entail massive construction costs and spatial requirements. For the computation of the overtopping discharge, the procedures from EurOtop Manual on Wave Overtopping of Sea Defenses and Related Structures are used. This is applicable for dikes and sea embankments with smooth or rough armored slopes. To further reduce the average overtopping discharge, the influence of the addition of a wall on top of the slope is included in the computation considerations. The following table summarizes the obtained overtopping discharge per meter length for various crest elevations. These values are based on critical case obtained from Typhoon Rita, in which the highest value of NOCE was obtained.

Table 27. Overtopping Discharge Results

q ($m^3/s/m$)		Reclamation Backfill Elevation (maMSL)		
		+3.0	**+3.5**	**+4.0**
h_{wall} (m)	**1.0**	0.066	0.034	0.017
	1.5	0.021	0.010	0.005

The computed overtopping discharge may be compared with the tolerable overtopping discharges from various field studies. This provides a rough guideline for the structural safety for a given value of the discharge. However, it must be noted that the intensity of water hitting a specific location is still dependent on the geometry and distance from the structure and thus maximum intensities locally may be over the obtained overtopping discharge.

In terms of design, the CEM recommends a range of critical values of average overtopping discharges for various coastal structures considering structural safety and the safety of traffic. For example, for an embankment seawall, it expects damage to the structure if its crest is not protected if an overtopping discharge of 0.002 to 0.02 cms/m is experienced. Following CEM, the table below summarizes the expected damage condition and range of overtopping discharges q for embankment seawall and building structures. For example, damage to an embankment seawall occurs if the back slope is not protected and the overtopping rate is between 0.02 – 0.005 cms/m. By using the lowest value q in this table together with various Reclamation Backfill Elevations (RBE) and the simulated wave conditions and storm tide corresponding to the critical NOCE condition, the required minimum elevation hmin of a vertical wall on top of the sloping embankment can be computed. **Table 29** summarizes the results of these computations based on Eq. (4) under the above conditions

Table 28. CEM Stipulated Overtopping Rates for Various Structures.

Structure	Range of average q (cms/m)	Damage Condition
Embankment	0.02 – 0.05	Damage if back slope not protected
Seawall	0.002 – 0.02	Damage if crest is not protected
Buildings	0.000001 – 0.00002	Minor damage to fittings, sign posts, etc.

Table 29. Synthesized NOCE of Project Island

RBE (maMSL)	Required Minimum Wall Height (m)		
	q=0.02 cms/m	q=0.002 cms/m	q=0.000001 cms/m
3.0	1.515	2.418	4.988
3.5	1.222	2.136	4.725
4.0	**0.921**	**1.847**	**4.456**

5.0 CONCLUSIONS AND RECOMMENDATIONS

The Geological Site Scoping Report made by MGB R4A was considered and adhered to in the conduct of this assessment.

The proposed Parañaque 286.86-Hecatre Reclamation Project is to be located offshore of the City of Parañaque, at approximately 990 meters west of the edge of the existing reclamation area (site of Okada and Marina). The nearest existing major road to the proposed project site is Roxas Boulevard at a straight distance of 2.76 km. Access ways will be built to connect to the reclamation islands; being initially considered at this time are viaducts to be built near the Marina.

Several earthquake generators that could affect the project site can be found in the region. These include the Valley Fault System, the Philippine Fault Zone, Lubang Fault and Manila Trench among others. At present, no major structures have been identified in the vicinity of the project site. The West Valley Fault, an active fault, lies about 9.4 kilometers to the east.

The proposed reclamation project is underlain by Quaternary Alluvium. The proposed site, which is presently under seawater, generally consists of an upper 4m to 15m of very soft silts and clays (N-value < 5). It is then underlain by 2m to 10m thick layers of stiff to very stiff silts and clays and medium dense sands. These are all underlain by the competent strata consisting of dense to very dense sands and hard clays, encountered at depths of around 10m to 30m. These are probably part of the Diliman Tuff member of the Guadalupe Formation.

Ground rupture hazard is seemingly absent in the project area but is prone to other seismic hazards such as: ground shaking, liquefaction, differential settlement, subsidence and tsunami. It is likewise prone to flooding and storm surge;

Using the deterministic method of Tanaka and Fukushima in calculating for the PGA, the values of 0.267g, 0.445g, and 0.632g for bedrock, medium soil and soft soil, respectively were computed.

Subsidence is another threat to the project due to both natural (geology and tectonic setting) and anthropogenic (groundwater extraction) causes. Metro Manila's coastal areas are sinking as fast as 9 cm/y (Rodolfo et al. 2003, Siringan and Rodolfo 2003, Rodolfo and

Siringan 2006). Nevertheless, the site itself is relatively far from the critically sinking areas around Manila Bay.

The project site is prone to tsunami hazard as delineated by PHIVOLCS. A 7.9 earthquake along Manila Trench or Scenario 13 will produce a maximum of 4m high wave and an average of 2m high wave along Manila Bay (MMEIRS, 2004).

Since the underlying soil layers are mostly silts and clays of varying plasticity, settlements are found to be long-term. The estimated total settlement ranges from 1830mm – 3210mm for a fill height of 4m-18m.

Furthermore, the coastal area of the metropolis, including Parañaque City, is delineated as highly susceptible to liquefaction hazard. Numerical liquefaction analysis shows that the upper 10-20m are susceptible to liquefaction considering the thick layers of loose sands. These liquefiable layers may induce settlements ranging from 12mm to 13mm

With settlement and subsidence hazards combined with sea-level rise, the cumulative effects can be very damaging to the project if not properly addressed in the engineering design.

In terms of flooding, the vicinity of the site falls within the delineated low to moderate susceptibility.

The coastal areas along Manila Bay is considered vulnerable to storm surges. The location of the reclaimed land will be such that it will be the farthest from the shore or the one facing the sea, which makes it most vulnerable to storm surge as well as tsunamis. Projections by Project NOAH using the TS Yolanda scenario show that the maximum storm surge height in the project site is 2-3m.

Storm tide levels of 3 potentially critical typhoons, Rita, Patsy and Xangsane, were simulated at the vicinity of the project site. Typhoon Rita caused storm tide levels of roughly 1.2m – 1.3m at the Island, which did not increase significantly for the post-development scenario. Typhoon Patsy caused storm tide levels of roughly 1m and the reclamation resulted to a marginal reduction in storm tide levels within the Manila South Harbor. Lastly, typhoon Xangsane resulted in the lowest storm tide level at roughly 0.8 m and the reclamation did not change the result significantly.

Simulative analyses of storm waves generated by the 3 historical typhoons were likewise carried out. The storm wave heights induced by these typhoons ranges from 0-4m at the harbor and along the coastline.

With respect to landslides, the site is not vulnerable. However, the island that will be built shall be exposed to slope failure hazards if the engineering design is inappropriate.

Based on the foregoing conclusions, the following are recommended:

1. The buildings and structures that would be constructed on the proposed reclamation site should conform to the National Structural Code of the Philippines. These building must be able to withstand an earthquake with a magnitude of at least 7.2. The computed “g” values of 0.632g must be utilized in the design of the structures. a site specific seismic hazard assessment may be warranted to optimize the design of structures considering seismic loads;

2. The site is considered prone to settlement and subsidence hazards, in order to mitigate these hazards, building and structures to be constructed must be founded on the solid bedrock and appropriate foundation design should be put in place to mitigate these hazards;

3. Remediation options for differential settlement, liquefaction and subsidence include: compaction – densifying sandy soil with vibration and impact; pore water pressure rod (vibro) compaction, dissipation – installing permeable drain pipes; cementation and solidification – mixing stabilizing material in sandy soil; replacement; lowering of groundwater level; shear strain restraint; preload; and structural measures. A combination of these methods has been found to be more effective. The choice of the remediation method will depend on site characteristics. It is important that the chosen method will minimize or mitigate the impacts to the reclaimed land and at the same time, will not bring adverse effects to its immediate environs. The selection is in accordance with international standards and suitability to the reclaimed land in terms of type of fill materials and existing ground conditions.

4. Precisely because of this physical characteristic of the underlying fill materials, deep foundation systems for planned structures should be undertaken to address or mitigate these hazards.

5. The fill materials must be fully engineered and compacted/densified to ensure stability and mitigate liquefaction potential. The soil remediation process that will increase the N-value should be advanced to the to the bottom of pre-existing alluvium, which is the cohesionless soft soil at the upper layers of the subsurface.

6. The retaining wall that will support the island must be properly designed to resist the lateral and hydrostatic pressures;

7. The platform level shall be above the extreme water level (+5 MLLW), securing a safe situation for future inhabitants. If this is not feasible, there must be protective structures (seawall, wave deflectors that can resist this wave height). The required platform level will therefore be above the most extreme water level that can occur given the design life of the land reclamation, also taking into account the storm surge for the defined safety level of 1/1000 year. Predictions/modeling will be done in consideration of the cumulative effects of subsidence, settlement, liquefaction and SLR to ensure that the platform level is still meeting requirements at the end of the design life.

    a. The structure crest elevation which is not overtopped by typhoon waves depends highly on the design of the reclamation wall structure in terms of seaward slope, hydraulic roughness, profile, and armor unit type and geometry. For a 1:2 embankment slope with rock armor, the critical non-overtopping crest elevation obtained is 6.99 m based on Typhoon Rita. With the obtained required elevation not viable, wave overtopping is to be expected for lower design crest elevations, and thus a slope with seawall on top was considered. Setting the FGL at 3 m to 4 m and wall heights of 1 to 1.5 m, the obtained wave overtopping discharge ranges from 0.005 to 0.066 $m^3/s/m$. With these obtained values, it is recommended to protect the embankment crest based from the critical values of overtopping discharges from the Coastal Engineering Manual.

b. To satisfy CEM code requirements specifying damage condition for a protective coastal structure such as an embankment seawall, combinations of minimum seawall height and RBE (reclamation backfill elevation, or height of fill above MSL) were computed to meet the maximum wave overtopping discharge for the damage condition. For example, in order not to damage the embankment seawall assuming no additional protection of the crest, the required minimum height is +1.85 m for a RBE of +4m.

c. Conservative scenarios of high tsunami heights, which could result from a case of strong earthquakes should be studied and mathematical modeling will be applied. The final design of the platform level should consider both the tsunami scenario and the guidelines and requirements of the PRA, as well as economic viability.

8. At worst case, the project will not increase the effects on land-based structures and facilities as well as on population. In so far as those in the reclaimed land itself, in addition to the platform level, some structures may be placed in stilts while others will be designed with certain parts (floors) of a building/structure at high levels. The proposed project will include a “no build’ zone and wave water catchment channels.

9. Make consultations with PHIVOLCS and other concerned agencies on this matter as well as on other design aspects such as liquefaction and ground shaking.

10. For flooding mitigation, the engineering design of the reclamation should provide for adequate channels, drainages and runoff discharges to the open sea as well as non-blockage of river outfalls and other flood paths.

    a. The design of structural flood defenses should account for possible overtopping but should not be over-estimated as this could also possibly cause trapping of floodwaters. Where flood defenses are breached, it will usually result in sudden flooding with little or no warning and will present a significant hazard and danger to life.

11. An essential part of hazard mitigation is the people’s awareness and preparedness. Vigilance and sustained community-level public education on tsunami and storm surge awareness, preparedness and mitigations are very important. The coastal communities must be aware of geohazard facts and must react appropriately during untoward event;

12. Safety drills should be institutionalized throughout the project life. This will include fire drills, earthquake drills, and the like. Evacuation muster points will be established. These efforts shall be in consonance with the Disaster/Risk Reduction and Management Plan of the government.

13. Monitoring of ground level should be done during the reclamation phase up to the end of the project. This is to determine quantitative surface movements with respect to both spatial and temporal rates;

14. Coordinate with PAGASA, MGB, PHIVOLCS, NDRRMC and other concerned agencies with regards to monitoring, warning/alert systems, and trainings/capability building.

6.0 LIMITATIONS AND CLOSURE

The scope of this assessment is limited to the matters expressly covered herein. The report was made for the sole benefit of the Parañaque 286.86-Hectare Reclamation Project represented by the City Government of Parañaque. This report was prepared using geological procedures in conducting the engineering–structural geological assessment and geohazards investigation. Its scope is limited to the project and location described herein and represents my understanding of the surface and sub-surface conditions of the site at the time of the assessment. The contents of this report are valid as of the date of the preparation, however, should there be appreciable changes in the site as a result of man-made or natural activities, the undersigned should be immediately notified so that supplemental recommendations can be provided. Consequently, this report should not be relied upon after an elapsed period of three (3) years without the review of the author for verification and validity. This warranty is in lieu of all other warranties, either expressed or implied.

To the best knowledge, the author has employed accepted geological procedures in the conduct of geohazard mapping and assessment in the project site. All the professional opinions and conclusions made are based on geotechnical drilling and interpretation, empirical evaluation and available documented information and within standard geoscientific principles and practices.

7.0 STATEMENT OF ACCOUNTABILITY

Pursuant to the requirement of the Office of Region IVA of the Mines and Geosciences Bureau, the undersigned as the Consultant and Preparer of the Engineering Geological and Geohazard Assessment Report for the proposed site of *"Parañaque 286.86-Hectare Reclamation Project"* do hereby attest, to the best of my knowledge and expertise, to the technical viability of the recommended engineering geological measures, for the purpose of ensuring the long-term stability of the structures, subject to proper construction workmanship and strict adherence to the National Structural Code of the Philippines.

Stated further that in no other case should the "recommended engineering geological measures" be revised without the proper consent and approval of the undersigned. The undersigned shall not be held accountable whether professionally or personally for whatever damages that may be incurred as a result thereof.

Prepared by:

JEAN S. RAVELO
Professional Geologist
PRC License No: 001184
PTR No. 6676714
Issued on: January 9, 2019
Issued in: Antipolo City

With Conformity:

____
Representative Officer
LGU-Parañaque City

8.0 REFERENCES

_________. 2018. Final Geotechnical Investigation Report. *internal report.* February 2018

AMH Philippines, Inc. 2018. Final Report (FS/EIS Inputs) for the Parañaque Reclamation Project, Coastal Engineering. *internal report*. October 31, 2018

AMH Philippines, Inc. 2018. Final Report (FS/EIS Inputs) for the Parañaque Reclamation Project, Geotechnical Engineering. *internal report*. December 12, 2018

Allen, et.al., 2014. Enhancing Risk Analysis Capacities for Flood, Tropical Cyclone Severe Wind and Earthquake for the Greater Metro Manila Area Component 5 – Earthquake Risk Analysis. PHIVOLCS and Geoscience Australia.

Association of Structural Engineers of the Philippines, 2001. National Structural Code of the Philippines, vol. 1, 5th edition

Aurelio and Peña, 2002. Geology and Mineral Resources of the Philippines, Vol. 1, DENR -Mines and Geosciences Bureau.

M.A. Aurelio and the EGGA Technical Working Group. Engineering Geological and Geohazard Assessment (EGGA) system for sustainable infrastructure development: the Philippine experience

M.L.P. Bautista, et al., 2014. Philippine Tsunamis and Seiches (1589-2012). PHIVOLCS

De Las Alas, J.G. & Sodusta, J.A. 1985. A model for the wind driven circulation of Manila Bay. *Nat. Appl. Sci. Bull.* 37(2):159-170.

Dell, et.al., 2001. Characterization of the Reclaimed Soil in the Foreshore Area of Manila Bay, Philippines.

Deltares - Taskforce Subsidence, October 2013. Sinking Cities, An integrated approach towards solutions. Delft/ Utrecht, The Netherlands.

Department of Environment and Natural Resources - Environmental Management Bureau, 1992. Manila Bay Monitoring Program. 87pp

Fuchs, R., Conran, M. & Louis, E. 2011. Climate change and Asis's coastal urban cities: Can they meet the challenge? Environment and Urbanization Asia, 2:13, 13- 28.

Idriss I.M. and R.W. Boulanger, 2008. Soil Liquefaction during Earthquakes.

Japan International Cooperation Agency (JICA), Metropolitan Manila Development Authority (MMDA) and Philippine Institute of Volcanology and Seismology (PHIVOLCS), March 2004. Metro Manila Earthquake Impact Reduction Study (MMEIRS) Final Report. Volume I-Executive Summary.

Lagmay, A.F., September 24, 2011, Two Years after Ondoy. Large areas of Metro Manila Sinking. Philippine Daily Inquirer

Lapidez, J.P., et.al., 2015. Identification of storm surge vulnerable areas in the Philippines through the simulation of Typhoon Haiyan-induced storm surge levels over historical storm tracks. DOST-Project NOAH. Published in Nat. Hazards Earth

Syst. Sci., 15, 1473–1481, 2015

NAMRIA, Edition 1, March 1995. Topographic Map of Manila, Sheet 7172-II, 1:50,000

2001, Topographic Map of Cavite City, Sheet 3129-I, 1:50,000
2001, Topographic Map of Manila, Sheet 2511, 1:250,000
2001, Topographic Map of Muntinlupa City, Sheet 3229-IV, 1:50,000
2001, Topographic Map of Quezon City, Sheet 3230-III, 1:50,000

Nelson, A.R., Personius, S.F., Rimando, R.E., Punongbayan, R.S., Tungol, N., Mirabueno, H., and Rasdas, A., 2000. Multiple large earthquakes in the past 1500 years on a fault in Metro Manila, the Philippines. Bull. Seis. Soc. Am., 90 (1), 73-85.

Perez, R.T., Feir, R.B., Carandang, E. & Gonzalez, E.B. (196). Potential impacts of sea level rise on the coastal resources of Manila Bay: A preliminary vulnerability assessment. Water, Air and Soil Pollution, 92, 137-147

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), 2013. Climatological normals recorded in Sangley Point Station.

Philippine Bureau of Mines and Geosciences, 1st Ed., 1984. Geological Map of Cavite Quadrangle, Sheet 3163-II, 1:50,000
ol 1st Ed., 1984. Geological Map of Manila-Quezon City Quadrangle, Sheet 3263-IV, 1:50,000
1st Ed., 1984. Geological Map of San Pedro Quadrangle, Sheet 3263-III, 1:50,000

PHIVOLCS, 2017. Seismicity Map of Metro Manila, Magnitude 5 and above, 1965-2015.
Philippine Earthquake Model,. December 2017
Distribution of Active Faults and Trenches in the Philippines. 2017

Punongbayan, 2011. MMEIRS Scenario 8: Magnitude 7.2 Earthquake along the West Valley Fault System – PHIVOLCS PPT presentation at UN OCHA MTG; RCBC

Raucoules, D.B., et.al., 2013. Strong non-linear urban ground motion in Manila (Philippines) from 1993 to 2010 observed by InSAR

READY for GMMA Project.
Preliminary Earthquake-Induced Landslide Hazard Map of Metro Manila. October 2013.
Preliminary Rain-Induced Landslide Hazard Map of Metro Manila. October 2013.
Preliminary Flood Hazard Map of Metro Manila. October 2013.
Preliminary Liquefaction Hazard Map of Metro Manila. December 2014.
Preliminary Storm Surge Hazard Map of Metro Manila. October 2013.
Preliminary Tsunami Hazard Map of Metro Manila. December 2014.

Risk Analysis Project.
Ground Shaking Hazard Map – Event Scenario: Magnitude 6.5 Earthquake along West Valley Fault. October 2013.
Ground Shaking Hazard Map – Event Scenario: Magnitude 7.2 Earthquake along West Valley Fault. October 2013.

Rodolfo, K.S., October 3, 2013. Why reclamation of nearshore Manila Bay is a very bad idea, The Philippine Star, Star Science.

Rodolfo, K.S., 2014. On the geological hazards that threaten existing and proposed reclamations of Manila Bay, Philippine Science Letters, Vol 7, No. 1, pp 228-240)

Rodolfo and Siringan, 2006. Global sea-level rise is recognized, but flooding from anthropogenic land subsidence is ignored around northern Manila Bay, Philippines.

Siringan and Ringor, 1997. Predominant Nearshore Sediment Dispersal Patterns in Manila Bay, Science Diliman, 9: 1 & 2, pp 29-40.

Siringan, F.P. & Ringor, C.L. 1998. Changes in bathymetry and their implications to sediment dispersal and rates of sedimentation in Manila Bay. *Science Diliman* 10(2):12-26

Solidum R.U., 2013. An Update on the Earthquake Hazards and Risk Assessment of Greater Metropolitan Manila Area

Solidum, R.U., 2016. Tsunami Disaster Management in the Philippines. ppt. presentation

Soria, J.L.A, F.P. Siringan and K.S. Rodolfo, 2006. Compaction rates and paleo-sea levels along the delta complex north of Manila Bay, Luzon Island, Philippines.

Tablazon, J., et.al., 2015. Probabilistic storm surge inundation maps for Metro Manila based on Philippine public storm warning signals. DOST-Project NOAH. Published in: Nat. Hazards Earth Syst. Sci., 15, 557–570, 2015. Pub. by Copernicus Publications on behalf of the European Geosciences Union.

Thenhaus, P. C., Hanson, S. L., Algermissen, S. T. (US Geological Survey) and Bautista, B. C., Punongbayan, B. J., Rasdas, A. R., Nillos, J. T., Punongbayan, R. S. (PHIVOLCS), Estimates of the regional ground-motion hazard in the Philippines.

Torres, R. C., Paladio, M. A. O, Punongbayan, R. S., Alonso, R. A. Liquefaction inventory and mapping in the Philippines: a worst case scenario, 1994, DOST-PHIVOLCS, Natural Disaster Mitigation in the Philippines, pp.71 – 98

Umali, R.S., 2019. Geological Site Scoping Report (GSSR) of the Proposed 286.86-Hectares Parañaque Reclamation Project located at the Coast of Manila Bay within the Territorial Jurisdiction of the City of Parañaque, Metro Manila. DENR-MGB Region 4A.

Villanoy, C. & Martin, M. 1997. Modelling the circulation of Manila Bay: Assessing the relative magnitudes of wind and tide forcing. *Science Diliman* 9(1/2):26-35

Whymark, 2015. Natural and Anthropogenic Hazards in Metro Manila

Yasuda, S., Ishihihara, K., Harada, K. and Shinkawa, N., Jan. 1996. Effect of Soil Improvement on Ground Subsidence Due to Liquefaction. Special Issue of Soils and Foundations, pp. 99-107, Japanese Geotechnical Society

Yoshimitsu Fukushima and Teiji Tanaka, 1990, A New Attenuation Relation for Peak Horizontal Acceleration of Strong Earthquake Ground Motion in Japan, Bull. Seism. Soc. Am., Vol. 80, No. 4, 757-783.

Yoshimitsu Fukushima and Teiji Tanaka, 1992, The revision of "A New Attenuation Relation for Peak Horizontal Acceleration of Strong Earthquake Ground Motion in Japan", Abstracts The Seismological Society of Japan, 1992, Fall Meeting, B18 (in Japanese).

Zen K., et.al., 2007. Handbook on Liquefaction Remediation on Reclaimed Land. Edited by Port & Harbor Research Inst.

http://www.phivolcs.dost.gov.ph/images/EIL/region%20iv-a.pdf

http://www.phivolcs.dost.gov.ph/index.php?option=com_content&view=article&id=78:hazard-map-of-active-fault-and-trenches&catid=45&Itemid=500024

http://202.90.128.67/html/update_GGRDD/Maps/AF-and-Trenches/Regional/Luzon/NCR.png

http://blog.noah.dost.gov.ph/2014/02/04/compilation-of-storm-surge-occurrences-in-the-philippines/

http://opinion.inquirer.net/15993/on-reclamation-and-flooding, October 25, 2011

ANNEX to Section 1

Buffer Zone of Parañaque 286.86

Maybe generally defined as a geographical zonal area that separates a project site from the impact areas (water, land, air and people) thereby providing added protection from the impacts of the project to communities/people and environmental resources.

Regulatory Guidelines

DAO 03-30 and the EMB MC 2014-005 do not provide clear definition of buffer zones while the E NIPAS Act stipulates the following:

> "SEC. 8. *Buffer Zones.* – When necessary, the DENR Secretary, upon the recommendation of the PAMB, may designate areas surrounding the protected areas as buffer zones for the purpose of providing extra layer of protection where restrictions may be applied: *Provided,* That, in cases where the designated buffer zone would cover private lands, the owners thereof shall be required to design their development with due consideration to the protected area management plan."

For the Parañaque 286.86 hectare reclamation projects a key environmental resource is the **LPP WP (LPPCHEA)**

The geographical coordinates of reclamation projects and the LPP WP are provided in **Table 1** and **Table 2.**

Table 1. Coordinates of the Project Landform in WGS 84,

GRID COORDINATES (PRS 92)			GEOGRAPHIC COORDINATES (WGS)	
POINT ID	EASTING	NORTHING	LAT	LONG
1	496188.05649	1604920.68486	14 30 41.2244 N	120 57 57.5846 E
2	495751.21640	1604084.05940	14 30 13.9995 N	120 57 42.9999 E
3	495631.43130	1603991.88370	14 30 10.9995 N	120 57 38.9999 E
4	495002.63360	1603899.81820	14 30 07.9995 N	120 57 17.9999 E
5	494951.78876	1603875.52536	14 30 07.2087 N	120 57 16.3020 E
6	494906.97118	1603852.36564	14 30 06.4548 N	120 57 14.8053 E
7	494869.26262	1603826.73547	14 30 05.6206 N	120 57 13.5461 E
8	494826.61067	1603792.02693	14 30 04.4909 N	120 57 12.1219 E
9	494799.77889	1603762.08708	14 30 03.5165 N	120 57 11.2260 E
10	494773.64410	1603727.96967	14 30 02.4062 N	120 57 10.3534 E
11	494757.61470	1603696.28907	14 30 01.3752 N	120 57 09.8183 E

GRID COORDINATES (PRS 92)			GEOGRAPHIC COORDINATES (WGS)	
12	494740.95466	1603662.56471	14 30 00.2778 N	120 57 09.2622 E
13	494712.98916	1603636.86063	14 29 59.4412 N	120 57 08.3284 E
14	494670.48172	1603615.62680	14 29 58.7500 N	120 57 06.9089 E
15	494626.29613	1603605.56865	14 29 58.4223 N	120 57 05.4333 E
16	494574.83983	1603607.24501	14 29 58.4765 N	120 57 03.7148 E
17	494523.49580	1603623.33270	14 29 58.9995 N	120 57 01.9999 E
18	494316.55137	1603775.13642	14 30 03.9373 N	120 56 55.0871 E
19	494301.92729	1603790.51999	14 30 04.4377 N	120 56 54.5986 E
20	494293.57450	1603810.03278	14 30 05.07255 N	120 56 54.3195 E
21	493790.43266	1605991.77665	14 31 16.0581 N	120 56 37.4955 E
22	493797.09869	1606035.53866	14 31 17.4821 N	120 56 37.7178 E
23	493836.52983	1606063.97101	14 31 18.4076 N	120 56 39.0346 E
24	493880.15711	1606056.47365	14 31 18.1640 N	120 56 40.4918 E
25	494587.64180	1605624.65323	14 31 04.1193 N	120 57 04.1260 E
26	494610.26819	1605529.82796	14 31 03.3117 N	120 57 04.8819 E
27	494616.00679	1605566.73240	14 31 02.2349 N	120 57 05.0739 E
28	494605.94077	1605477.24497	14 30 59.3231 N	120 57 04.7384 E
29	494612.24294	1605418.75491	14 30 57.4200 N	120 57 04.9493 E
30	494630.97737	1605362.98910	14 31 55.6056 N	120 57 05.5755 E
31	494661.26720	1605312.55765	14 30 53.9649 N	120 57 06.5876 E
32	494701.69472	1605269.82101	14 30 52.5746 N	120 57 07.9382E
33	494750.36772	1605236.77946	14 30 51.4999 N	120 57 09.5642 E
34	494805.00807	1605214.97952	14 30 50.7910 N	120 57 11.3893 E
35	494863.05831	1605205.44151	14 30 50.4811 N	120 57 13.3282 E
36	494921.80143	1605208.61188	14 30 50.5847 N	120 57 15.2902 E
37	494978.48794	1605224.34223	14 30 51.0969 N	120 57 17.1834 E
38	495030.46465	1605251.89631	14 30 51.9939 N	120 57 18.9192 E
39	495076.35491	1605290.98507	14 30 53.2661 N	120 57 20.4517 E
40	495110.20682	1605306.96960	14 30 53.7864 N	120 57 21.5822 E
41	495146.94512	1605299.77554	14 30 53.5526 N	120 57 22.8093 E
42	495753.41681	1604960.03471	14 30 42.5022 N	120 57 43.0677 E
43	495970.73823	1605042.40496	14 30 45.1837 N	120 57 50.3256 E

Table 2. Coordinates of the LPP WP in WGS 84

Reference: Proclamation No 1412 s. 2007 Perimeter: 8,133.6875 Meters Total Area: 175.307 Hectares		
Point	**#1:**	(14°°29'21.63"N,120°°59'12.66"E)
Point	**#2:**	(14°°29'21.77"N,120°°59'22.14"E)
Point	**#3:**	(14°°29'27.34"N,120°°59'26.23"E)
Point	**#4:**	(14°°29'33.58"N,120°°59'29.74"E)
Point	**#5:**	(14°°29'38.25"N,120°°59'31.67"E)
Point	**#6:**	(14°°29'45.49"N,120°°59'33.78"E)
Point	**#7:**	(14°°29'50.68"N,120°°59'35.33"E)
Point	**#8:**	14°°29'50.64"N,120°°59'31.13"E)
Point	**#9:**	(14°°29'52.82"N,120°°59'31.14"E)
Point	**#10:**	(14°°29'55.05"N,120°°59'32.89"E)
Point	**#11:**	(14°°29'57.79"N,120°°59'33.77"E)
Point	**#12:**	(14°°29'59.35"N,120°°59'33.35"E)
Point	**#13:**	(14°°29'59.93"N,120°°59'29.34"E)
Point	**#14:**	(14°°29'59.95"N,120°°59'27.74"E)
Point	**#15:**	(14°°30'0.22"N,120°°59'25.46"E)
Point	**#16:**	(14°°30'0.93"N,120°°59'24.22"E)
Point	**#17:**	(14°°30'1.10"N,120°°59'21.65"E)
Point	**#18:**	(14°°30'2.88"N,120°°59'20.33"E)
Point	**#19:**	(14°°30'2.77"N,120°°59'7.88"E)
Point	**#20:**	(14°°29'58.22"N,120°°59'7.88"E)
Point	**#21:**	(14°°29'56.18"N,120°°59'9.17"E)
Point	**#22:**	(14°°29'54.20"N,120°°59'9.16"E)
Point	**#23:**	(14°°29'51.43"N,120°°59'9.65"E)
Point	**#24:**	(14°°29'48.67"N,120°°59'9.64"E)
Point	**#25:**	(14°°29'40.98"N,120°°59'8.64"E)
Point	**#26:**	(14°°29'36.01"N,120°°59'8.85"E)
Point	**#27:**	(14°°29'33.08"N,120°°59'8.65"E)
Point	**#28:**	(14°°29'30.37"N,120°°59'8.24"E)
Point	**#29:**	(14°°29'27.23"N,120°°59'6.36"E)
Point	**#30:**	(14°°29'25.59"N,120°°59'4.84"E)
Point	**#31:**	(14°°29'22.68"N,120°°58'55.62"E)
Point	**#32:**	(14°°29'20.78"N,120°°58'53,43"E)
Point	**#33:**	(14°°29'12.76"N,120°°58'47.99"E)
Point	**#34:**	(14°°29'11.09"N,120°°58'50.18"E)
Point	**#35:**	(14°°29'9.76"N,120°°58'51.09"E)
Point	**#36:**	(14°°29'3.28"N,120°°58'46.18"E)
Point	**#37:**	(14°°29'3.47"N,120°°58'45.91"E)
Point	**#38:**	(14°°28'56.72"N,120°°58'40.43"E)
Point	**#39:**	(14°°28'57.45"N,120°°58'37.82"E)
Point	**#40:**	(14°°28'54.05"N,120°°58'35.71"E)
Point	**#41:**	(14°°28'44.06"N,120°°58'31.59"E)
Point	**#42:**	(14°°28'41.71"N,120°°58'31.85"E)
Point	**#43:**	(14°°28'39.56"N,120°°58'31.13"E)

Point	**#44:**	14°°28’34.02″N,120°°58’30.42″E)
Point	**#45:**	(14°°28’32.17″N,120°°58’30.53″E)
Point	**#46:**	(14°°28’31.20″N,120°°58’31.28″E)
Point	**#47:**	(14°°28’29.02″N,120°°58’34.57″E)
Point	**#48:**	14°°28’30.50″N,120°°58’36.76″E)
Point	**#49:**	(14°°28’40.86″N,120°°58’49.45″E)
Point	**#50:**	(14°°28’43.88″N,120°°58’52.60″E)
Point	**#51:**	(14°°28’48.30″N,120°°58’56.20″E)
Point	**#52:**	(14°°28’58.55″N,120°°59’3.38″E)
Point	**#53:**	(14°°29’7.12″N,120°°59’8.75″E)
Point	**#54:**	(14°°29’8.97″N,120°°59’9.30″E)
Point	**#55:**	(14°°29’9.65″N,120°°59’8.52″E)
Point	**#56:**	14°°29’11.80″N,120°°59’8.40″E)
Point	**#57:**	(14°°29’13.14″N,120°°59’9.49″E)
Point	**#58:**	(14°°29’15.09″N,120°°59’9.08″E)
Point	**#59:**	(14°°29’17.73″N,120°°59’10.09″E)
Point	**#60:**	(14°°29’19.70″N,120°°59’11.70″E)

Figure 1. Map Showing the Parañaque 286.86 hectare Reclamation Project and the LPP WP (LPPCHEA)

Framework for Definition of the Buffer Zone for the Bacoor Reclamation Projects For EIS Purposes

1. Identify the resources in LPP WP (LPPCHEA) to be impacted on
2. Identify the aspects of the Reclamation Project that will cause impacts
3. Identify existing natural features that could exacerbate or otherwise mitigate these impacts
4. Show by mathematical modeling studies the parameters causing impacts and the reach of these parameter
5. Delineate the Buffer Zone based on the above (1-4)

Item 1. Resources

- Migratory Birds
- Mangroves

Item 2. Impacts Triggers

- **Sediment Transport**

Sediments from the dredging/reclamation works should be assessed for potential disturbance or damage to the LPP WP

- **Water Circulation**

The flow/direction of currents should be likewise evaluated to assess if such could carry sediment or pollution loads to LPP WP

- **Navigation of Sea Crafts**

Potential risk from the movement of sea crafts, e.g. the TSHD should be evaluated.

Item 3. Existing Natural Features

It is noted from the images below that:

- **Lagoons shelter the migratory birds**

With respect to the mangroves

The location of these are shown in **Figure 2.**

Plate 1. Images of the LPP WP (LPPCHEA)

Figure 2. Location of the Mangroves

Item 4. Key Results from Mathematical Modeling Studies

Suspended sediment is capable of being transported far away from the source if no settling velocity is considered. However, the concentrations far away will be very small compared to the initial concentration. In this given scenario with an initial source and no settling velocity, the farthest southern, western-, northern- and easternmost points containing concentrations of suspended sediment are as listed in **Table 1**. Concentrations in the outermost locations will be in the range of 0.1 – 1 % of the initial concentration.

It should be noted that the easternmost point is taken as the location of the source since sediment concentrations during tidal currents are observed to be transported west-, north- or southwards.

Table 1. **Farthest North, South, East and West points of suspended sediment concentrations.**

	Easting (UTM 51)	Northing (UTM 51)
South	277545.5	1600927
West	275783.5	1602533.5
North	276958.9	1609504
East	282233.1	1609378.5

A two-month simulation of particle tracking for the period of January 29 – March 29, 2016 was carried out. The hydrodynamic forcing are the tide boundaries offshore and no wind effects (calm wind condition). The model set-up includes instantaneous release of 8,640 particles from the source to determine their position after two months. In the post-development scenario, the particles disperse mostly to the north within the vicinity of reclaimed lands. The particles also disperse to the southwest, almost reaching Canacao Bay. However, there is less dispersion to the east and the particles do not reach LPPCHEA.

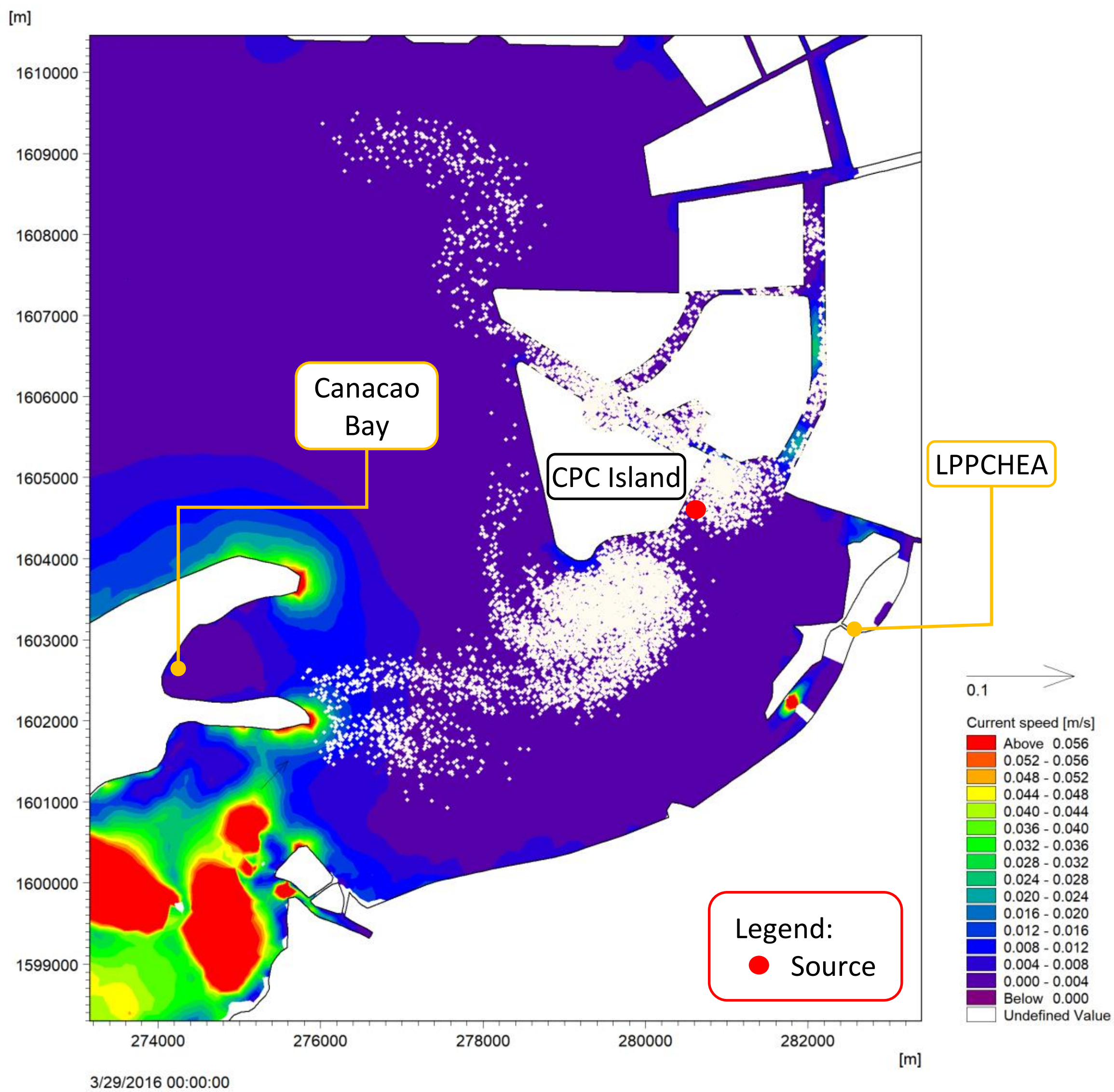


Figure 3. Location of the Sediments Farthest From the Reclamation Project and Thus Nearest the LPP WP (LPPCHEA), after two months during Amihan

Accidental Oil Spills

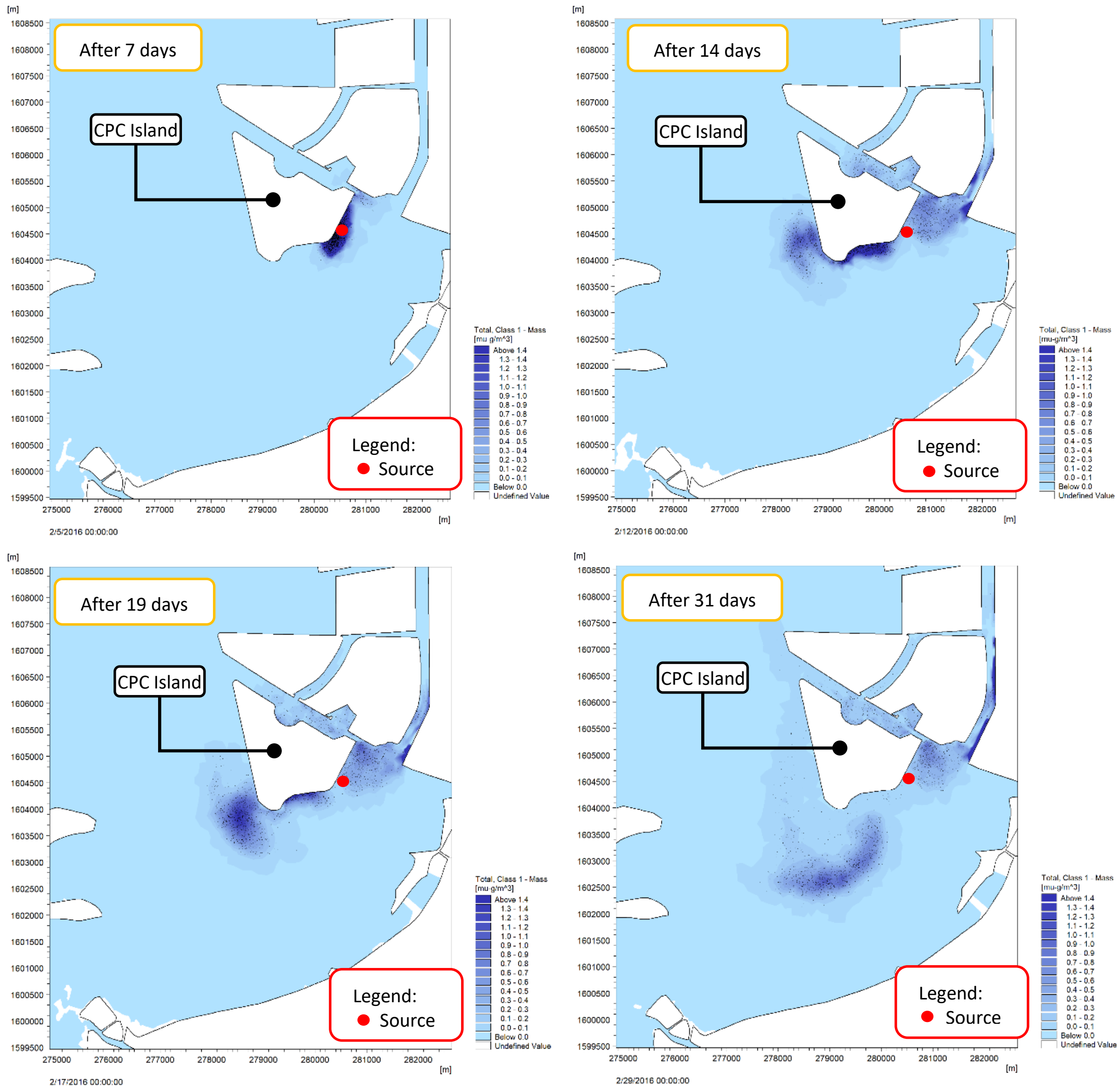


Figure 4. Relative sediment concentrations after 7, 14, 19 and 31 days. Initial source and no settling velocity.

Accretion/Erosion

Map showing the results of the modeling for the shoreline of LPPCHEA especially on the mangrove communities. It is noted that the migratory birds are sheltered by the lagoons and thus it may be deemed that migratory birds are not vulnerable to accretion /erosion.

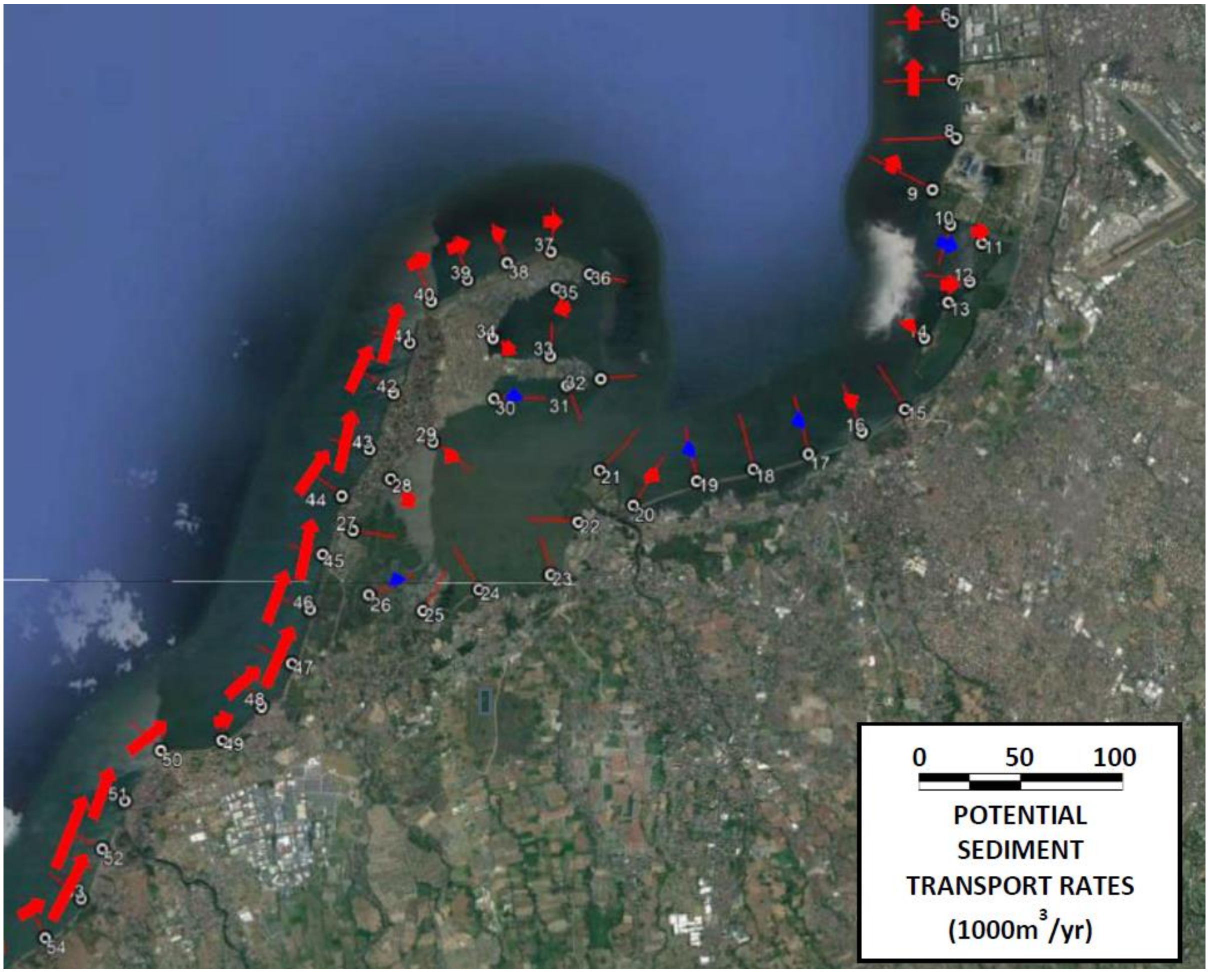


Figure 5. Longshore Sediment Transport

WATER CIRCULATION

The circulating currents within Manila Bay is the driving mechanism of the movement of particles within Manila Bay. Under calm wind condition, the snapshot of the circulating currents every 2 weeks for the period of January 29, 2016 to February 29, 2016 for both the pre-development scenario and post-development scenario is shown in Figure 6. The snapshots are taken during flood tide condition where the incoming tides from offshore are split into two direction, one going northwards passing through the proposed reclaimed lands and the Manila International Container Terminal (MICT) and one going into the Bacoor Bay. The currents near the MICT and the vicinity of the Sangley Spit are observed to increase during post-development scenario. Constricted flow between the proposed reclaimed is shown to have large current speeds. The proposed reclaimed land also caused increasing circulating current within the Bacoor Bay. The currents in the inner part of Canacao Bay is observed to be unaffected by the circulating currents within the larger Manila Bay both in the pre-development and post-development scenarios. Outside the mouth of this bay, the currents can be observed to be higher in the post-development scenario due to the constriction of flow caused by the proposed reclaimed land in the east of Canacao Bay.

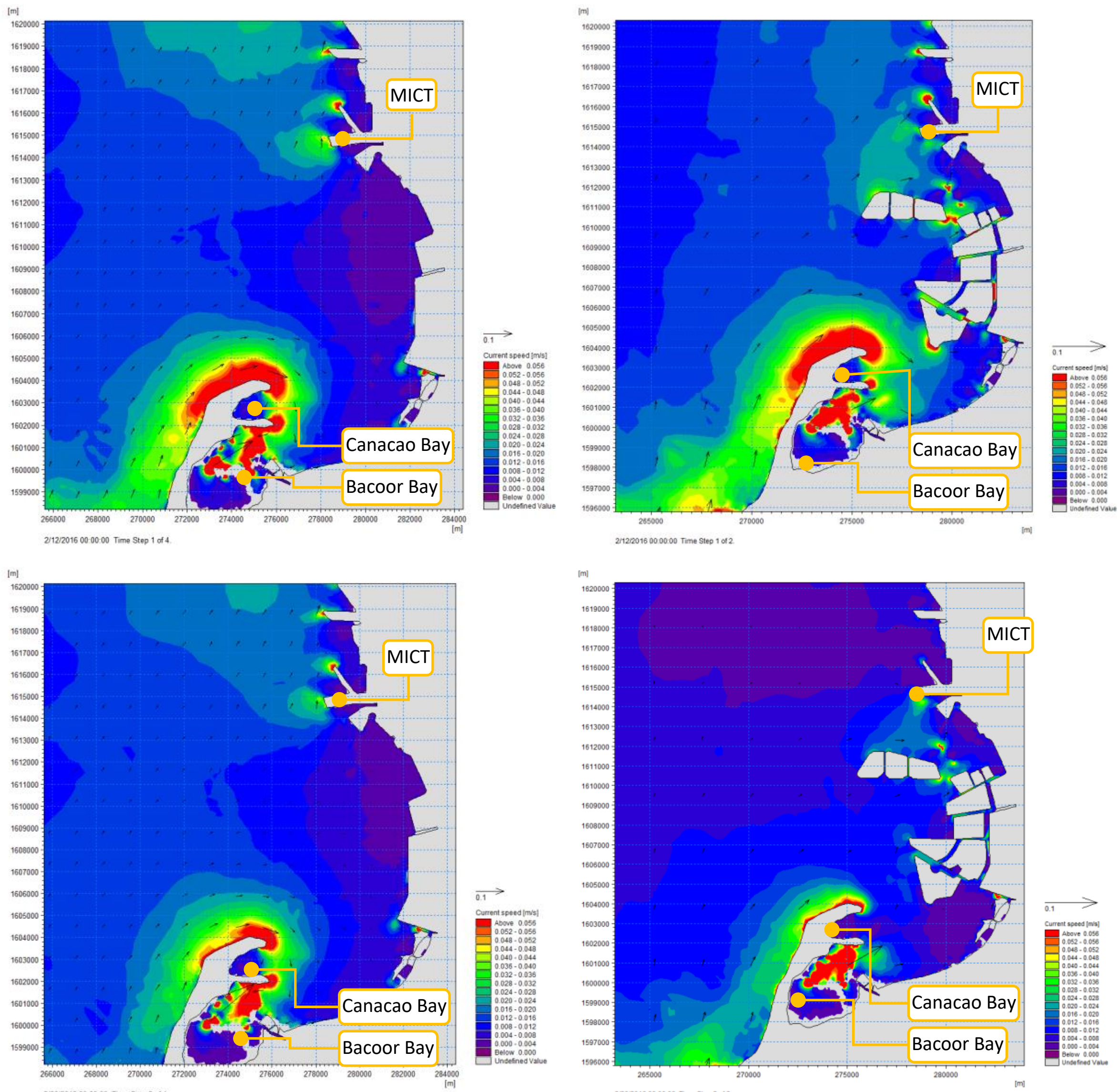


Figure 6. Snapshots of the circulating currents from January to February 2016

During ebb tide condition, where the flow of water is going offshore, it can be observed that the proposed reclaimed land constricted the flow in the east of Canacao Bay causing the current speed to increase (Figure 7). When the flow direction of tide just reverses from flood tide to ebb tide, a concentration of large current speeds within Bacoor Bay can be observed to occur during post-development scenario (Figure 7). This may be due to the constriction of flow by the proposed reclaimed land in the east of Canacao Bay.

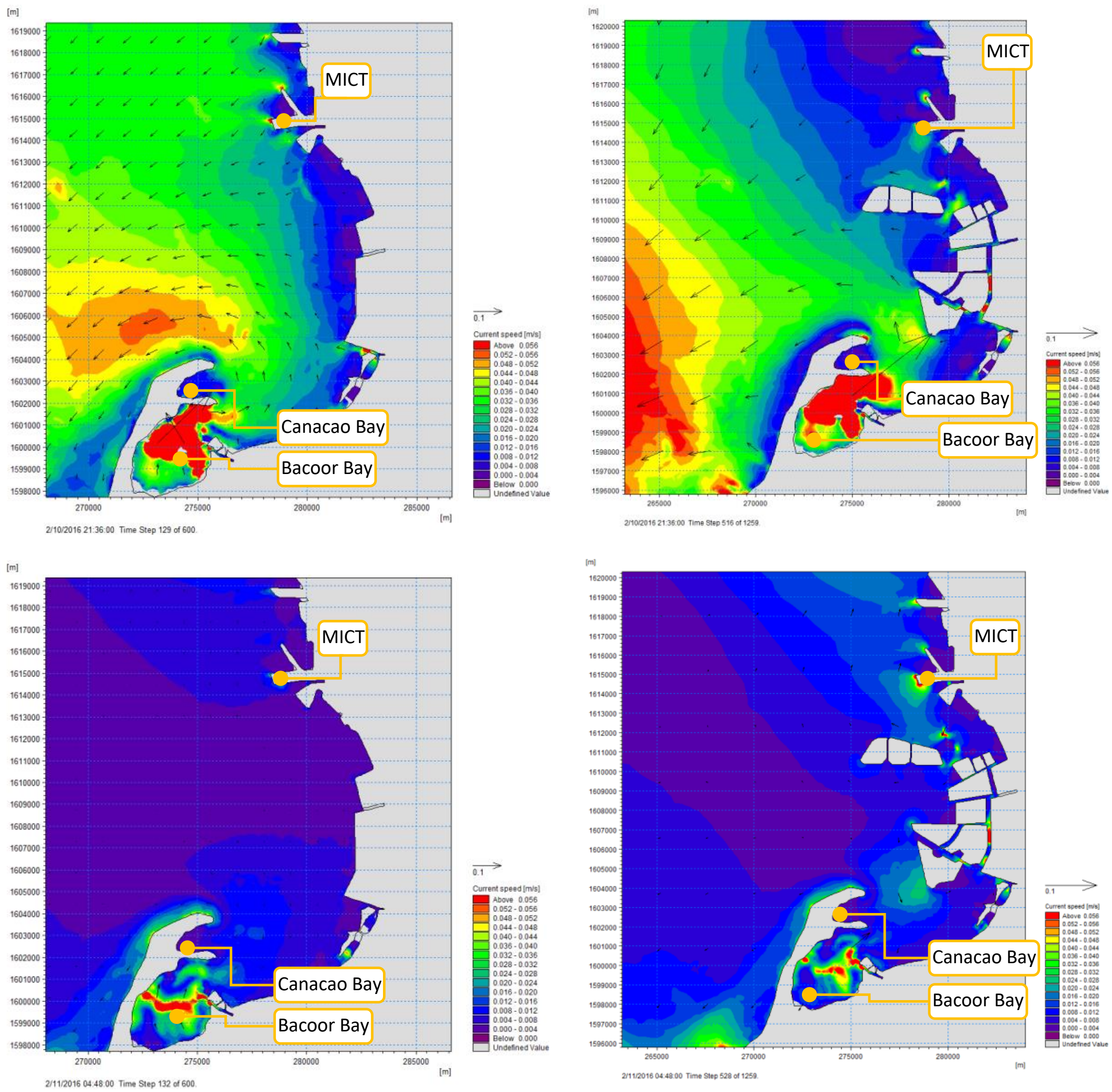


Figure 7. Changes in the circulating currents during ebb tide condition

Generally, the flow condition along Manila Bay varies between flow tide condition and ebb tide condition with a period of approximately 12 hours. However, in an event of accidental spills of oil or wastewater, the general track of these pollutants is northwards and will not reach the LPPCHEA as shown in the figure above.

Potential Impact of the Navigation of Sea Crafts

From **Figure 7** it is deemed that there would be no impacts.

Figure 7 Navigational Lane for the Sea Crafts

Item 5. Delineation of the Buffer Zone

SUMMARY

Based the foregoing discussions, the buffer zone is thus delineated as shown in **Figure 8** below:

Figure 8. Delineation of the Buffer Zone for Paranaque 286.86 Ha Reclamation Project

It is significant to note that the potential impacts on LPPCHEA are short-lived and only during the construction phase through the formation of land. Thereafter the dredging and reclamation activities cease perpetually.

Annex 2.1-A

List of Recent Earthquakes of Magnitude 5 and above that Affected Metro Manila (1907-2016)

Date	North Latitude	East Longitude	Depth (km)	MI	Mb	Ms	Intensity Reports RF & PEIS
18 April, 1907	14.000	123.000	033			7.6	
21 March, 1919	13.000	123.000	50			6.5	
03 April, 1922	13.820	119.910	68			5.0	
19 April, 1927	16.000	120.000	100			6.7	
18 July, 1932	14.000	120.000	100			6.0	
03 March, 1933	15.500	120.100	120			6.5	
06 June, 1933	14.000	120.000	33			6.3	
20 September, 1933	13.000	121.000	100			6.5	
31 July, 1934	15.100	119.700	33			5.6	
26 November, 1934	14.200	120.200	33			6.3	
07 February, 1935	13.500	122.700	33			6.0	
20 May, 1936	13.500	121.500	160			6.0	
20 August, 1937	14.500	121.500	33			7.5	
06 May, 1939	13.500	121.300	110			6.5	
28 March, 1940	14.200	120.600	160			6.8	
09 May, 1941	14.200	122.100	33			6.8	
08 April, 1942	13.200	120.600	33			7.7	
22 December, 1953	16.000	119.000	33			5.7	
19 July, 1956	15.100	120.500	033			5.7	
23 October, 1956	13.500	120.500	100			6.7	
24 August, 1958	14.000	121.000	150			5.7	
18 July, 1959	15.500	120.500	150			6.6	
21 May, 1960	15.500	121.500	33		5.0		
19 September, 1960	16.000	120.000	25		5.5		
26 February, 1961	15.500	121.100	32		6.1		
19 June, 1961	13.100	121.500	056		5.7		
15 July, 1961	13.230	120.580	60		5.7		
27 November, 1962	14.900	120.200	45		5.1		
21 December, 1962	15.900	121.800	033		5.0		
25 February, 1963	15.580	121.490	61		5.5		
17 May, 1963	15.690	120.130	99		5.6		
22 June, 1964	13.670	120.550	72		5.1		
09 July, 1964	15.360	119.670	048		5.3		
30 November, 1964	13.800	120.800	207		5.0		
13 August, 1965	13.570	120.060	36		5.2		
10 September, 1965	13.960	120.870	149		5.0		
10 January, 1966	13.810	120.720	133		5.3		
15 August, 1966	13.280	121.360	24		5.5		
28 August, 1966	13.730	120.840	114		5.0		
30 August, 1966	13.400	120.800	86		5.3		
11 October, 1966	13.980	120.740	104		5.1		
20 December, 1966	14.570	122.170	032		5.3		
05 January, 1967	13.780	120.710	170		5.4		
06 June, 1968	14.900	119.900	053		5.3		
12 June, 1968	13.800	120.700	135		5.1		
01 August, 1968	15.770	121.790	33		5.0		
06 August, 1968	15.700	122.000	48		5.3		
09 August, 1968	15.710	121.920	63		5.1		
10 August, 1968	15.410	121.590	86		5.1	5.2	

Date	North Latitude	East Longitude	Depth (km)	Ml	Mb	Ms	Intensity Reports RF & PEIS
13 August, 1968	15.620	121.830	042		5.0		
14 August, 1968	15.080	122.510	15		5.5		
23 August, 1968	15.700	121.900	057		5.1		
28 August, 1968	15.550	122.020	42		4.7	6.1	
29 August, 1968	15.510	121.980	39		5.3		
03 September, 1968	15.500	122.200	21		5.0		
19 September, 1968	14.920	120.240	060		5.2		
22 September, 1968	15.720	121.880	47		5.3		
04 November, 1968	13.500	120.500	75		5.0		
22 November, 1968	13.200	122.600	007		5.5		
29 December, 1968	13.600	120.540	46		5.2		
02 March, 1969	13.100	120.800	069		5.0		
02 March, 1969	13.020	120.830	73		5.0		
04 June, 1969	15.200	122.300	29		5.0		
10 June, 1969	13.200	121.500	017		5.1		
25 June, 1969	13.460	120.330	60		5.0		
06 October, 1969	14.990	120.110	66		5.6		
29 March, 1970	13.940	120.670	121		5.3		
06 April, 1970	13.970	120.370	88		5.2		
07 April, 1970	15.780	121.710	40		6.5	7.3	METRO MANILA VII
08 April, 1970	15.400	121.750	7		5.7	6.2	
12 April, 1970	15.080	122.010	025		5.8	7.0	
15 April, 1970	15.110	122.710	50		5.6	6.0	
22 April, 1970	15.370	121.830	046		5.1		
01 May, 1970	15.640	121.780	33		5.3	5.4	
06 May, 1970	15.710	121.760	041		5.1		
16 June, 1970	15.100	122.000	19		5.1		
10 July, 1970	13.930	120.420	89		5.5		
21 November, 1970	15.010	120.130	053		5.5	5.2	
29 April, 1971	13.000	122.300	090		6.0		
04 July, 1971	15.600	121.870	30		5.5	5.1	MANILA INTENSITY V
20 July, 1971	15.270	120.260	33		5.4		
14 January, 1972	13.550	120.870	126		5.1		
16 March, 1972	15.690	121.810	53		5.1		MANILA INFANTA RF1
28 March, 1972	13.520	120.760	165		5.8		
14 April, 1972	14.890	119.740	47		5.0		
25 April, 1972	13.370	120.310	050		7.2		MANILA CAVITE AMBULONG RF5;
26 April, 1972	13.550	120.550	33		5.2		MANILA RF3
27 April, 1972	13.510	120.680	072		5.4		MANILA RF4
29 April, 1972	13.350	120.640	56		5.2		
30 April, 1972	13.540	120.540	56		5.5		MANILA RF3
01 May, 1972	13.380	120.390	063		5.0		
08 May, 1972	13.410	120.460	53		5.1		
17 May, 1972	13.360	119.880	37		5.7		
26 May, 1972	13.290	120.410	38		5.2		
28 May, 1972	13.370	120.650	46		5.2		
19 June, 1972	13.340	120.340	049		5.3		
03 August, 1972	13.440	120.350	33		5.3		
28 August, 1972	13.270	120.560	62		5.2		
15 March, 1973	13.940	120.360	113		5.2		MANILA RF2 QUEZON CITY RF1
17 March, 1973	13.370	122.790	33		5.6	7.0	INTENSITY VI - MANILA; IV - PASAY CITY; VII MANILA VI
13 May, 1973	13.640	120.750	001		5.3		

Date	North Latitude	East Longitude	Depth (km)	MI	Mb	Ms	Intensity Reports RF & PEIS
18 July, 1973	14.930	119.860	56		5.1		MANILA RF3; QUEZON CITY RF2
25 October, 1973	13.790	120.240	63		5.6		MANILA RF4; AMBULONG RF2
21 November, 1973	13.450	121.020	039		5.1		
09 February, 1974	15.900	119.900	65		5.2		
12 February, 1974	13.600	120.400	88		5.4		
19 February, 1974	14.000	122.200	017		5.7		
16 April, 1974	13.830	120.650	123		5.4		MANILA RF3
22 October, 1974	13.480	120.570	041		5.2		MANILA RF3
03 November, 1974	15.020	122.670	33		5.1		
29 April, 1975	13.700	120.800	33	5.6			
18 June, 1975	13.900	120.600	134	5.4			
04 May, 1976	13.380	120.210	033	5.4			
23 April, 1985	15.300	120.600	188	5.4			RF4-MANILA RF3I- QUEZON CITY
25 April, 1987	15.870	120.220	106	5.5			RF5-MANILA SANGLEY POINT; RF4- QUEZON CITY
05 June, 1987	15.600	121.000	045	5.6			
08 April, 1988	13.300	120.100	61	5.6			RF4-MANILA; RF3-QUEZON CITY
24 March, 1989	14.411	119.698	33	5.5			
May 17, 1990	13.370	121.230	011			5.1	
October 22, 1990	13.740	121.030	033			5.1	
July 16, 1990	15.660	121.180	033			5.2	
November 20, 1990	14.440	121.890	016			5.2	
December 25, 1990	13.590	120.080	010			5.3	
October 7, 1990	13.300	120.170	007			5.5	
December 5, 1990	14.480	121.970	013			5.9	
July 16, 1990	15.680	121.170	025		6.5	7.8	Int VII - MANILA
June 16, 1991	15.150	120.460	009			5.0	
February 23, 1991	15.910	120.840	003			5.1	
June 16, 1991	15.050	120.320	024			5.1	
June 18, 1991	15.220	120.350	011			5.1	
February 7, 1991	13.660	120.670	011			5.2	
June 17, 1991	15.040	120.240	027			5.2	
September 4, 1991	15.150	120.340	048			5.3	
January 19, 1991	15.440	121.210	009			5.4	
October 25, 1991	13.270	120.150	006			5.5	
April 19, 1991	13.800	121.040	186			5.6	
June 16, 1991	15.150	120.270	012			5.8	
July 3, 1991	15.210	120.440	008			5.8	
May 25, 1992	13.770	119.960	016			5.3	Int IV - MANILA; Int III - QUEZON CITY
October 30, 1993	15.440	121.730	008			5.1	MANILA RF4; QUEZON CITY RF3
March 29, 1993	13.410	120.620	022			5.3	
April 9, 1993	14.950	120.250	014			5.3	Int V - MANILA; Int IV - QC
September 6, 1993	13.730	120.530	120			5.3	
March 29, 1993	13.400	120.580	017			5.4	INT II - QUEZON CITY
November 15, 1994	13.170	121.190	034			5.1	
February 20, 1994	13.730	120.750	185			5.2	
November 15, 1994	13.410	120.630	033			5.3	
April 27, 1994	13.130	119.350	048			5.7	
November 15, 1994	13.700	120.920	070			6.0	
November 14, 1994	13.500	121.090	007		6.1	7.1	Int III - MANILA
February 18, 1996	14.130	120.500	260			5.0	RF2; MANILA
September 25, 1996	13.700	120.330	138			5.0	

Date	North Latitude	East Longitude	Depth (km)	Ml	Mb	Ms	Intensity Reports RF & PEIS
July 20, 1996	13.850	120.340	082			5.3	MANILA; RF3; QUEZON CITY RF2 CLARK RF2
July 30, 1996	14.700	119.500	007			5.8	MANILA MAKATI PASIG RF5
July 22, 1997	15.200	122.580	011			5.2	Intensity III - QUEZON CITY
May 5, 1997	15.150	119.920	014			5.5	Int I - QUEZON CITY
March 12, 1997	13.610	121.010	012			5.9	Int II - QUEZON CITY
March 23, 1998	13.120	121.180	003			5.1	
January 4, 1998	14.800	121.940	003			5.4	
August 23, 1998	14.730	119.900	035			6.1	
May 27, 1999	15.360	119.680	057			5.1	Int IV – MANILA; Int II - MAKATI PASAY.
December 11, 1999	15.850	119.670	065			6.8	Int VI – MANILA; Int V - PASIG TAGUIG;
February 3, 2000	13.640	121.480	002	4.7	5.7	5.0	Int III – MANILA; Int II - MAKATI
October 21, 2000	13.714	120.617	130	4.9	5.9	5.3	Int I - QUEZON CITY
June 19, 2000	14.087	120.330	108	5.1	6.0	5.6	Int IV - MANILA; Int II - PASAY
August 1, 2000	15.099	122.305	081	5.2	6.1	5.7	Int IV - MANILA ORTIGAS; Int III - MAKATI
July 8, 2001	13.594	120.835	008			5.0	Int III- MANILA; Int II- TAGUIG
September 3, 2002	13.522	120.649	001	5.1	6.0	5.7	INTENSITY III- MANILA TAGUIG PATEROS; Int II - MAKATI
March 2, 2003	15.420	121.670	005	4.7	5.7	5.0	Int IV - MANILA PASIG & PASAY CITY
October 9, 2003	13.676	119.580	039	5.0	5.8	5.0	MANILA IV; PASIG III
June 12, 2003	13.067	120.244	003	4.8	5.8	5.2	MANILA II
April 12, 2003	13.715	120.467	107	4.9	5.8	5.3	MANILA TAGUIG INTENSITY II
September 15, 2004	14.284	120.166	091	5.5	6.4	6.2	Int IV - MANILA
October 8, 2004	13.815	120.413	094	5.5	6.4	6.2	
December 11, 2005	14.024	120.654	205	4.7	5.7	5.1	
April 3, 2005	13.558	120.584	095	4.9	5.9	5.3	Int II - MANILA PASAY; ALABANG
February 9, 2005	13.699	120.535	089	4.8	5.7	5.4	Int III - PASAY CITY; Int II - MAKATI
October 20, 2006	13.442	121.552	011	4.7	5.7	5.1	
October 20, 2006	13.452	121.544	010	4.8	5.8	5.2	Int IV - MANILA. Int II - MAKATI
October 20, 2006	13.453	121.536	009	4.8	5.7	5.2	Int IV - MANILA. Int III - MAKATI
July 17, 2007	13.522	120.698	104	4.6	5.6	5.0	
June 3, 2007	13.658	122.686	005	4.8	5.8	5.3	
January 9, 2008	15.443	122.735	015	4.6	5.6	5.0	
February 27, 2008	13.134	120.358	032	4.7	5.7	5.2	
June 7, 2008	13.661	120.517	079	4.8	5.7	5.2	
July 6, 2008	15.405	122.386	015	4.8	5.7	5.2	Int III - Parañaque
August 1, 2008	13.601	120.645	117	4.7	5.7	5.3	Int III - MANILA CITY
September 27, 2008	13.333	120.317	073			5.3	Int IV - MANILA; LAS PINAS; Int III - QUEZON CITY; Int II - MAKATI
October 1, 2008	13.299	120.208	054			5.3	Int II - MAKATI QUEZON CITY
July 6, 2008	15.404	122.381	001	4.9	5.8	5.4	Int III - PARAÑAQUE;
July 8, 2008	15.425	122.407	003	4.9	5.8	5.4	Int IV - QUEZON CITY; MANILA CITY
September 27, 2008	13.315	120.080	086	5.5	6.4	6.5	
October 31, 2009	15.320	119.934	008	4.6	5.6	5.0	Int II - PASIG CITY HALL
July 4, 2009	13.790	120.518	094	4.7	5.7	5.1	
May 24, 2009	15.127	119.770	001	4.8	5.7	5.2	Int II - QUEZON CITY; ORTIGAS
April 20, 2009	15.266	119.726	014	4.8	5.8	5.3	

Date	North Latitude	East Longitude	Depth (km)	MI	Mb	Ms	Intensity Reports RF & PEIS
October 18, 2009	13.768	120.493	135	5.2	6.1	5.8	Int II - MANILA
January 16, 2010	13.573	120.523	060	4.6	5.6	5.0	Int II - ALABANG MUNTINLUPA
February 1, 2010	13.785	120.511	111	4.7	5.7	5.1	
November 10, 2010	15.115	119.726	016	4.8	5.7	5.2	Int III - PASIG; Int II - MANILA MAKATI
March 25, 2010	13.738	119.727	011	5.4	6.3	6.0	Int V - MANILA; Int IV - MANDALUYONG; MAKATI; PASAY; TAGUIG; PASIG
August 12, 2011	13.434	120.886	142	4.6	5.6	5.0	Int II – PASIG, PASAY, MANILA
November 29, 2011	14.070	119.214	062	4.6	5.6	5.0	
March 10, 2011	13.650	120.360	078	4.5	5.5	5.1	
December 23, 2011	13.074	120.313	022	4.8	5.8	5.3	Int III - MANILA PASIG CITY; Int II - MAKATI; PASAY; MARIKINA
April 8, 2011	13.840	119.790	033	4.9	5.9	5.4	Int III - MANILA; MAKATI
March 21, 2011	13.855	120.230	075	5.1	6.0	5.7	Int IV - MANILA; MARIKINA; Int II - PATEROS
May 22, 2011	13.653	120.712	103	5.1	6.0	5.7	Int III - MALATE MANILA
July 25, 2011	15.070	119.860	037	5.3	6.2	5.9	Int IV - MANILA; Int III - MAKATI; PASIG; TAGUIG; MANDALUYONG; MARIKINA; PATEROS
November 30, 2011	15.465	119.019	016	5.3	6.2	6.0	Intensity II - MANILA MANDALUYONG; ORTIGAS PASIG; MAKATI
August 7, 2012	13.808	119.755	032	4.7	5.7	5.0	Int II - PASAY; SAMPALOC MANILA
November 23, 2012	14.149	120.570	196	4.7	5.7	5.0	
March 8, 2012	13.547	120.320	004	4.8	5.7	5.1	Int IV - MANILA; MUNTINLUPA; MANDALUYONG
July 14, 2012	14.931	119.464	001	4.7	5.7	5.1	
September 29, 2012	13.846	120.538	126	4.8	5.8	5.2	
March 8, 2012	13.507	120.203	005	4.9	5.9	5.3	Int III - MANILA; MUNTINLUPA
October 4, 2012	13.085	120.327	028	4.9	5.8	5.3	Int III - PASAY
June 16, 2012	15.618	119.323	023	5.3	6.3	6.0	Int IV - MAKATI CITY
January 14, 2013	14.988	119.570	014	4.7	5.7	5.0	Int II - PASAY CITY
April 4, 2013	15.859	121.695	025			5.4	Int III - MANDALUYONG; TAGUIG; PASAY; Intensity II- MANILA; MUNTINLUPA; Int I - MAKATI
June 8, 2014	13.154	120.131	001	4.8	5.7	5.1	
December 31, 2014	13.724	120.506	107			5.4	Intensity III - QUEZON CITY
September 3, 2014	15.156	122.428	012			5.5	Int II- MAKATI; TAGUIG; PASAY
June 25, 2014	13.547	120.510	040			5.8	Int III - Parañaque
January 10, 2015	14.740	119.910	48			5.9	Int IV - Parañaque
January 17, 2015	13.885	120.450	128			5.1	Int II – Quezon City
January 18, 2015	13.912	120.492	117			5.0	
February 10, 2015	14.004	120.360	101	4.6	5.6	5.0	Int II - Pasay
June 13, 2015	13.816	120.489	118			5.0	
August 9, 2015	13.434	120.193	017	4.8	5.7	5.1	
February 5, 2016	13.781	122.279	3	4.8	5.8	5.2	
April 19, 2016	15.589	119.952	33	4.6	5.6	5.0	
April 19, 2016	15.778	119.604	009	4.6	5.6	5.0	
Sept 2, 2016	13.727	120.541	84	4.6	5.6	5.0	
Nov 10, 2016	14.843	121.399	9	4.7	5.6	5.0	Int II - Parañaque

Source: Phivolcs, May 26. 2017

Notes: *RF - Rossi-Forel Intensity Scale*
PEIS - PHIVOLCS Earthquake Intensity Scale

ANNEX 2.1-B

GEOTECHNICAL SERVICES FOR UNSOLICITED PROPOSAL AND FEASIBILITY STUDY FOR THE PARAÑAQUE RECLAMATION AND DEVELOPMENT PROJECT

FINAL BORING LOG

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project | HOLE NO.: BH-16

LOCATION: Parañaque City | DEPTH: 30.0 m

DATE DRILLED: 01/19/2018 | DATE FINISHED: 01/23/2018 | WATER TABLE: -9.0 m

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION (Ground Surface)	SPT 15 cm	SPT 15 cm	SPT 15 cm	GRAPH	MOISTURE CONTENT	LL (%)	PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
1	100	-	UDS	MH	Greenish-gray, very soft elastic silt with traces of shell fragments of high plasticity	-	-	-		28.24	63	28						100	99	96	93
2	100	-	UDS	MH	Greenish-gray, very soft elastic silt with traces of shell fragments of high plasticity	-	-	-		38.64	60	23							100	99	99
3	100	-	SS	MH	Greenish-gray, stiff elastic silt of high plasticity	5	5	8		32.18	59	26					100	99	98	95	92
4	100	-	SS	MH	Brown, hard elastic silt of high plasticity	11	16	22		42.90	65	29						100	100	99	98
5	100	-	SS	MH	Brown, hard elastic silt of high plasticity	10	18	28		42.59	62	27						100	98	96	95
6	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	9	12	16		38.65	48	16					100	98	96	89	81
7	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	23	40	45		43.96	46	18					100	99	98	93	83
8	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	10	13	18		45.88	49	18					100	98	95	92	77
9	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	16	26	34		42.46	48	17						100	98	92	75
10	100	-	SS	ML	Light brown, hard silt with sand of medium high plasticity	14	28	38		40.34	47	19						100	97	93	79
11	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	18	22	38		48.53	43	15				100	98	95	93	90	80
12	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	17	30	36		40.05	47	17					100	97	93	89	76
13	100	-	SS	SM	Light gray, very dense silty sand of no plasticity	15	25	33		33.18	NP	NP					100	96	94	88	39
14	100	-	SS	SM	Light gray, very dense silty sand of no plasticity	16	34	46		29.85	NP	NP					100	98	96	92	31
15	89	-	SS	SM	Brown, very dense silty sand of no plasticity	36	42	49		36.79	NP	NP				100	98	96	93	90	35
16	67	-	SS	SM	Brown, very dense silty sand of no plasticity	33	45	51		35.44	NP	NP				100	99	98	96	93	27
17	89	-	SS	SM	Brown, very dense silty sand of no plasticity	35	48	60		41.96	NP	NP					100	100	98	96	25
18	78	-	SS	SM	Brown, very dense silty sand of no plasticity	32	46	62		28.85	NP	NP						100	95	92	36
19	89	-	SS	SM	Brown, very dense silty sand of no plasticity	38	44	68		37.56	NP	NP				100	98	95	91	87	30
20	89	-	SS	SM	Brown, very dense silty sand of no plasticity	36	47	69		35.14	NP	NP					100	98	93	90	22

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

B.P. Vidaya
Laboratory Technician

D.B. Santos
Manager

UNIVERSAL TESTING LABORATORY AND INSPECTION, INC.
7 E. Rodriguez Jr. Avenue, Brgy. Bagong Ilog, Pasig City

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project — HOLE NO.: BH-18 (Offshore)

LOCATION: Parañaque City — DEPTH: 30.0 m

DATE DRILLED: 02/03/2018 — DATE FINISHED: 02/08/2018 — WATER TABLE: -8.60 m

DEPTH,m	SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION (Ground Surface)	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	ATTERBERG LIMITS LL (%)	ATTERBERG LIMITS PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
1	1	100	-	UDS	MH	Greenish-gray, very soft, elastic silt with shell fragments of high plasticity	-	-	-	32.18	67	27						100	97	92	87
2, 3	2	100	-	UDS	MH	Greenish-gray, very soft, elastic silt with shell fragments of high plasticity	-	-	-	35.67	52	23						100	99	94	89
4	3	100	-	SS	ML	Greenish-gray, hard sandy silt with gravel of medium high plasticity	10	15	20	34.29	48	17				100	93	83	70	63	55
5, 6	4	100	-	SS	ML	Greenish-gray, hard silt with sand of medium high plasticity	12	20	33	38.37	49	20				100	95	90	81	76	72
7	5	100	-	SS	ML	Greenish-gray, hard silt with sand of medium high plasticity	8	10	25	40.63	46	17					100	95	87	75	71
8, 9	6	89	-	SS	MH	Brown, hard elastic silt of high plasticity	13	23	31	64.38	60	28						100	98	92	87
10	7	89	-	SS	ML	Brown, hard silt with sand of medium high plasticity	20	27	36	49.37	43	14						100	93	81	76
11, 12	8	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	18	27	40	46.18	48	19					100	97	91	86	72
13	9	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	22	31	42	50.38	45	16					100	99	90	78	73
14, 15	10	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	21	29	34	41.16	39	13						100	95	88	79
16	11	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	21	31	37	46.72	37	11						100	95	80	71
17, 18	12	89	-	SS	ML	Brown, hard silt with sand of medium high plasticity	22	34	40	53.29	36	15					100	97	90	84	76
19	13	89	-	SS	ML	Brown, hard silt with sand of medium high plasticity	20	31	29	45.31	49	18				100	95	87	81	76	71
20, 21	14	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	18	28	35	49.38	47	16				100	97	90	86	79	73
22	15	89	-	SS	SM	Brown, hard silty sand with gravel of no plasticity	19	29	37	41.27	NP	NP				100	90	81	61	42	18
23, 24	16	89	-	SS	SM	Brown, hard silty sand with gravel of no plasticity	20	31	36	39.27	NP	NP				100	93	79	56	43	21
25	17	89	-	SS	SM	Brown, hard silty sand with gravel of no plasticity	22	29	34	46.21	NP	NP				100	91	80	67	49	16
26, 27	18	100	-	SS	SM	Brown, hard silty sand with gravel of no plasticity	21	31	36	53.71	NP	NP				100	93	83	70	50	22
28	19	89	-	SS	SM	Brown, hard silty sand with gravel of no plasticity	20	29	34	47.68	NP	NP				100	92	80	63	47	17
29, 30	20	100	-	SS	SM	Brown, hard silty sand with gravel of no plasticity	23	34	38	41.39	NP	NP				100	96	84	62	49	27

END OF BOREHOLE

N-VALUES — GRAPH: 10 20 30 40

SIEVE ANALYSIS — % PASSING SIEVE NO.

Split-spoon Sample — Undisturbed Sample — Wash Sample — Core Sample

B.P. Viduya
Laboratory Technician

D.B. Santos
Manager

UNIVERSAL TESTING LABORATORY AND INSPECTION, INC.
7 E. Rodriguez Jr. Avenue, Brgy. Bagong Ilog, Pasig City

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project
HOLE NO.: BH-19 (Offshore)
LOCATION: Parañaque City
DEPTH: 40.50 m
DATE DRILLED: 12/10/2017 DATE FINISHED: 12/11/2017 WATER TABLE: -9.0 m

Ground Surface

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	LL (%)	PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
1	100	-	SS	ML	Gray, very soft **SILT** of medium plasticity	0	0	1	26.92	45	16							100	98	96
2	100	-	SS	ML	Gray, very soft **SILT** of medium high plasticity with traces of sand	1	0	1	35.53	48	18						100	98	93	91
3	100	-	SS	ML/MH	Dark gray, very soft **SILT** of medium high plasticity	1	1	0	39.85	49	18								100	97
4	100	-	SS	MH	Dark gray, very soft **SILT** of high plasticity with traces of sand	1	1	1	42.96	57	20						100	98	96	90
5	100	-	SS	ML/MH	Light brown, stiff **SILT** of medium high plasticity with traces of sand	5	5	6	36.87	49	19							100	95	92
6	100	-	SS	MH	Gray, stiff **SILT** of high plasticity with traces of sand	6	5	6	39.05	61	23							100	98	92
7	100	-	SS	MH	Gray, stiff **SILT** of high plasticity	6	5	7	42.53	59	21								100	98
8	100	-	SS	MH	Gray, stiff **SILT** of high plasticity with traces of sand	4	7	7	40.33	67	25						100	99	98	95
9	100	-	SS	MH	Gray, stiff **SILT** of high plasticity with traces of sand	6	8	6	45.45	65	25						100	97	93	88
10	100	-	SS	MH	Gray, stiff **SILT** of high plasticity with traces of sand	7	5	5	43.61	62	24							100	96	93
11	100	-	SS	ML/MH	Gray, stiff **SILT** of medium high plasticity with traces of sand	7	8	8	48.43	48	17						100	98	97	95
12	100	-	SS	ML	Gray, very stiff **SILT** with gravel of medium plasticity	9	10	12	52.48	47	17				100	99	85	85	85	83
13	100	-	SS	ML/CL	Gray, very stiff **SILT** clay with gravel of medium plasticity	9	8	10	56.83	46	19					100	84	84	83	80
14	100	-	SS	ML/CL	Light brown, very stiff silty clay of medium plasticity with traces of sand	12	10	12	59.99	45	18							100	98	95
15	100	-	SS	ML/MH	Light brown, very stiff **SILT** of medium high plasticity	12	13	13	43.76	49	18							100	99	98
16	100	-	SS	ML	Light brown, hard **SILT** of medium plasticity	12	17	17	48.83	47	15						100	100	99	98
17	100	-	SS	CL	Light brown, very stiff lean clay with sand of medium plasticity	14	13	17	44.50	39	16							100	89	79
18	100	-	SS	CL	Light brown, very stiff lean clay with sand of medium plasticity	13	15	15	62.11	36	14						100	98	92	83
19	100	-	SS	CL	Light brown, hard lean clay with sand of medium plasticity	12	17	24	52.90	40	18						100	97	91	85
20	100	-	SS	CL	Light brown, hard sandy lean clay of medium plasticity	14	19	21	53.88	41	17					100	98	96	87	68
21	100	-	SS	CL	Light brown, hard lean clay of medium plasticity with traces of sand	19	20	20	53.38	43	18						100	96	93	86
22	100	-	SS	ML	Light brown, hard **SILT** of medium plasticity with traces of sand	18	17	18	46.64	47	15					100	98	97	90	86
23	100	-	SS	ML/MH	Light brown, hard **SILT** of medium high plasticity with traces of sand	19	21	20	42.59	49	19						100	99	98	92

UNIVERSAL TESTING LABORATORY AND INSPECTION, INC.
7 E. Rodriguez Jr. Avenue, Brgy. Bagong Ilog, Pasig City

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project
HOLE NO.: BH-19 (Offshore)

LOCATION: Parañaque City
DEPTH: 40.50 m

DATE DRILLED: 12/10/2017 DATE FINISHED: 12/11/2017 WATER TABLE: -9.0 m

DEPTH,m	SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	LOG SYMBOL	UNIFIED CLASSIFICATION	DESCRIPTION	N-VALUES SPT 15 cm	15 cm	15 cm	GRAPH	MOISTURE CONTENT	ATTERBERG LIMITS LL (%)	PI (%)	SIEVE ANALYSIS % PASSING SIEVE NO. 1 1/2	1	3/4	1/2	3/8	4	10	40	200
							Ground Surface																
35	24	100	-	SS		CL	Light brown, hard lean clay of medium plasticity with traces of sand	18	20	22		45.77	39	16						100	96	93	88
36, 37	25	100	-	SS		CL	Light brown, hard lean clay of medium plasticity with traces of sand	16	27	23		48.82	40	17							100	97	95
38	26	100	-	SS		ML	Light brown, hard **SILT** of medium plasticity	19	24	26		51.45	45	17							100	99	98
39, 40	27	100	-	SS		CL	Light brown, hard lean clay of medium plasticity with traces of sand	20	20	21		50.05	42	18						100	99	95	93

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

B.V. Viaña
Laboratory Technician

D.B. Santos
Manager

UNIVERSAL TESTING LABORATORY AND INSPECTION, INC.
7 E. Rodriguez Jr. Avenue, Brgy. Bagong Ilog, Pasig City

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project HOLE NO.: BH-20

LOCATION: Parañaque City DEPTH: 30.0 m

DATE DRILLED: 02/01/2018 DATE FINISHED: 02/02/2018 WATER TABLE: -

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	LL (%)	PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
					Ground Surface															
1	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	30.33	76	38						100	99	98	97
2	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	45.73	66	33						100	98	97	96
3	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	39.92	70	35							100	98	96
4	100	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of very high plasticity	1	2	3	44.89	71	35						100	100	99	97
5	100	-	SS	ML	Greenish-gray, medium stiff silt with shell fragments of medium high plasticity	2	3	3	52.53	48	18					100	99	98	96	92
6	100	-	SS	ML	Greenish-gray, medium stiff silt with shell fragments of medium high plasticity	3	4	4	56.65	47	14						100	100	99	99
7	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	4	4	6	48.18	69	23						100	100	98	97
8	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	5	6	6	54.21	58	26							100	99	98
9	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	5	7	8	59.52	53	21							100	97	95
10	100	-	SS	ML	Greenish-gray, stiff silt with shell fragments of medium high plasticity	7	8	7	62.99	47	18					100	97	95	93	91
11	100	-	SS	ML	Dark greenish-gray, very stiff silt with shell fragments of medium high plasticity	7	9	9	49.95	43	15							100	99	98
12	89	-	SS	ML	Dark greenish-gray, very stiff silt with shell fragments of medium high plasticity	6	8	9	31.65	48	14					100	98	97	93	92
13	100	-	SS	ML	Dark greenish-gray, very stiff silt with shell fragments of medium high plasticity	7	9	9	38.96	49	19						100	98	96	95
14	78	-	SS	ML	Dark greenish-gray, very stiff silt with shell fragments of medium high plasticity	7	8	10	42.08	46	17							100	98	96
15	89	-	SS	CL	Dark greenish-gray, very stiff lean clay with shell fragments of medium high plasticity	8	9	11	45.51	35	16					100	98	96	90	87
16	89	-	SS	CH	Light brown, very stiff sandy fat clay of high plasticity	9	11	13	42.45	52	26				100	96	92	75	69	59
17	67	-	SS	CH	Light brown, very stiff sandy fat clay of high plasticity	10	12	13	45.27	54	26		100	98	95	96	87	82	76	68
18	78	-	SS	CH	Light brown, very stiff sandy fat clay of high plasticity	10	13	14	49.96	59	29				100	95	91	82	75	65
19	89	-	SS	CH	Light brown, very stiff sandy fat clay of high plasticity	11	14	16	52.25	53	25				100	89	86	86	69	61
20	78	-	SS	CH	Light brown, hard sandy fat clay of high plasticity	13	16	16	33.46	53	27			100	97	93	90	86	73	63

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

B.D. Vidue
Laboratory Technician

D.D. Santos
Manager

UNIVERSAL TESTING LABORATORY AND INSPECTION, INC.
7 E. Rodriguez Jr. Avenue, Brgy. Bagong Ilog, Pasig City

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project

HOLE NO.: BH-22

LOCATION: Parañaque City

DEPTH: 30.0 m

DATE DRILLED: 02/01/2018 DATE FINISHED: 02/02/2018 WATER TABLE: -15.0 m

Ground Surface

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	LL (%)	PI (%)	1 1/2	1	3/4	1/2	3/8	4	16	40	200
1	100	-	UDS	MH	Gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	35.90	69	36							100	98	98
2	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	28.89	75	37						100	100	99	99
3	78	-	SS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	1	1	1	42.43	72	38							100	98	97
4	100	-	SS	MH	Greenish-gray, soft elastic silt with shell fragments of very high plasticity	1	1	2	33.66	78	43						100	99	98	95
5	100	-	SS	MH	Greenish-gray, soft elastic silt with shell fragments of very high plasticity	1	1	2	37.35	64	34							100	97	96
6	100	-	SS	MH	Greenish-gray, medium stiff silt with shell fragments of very high plasticity	2	2	2	48.44	62	31						100	98	95	93
7	100	-	SS	CH	Greenish-gray, medium stiff fat clay with shell fragments of high plasticity	1	3	4	55.24	54	27						100	100	99	99
8	89	-	SS	CH	Greenish-gray, stiff fat clay with shell fragments of high plasticity	2	4	6	58.85	52	26						100	100	100	98
9	89	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	4	4	11	65.82	61	28					100	99	98	95	90
10	100	-	SS	ML	Greenish-gray, very stiff silt with shell fragments of medium high plasticity	5	6	10	82.78	46	18						100	98	94	91
11	100	-	SS	ML	Greenish-gray, very stiff silt with shell fragments of medium high plasticity	7	8	8	52.67	47	15							100	99	98
12	89	-	SS	ML	Gray, very stiff silt with shell fragments of medium high plasticity	6	9	10	45.36	45	16						100	99	97	95
13	100	-	SS	ML	Gray, very stiff silt with shell fragments of medium high plasticity	6	8	12	48.26	48	19						100	98	96	92
14	89	-	SS	ML	Gray, very stiff silt with shell fragments of medium high plasticity	6	10	13	36.82	49	17					100	98	95	92	86
15	89	-	SS	CL	Light brown, very stiff lean clay with gravel of medium high plasticity	6	10	15	41.08	30	11			100	96	91	85	84	83	82
16	67	-	SS	CL	Light brown, very stiff lean clay with gravel of medium high plasticity	8	11	15	59.05	37	15			100	96	85	79	78	76	75
17	67	-	SS	CL	Light brown, very stiff lean clay with gravel of medium high plasticity	12	12	14	53.30	30	12		100	93	90	88	79	78	77	76
18	78	-	SS	CL	Light brown, very stiff lean clay with gravel of medium high plasticity	11	12	16	50.33	29	12		100	95	92	89	86	84	82	79
19	89	-	SS	CL	Light brown, hard lean clay with gravel of medium high plasticity	9	15	19	56.43	35	13			100	95	91	86	85	84	33
20	67	-	SS	CL	Light brown, hard lean clay with gravel of medium high plasticity	12	14	23	63.11	32	14			100	98	98	82	82	81	79

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

B. J. Vidaya
Laboratory Technician

D. B. Santos
Manager

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project — HOLE NO.: BH-23

LOCATION: Parañaque City — DEPTH: 30.0 m

DATE DRILLED: 02/02/2018 — DATE FINISHED: 02/03/2018 — WATER TABLE: -14.50 m

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION (Ground Surface)	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	LL (%)	PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
1	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	45.11	65	32				100	99	98	96	95	93
2	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	50.38	72	37						100	100	99	96
3	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	38.95	76	35						100	99	93	92
4	100	-	SS	MH	Greenish-gray, soft elastic silt with shell fragments of very high plasticity	1	1	2	42.57	78	42					100	100	100	98	98
5	100	-	SS	MH	Greenish-gray, soft elastic silt with shell fragments of very high plasticity	1	1	2	39.85	76	40						100	99	98	97
6	89	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of very high plasticity	1	2	2	44.57	67	36						100	100	100	96
7	100	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of high plasticity	2	2	3	48.92	62	29							100	99	99
8	100	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of high plasticity	2	3	5	53.28	56	22						100	100	99	99
9	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	4	5	7	55.33	59	25							100	99	98
10	89	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	7	7	8	57.90	60	28						100	98	96	90
11	100	-	SS	MH	Gray, very stiff elastic silt with shell fragments of high plasticity	9	8	10	66.05	60	23					100	98	95	93	91
12	78	-	SS	ML	Gray, very stiff silt with shell fragments of medium high plasticity	9	10	12	68.68	48	18						100	100	99	98
13	100	-	SS	ML	Gray, very stiff silt with shell fragments of medium high plasticity	11	11	13	77.81	43	16							100	100	95
14	89	-	SS	ML	Gray, very stiff silt with shell fragments of medium high plasticity	10	12	15	81.99	47	15						100	96	95	92
15	89	-	SS	ML	Gray, very stiff silt with shell fragments of medium high plasticity	12	12	14	54.33	47	17					100	99	98	86	88
16	78	-	SS	CL	Light brown, very stiff lean clay with sand of medium high plasticity	10	13	16	45.25	48	17				100	98	95	92	90	84
17	67	-	SS	CL	Light brown, very stiff lean clay with sand of medium high plasticity	4	10	19	55.05	48	18						100	98	96	80
18	56	-	SS	CL	Light brown, hard lean clay with sand of medium high plasticity	8	15	17	57.16	46	18			100	97	96	90	88	87	85
19	89	-	SS	CL	Light brown, hard lean clay with gravel of medium high plasticity	10	17	20	61.45	48	15		100	97	94	90	84	82	79	78
20	44	-	SS	CL	Light brown, hard lean clay with gravel of medium high plasticity	13	15	25	53.63	47	19			100	98	92	82	79	77	75

END OF BOREHOLE

Legend: Split-spoon Sample — Undisturbed Sample — Wash Sample — Core Sample

B.P. Vidaya
Laboratory Technician

D.B. Santos
Manager

UNIVERSAL TESTING LABORATORY AND INSPECTION, INC.
7 E. Rodriguez Jr. Avenue, Brgy. Bagong Ilog, Pasig City

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project

HOLE NO.: BH-24 (Offshore)

LOCATION: Parañaque City

DEPTH: 40.50 m

DATE DRILLED: 12/14/2017 DATE FINISHED: 12/16/2017 WATER TABLE: -11.0 m

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION (Ground Surface)	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	ATTERBERG LIMITS LL (%)	ATTERBERG LIMITS PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
1	100	-	SS	MH/ML	Dark gray, very stiff **SILT** of medium high plasticity	11	4	16	39.38	52	20					100	98	97	95	93
2	100	-	SS	MH	Dark gray, hard **SILT** of high plasticity with traces of sand	12	14	17	33.66	53	18						100	99	93	87
3	100	-	SS	CL	Light brown, stiff lean clay of medium plasticity with traces of sand	5	6	6	42.84	40	17							100	98	90
4	100	-	SS	CL	Light brown, very stiff lean clay of medium plasticity with traces of sand	6	10	9	43.43	43	18							100	98	95
5	100	-	SS	CL	Light brown, stiff lean clay of medium plasticity	5	6	5	33.89	39	15								100	99
6	100	-	SS	CH/MH	Light brown, very stiff **SILT** fat clay of high plasticity	5	9	9	38.92	54	23							100	99	98
7	100	-	SS	CH/MH	Light brown, very stiff **SILT** fat clay of high plasticity with traces of sand	5	9	10	40.22	53	21						100	98	95	92
8	100	-	SS	CL	Light brown, stiff lean clay with gravel of medium plasticity	5	6	6	45.40	37	15				100	88	81	80	79	78
9	100	-	SS	MH	Light brown, medium stiff **SILT** with sand of high plasticity	3	3	4	53.05	63	24						100	99	96	83
10	100	-	SS	MH	Light brown, very stiff **SILT** of high plasticity	8	10	11	36.53	58	20								100	99
11	100	-	SS	ML/MH	Light brown, very stiff **SILT** of medium high plasticity	12	10	8	42.94	49	17							100	99	97
12	100	-	SS	ML	Light brown, very stiff **SILT** of medium high plasticity with traces of sand	12	10	9	48.43	46	17							100	97	93
13	100	-	SS	MH	Light brown, very stiff **SILT** with gravel of high plasticity with traces of gravel	10	10	9	42.50	65	23			100	98	93	86	86	85	85
14	100	-	SS	MH	Light brown, very stiff elastic **SILT** of high plasticity	12	12	13	44.33	67	25						100	99	98	96
15	100	-	SS	MH	Light brown, very stiff of high plasticity	12	14	8	33.26	59	22						100	100	98	97
16	100	-	SS	ML/CL	Light brown, very stiff silty clay with sand of medium high plasticity	12	15	15	57.78	45	18							100	93	79
17	100	-	SS	ML	Light brown, hard **SILT** with sand of medium plasticity	11	16	15	48.94	46	14						100	98	93	84
18	100	-	SS	ML	Light brown, hard **SILT** with sand of medium plasticity	10	16	16	46.53	45	14						100	96	91	84
19	100	-	SS	ML	Light brown, hard **SILT** of medium plasticity with traces of sand	11	14	18	53.23	47	15							100	98	94
20	100	-	SS	ML	Light brown, very stiff **SILT** of medium plasticity with traces of sand	10	15	14	55.08	47	16							100	98	95
21	100	-	SS	ML	Light brown, hard **SILT** of medium plasticity	13	18	15	48.14	46	12							100	100	98
22	100	-	SS	MH	Light brown, hard **SILT** of medium high plasticity with traces of sand	15	16	15	51.27	48	15							100	98	95
23	100	-	SS	ML/MH	Light brown, hard **SILT** with gravel of medium high plasticity	14	15	18	50.80	49	18			100	98	94	85	85	84	83

UNIVERSAL TESTING LABORATORY AND INSPECTION, INC.
7 E. Rodriguez Jr. Avenue, Brgy. Bagong Ilog, Pasig City

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project

HOLE NO.: BH-24 (Offshore)

LOCATION: Parañaque City

DEPTH: 40.50 m

DATE DRILLED: 12/14/2017 DATE FINISHED: 12/16/2017 WATER TABLE: -11.0 m

DEPTH,m	SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	LOG SYMBOL	UNIFIED CLASSIFICATION	DESCRIPTION	N-VALUES SPT 15 cm	SPT 15 cm	SPT 15 cm	GRAPH (10 20 30 40)	MOISTURE CONTENT	ATTERBERG LIMITS LL (%)	PI (%)	SIEVE ANALYSIS % PASSING SIEVE NO. 1 1/2	1	3/4	1/2	3/8	4	10	40	200
							Ground Surface																
35 36	24	100	-	SS		ML/MH	Light brown, hard **SILT** with gravel of medium high plasticity	22	23	23		49.75	49	16				100	92	83	83	83	81
37	25	100	-	SS		ML	Grayish brown, hard **SILT** of medium plasticity with traces of sand	22	24	25		44.57	47	16							100	96	92
38 39	26	100	-	SS		ML/MH	Grayish brown, hard **SILT** of medium high plasticity	22	25	27		38.96	48	15						100	99	98	96
40	27	100	-	SS		ML	Grayish brown, hard **SILT** of medium plasticity	23	25	28		42.81	47	17						100	99	98	96

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

B.P. Vidaya
Laboratory Technician

D.B. Santos
Manager

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project

HOLE NO.: BH-27

LOCATION: Parañaque City

DEPTH: 30.0 m

DATE DRILLED: 02/09/2018 DATE FINISHED: 02/11/2018 WATER TABLE: -13.60 m

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION (Ground Surface)	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	ATTERBERG LIMITS LL (%)	ATTERBERG LIMITS PI (%)	SIEVE 1 1/2	1	3/4	1/2	3/8	4	10	40	200
1	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	31.63	70	33						100	98	96	92
2	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	38.55	68	35						100	99	97	96
3	89	-	SS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	1	1	1	32.59	78	39							100	99	98
4	89	-	SS	MH	Greenish-gray, soft elastic silt with shell fragments of very high plasticity	1	1	2	42.73	66	32						100	98	96	92
5	100	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of very high plasticity	2	2	2	35.96	46	41						100	98	96	89
6	100	-	SS	ML	Greenish-gray, medium stiff silt with shell fragments of medium high plasticity	3	4	4	44.82	46	18					100	99	98	97	96
7	100	-	SS	ML	Greenish-gray, stiff silt with shell fragments of medium high plasticity	4	4	6	48.18	48	16							100	100	98
8	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	5	6	7	40.05	59	23						100	100	98	96
9	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	6	7	8	46.70	60	25							100	99	98
10	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	6	7	8	53.35	53	21						100	98	95	92
11	100	-	SS	ML	Greenish-gray, very stiff silt with shell fragments of medium high plasticity	7	8	8	66.23	48	19							100	100	96
12	100	-	SS	ML	Greenish-gray, very stiff silt with shell fragments of medium high plasticity	7	8	9	39.65	49	17						100	98	94	90
13	89	-	SS	ML	Greenish-gray, very stiff silt with shell fragments of medium high plasticity	9	9	9	46.44	49	18					100	98	95	93	91
14	89	-	SS	CL	Greenish-gray, very stiff lean clay of medium high plasticity	8	9	8	44.94	43	18							100	98	96
15	89	-	SS	CL	Greenish-gray, very stiff lean clay of medium high plasticity	8	8	11	46.88	40	16						100	98	96	92
16	78	-	SS	CL	Light brown, hard lean clay with sand of medium high plasticity	14	18	18	57.59	42	18						100	96	92	76
17	100	-	SS	CL	Light brown, hard lean clay with sand of medium high plasticity	15	18	20	61.25	41	17				100	98	96	93	89	82
18	67	-	SS	CH	Light brown, hard fat clay with gravel of high plasticity	18	18	21	65.92	51	25					100	98	97	90	81
19	67	-	SS	CH	Light brown, hard fat clay with gravel of high plasticity	20	20	22	40.59	53	27				100	89	83	82	80	79
20	89	-	SS	CH	Light brown, hard fat clay with gravel of high plasticity	20	22	25	43.14	54	26			100	95	92	86	85	84	83

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

B.B. Vidaya
Laboratory Technician

D.B. Santos
Manager

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project

HOLE NO.: BH-28 (Offshore)

LOCATION: Parañaque City

DEPTH: 30.0 m

DATE DRILLED: 02/09/2018 DATE FINISHED: 02/12/2018 WATER TABLE: -8.0 m

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	LL (%)	PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
					Ground Surface															
1	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of high plasticity	-	-	-	34.45	59	23					100	98	96	94	91
2	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of high plasticity	-	-	-	35.59	60	25						100	100	99	98
3	89	-	SS	ML	Dark brown, very stiff silt with sand of medium high plasticity	10	13	17	42.95	47	18						100	96	93	81
4	89	-	SS	ML	Dark brown, hard silt with sand of medium high plasticity	11	19	26	45.15	47	15					100	98	94	90	85
5	100	-	SS	ML	Brown, hard silt of medium high plasticity	22	29	34	40.91	41	13					100	97	95	92	89
6	100	-	SS	ML	Brown, hard silt of medium high plasticity	23	30	37	36.08	48	17						100	98	96	92
7	100	-	SS	ML	Dark gray, hard silt of medium high plasticity	20	28	38	37.77	43	12							100	99	95
8	100	-	SS	ML	Dark gray, hard silt with sand of medium high plasticity	14	23	32	44.33	44	15					100	97	95	92	80
9	100	-	SS	ML	Dark gray, hard sandy silt of low plasticity	16	26	35	45.16	37	10					100	98	89	77	67
10	100	-	SS	ML	Dark brown, hard sandy silt of low plasticity	18	27	37	49.05	35	7					100	97	92	82	69
11	89	-	SS	ML	Dark brown, hard sandy silt of medium high plasticity	20	31	36	56.55	38	12						100	92	83	61
12	78	-	SS	ML	Brown, hard sandy silt of medium high plasticity	15	19	22	62.14	43	16				100	98	98	97	97	96
13	100	-	SS	ML	Brown, hard sandy silt of medium high plasticity	21	26	39	42.28	46	15						100	99	99	98
14	100	-	SS	ML	Brown, hard sandy silt of medium high plasticity	20	27	38	38.99	47	18						100	100	98	95
15	100	-	SS	ML	Brown, hard sandy silt of medium high plasticity	23	39	29	48.55	40	12						100	95	93	92
16	100	-	SS	ML	Brown, hard sandy silt of medium high plasticity	21	31	38	51.22	43	14						100	100	99	98
17	100	-	SS	ML	Brown, hard silt with sand of medium high plasticity	23	24	40	38.92	42	14					100	98	94	92	81
18	100	-	SS	ML	Brown, hard silt of medium high plasticity	24	34	42	49.48	45	16					100	99	99	98	97
19	100	-	SS	ML	Greenish-gray, hard silt with sand of medium high plasticity	22	30	39	52.34	42	15					100	98	93	90	78
20	89	-	SS	CL	Dark brown, hard lean clay with sand of medium high plasticity	26	33	40	40.53	40	18						100	96	92	82

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

B.F. Viduya
Laboratory Technician

D.B. Santos
Manager

FINAL BOREHOLE LOG AND SUMMARY OF TEST RESULTS

PROJECT: Geotechnical Services for Unsolicited Proposal and Feasibility Study for the Parañaque Reclamation and Development Project | HOLE NO.: BH-30

LOCATION: Parañaque City | DEPTH: 30.0 m

DATE DRILLED: 02/03/2018 | DATE FINISHED: 02/04/2018 | WATER TABLE: -14.0 m

SAMPLE NUMBER	% RECOVERY	% RQD	SAMPLE TYPE	UNIFIED CLASSIFICATION	DESCRIPTION	SPT 15 cm	SPT 15 cm	SPT 15 cm	MOISTURE CONTENT	LL (%)	PI (%)	1 1/2	1	3/4	1/2	3/8	4	10	40	200
					Ground Surface															
1	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	38.46	72	37						100	98	96	95
2	100	-	UDS	MH	Greenish-gray, very soft elastic silt with shell fragments of very high plasticity	-	-	-	45.85	66	32						100	99	97	96
3	89	-	SS	MH	Greenish-gray, soft elastic silt with shell fragments of high plasticity	1	1	2	36.33	60	24					100	98	97	95	90
4	100	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of high plasticity	1	2	2	48.63	54	21						100	98	96	92
5	100	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of high plasticity	3	3	3	52.76	57	23							100	100	99
6	100	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of high plasticity	2	3	4	63.70	59	25						100	100	99	98
7	89	-	SS	MH	Greenish-gray, medium stiff elastic silt with shell fragments of high plasticity	3	3	5	42.27	57	25							100	98	94
8	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	5	6	7	45.08	68	29						100	98	96	93
9	100	-	SS	MH	Greenish-gray, stiff elastic silt with shell fragments of high plasticity	6	7	8	69.82	65	26						100	98	96	95
10	89	-	SS	ML	Greenish-gray, very stiff silt with few shell fragments of medium high plasticity	5	8	9	72.59	49	18							100	100	99
11	100	-	SS	ML	Greenish-gray, very stiff silt with few shell fragments of medium high plasticity	7	8	11	51.35	45	13							100	100	98
12	100	-	SS	ML	Greenish-gray, very stiff silt with few shell fragments of medium high plasticity	9	9	11	47.29	47	15						100	100	99	98
13	89	-	SS	ML	Gray, very stiff silt with few shell fragments of medium high plasticity	9	11	13	48.22	42	12						100	98	96	95
14	78	-	SS	ML	Gray, very stiff silt with few shell fragments of medium high plasticity	11	12	12	52.05	43	16					100	99	98	94	90
15	89	-	SS	ML	Gray, very stiff silt with few shell fragments of medium high plasticity	10	12	14	42.92	39	11						100	98	96	95
16	100	-	SS	ML	Gray, very stiff silt with few shell fragments of medium high plasticity	10	14	14	35.45	43	12						100	98	95	92
17	78	-	SS	CL	Light brown, sandy lean clay of low plasticity	10	13	15	46.56	29	8				100	95	89	79	75	60
18	89	-	SS	CL	Light brown, sandy lean clay of low plasticity	11	14	15	41.96	32	10				100	98	88	82	72	57
19	67	-	SS	CL	Light brown, sandy lean clay of low plasticity	12	15	18	45.88	30	9			100	98	95	92	86	80	66
20	78	-	SS	CL	Light brown, sandy lean clay of low plasticity	10	16	21	42.28	27	8					100	90	86	76	65

END OF BOREHOLE

Split-spoon Sample | Undisturbed Sample | Wash Sample | Core Sample

R.P. Vic...ya
Laboratory Technician

D.B. Santos
Manager

ANNEX 2.2-A

REF. NO. NP17.152.033

INTERIM/PROGRESS REPORT FOR THE CPC RECLAMATION & DEVELOPMENT PROJECT COASTAL ENGINEERING ASSESMENT

THIS DOCUMENT FORMS PART OF INTERIM DELIVERABLES OF AMH TO CENTURY PEAK CORP, AND IS BEING ISSUED BY AMH TO TECHNOTRIX AS SUPPORT DOCUMENT FOR THE PREPARATION OF THE DRAFT ECC

APPROVED FOR RELEASE:

EDGARDO P. KASILAG II, MTM
PROJECT TEAM LEADER
08 JANUARY 2020

CPC PARAÑAQUE RECLAMATION PROJECT
COASTAL ENGINEERING/ WAVE MODELING REPORT
Manila Bay, Province of Parañaque

GENERAL INFORMATION

Century Peak Corporation (CPC / Client) commissioned AMH Philippines, Inc. (AMH / Consultant) to undertake the specialized studies in Geotechnical, Hydrologic and Hydraulic, and Coastal Engineering for the proposed 289.0 Has reclamation project located in Manila Bay, Province of Parañaque. The general objective of these services is to provide inputs for the preparation/compilation of documents necessary for the completion of the Client's Memorandum of Understanding (MOU) with the Province of Parañaque, securing permits and other approvals with the Department of Environment and Natural Resources (DENR) and Philippine Reclamation Authority (PRA), and as reference to the design.

This submission forms part of the contractual deliverables of AMH for this project, covering collected public data for coastal engineering, along with the results of coastal numerical models.

Figure 1. Project Location

PROJECT AREA DATA

Project Location

The project site is located in Manila Bay, west of Okada Manila in Parañaque, as shown in Figure 2. The general geographic coordinates of the CPC reclamation on the World Geodetic System (WGS) are 14°28'0.86"N latitude and 120°54'22.10"E longitude.

Figure 2. Vicinity Map (Source: Google Earth™)

General Topography

A topographic map and a bathymetric map are graphical representations of the topography of the landforms above and below the sea level, respectively. Both maps are represented through the use of contour lines corresponding to elevation values to illustrate the locations of vertical depressions and protrusions of the area.

The general topographic information for the project area was obtained from the National Mapping and Resource Information Authority (NAMRIA), under the Department of Environmental and Natural Resources (DENR) of the Philippines. Based on the stitched clipped topographic map of the Cavite (Map #3129-I), Muntinlupa City (Map #3229-IV), Quezon City (Map #3230-III), and Manila (Map #7172-II), the municipalities near the project site have relatively flat topography (Figure 3). Due to the sparseness of data, the local topographic features of the shore or site are not evident, and hence AMH requested remote sensing data in the form of IfSAR based DTM's from NAMRIA (Figure 4).

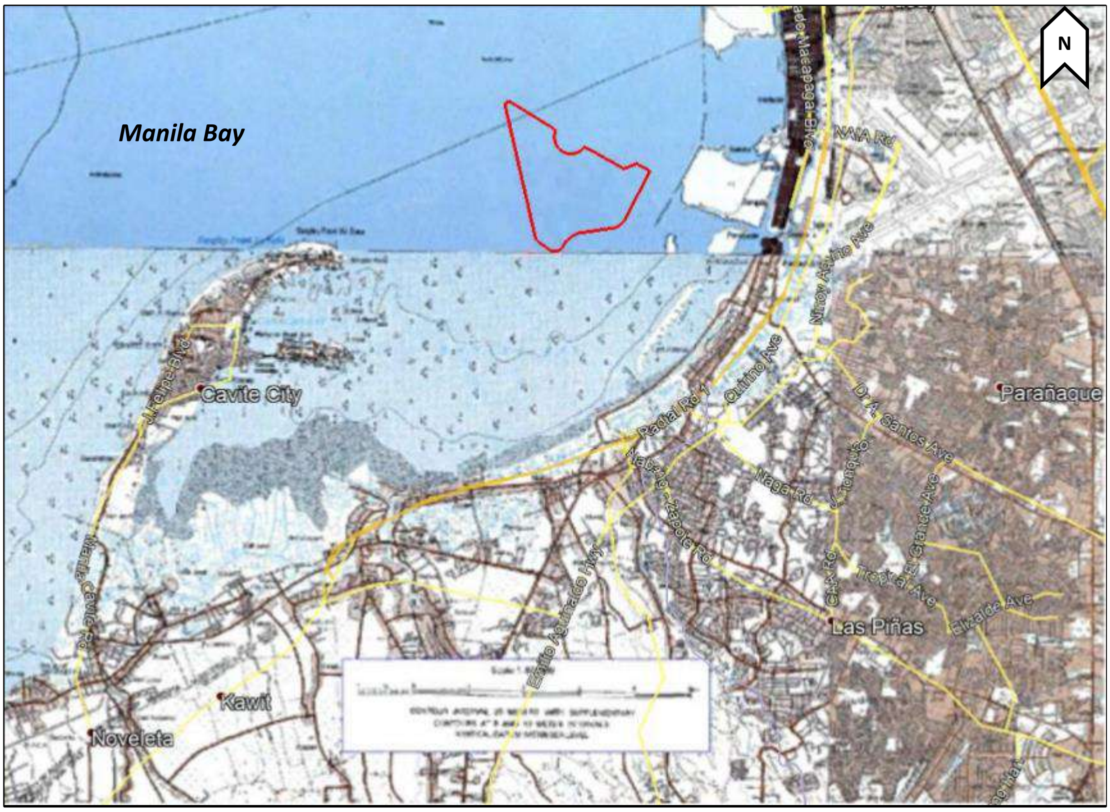


Figure 3. Stitched Topographic Map of the Project Site (NAMRIA)

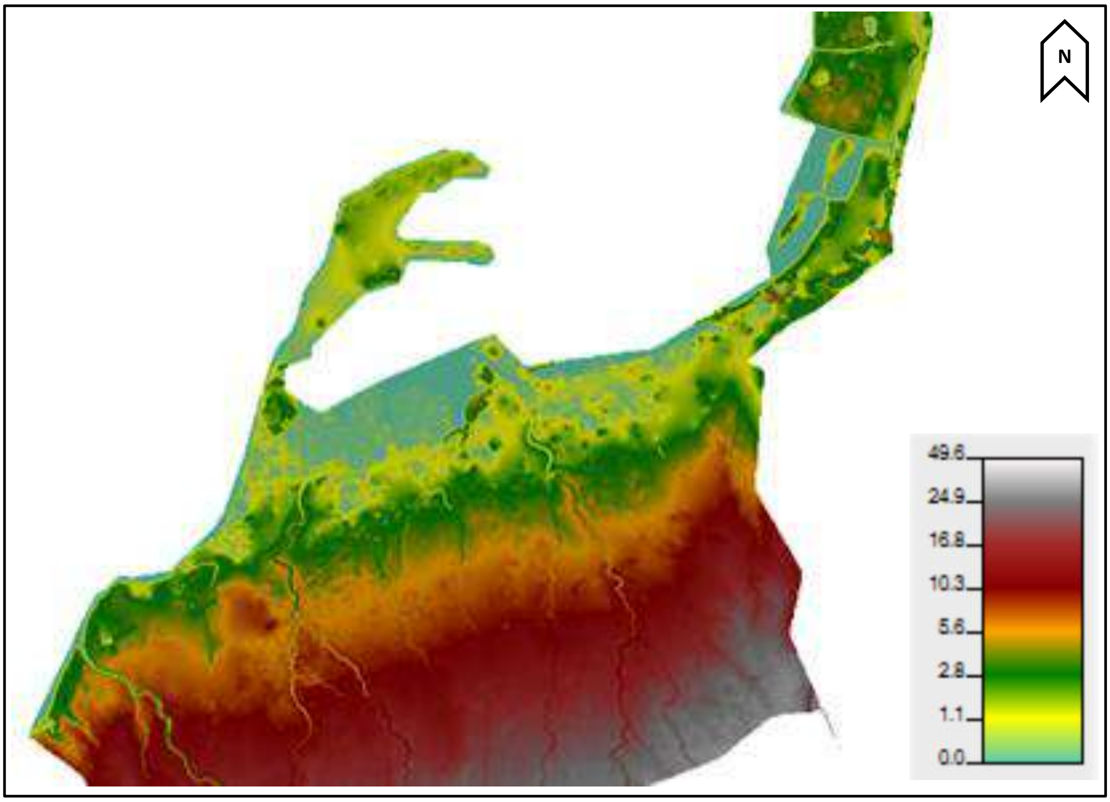


Figure 4. IfSAR Data of the Project Site (Source: NAMRIA)

General Bathymetry

A topographic or bathymetric map is a graphical representation of the topography of the ground surface or seabed through the use of contour lines corresponding to elevation values to illustrate the locations of vertical depressions and protrusions of the area. These maps are usually measured from the Mean Tide Level (MTL), while depth soundings are measured from Mean Lower Low Water (MLLW). The following charts have been collected:

NAMRIA Nautical Chart 1501 (Manila Bay and Approaches),
NAMRIA Nautical Chart 4243 (Manila to Cavite),
NAMRIA Nautical Chart 4236 (Fairways and Anchorages), and
General Bathymetry Chart of the Oceans (GEBCO) which provides gridded depth points at 30 arc-second intervals (~1 km).

Figure 5 shows a Digital Elevation Model (DEM) of the bathymetry in the vicinity of the project area, overlain on Google Earth satellite imagery, derived from various Nautical Charts available for Manila Bay. Based on the NAMRIA topography and nautical map of Manila Bay and Approaches shown in Figure 6, the bathymetry of the project site is mild; at one location the depth of only 10 m is reached at 2.5 km away from the shore, where at another location the 10 m depth only materializes at 5 km from the shore.

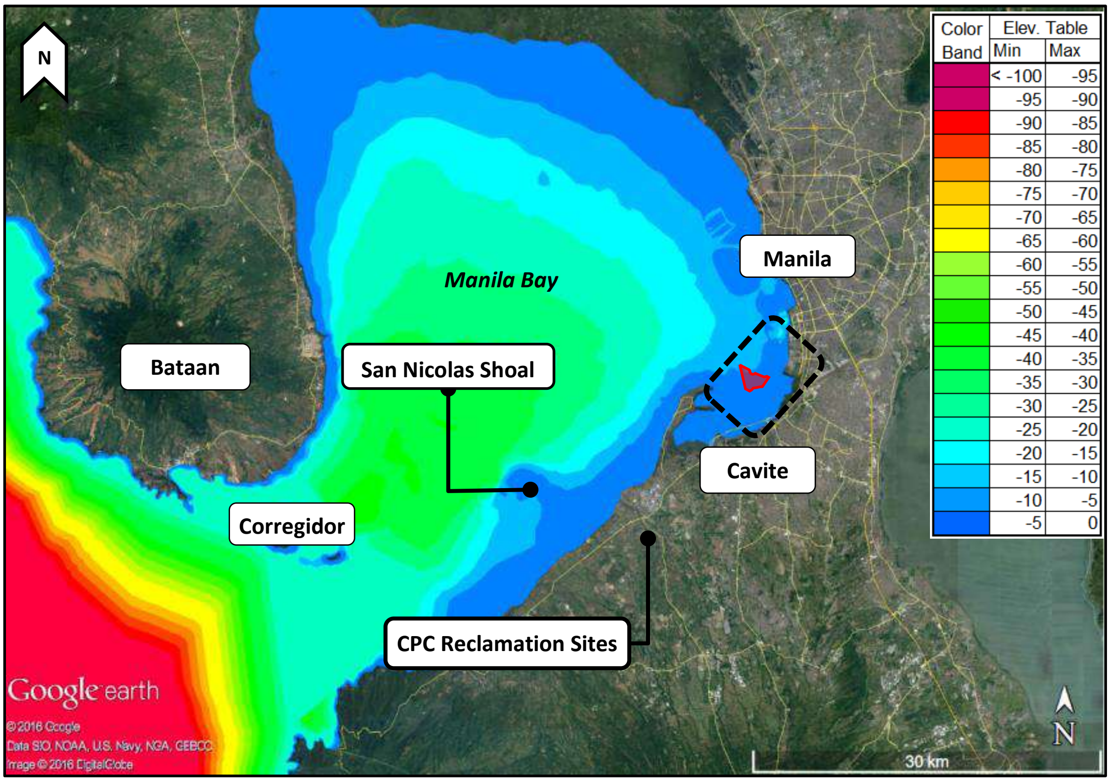


Figure 5. Digital Elevation Model (DEM) of the bathymetry of the area (Google Earth™ and NAMRIA)

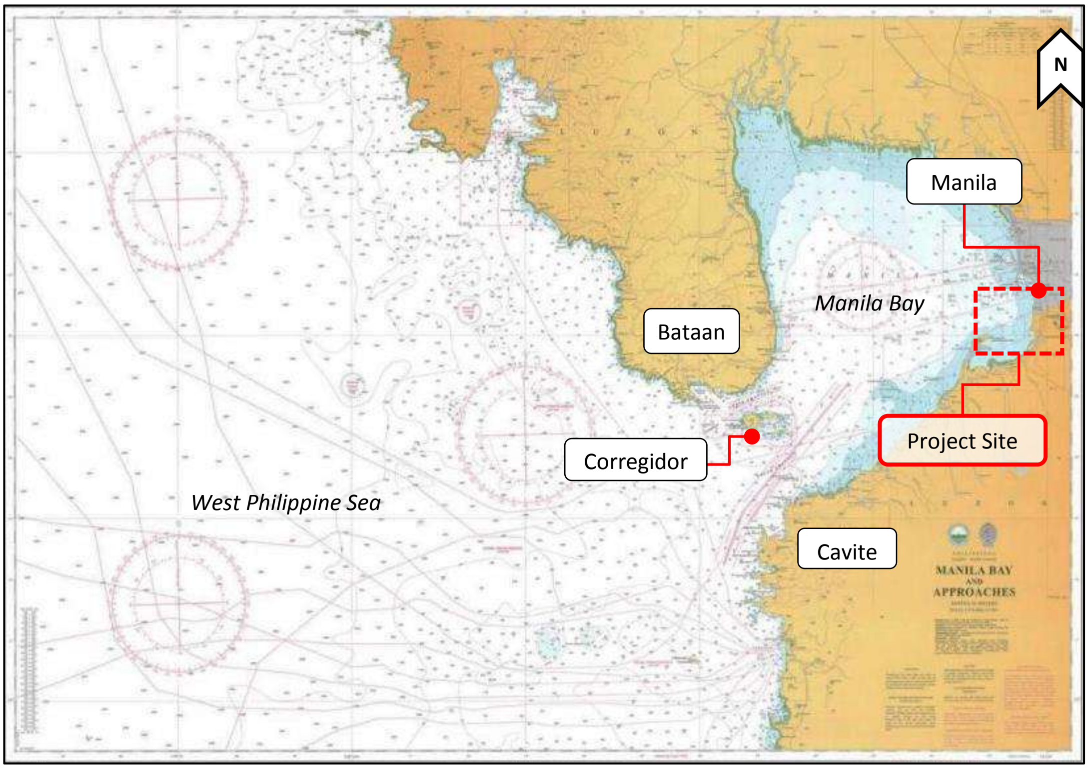


Figure 6. NAMRIA Nautical Chart - Manila Bay and Approaches (Chart #1501)

Meteorological Data

The Philippine Astronomical and Geophysical Services Administration (PAGASA) installed several surface synoptic stations, agro-meteorological stations, and other weather stations that collect meteorological, astronomical, and climatological information over the country. The weather station that is nearest to the project site and has comparable meteorological condition is the Sangley Point station in Sangley Point, Cavite, which is approximately 5.5 kilometers west of the property and has 19 years of record.

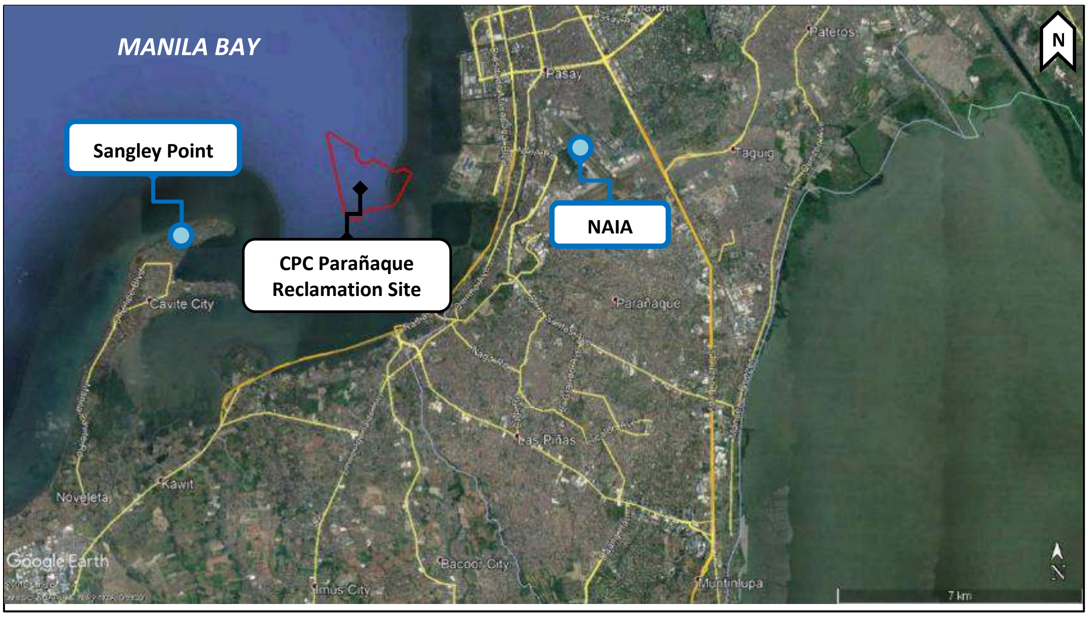


Figure 7. Nearby PAGASA Weather Stations

Climatological extremes refer to maximum and minimum values of weather related data at a certain station as observed and determined from a long record of data. These values include the precipitation, temperature, wind speed, and sea level pressure at the weather station and can be requested from PAGASA at monthly or annual extremes. The climatological extremes of the NAIA Station as of 2016, and the Sangley Point Station as of 2016 are shown in Table 1 and Table 2, respectively. This table contains the highest winds in meters per second (MPS) and lowest pressures in millibars (MBS). Generally low sea level pressures (highlighted in blue) coupled with high wind speeds (highlighted in red) correspond to a strong typhoon tracking close to the weather station.

Table 1. Summary of Climatological Extremes of NAIA Station (Source: PAGASA)

MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (mm)		STRONGEST WINDS (mps)			SEA LEVEL PRESSURES (mbs)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	35.8	01-07-1989	14.8	01-18-1961	55.3	01-03-1970	20	ENE	01-12-1986	1022.3	01-27-1987	1004.4	01-01-1950
FEB	35.1	02-21-1998	14.6	02-01-1962	16.5	02-27-1950	20	E	02-28-1988	1021.4	02-01-1998	1003.8	02-21-2001
MAR	36.5	03-30-1978	16.0	03-03-1963	36.0	03-07-2011	26	E	03-29-1992	1021.1	03-02-1987	1002.4	03-06-1999
APR	37.8	04-23-1948	18.7	04-01-1994	63.0	04-04-1992	22	ESE	04-06-1986	1019.9	04-23-1987	1002.8	04-21-2001
MAY	38.2	05-18-2014	19.1	05-11-1950	229.1	05-27-1960	31	SW	05-22-1976	1015.9	05-09-1957	992.2	05-17-1989
JUNE	38.0	06-02-1991	20.0	06-22-1954	353.8	06-01-1958	36	S	06-29-1964	1016.0	06-07-1997	974.6	06-29-1964
JULY	36.4	07-26-2016	18.3	07-28-1948	472.4	07-20-1972	36	W	07-08-1986	1014.9	07-07-1953	990.1	07-16-2014
AUG	35.2	08-29-1989	17.4	08-09-1949	401.8	08-10-1947	30	WSW	08-16-1984	1015.2	08-12-1958	992.8	08-24-1978
	35.2	08-19-2014											
SEP	35.2	09-02-2013	19.1	09-15-1950	228.9	09-08-1963	40	NNW	09-28-2006	1016.2	09-18-2005	986.7	09-30-1995
OCT	36.0	10-24-1976	18.0	10-23-1981	274.5	10-09-1978	27	W	10-18-1985	1017.0	10-25-1986	977.9	10-14-1970
NOV	35.8	11-17-1972	17.2	11-26-1949	121.7	11-14-1977	56	W	11-19-1970	1019.4	11-03-1989	899.4	11-03-1995
DEC	34.2	12-29-1978	16.3	12-18-1955	125.5	12-15-2015	25	NW	12-30-1950	1020.9	12-08-1960	995.5	12-02-2004
ANNUAL	**38.2**	**05-18-1969**	**14.6**	**02-01-1962**	**472.4**	**07-20-1972**	**56**	**W**	**11-19-1970**	**1022.3**	**01-27-1987**	**899.4**	**11-03-1995**
Period of Record	**1947 - 2015**				**1949 - 2015**		**1950 - 2015**			**1950 - 2015**			

Maximum Wind (MPS) Lowest Pressure

Table 2. Summary of Climatological Extremes of Sangley Point, Cavite (Source: PAGASA)

MONTH	TEMPERATURE (°C)				GREATEST DAILY RAINFALL (mm)		STRONGEST WINDS (mps)			SEA LEVEL PRESSURES (mbs)			
	HIGH	DATE	LOW	DATE	AMOUNT	DATE	SPD	DIR	DATE	HIGH	DATE	LOW	DATE
JAN	34.8	01-25-1999	19.0	01-03-1982	94.0	01-12-1977	17	ESE	01-19-2010	1023.4	01-16-1999	1001.9	01-31-2001
FEB	35.2	02-28-1998	18.0	02-01-1982	45.8	02-06-2016	15	ESE	02-27-1992	1019.9	02-03-1993	1005.4	02-21-2001
MAR	36.6	03-29-1981	19.1	03-25-1980	52.4	03-22-2013	24	ESE	03-23-1998	1020.5	03-05-2005	1003.9	03-06-1999
APR	37.8	04-07-1983	21.5	04-03-2007	53.9	04-24-1975	16	ESE	04-05-1996	1017.5	04-14-1993	1002.0	04-30-1988
MAY	38.5	05-16-1987	22.0	05-15-1980	237.1	05-26-1997	27	SW	05-22-1976	1015.5	05-25-1983	993.4	05-22-1976
JUNE	38.4	06-04-1987	22.0	06-16-1981	172.4	06-27-1985	25	SE	06-08-2011	1014.3	06-08-1997	997.6	06-28-2004
JULY	36.3	07-25-2007	21.2	07-15-1982	231.4	07-20-2002	54	E	07-13-2010	1013.8	07-29-1983	986.1	07-15-2014
AUG	36.5	08-16-2009	22.0	08-02-1994	475.4	08-19-2013	30	W	08-18-1990	1014.5	08-13-2005	998.1	08-17-1990
SEP	35.6	09-02-1996	21.0	09-16-1979	275.4	09-22-2013	44	NNW	09-28-2006	1015.6	09-18-2005	984.3	09-28-2006
OCT	35.8	10-08-1996	21.0	10-24-1988	260.7	10-05-1986	45	NW	10-21-1994	1016.4	10-27-1993	990.3	10-21-1994
NOV	36.4	11-08-1978	21.5	11-26-1982	171.2	11-02-2000	49	NW	11-03-1995	1017.5	11-30-1989	977.0	11-03-1995
DEC	34.0	12-06-1998	20.0	12-24-1985	131.3	12-10-2006	22	NNW	12-05-1993	1019.1	12-31-1992	997.9	12-02-2004
ANNUAL	**38.5**	**05-16-1987**	**18.0**	**02-01-1982**	**475.4**	**08-19-2013**	**54**	**E**	**07-13-2010**	**1023.4**	**01-16-1999**	**977.0**	**11-03-1995**
Period of Record	**1974 - 2015**				**1974 - 2015**		**1974 - 2015**			**1974 - 2015**			

Maximum Wind (MPS) Lowest Pressure

Historical Typhoons

A tropical cyclone is caused by large temperature differences between the sea surface and the overlying atmosphere. Water vapor rises from the sea surface releasing latent heat that decreases atmospheric pressure, and induces atmospheric currents that further affect the sea surface. This interaction of the seawater with the atmosphere, together with the effect of the earth's rotation, can cause the seawater to swirl into a vortex with a translational motion, with a large pressure drop at the center and extreme wind speeds and gustiness around it. In the Philippines classification system, a tropical storm is formed when sustained gust speed reach 61 kph (16.94 mps), and a typhoon when gust speeds reach 117 kph (32.5 mps). Tropical storms and typhoons are thus characterized by a large atmospheric pressure drop (ΔPc), extreme gusts with sustained wind speed (Vmax), and some translational or forward speed of their centers (Vf). The size of typhoons is associated with the radius from the center (Rmax) to where the wind gusts reach their maximum speeds, while the strength of the typhoon is associated with both the maximum wind speed, Vmax, and the cyclone's lifetime.

To determine the potentially critical typhoons which could affect the project site, all typhoons whose tracks passed within a 200 km radius from the site were determined from secondary data (Figure 8). From this long list, the top five (5) strongest typhoons in terms of wind speed were further selected, with their properties shown in Table 3.The individual tracks of the top five typhoons are shown in Figure 9 - Figure 13.

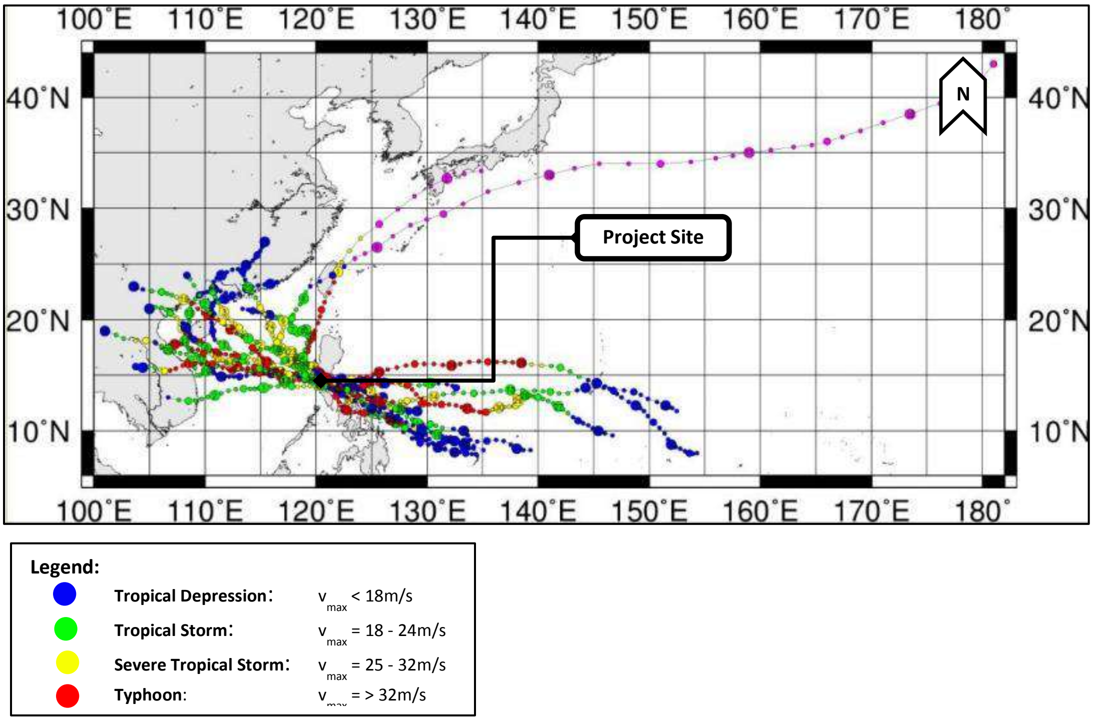


Figure 8. Typhoon Tracks within 200km of Project Site (Source: Digital Typhoon)

Table 3. Top 5 Historical Typhoons passing within a 200km radius of the Property based on Wind Speed

No.	Name Int'l / Local	JMA No.	Duration	Vmax (kph)	Rmax (km)	Pc (hPa)	Relative Track to the Site
1	Rita / Kading	197826	11 Days 18 Hours	203.72	14.42	905	S
2	Georgia / Ruping	198622	4 Days 6 Hours	198.57	17.33	920	S
3	Patsy / Yoling	197025	8 Days 0 Hours	192.66	18.31	925	S
4	Betty / Herming	198709	8 Days 0 Hours	185.20	19.28	930	S
5	Koppu / Lando	201524	7 Days 18 Hours	185.20	18.31	925	N

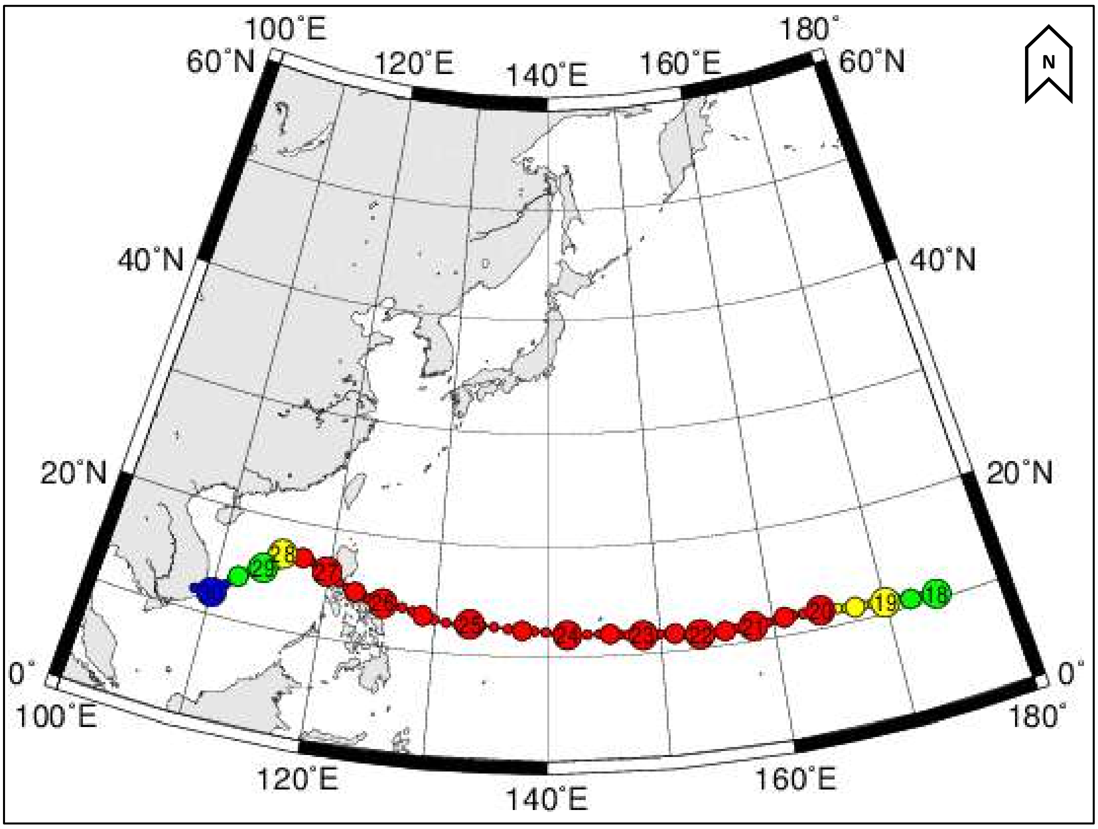


Figure 9. Typhoon Rita / *Kading* (Source: Digital Typhoon)

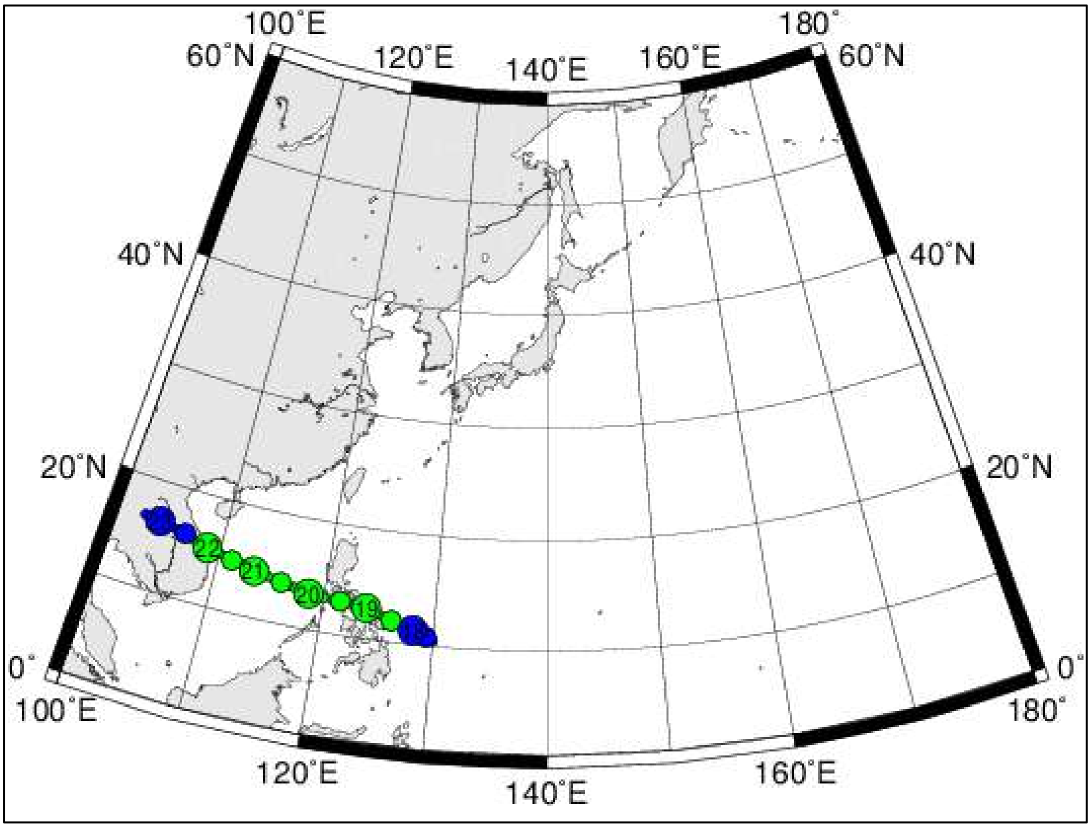


Figure 10. Typhoon Georgia / *Ruping* (Source: Digital Typhoon)

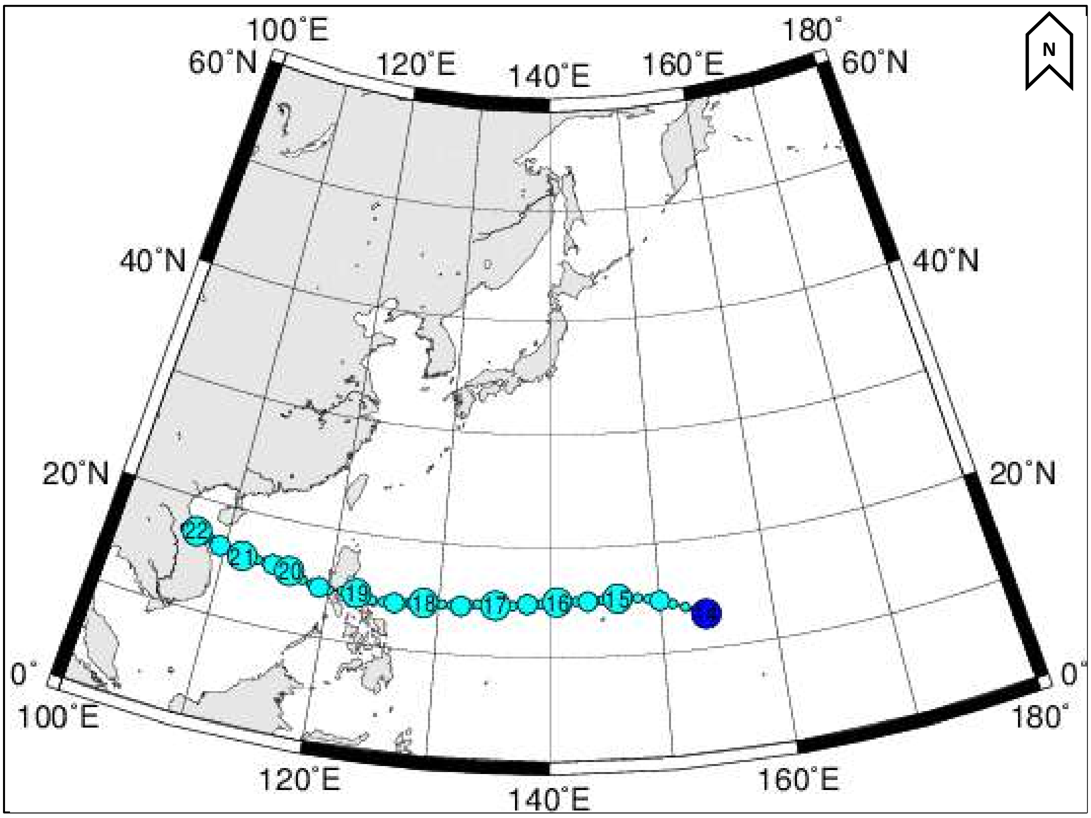


Figure 11. Typhoon Patsy / *Yoling* (Source: Digital Typhoon)

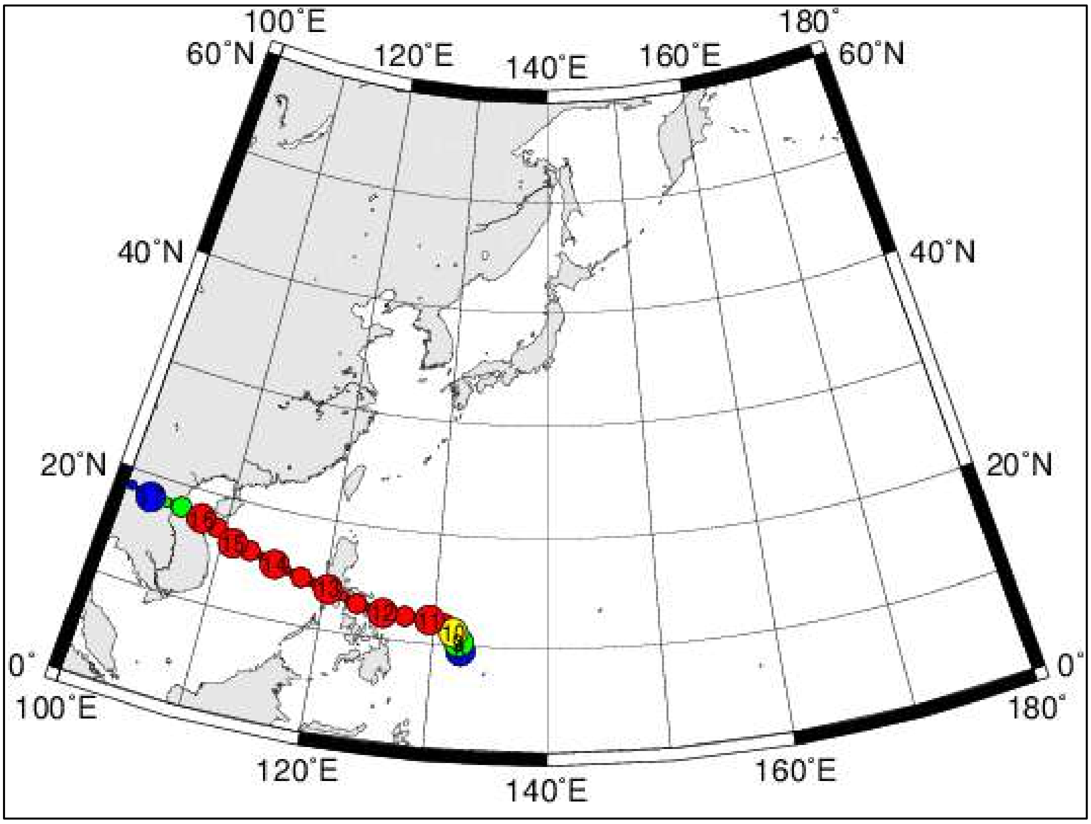


Figure 12. Typhoon Betty / *Herming* (Source: Digital Typhoon)

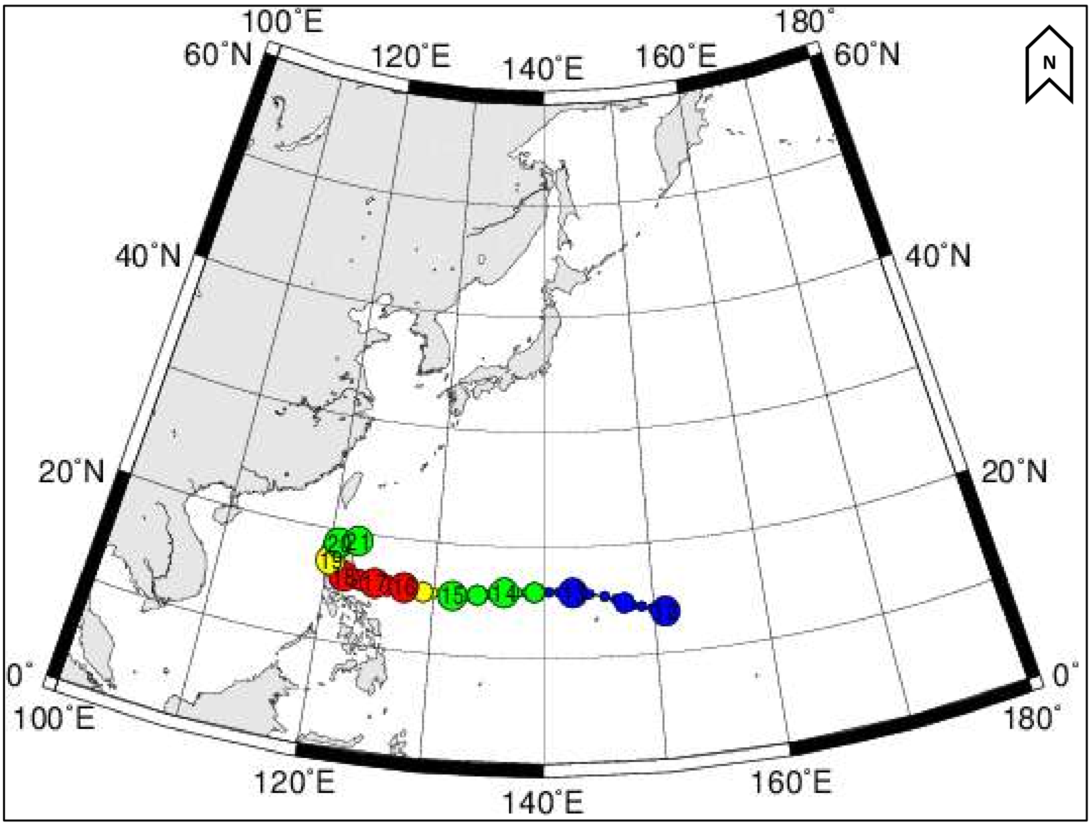


Figure 13. Typhoon Koppu / *Lando* (Source: Digital Typhoon)

Wind Rose Data

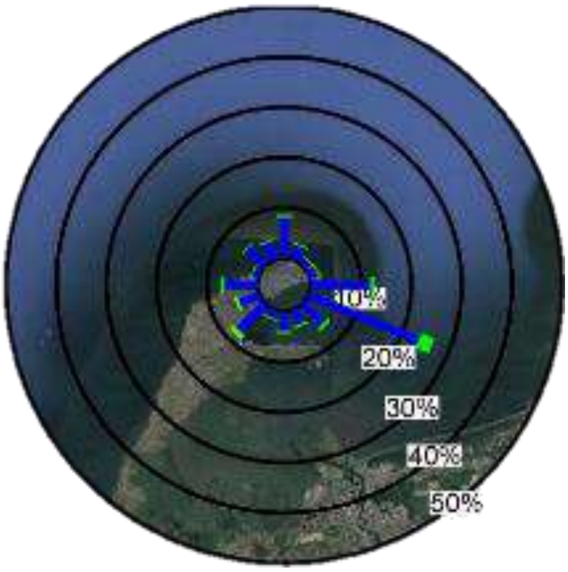
A wind rose diagram represents the frequency of winds blowing from particular directions. It uses sixteen (16) cardinal directions—North (N), North-northeast (NNE), Northeast (NE), East-northeast (ENE), East (E), East-southeast (ESE), Southeast (SE), South-southeast (SSE), South (S), South-southwest (SSW), Southwest (SW), West-southwest (WSW), West (W), West-northwest (WNW), Northwest (NW), and North-northwest (NNW). The Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) wind station at Sangley Point was used to determine the wind conditions at the project site.

From the annual wind rose diagram (Figure 14), it is evident that the prevailing critical wind directions are from the west northwest, west, west southwest, and southwest. Although there are other prevailing directions, these are not as critical due to exposure of the project site to winds coming from the West Philippine Sea.

The monthly wind rose diagram (Figure 15) shows the variation of the wind directions over the entire year. The northeasterly winds occur during the amihan season from November to April, while the southwesterly winds occur during the habagat season from June to September. The remaining months are considered transition months between the two seasons.

Table 4. Wind Rose Color Legend (PAGASA)

Color	Wind Speed Range (mps)	Description
	1 - 4	Light
	5 - 8	Moderate
	9 - 12	Moderate to Strong
	13 - 16	Strong
	17 - 20	Very Strong



Dir.	Freq. (%)	Dir.	Freq. (%)
N	15.7	S	2.0
NNE	3.4	SSW	0.1
NE	1.6	SW	0.1
ENE	1.7	WSW	0.1
ENE	21.9	W	0.9
ESE	30.9	WNW	0.2
SE	6.8	NW	5.0
SSE	4.7	NNW	4.9

Figure 14. Annual wind rose diagram at Sangley Point wind station (PAGASA)

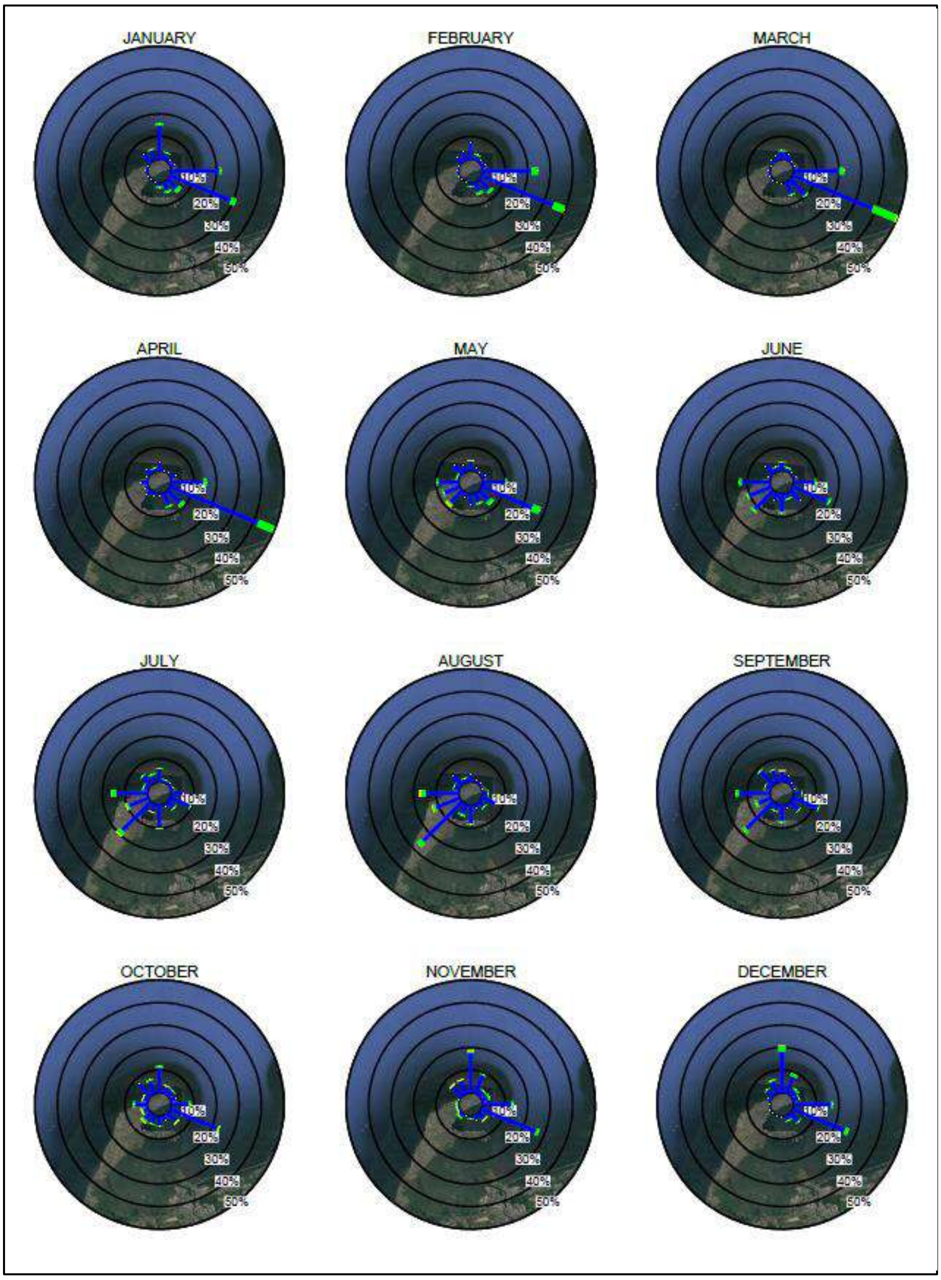


Figure 15. Monthly Wind Rose based on the Sangley Point Wind Station (PAGASA)

Tide Data

Tide levels are the horizontal planes representing averaged vertical positions of the sea surface at a particular site as influenced by astronomical effects such as the combined effects of the gravitational forces of attraction between the earth, sun, and moon, and modified by the land masses on the earth's surface. These levels are determined from daily sea surface fluctuation recordings over a period of at least nineteen (19) years. In general, the levels are typically noted as the Mean Tide Level (MTL), Mean High Water (MHW), Mean Higher High Water (MHHW), Mean Low Water (MLW), and Mean Lower Low Water (MLLW).

Tides in the Philippines vary from diurnal (high tide occurs once a day) to semi-diurnal (high tide occurs twice a day), depending on the location and date as illustrated in Figure 16. Up to Day Four in the figure, there are two high tides and two low tides per day (semi-diurnal); after which, the tides become diurnal again. The Mean Higher High Water (MHHW) corresponds to the average of all higher high tide (during semi-diurnal seasons) and high tide (during diurnal seasons) levels, while the Mean High Water corresponds to the average of all high tides (including the lower high tide). The corresponding MLLW and MLW follow the same principle.

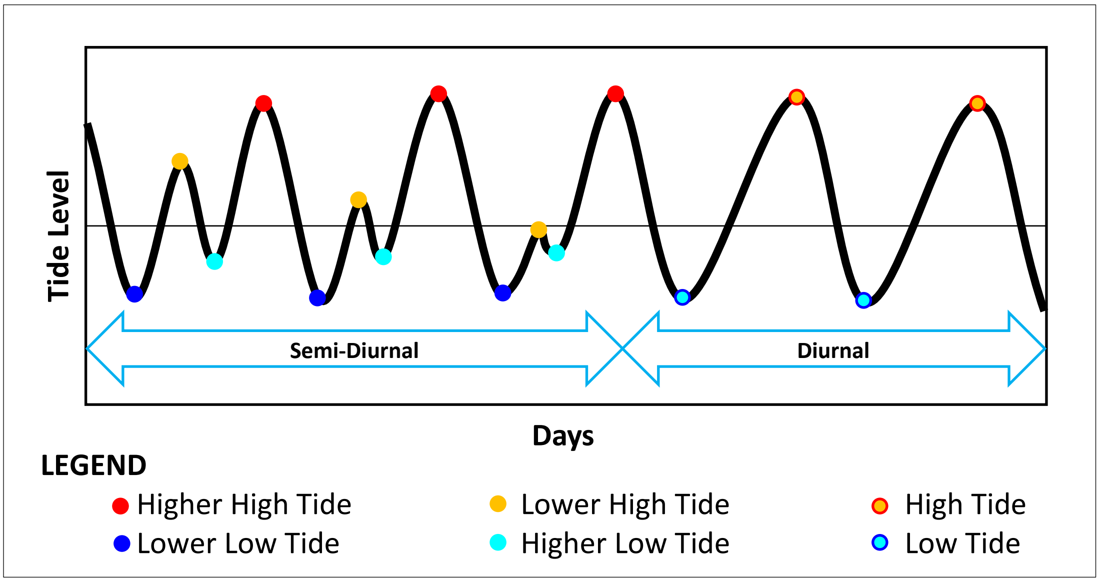


Figure 16. Sample Tide Levels

The location and data of nearby tide stations are shown in Figure 17 and

Table 5, respectively. The nearby stations consist of one (1) primary station (Manila South Harbor) and two (2) secondary station (Puerto Azul & Mariveles).

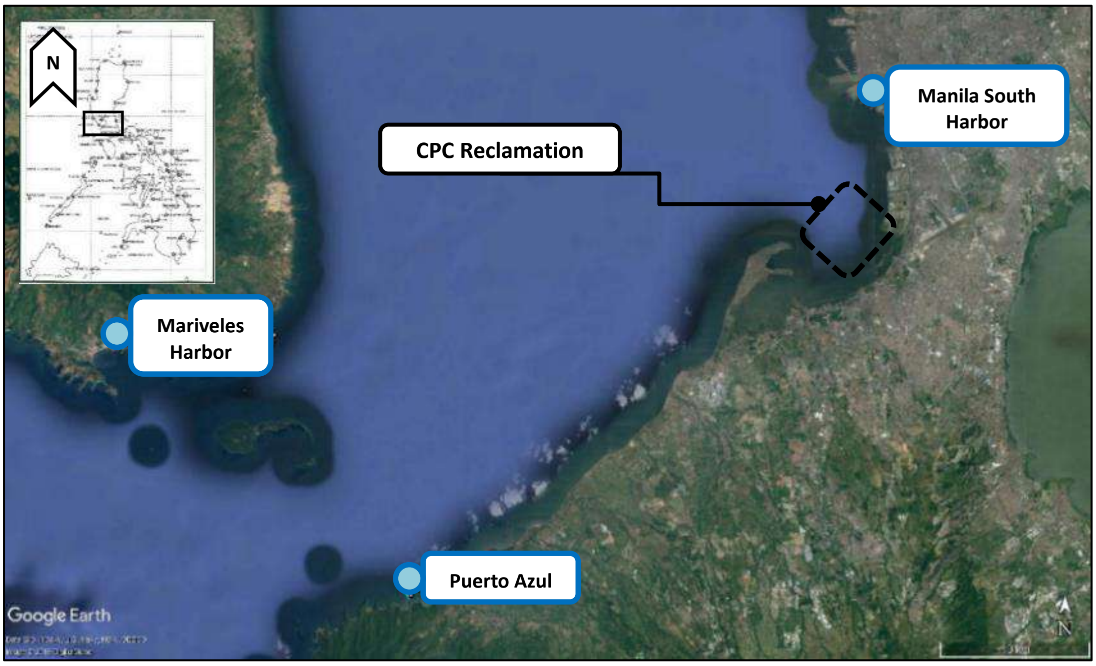


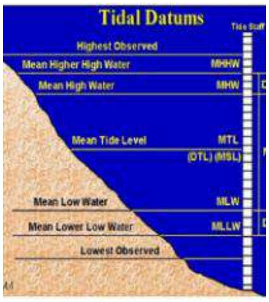
Figure 17. Tide Station Location (Source: Google Earth®)

Table 5. Tide Station Information

NAME	TYPE	LAT	LONG	MUNICIPALITY	BM	EL. (MTL)
Manila South Harbor	Primary	14°35'N	120°58'E	South Harbor, Manila	BM 66	1.30
Mariveles Harbor	Secondary	14°26'N	120°30'E	Mariveles, Bataan	BM 1	2.696
Puerto Azul	Secondary	14°47'N	120°41'E	Ternate, Cavite	BM 2A	3.386

Shown in Table 6 are the tide data recorded and tide statistics in the Manila South Harbor, Mariveles Harbor, and Puerto Azul stations. For every station, tide data indicating the mean, high, and low elevations are presented. The closest tide station to the project site is the Manila South Harbor station, which has a mean tidal range of 1.0m – the difference between the mean higher high water (MHHW) and mean lower low water level (MLLW).

Table 6. Tide Data in Manila Bay



Station	Tide Elevation (m)						
	HHWL Highest Observed	MHHW Mean Higher High Water	MHW Mean High Water	MTL Mean Tide Level	MLW Mean Low Water	MLLW Mean Lower Low Water	LLWL Lowest Observed
Manila South Harbor	1.475	0.51	0.39	0	-0.38	-0.49	-1.635
Mariveles Harbor	1.083	0.50	0.42	0	-0.41	-0.48	-0.977
Puerto Azul	1.293	0.51	0.42	0	-0.42	-0.49	-0.967
Note: All heights are referred to mean tide level (MTL) in meters.							

Shown in Table 7 to Table 9 are the available data of the annual highest and lowest tide level at each station and the dates when the tidal extremes occurred.

Table 7. Annual tidal extremes for the Manila South Harbor station (Source: NAMRIA)

MANILA SOUTH HARBOR						
YEAR	HIGHEST TIDE LEVEL			LOWEST TIDE LEVEL		
	MONTH	DATE	METER	MONTH	DATE	METER
1997	August	18	0.975	December	31	-0.885
1998	November	22	1.095	January	28	-0.885
1999	April	22	1.085	February	14	-0.805
2000	July	4	1.205	December	13/14	-0.665
2001	June	30	1.205	January	10	-0.715
2002	July	11	1.175	February	26	-0.905
2003	October	5	0.985	December	24	-1.265
2004	December	14	1.005	December	14	-0.975
2005	June	24	1.205	February	8	-0.985
2006	August	9	1.415	December	22	-0.865
2007	November	26	1.295	December	25	-0.895
2008	December	14	1.365	January	21	-0.935
2009	June	24	1.395	January	12	-0.905

2010	August	8	1.225	January	30	-0.885
2011	September	27	1.475	January	19	-0.715
2012	July	30	1.345	December	15	-0.715
2013	October	12	1.275	January / December	12/5	-0.665
2014	July	16	1.305	January / December	2/24	-0.695
2015	September	27	1.075	January	22	-0.685
2016	October	20	1.165	January	11	-0.685
Note: All heights are referred to mean tide level (MTL) in meters.						

Table 8. Annual tidal extremes for the Mariveles Harbor station (Source: NAMRIA)

MARIVELES HARBOR						
YEAR	HIGHEST TIDE LEVEL			LOWEST TIDE LEVEL		
	MONTH	DATE	METER	MONTH	DATE	METER
2002	July	12	0.863	December	6	-0.837
2003	November	26	0.823	December	25	-0.927
2004	June	6	0.943	December	14	-0.977
2005	July	22	0.873	June	23	-0.967
2006	July	13	0.913	July	11	-0.857
2007	July	14	0.943	June/February	1/15	-0.857
2008	July	3	1.063	December	14	-0.817
2009	June	25	1.083	January	11	-0.897
2010	August	9	0.933	February	26	-0.827
2011	January	20	0.843	January	20	-0.747
2012	August	2	0.903	May	8	-0.857
2013	August	21	1.213	June	24	-0.697
2014	July	13	0.823	February	27	-0.687
Note: All heights are referred to mean tide level (MTL) in meters.						

Table 9. Annual tidal extremes for the Puerto Azul station (Source: NAMRIA)

PUERTO AZUL						
YEAR	HIGHEST TIDE LEVEL			LOWEST TIDE LEVEL		
	MONTH	DATE	METER	MONTH	DATE	METER
2002	June	26	0.953	December	6	-0.807
2003	June	16	0.873	December	25	-0.867
2004	August	1	0.923	December	14	-0.967
2005	July	22	1.013	January	10	-0.937
2006	July	13	1.003	January/December	29/7	-0.897
2007	November	26	1.293	January	4	-0.887
Note: All heights are referred to mean tide level (MTL) in meters.						

NUMERICAL MODEL

Introduction

The hydrodynamics of the sea waters around and far offshore of the project coast is described by the water level variation and currents induced by both astronomic and meteorological tides. In this study, numerical modelling of tide flows is carried out for the project's offshore region. The governing mathematical model applies to the so-called "long-period oscillations" that are non-dispersive, but accounts for the nonlinearity of the tide motion. It also accounts for the Coriolis effects (due to the earth's rotation), wind shear stress, translating pressure field, long-period wave damping, and bottom friction (linear and nonlinear). While the numerical model used can handle inundation conditions along the coasts, such as that caused by storm surge overtopping, this model capability is not activated during the simulations. In the sea hydrodynamics modelling, the main external loadings are as follows: (1) astronomic tides through the open boundaries; (2) surface wind field due a translating pressure field (typhoons).

Computational Domain

An unstructured mesh is used in order to resolve the spatial scales required by the variation of depths and the irregular shape of the coastline. Two numerical domains were used for the analyses, namely the regional model (Figure 18) encompassing the entire Philippine archipelago, and the local domain limited to Manila Bay alone (Figure 19). All bathymetric data was consolidated to ensure all simulations are based on a common bathymetric model. The datum used for the simulations is the mean tide level (MTL).

The two color-banded digital elevation model (DEM) with varying scales are shown in Figure 18 and Figure 19.

NAMRIA Nautical Chart 1501 (Manila Bay and Approaches),

NAMRIA Nautical Chart 4243 (Manila to Cavite),

NAMRIA Nautical Chart 4236 (Fairways and Anchorages), and

General Bathymetry Chart of the Oceans (GEBCO) which provides gridded depth points at 30 arc-second intervals (~1 km).

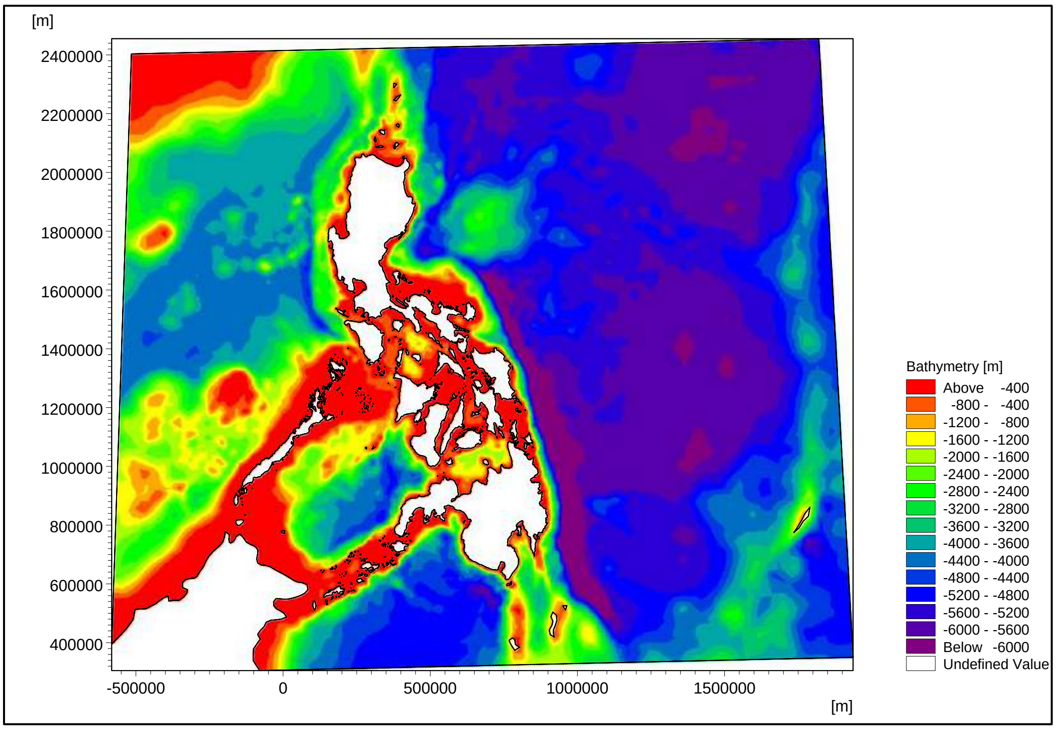


Figure 18. Domain extents for the hydrodynamic computation of the regional model

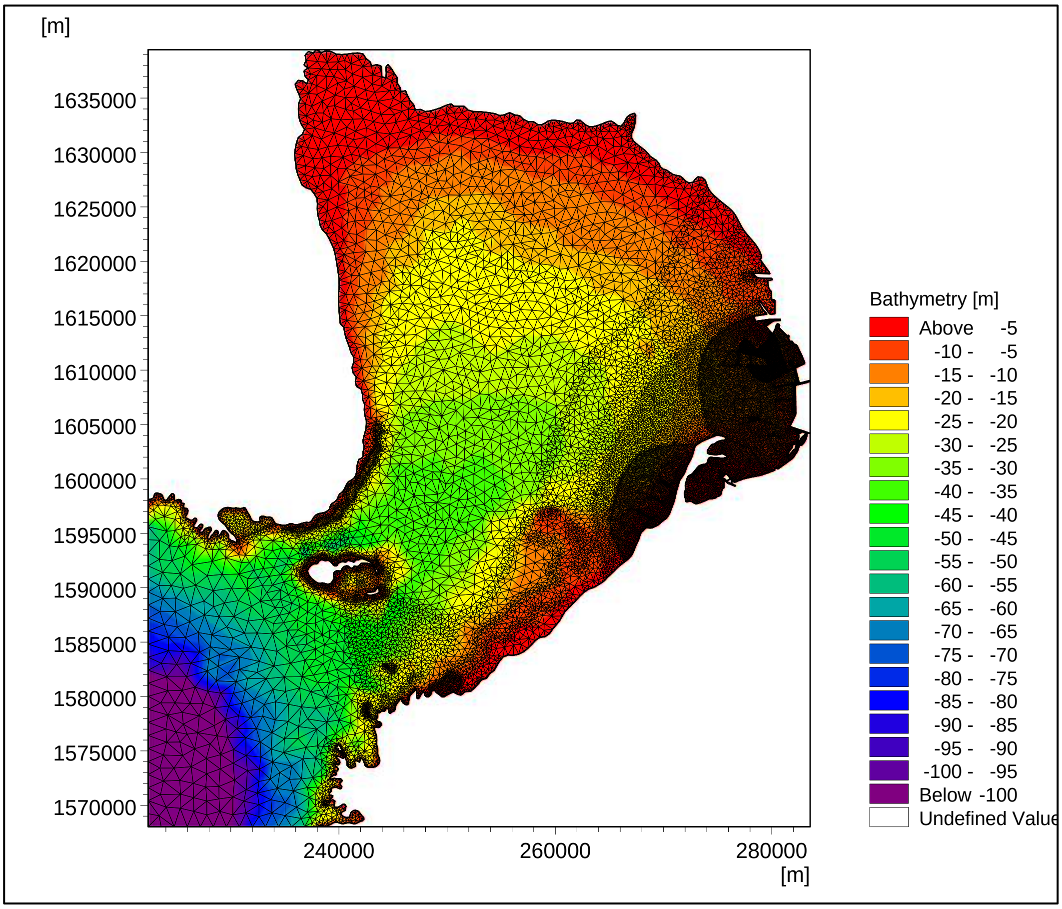


Figure 19. Flexible Element Mesh for the hydrodynamic computation of the local model at Manila Bay

The marine region around the project area is modeled with a finer mesh in order to improve the accuracy of simulated hydrodynamics in this region. A depth-adaptive mesh is used to satisfy the conditional stability condition of the numerical model. Smaller grids are used for shallow waters and around small islands while larger grids are designed for deep waters and along open boundaries where the astronomic tides are forced as boundary conditions.

Development Scenarios
For all succeeding simulations, two basic scenarios were considered namely pre-development and post-development. Pre-development assumes the existing coastline with no projects in place, whereas the post-development scenario imposed additional reclaimed areas within Manila Bay that have been approved by DENR. Hence, no separate simulation assuming only the project site has been done. The list of reclamation projects included in the computational domain are:

CPC Reclamation
Horizon Manila Reclamation
SMIC Reclamation (Pasay 360)
Manila Gold Coast Reclamation

However as all of these projects are by various different proponents and are at differing levels of refinement, the plan-forms of the reclamation projects shown in Figure 21 may not be the final layouts of these projects. Additionally, due to the inclusion of these other projects, it will be difficult to ascertain which effects – either detrimental or beneficial – can be attributed to the reclamation of the project site.

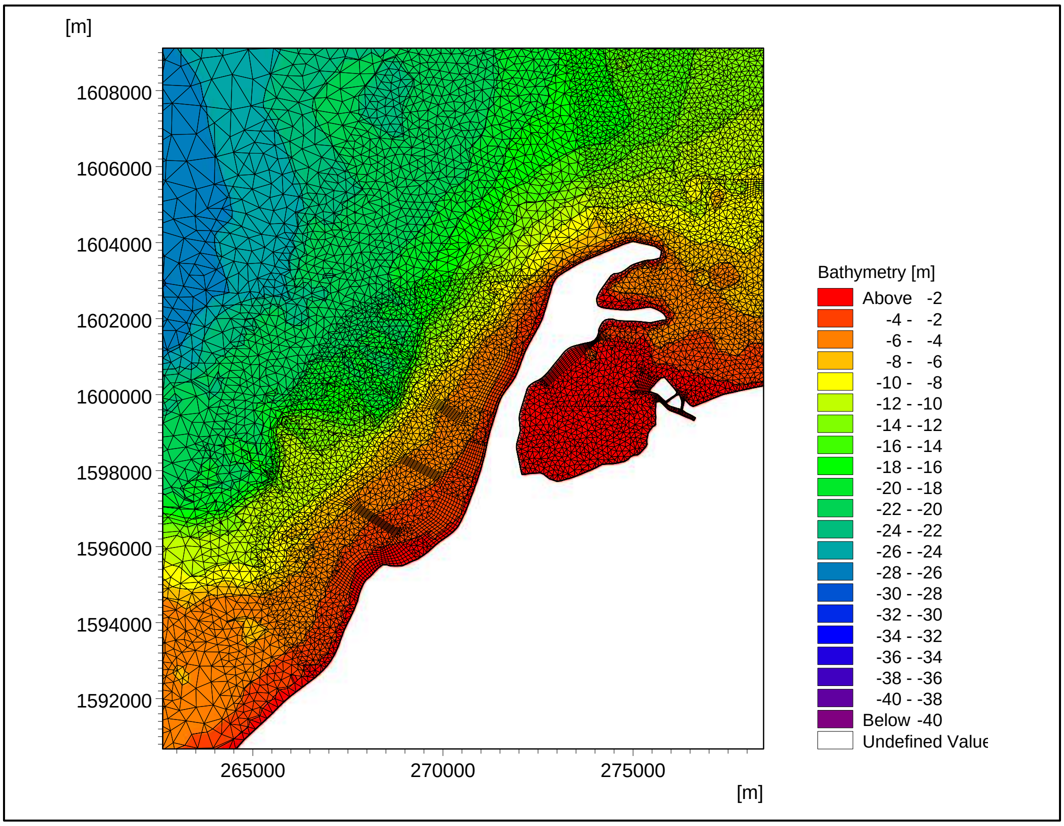


Figure 20. Flexible Element Mesh for the hydrodynamic computation of the local model at Manila Bay zoomed in at the project site – predevelopment

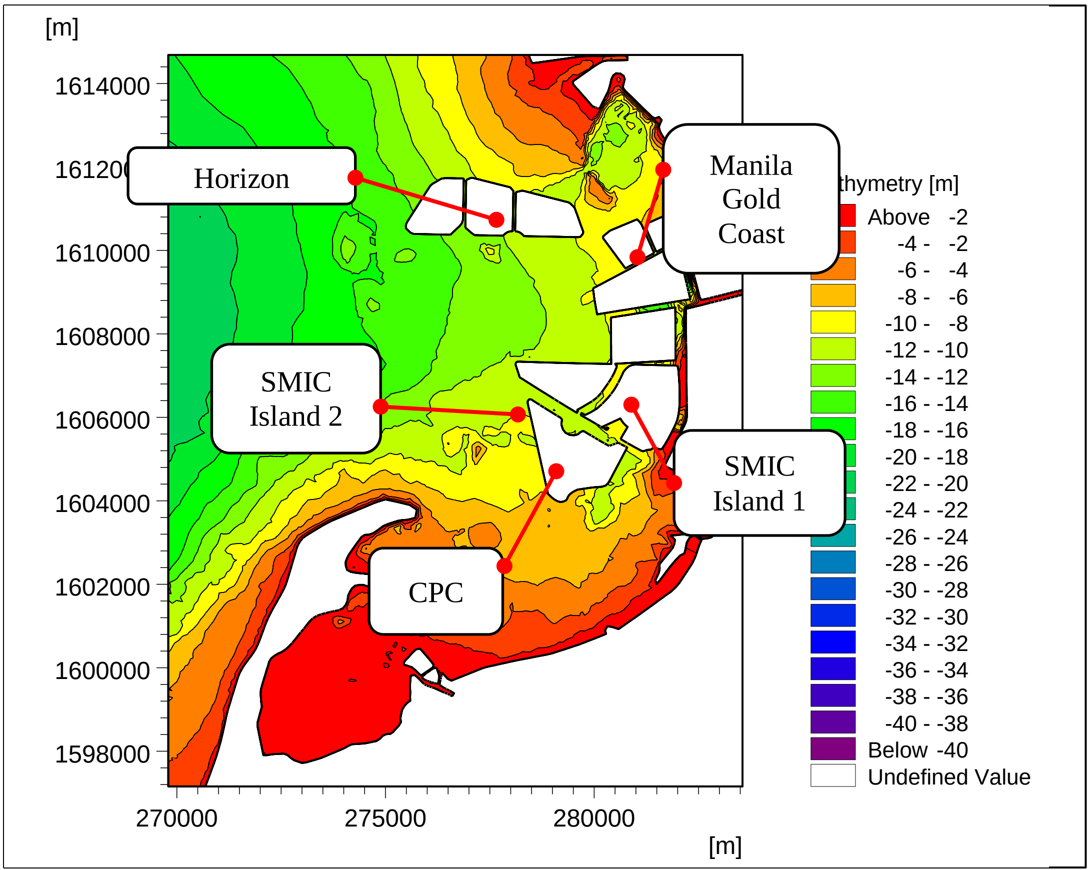


Figure 21. Bathymetry of the local hydrodynamic model at Manila Bay zoomed in at the project site – post-development

Calibration

To model the hydrodynamics of Manila Bay, a numerical model was used namely the Mike21 Flexible Mesh Hydrodynamic Model; it can simulate the water level and current changes caused by various external forces. To calibrate the local model, tidal forcing was extracted from a regional tidal model (Figure 18) and applied to the offshore boundary outside of the local model of Manila Bay (Figure 21). The simulation time included one month during a non-typhoon period, namely the month of February, 2016, to minimize meteorological effects on the tidal fluctuations, was selected. Hence, no meteorological forcing was applied to this tidal current model. One month was selected to allow for adequate warm-up time of the simulation and to ensure two tidal cycles – including the spring and neap tides – are included in the simulation (Figure 22). A statistical comparison of the simulated water surface elevations against actual tide readings acquired from NAMRIA resulted in a coefficient of determination (R2) value of 0.91 at Manila South Harbor.

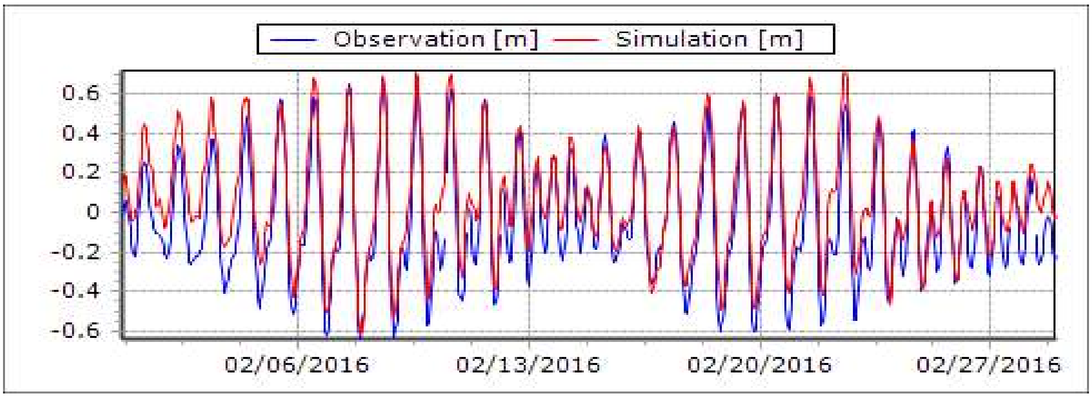


Figure 22. Simulated tide levels at Manila Bay South Harbor

Prevailing Wave Simulation
Local waves at the project site were determined by analyzing the transformation of hindcast deepwater wave conditions at the mouth of Manila Bay as they propagate to the site, while simultaneously adding a constant wind shear on the surface water within the local domain of the numerical model; this was done using the Mike21 Spectral Wave module. This module is capable of simulating the growth, decay, and transformation of offshore swells and wind-generated waves (DHI, Mike21 SW FM Short Description).

Based on the prevailing winds, six directions were modelled, namely E, ESE, N, SW, W, and WSW. A summary of the wind conditions in the simulation cases are shown in Table 10, with the results shown in Figure 23 to Figure 58. The figures show the spatial distribution of the significant wave height (Hs) in the nearshore region fronting the project waterfront during MHHW, as this would generally result in a more agitated wave climate. For ease of reference and comparison, all plots have the same range of wave heights. Also shown are the resulting wave climates under post-development conditions.

Table 10. Wind and deepwater wave condition for simulated wave conditions

Direction	Velocity Range	Annual Occurrence Frequency (%)	Remark on wind	Deepwater Wave Height (m)	Deepwater Wave Period (s)	Figure
N	1-4	8.2	3rd prevailing	n/a	n/a	Figure 23 & Figure 24
	5-8	0.4				Figure 25 & Figure 26
	9-12	0				
E	1-4	11.9	2nd prevailing	n/a	n/a	Figure 27 & Figure 28
	5-8	0.8				Figure 29 & Figure 30
	9-12	0				
ESE	1-4	23.7	1st prevailing	n/a	n/a	Figure 31 & Figure 32
	5-8	2.6				Figure 33 & Figure 34
	9-12	0				
SE	1-4	5.6	6th prevailing	n/a	n/a	Figure 35 & Figure 36
	5-8	0.5				Figure 38 & Figure 37
	9-12	0				
SW	1-4	7.4	4th prevailing	0.63	3.41	Figure 39 & Figure 40
	5-8	0.7		1.95	5.55	Figure 41 & Figure 42
	9-12	0.1		3.64	7.23	Figure 43 & Figure 44
WSW	1-4	4.2	8th prevailing	0.68	3.62	Figure 45 & Figure 46
	5-8	0.4		2.19	6.02	Figure 47 & Figure 48
	9-12	0.1		4.21	7.95	Figure 49 & Figure 50
W	1-4	6.5	5th prevailing	0.69	3.68	Figure 51 & Figure 52
	5-8	0.6		2.27	6.17	Figure 53 & Figure 54
	9-12	0		-	-	
NW	1-4	4.9	7th	n/a	n/a	Figure 55 & Figure 56

	5-8	0.1	prevailing			Figure 57 & Figure 58
	9-12	0				

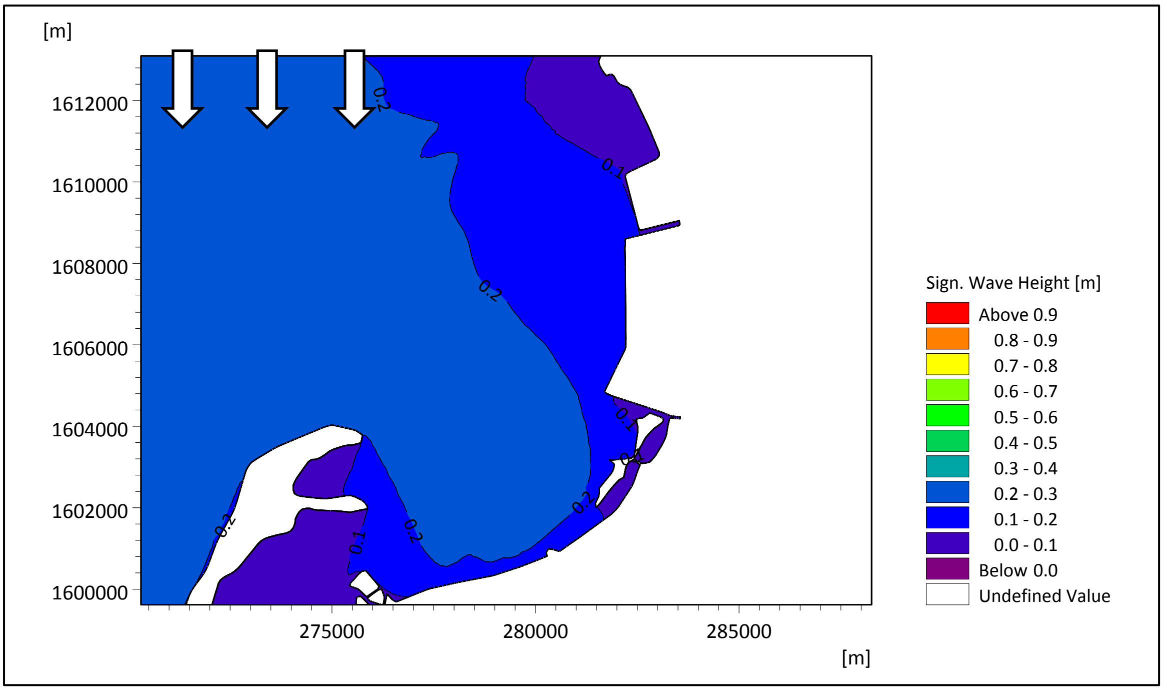


Figure 23. Wave climate due to 1-4 mps surface winds and offshore waves from N during MHHW for pre-development condition

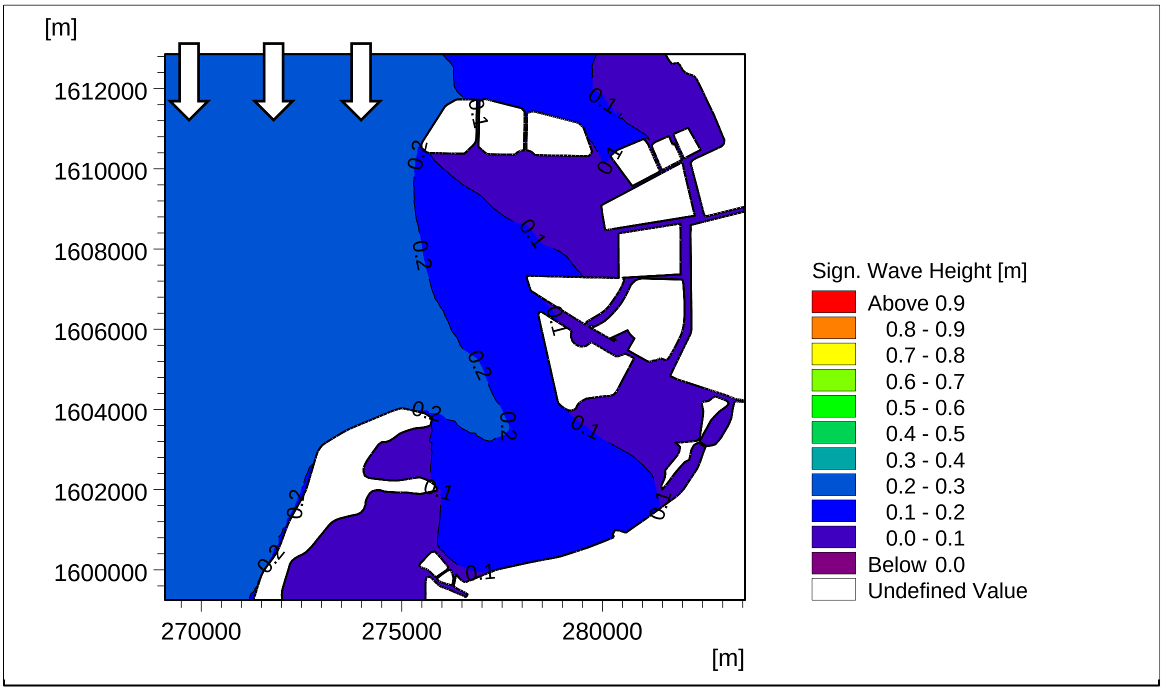


Figure 24. Wave climate due to 1-4 mps surface winds and offshore waves from N during MHHW for post-development condition

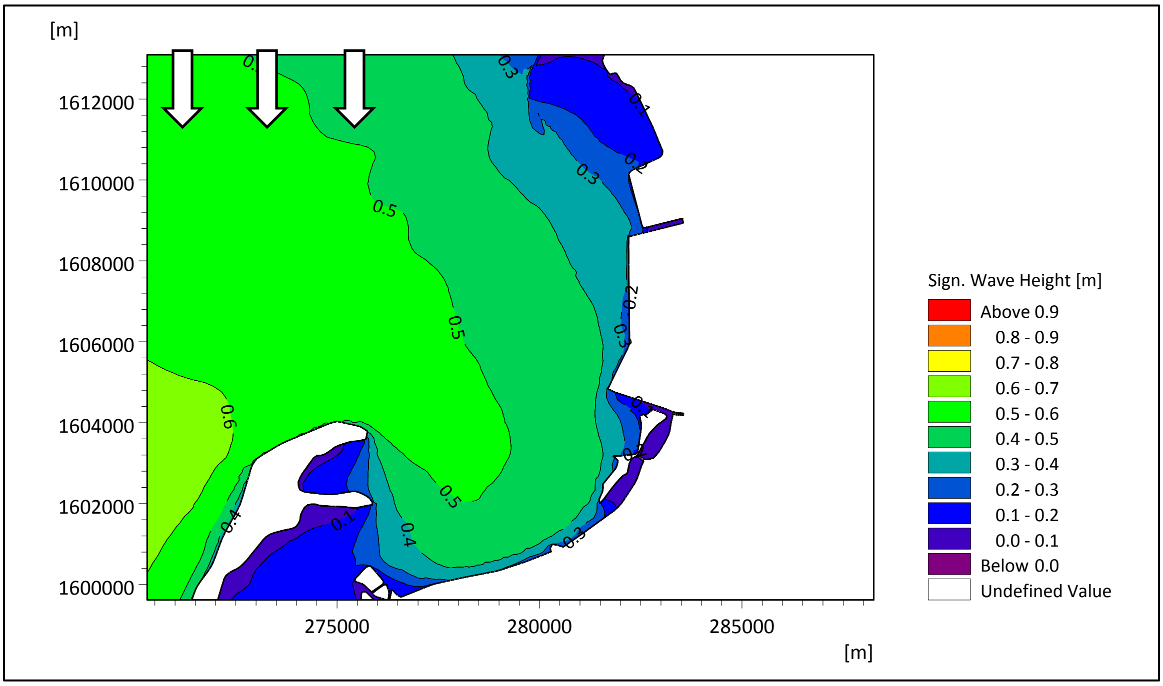


Figure 25. Wave climate due to 5-8 mps surface winds and offshore waves from N during MHHW for pre-development condition

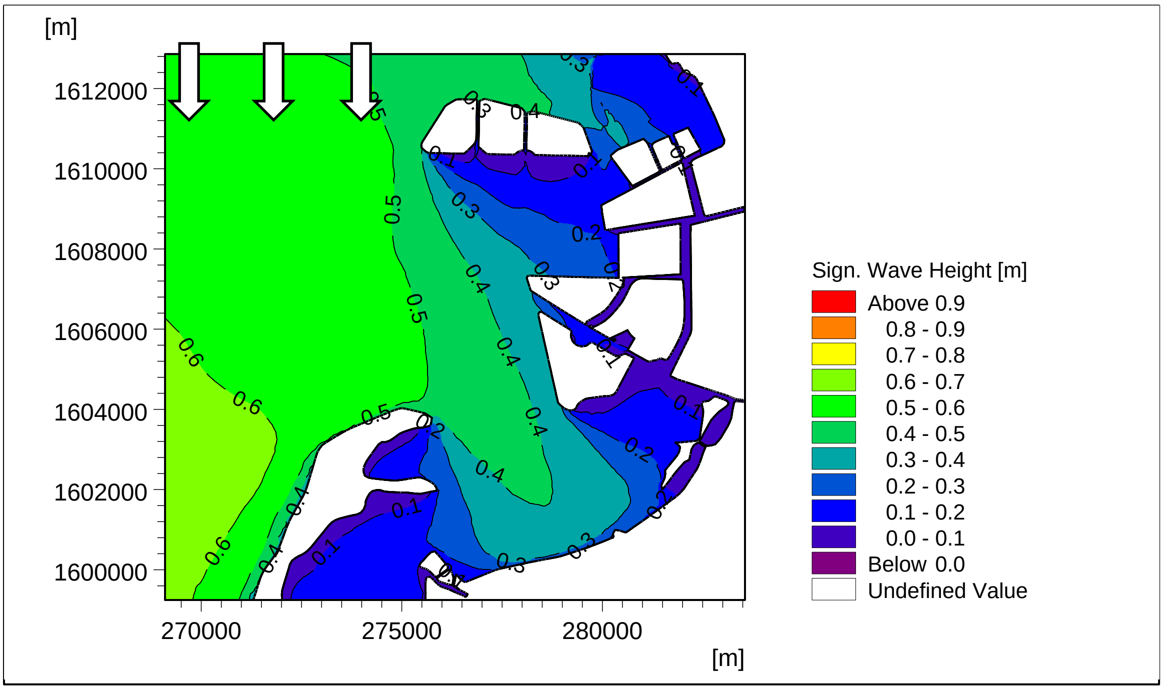


Figure 26. Wave climate due to 5-8 mps surface winds and offshore waves from N during MHHW for post-development condition

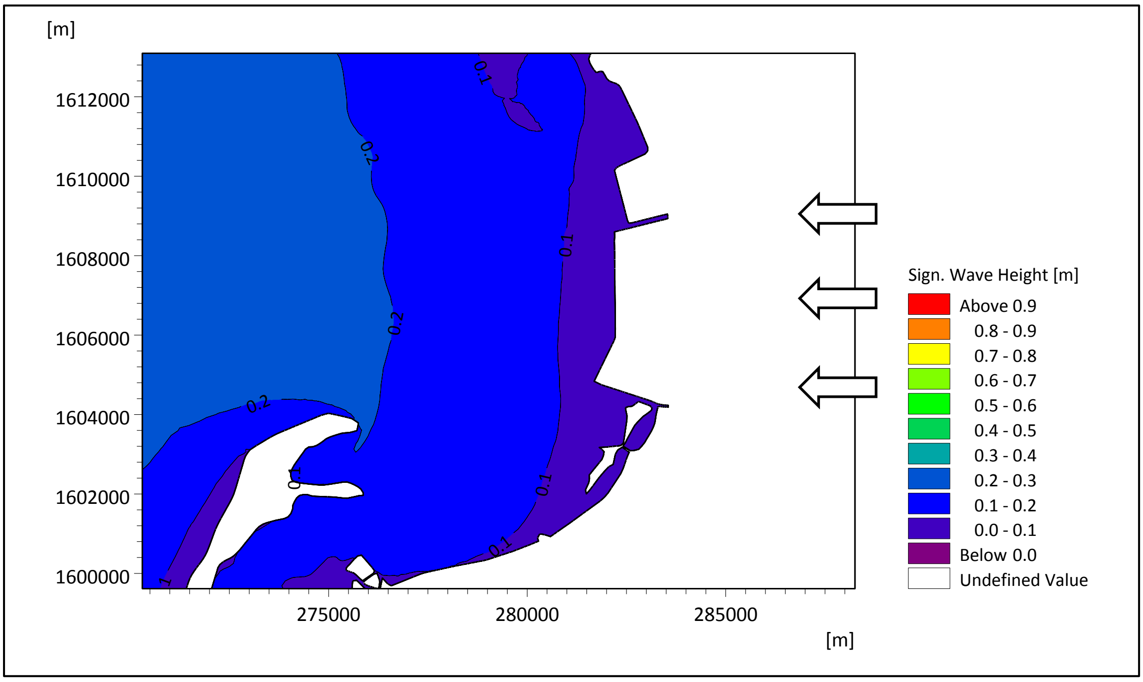


Figure 27. Wave climate due to 1-4 mps surface winds and offshore waves from E during MHHW for pre-development condition

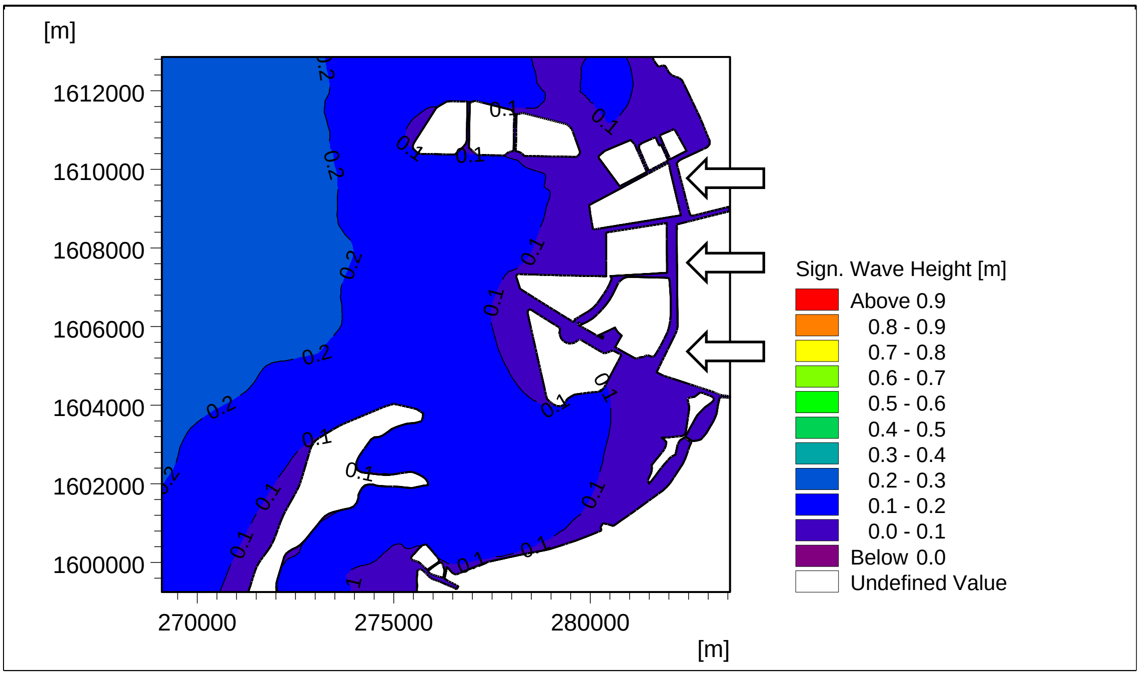


Figure 28. Wave climate due to 1-4 mps surface winds and offshore waves from E during MHHW for post-development condition

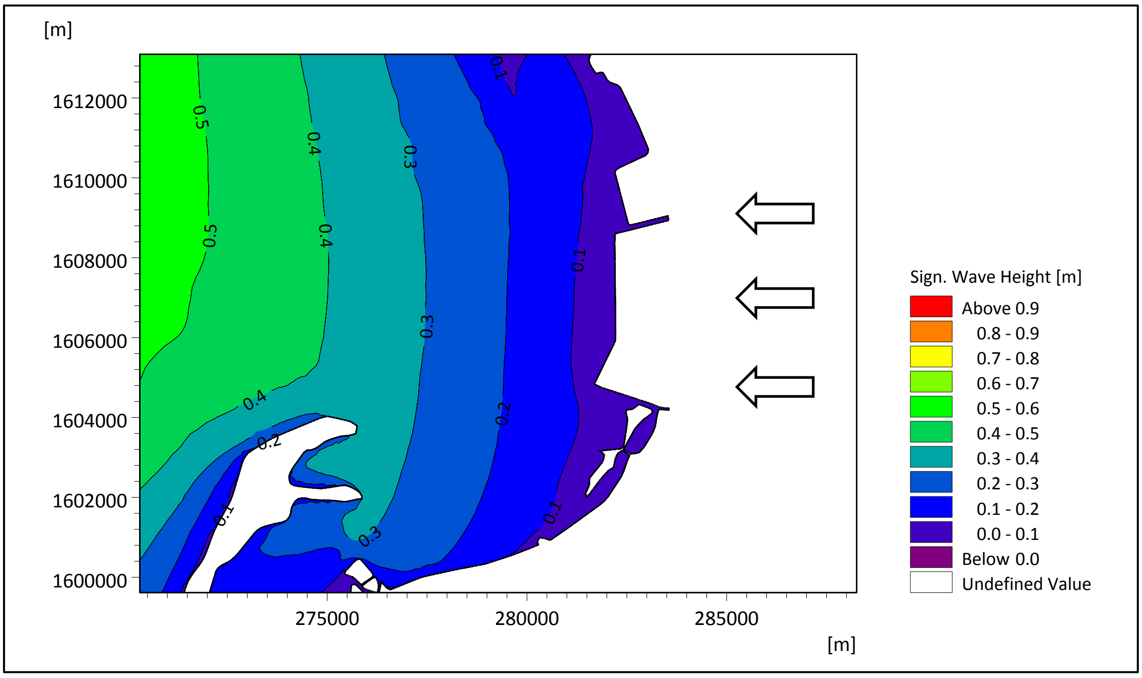


Figure 29. Wave climate due to 5-8 mps surface winds and offshore waves from E during MHHW for pre-development condition

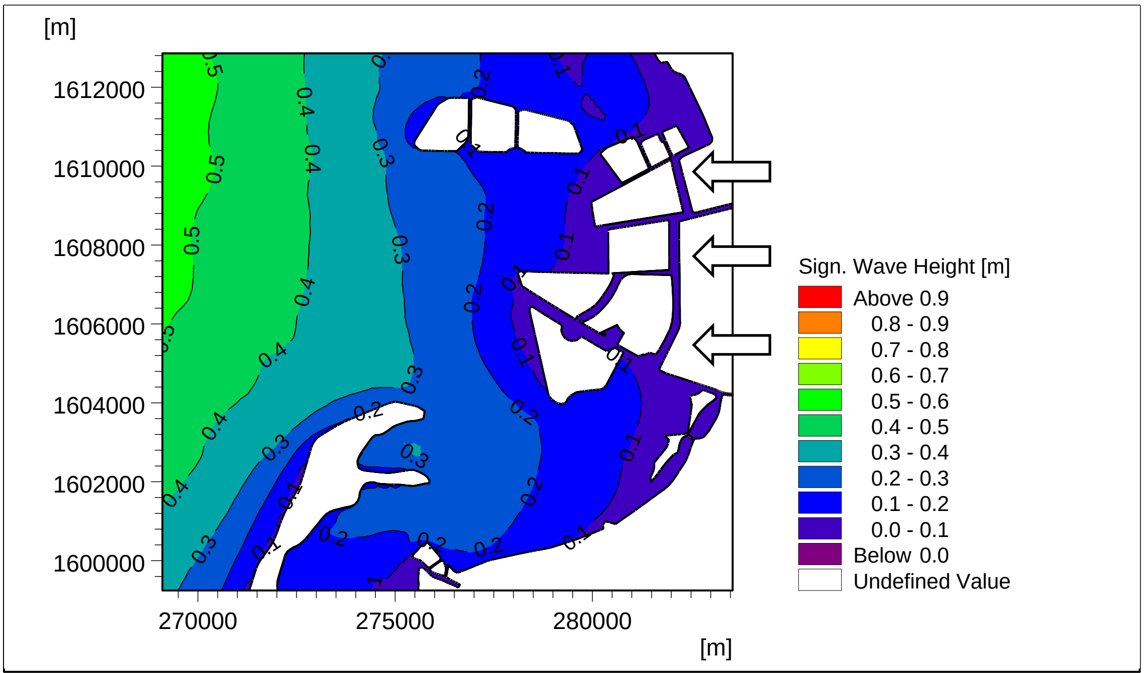


Figure 30. Wave climate due to 5-8 mps surface winds and offshore waves from E during MHHW for post-development condition

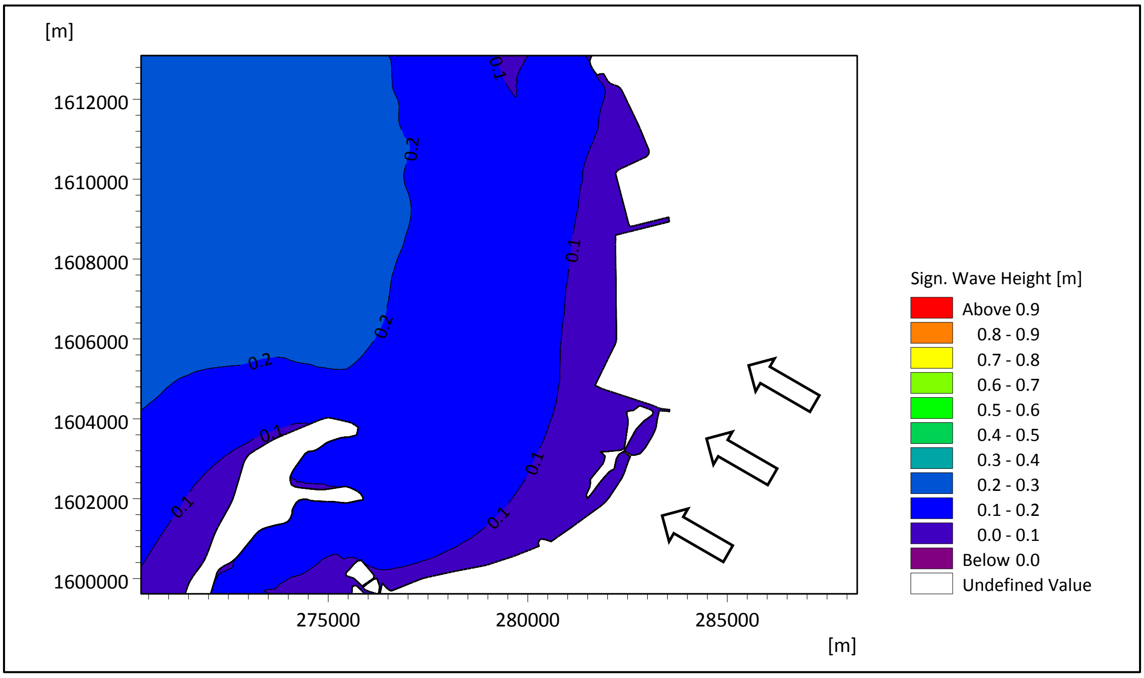


Figure 31. Wave climate due to 1-4 mps surface winds and offshore waves from ESE during MHHW for pre-development condition

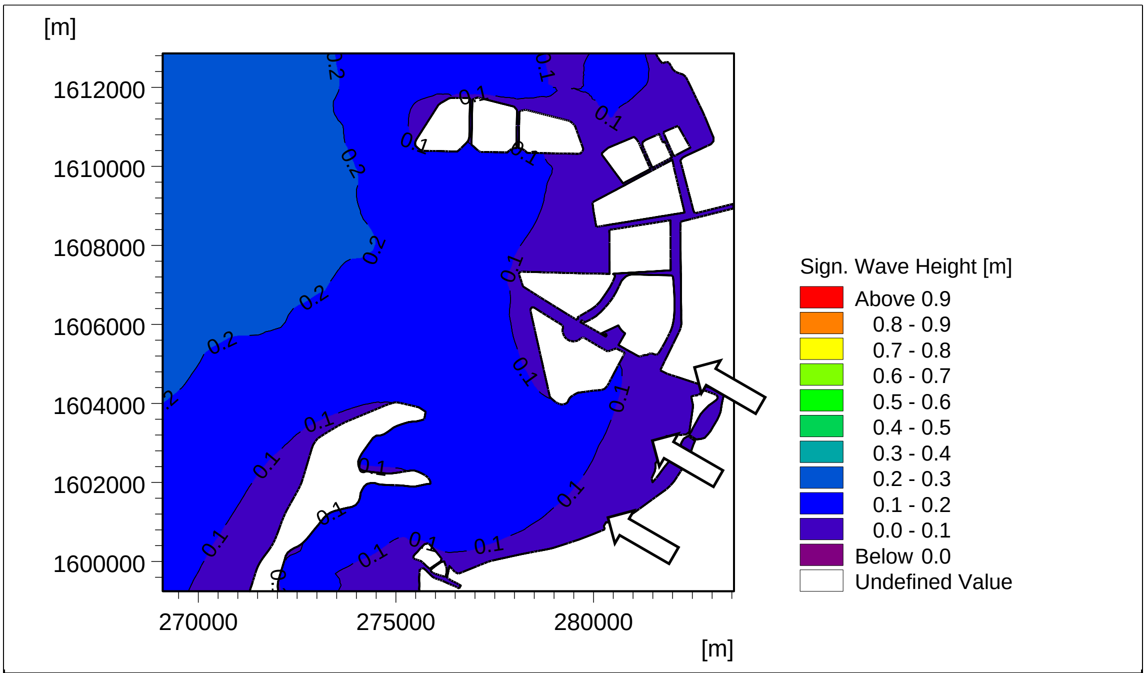


Figure 32. Wave climate due to 1-4 mps surface winds and offshore waves from ESE during MHHW for post-development condition

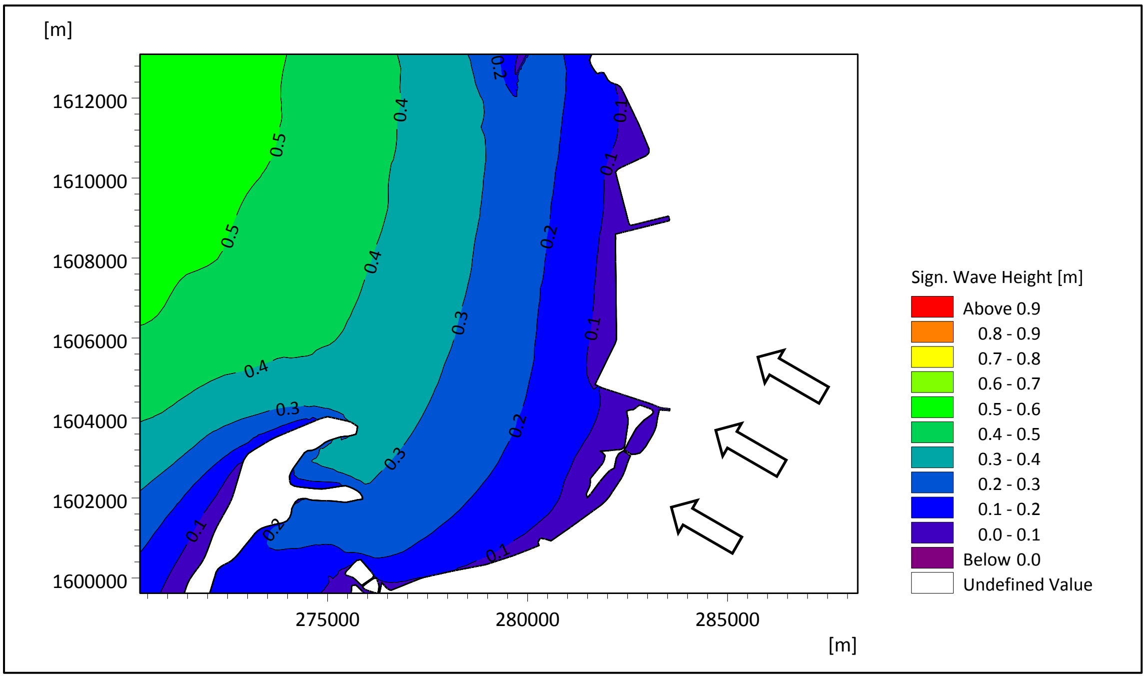


Figure 33. Wave climate due to 5-8 mps surface winds and offshore waves from ESE during MHHW for pre-development condition

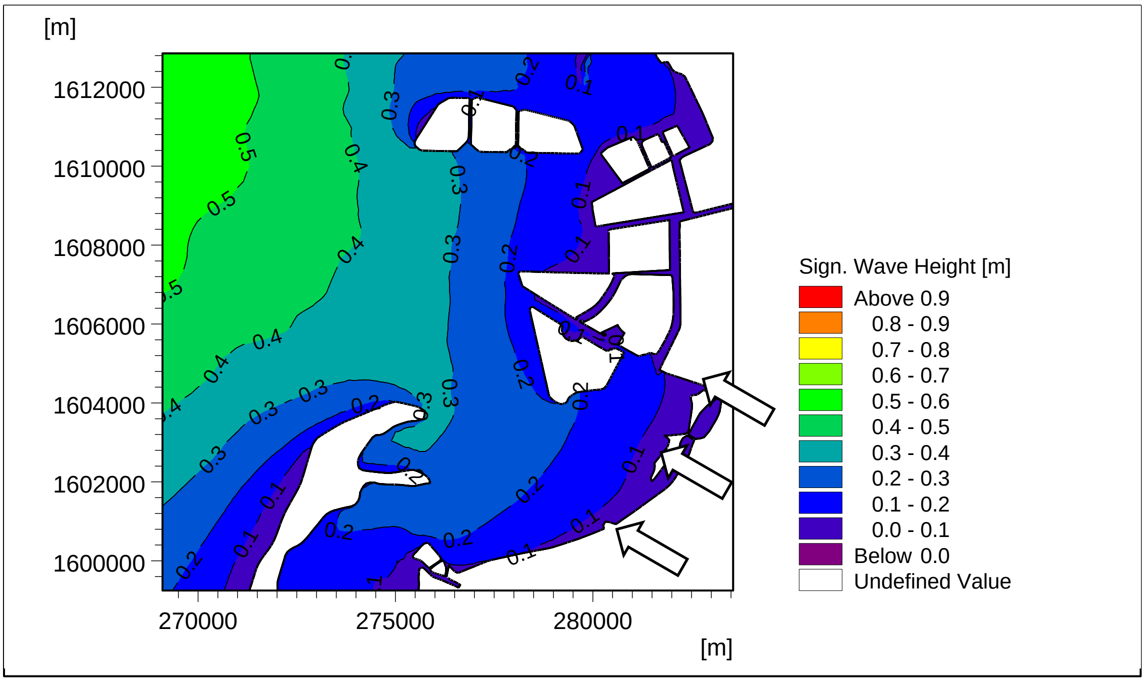


Figure 34. Wave climate due to 5-8 mps surface winds and offshore waves from ESE during MHHW for post-development condition

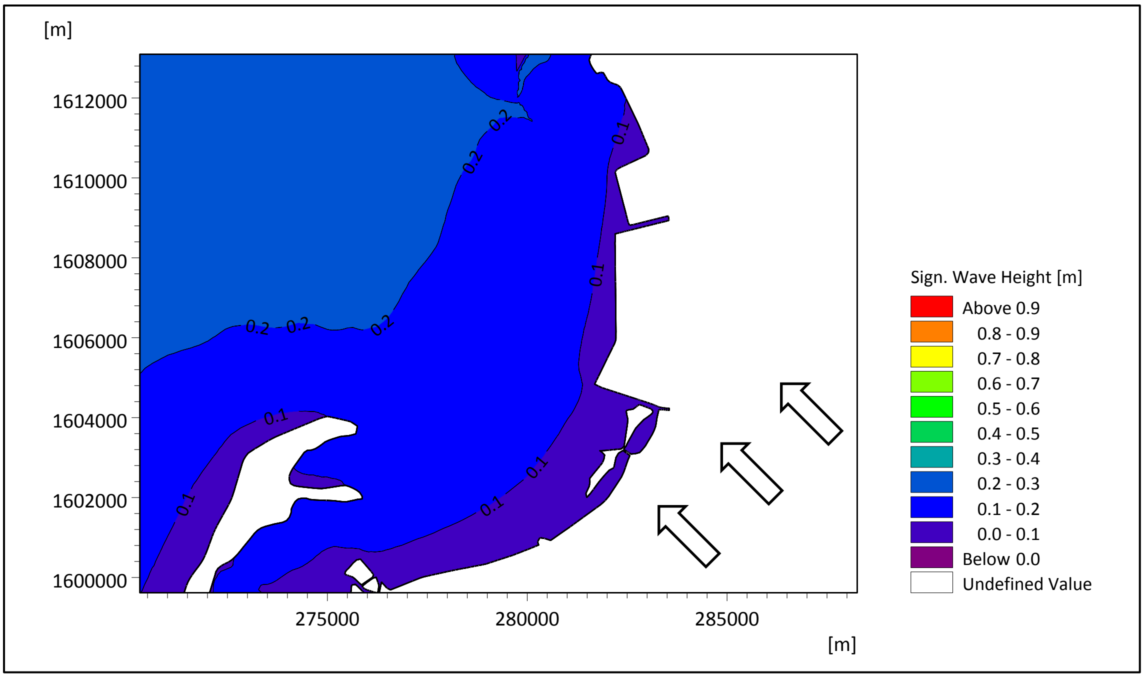


Figure 35. Wave climate due to 1-4 mps surface winds and offshore waves from SE during MHHW for pre-development condition

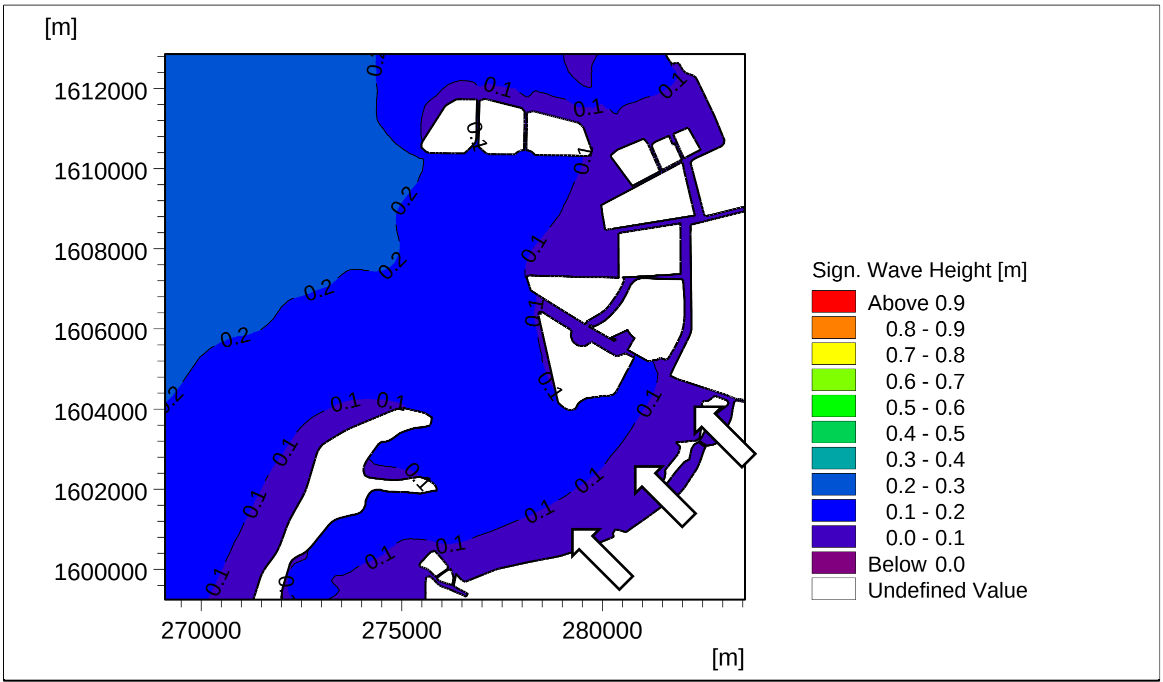


Figure 36. Wave climate due to 1-4 mps surface winds and offshore waves from SE during MHHW for post-development condition

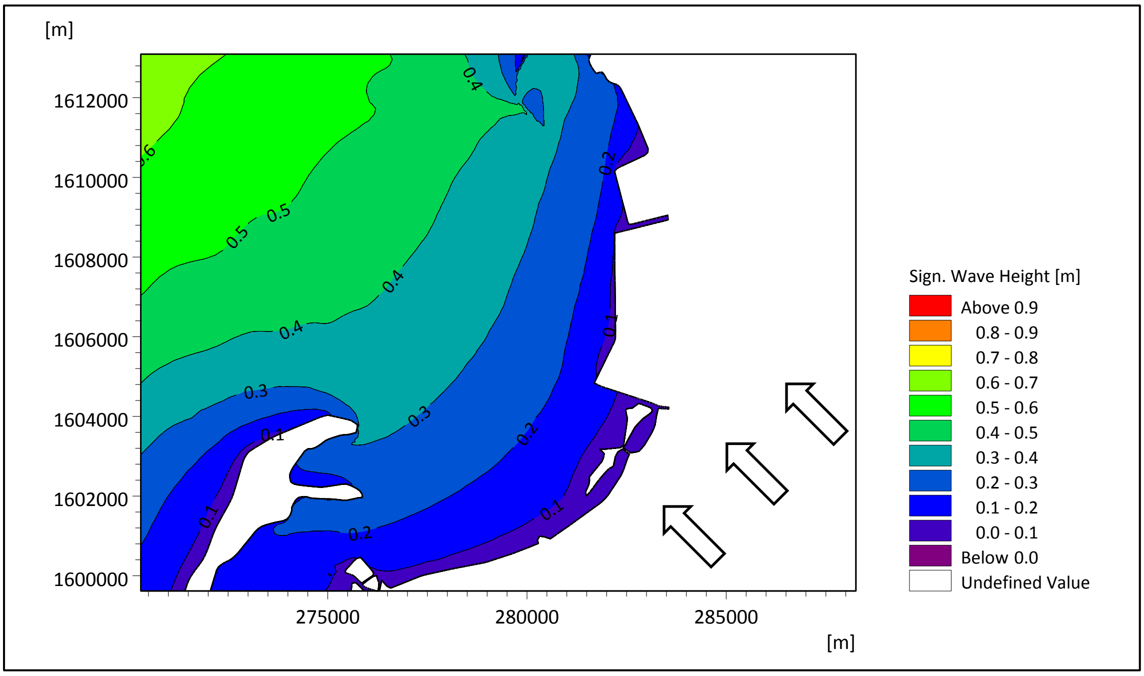


Figure 37. Wave climate due to 5-8 mps surface winds and offshore waves from SE during MHHW for pre-development condition

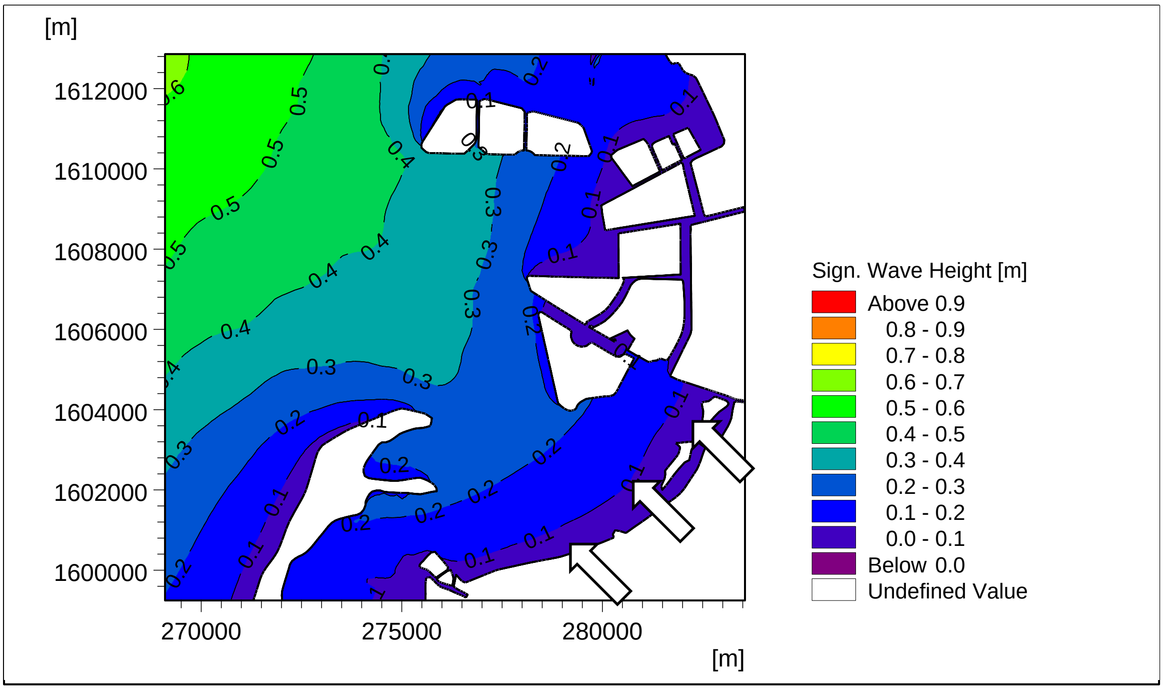


Figure 38. Wave climate due to 5-8 mps surface winds and offshore waves from SE during MHHW for post-development condition

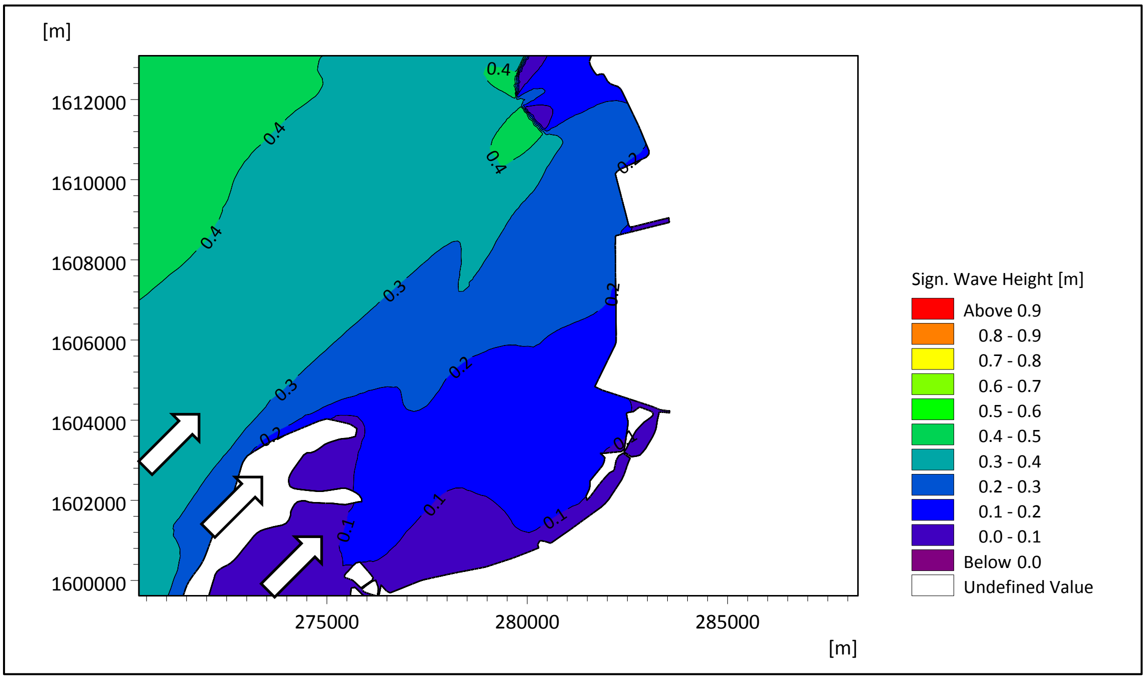


Figure 39. Wave climate due to 1-4 mps surface winds and offshore waves from SW during MHHW for pre-development condition

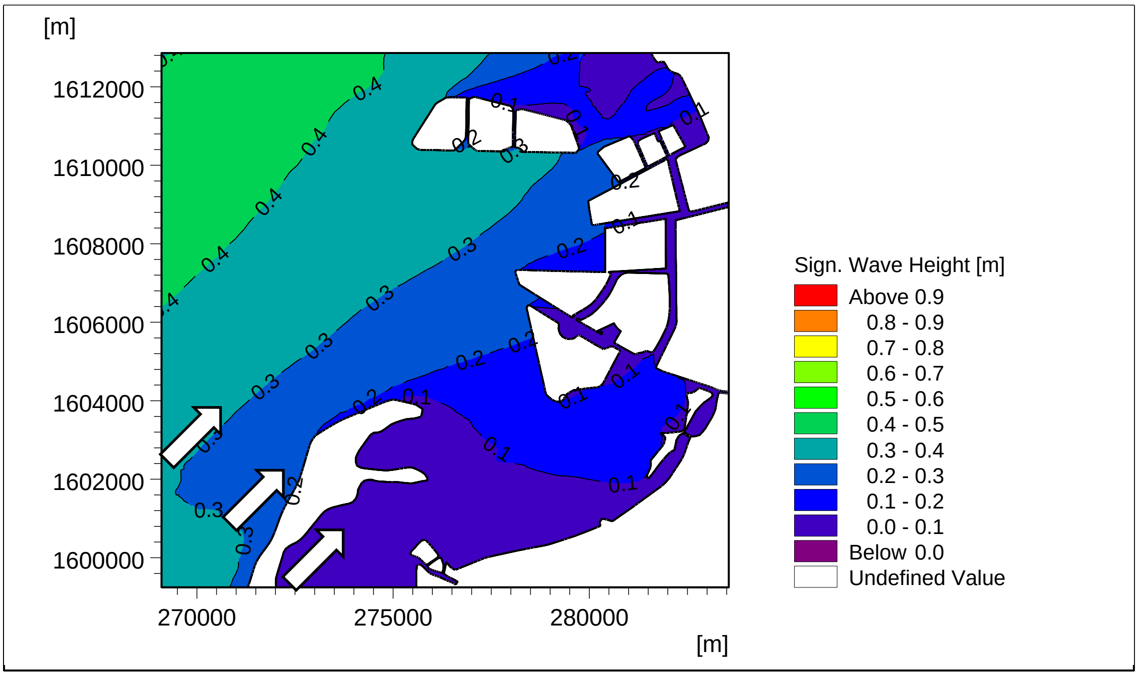


Figure 40. Wave climate due to 1-4 mps surface winds and offshore waves from SW during MHHW for post-development condition

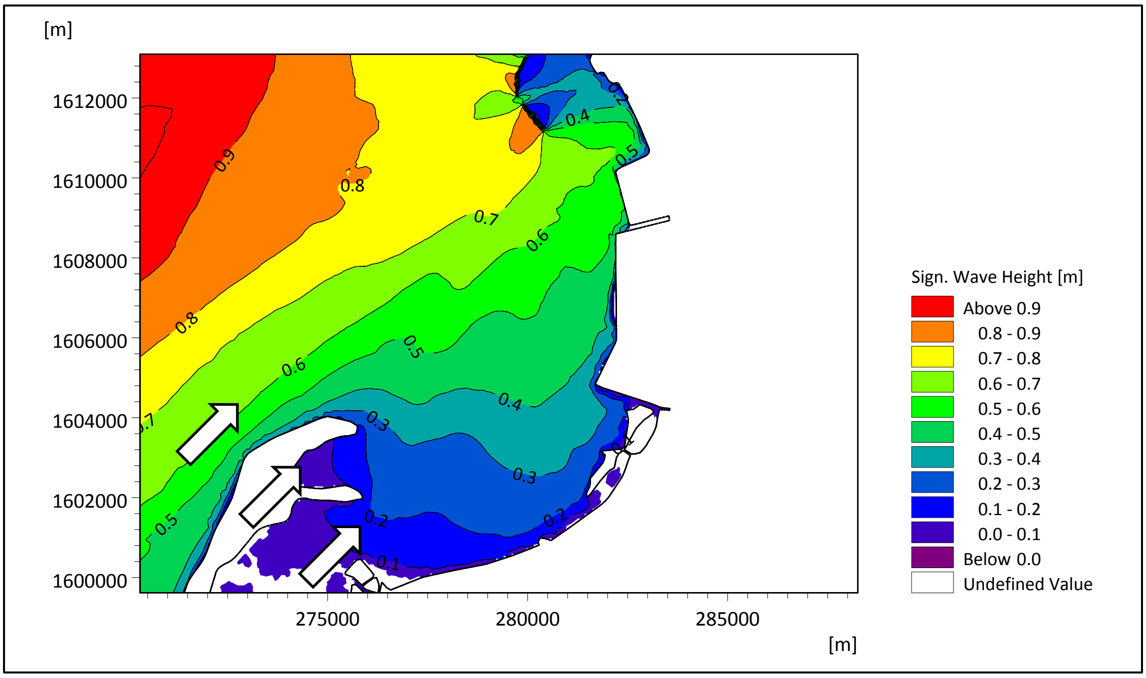


Figure 41. Wave climate due to 5-8 mps surface winds and offshore waves from SW during MHHW for pre-development condition

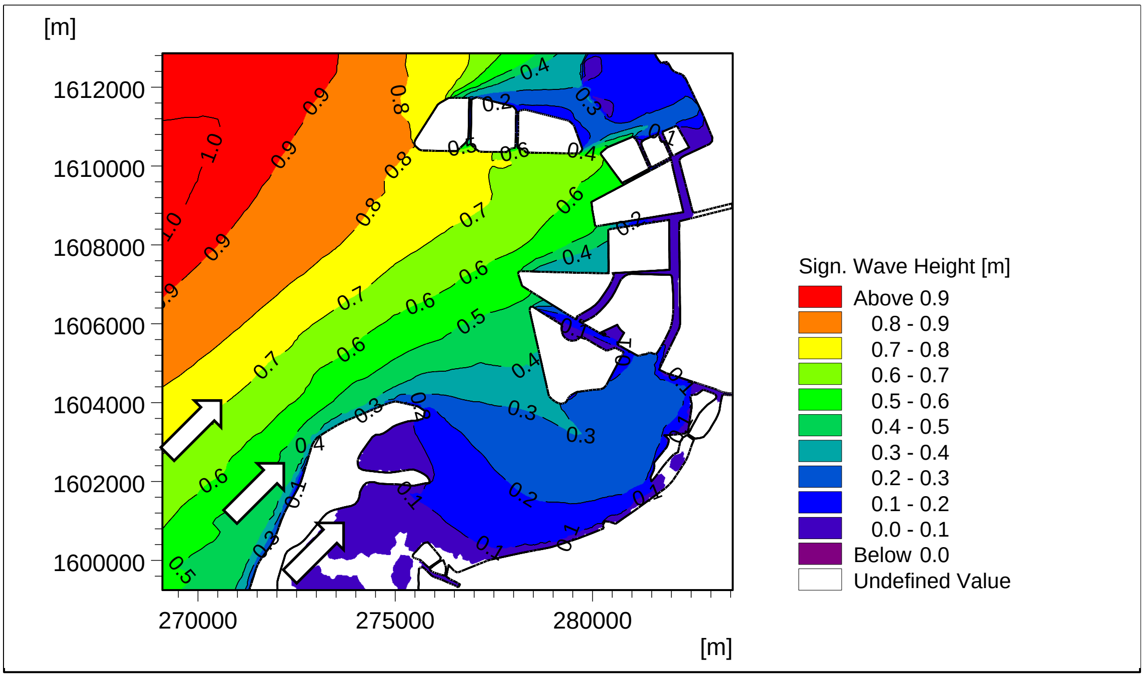


Figure 42. Wave climate due to 5-8 mps surface winds and offshore waves from SW during MHHW for post-development condition

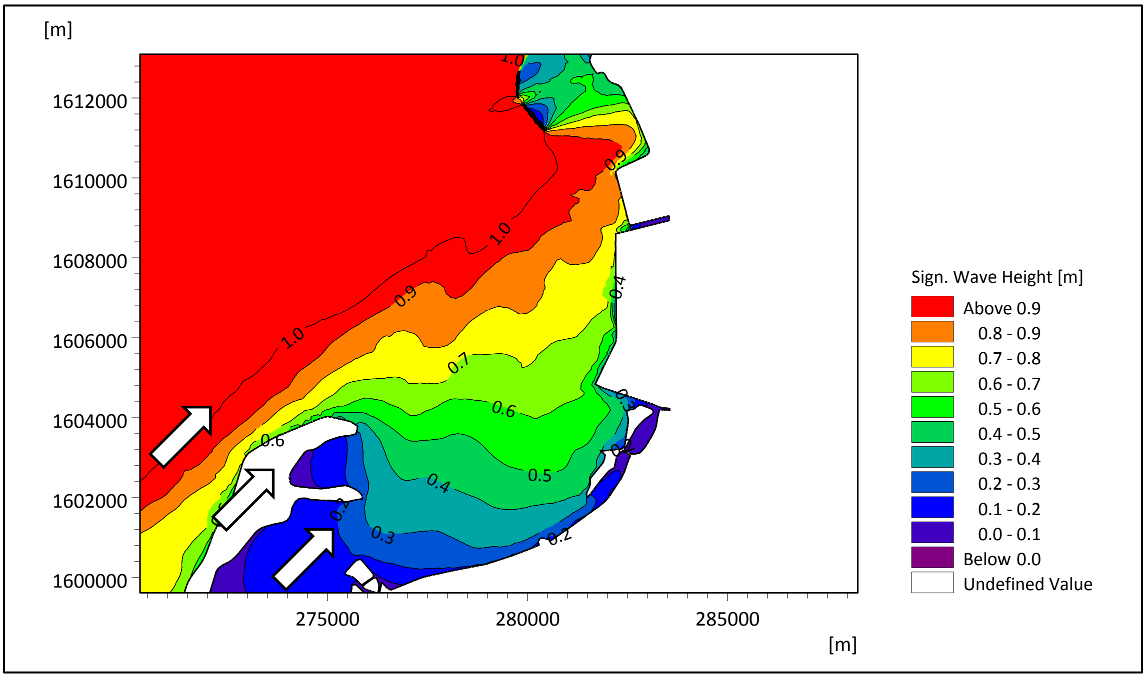


Figure 43. Wave climate due to 9-12 mps surface winds and offshore waves from SW during MHHW for pre-development condition

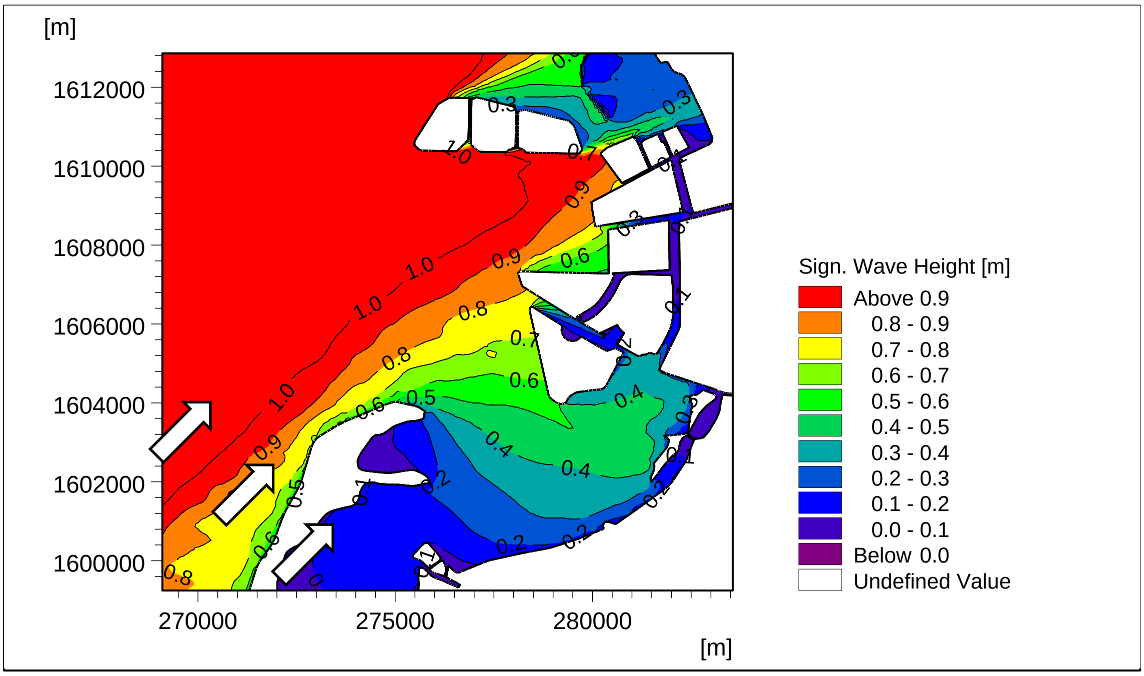


Figure 44. Wave climate due to 9-12 mps surface winds and offshore waves from SW during MHHW for post-development condition

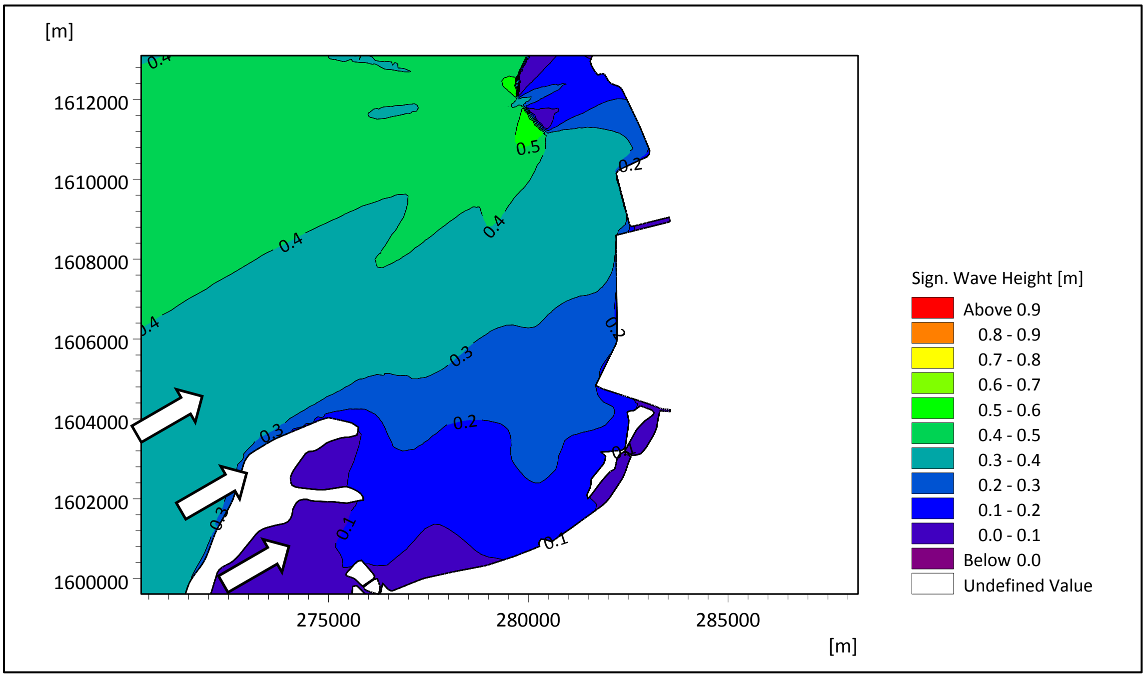


Figure 45. Wave climate due to 1-4 mps surface winds and offshore waves from WSW during MHHW for pre-development condition

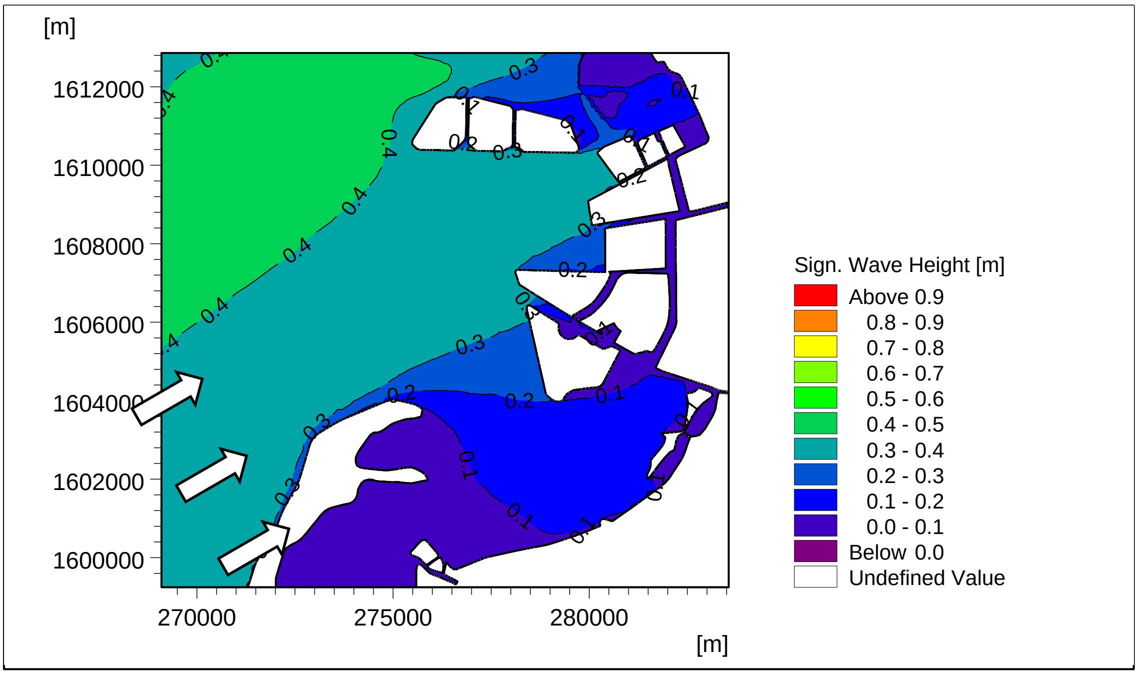


Figure 46. Wave climate due to 1-4 mps surface winds and offshore waves from WSW during MHHW for post-development condition

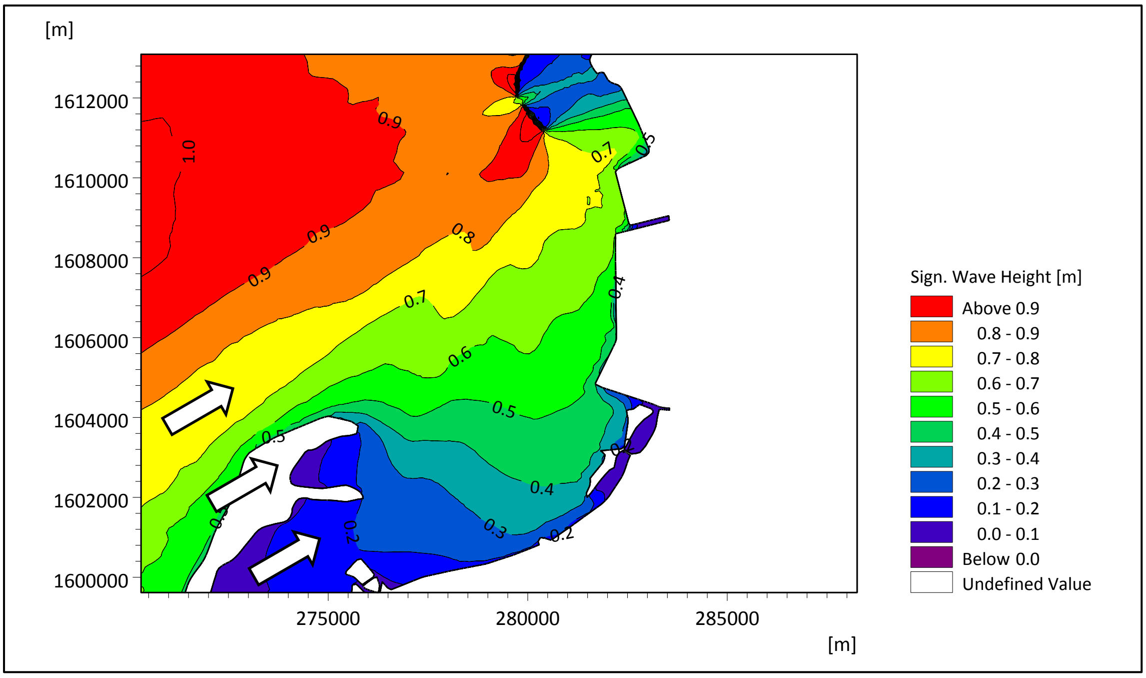


Figure 47. Wave climate due to 5-8 mps surface winds and offshore waves from WSW during MHHW for pre-development condition

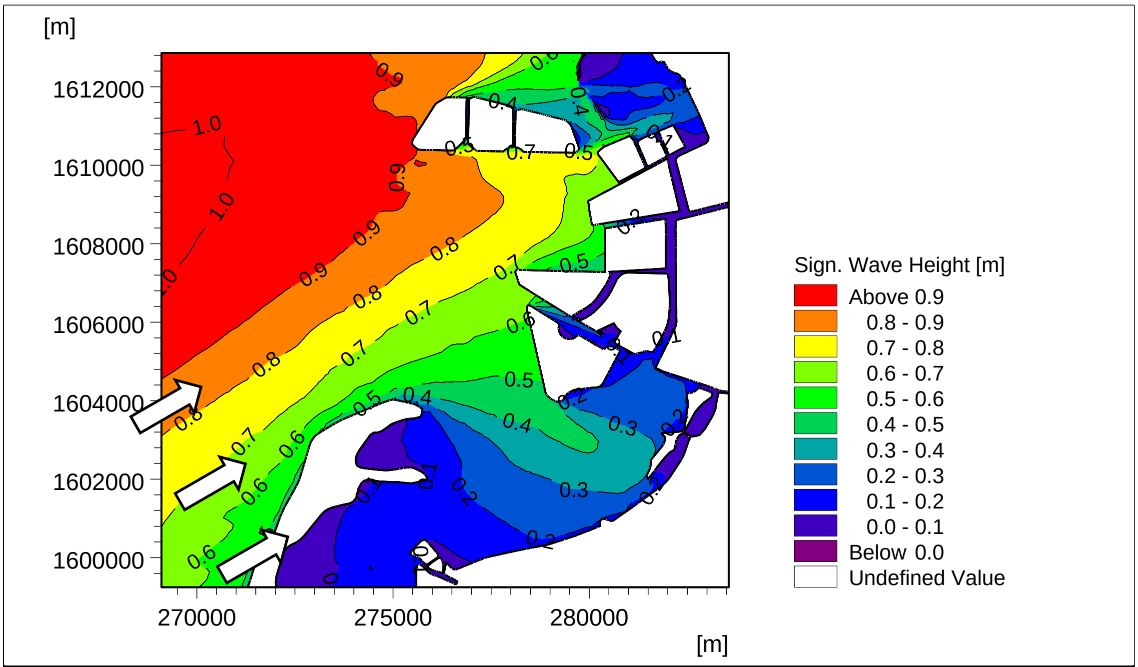


Figure 48. Wave climate due to 5-8 mps surface winds and offshore waves from WSW during MHHW for post-development condition

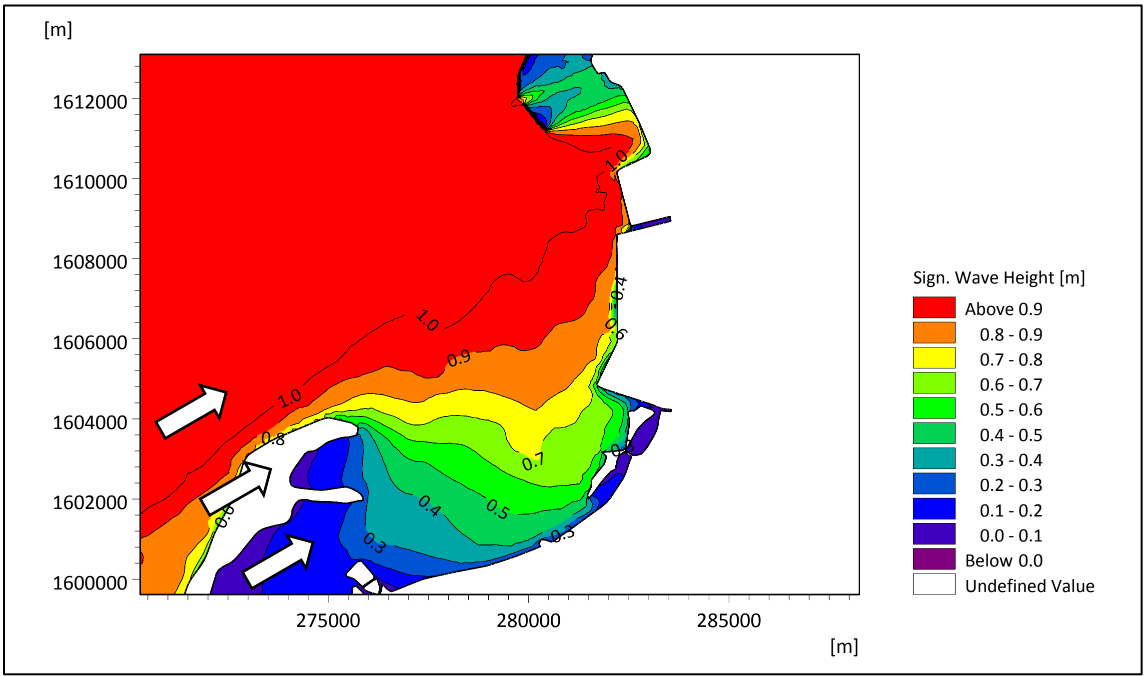


Figure 49. Wave climate due to 9-12 mps surface winds and offshore waves from WSW during MHHW for pre-development condition

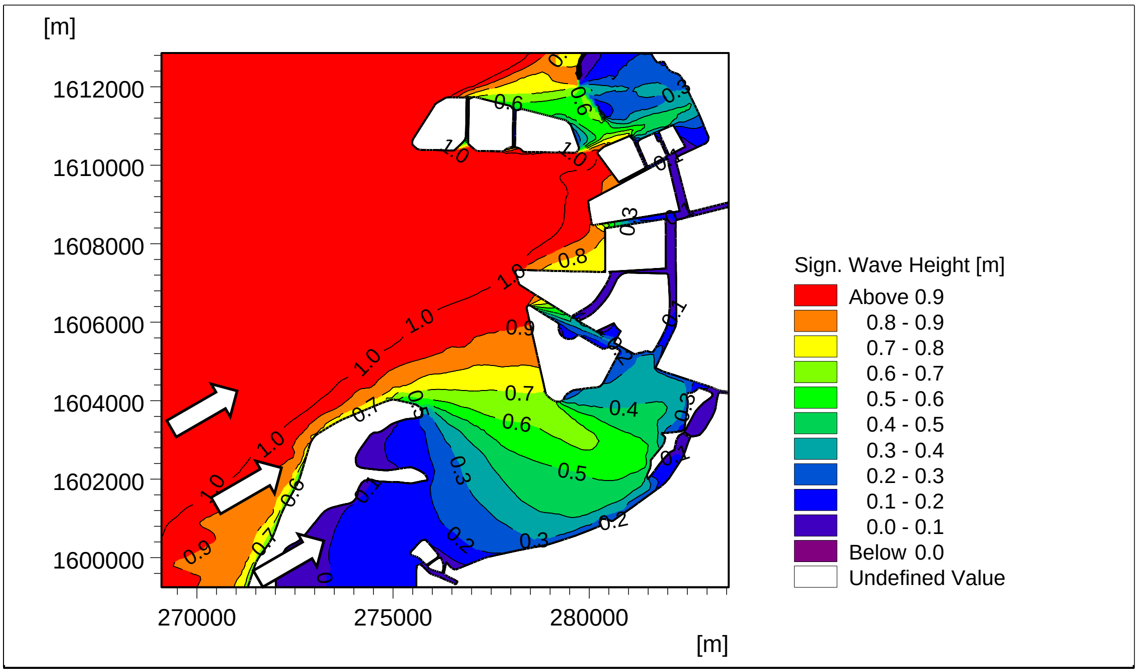


Figure 50. Wave climate due to 9-12 mps surface winds and offshore waves from WSW during MHHW for post-development condition

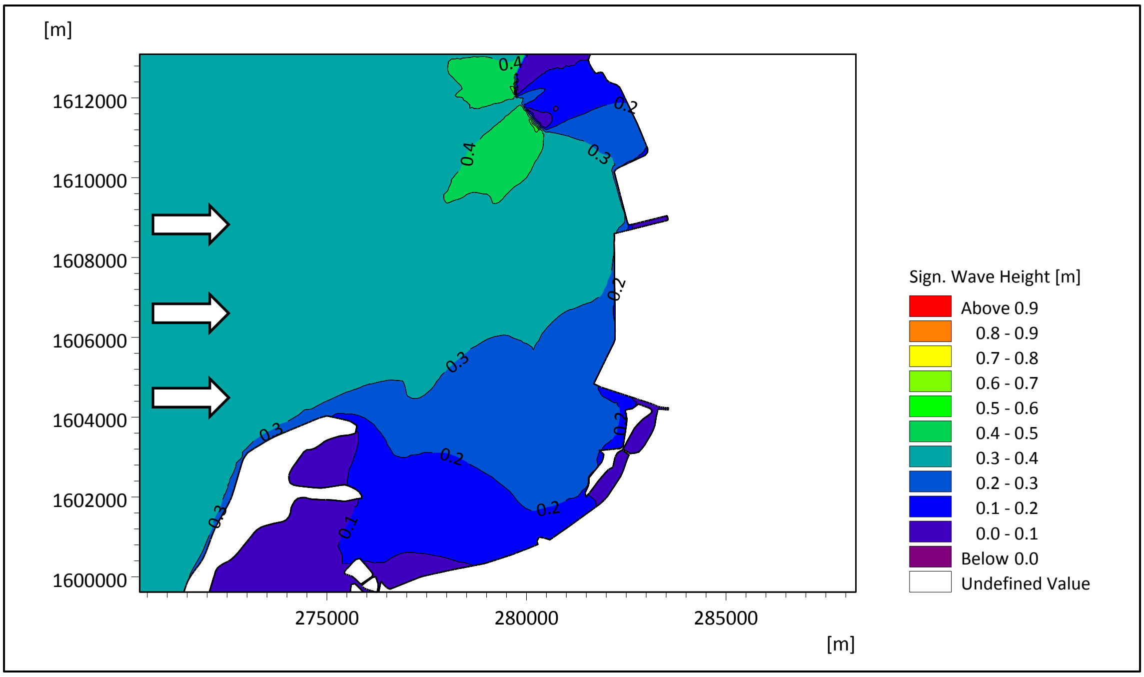


Figure 51. Wave climate due to 1-4 mps surface winds and offshore waves from W during MHHW for pre-development condition

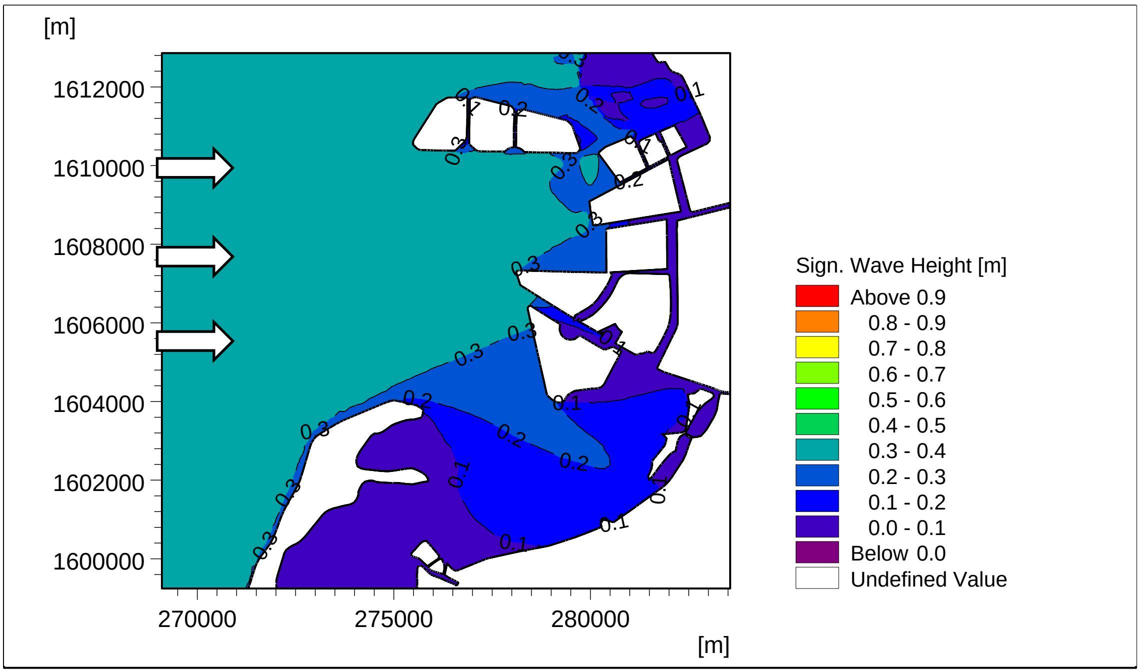


Figure 52. Wave climate due to 1-4 mps surface winds and offshore waves from W during MHHW for post-development condition

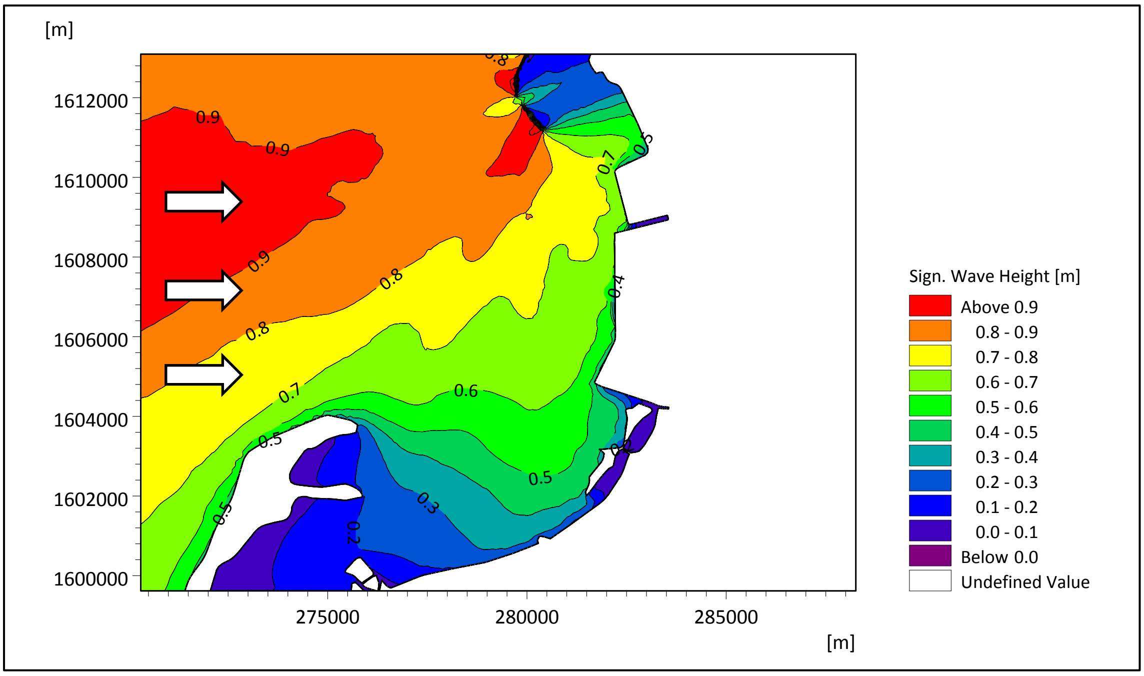


Figure 53. Wave climate due to 5-8 mps surface winds and offshore waves from W during MHHW for pre-development condition

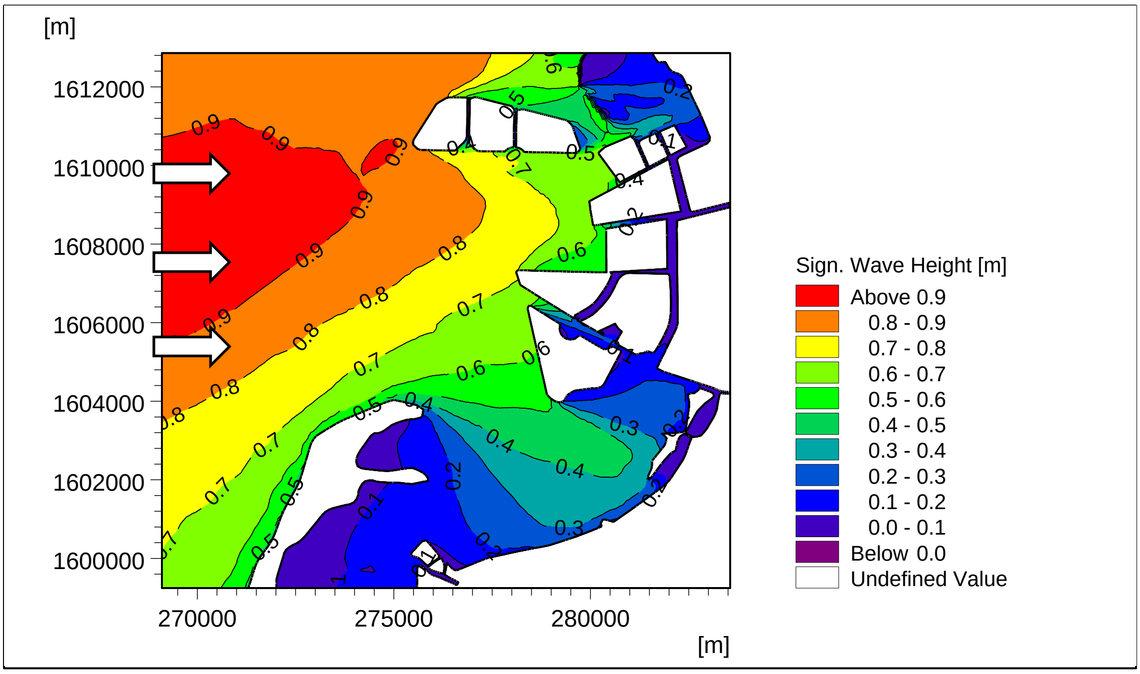


Figure 54. Wave climate due to 5-8 mps surface winds and offshore waves from W during MHHW for post-development condition

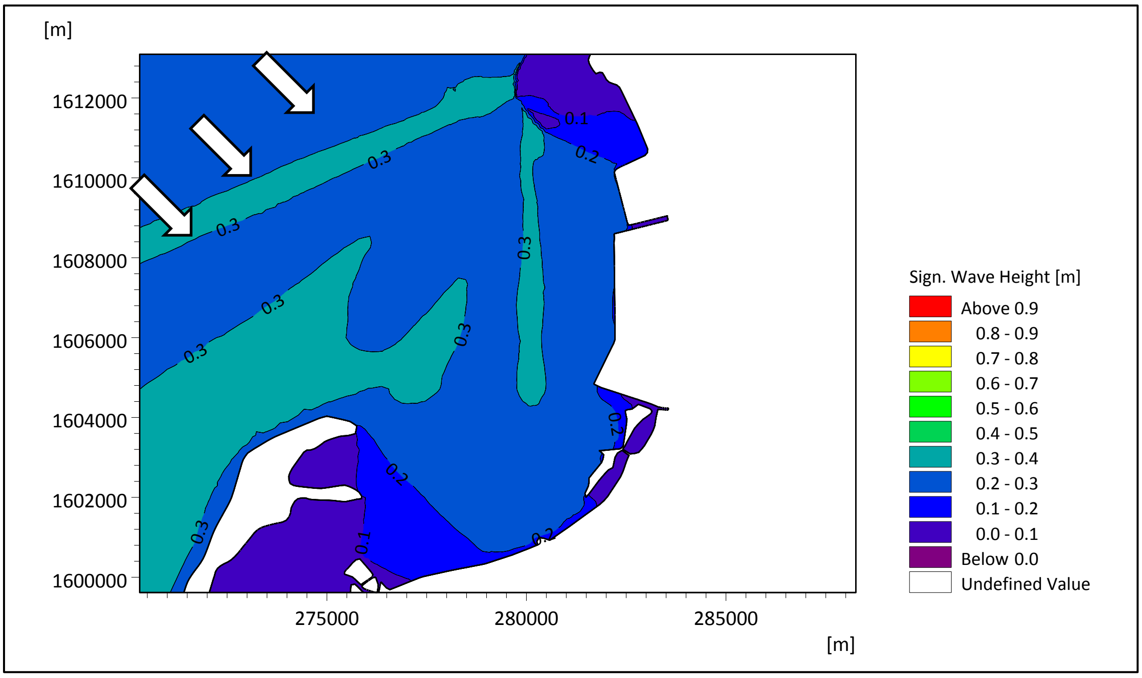


Figure 55. Wave climate due to 1-4 mps surface winds and offshore waves from NW during MHHW for pre-development condition

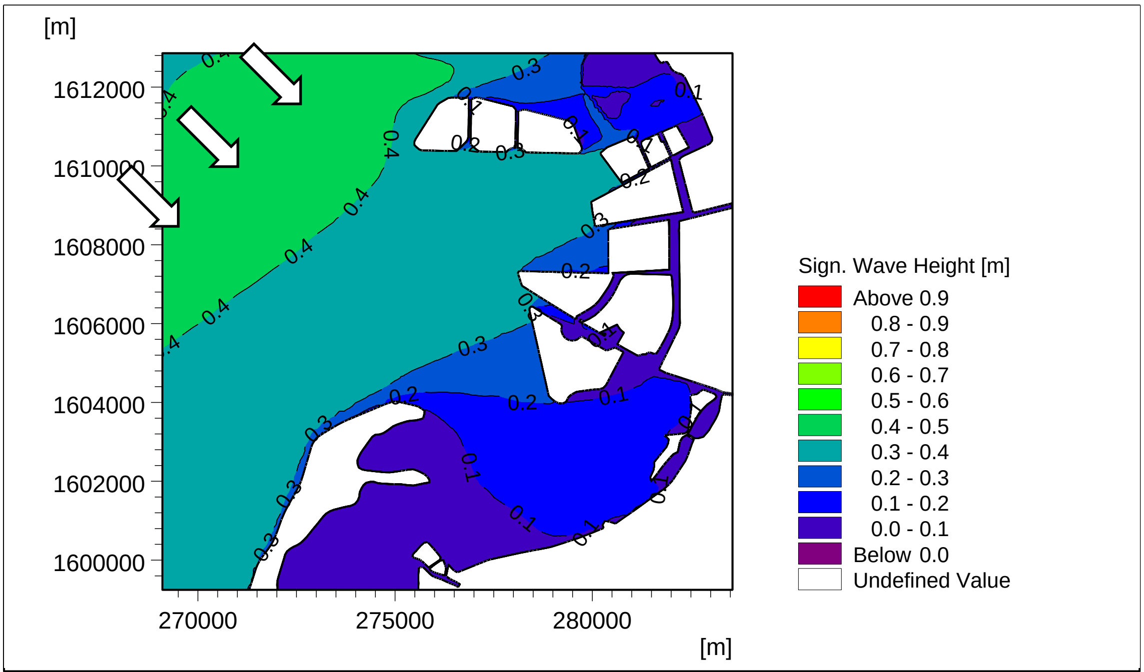


Figure 56. Wave climate due to 1-4 mps surface winds and offshore waves from NW during MHHW for post-development condition

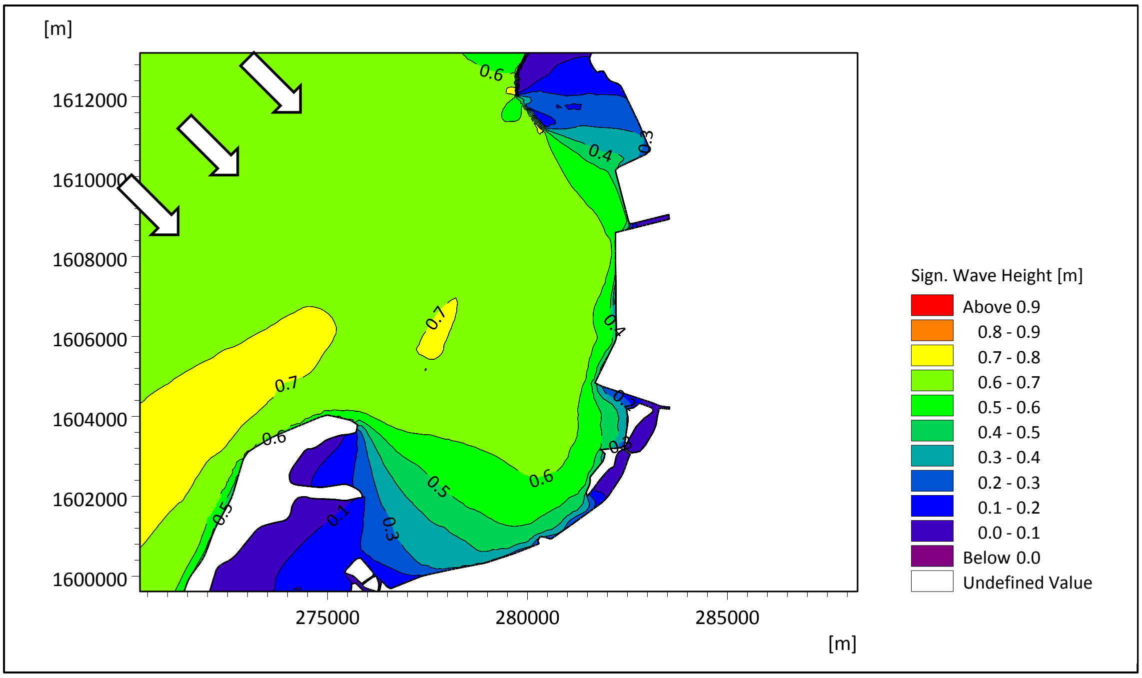


Figure 57. Wave climate due to 5-8 mps surface winds and offshore waves from NW during MHHW for pre-development condition

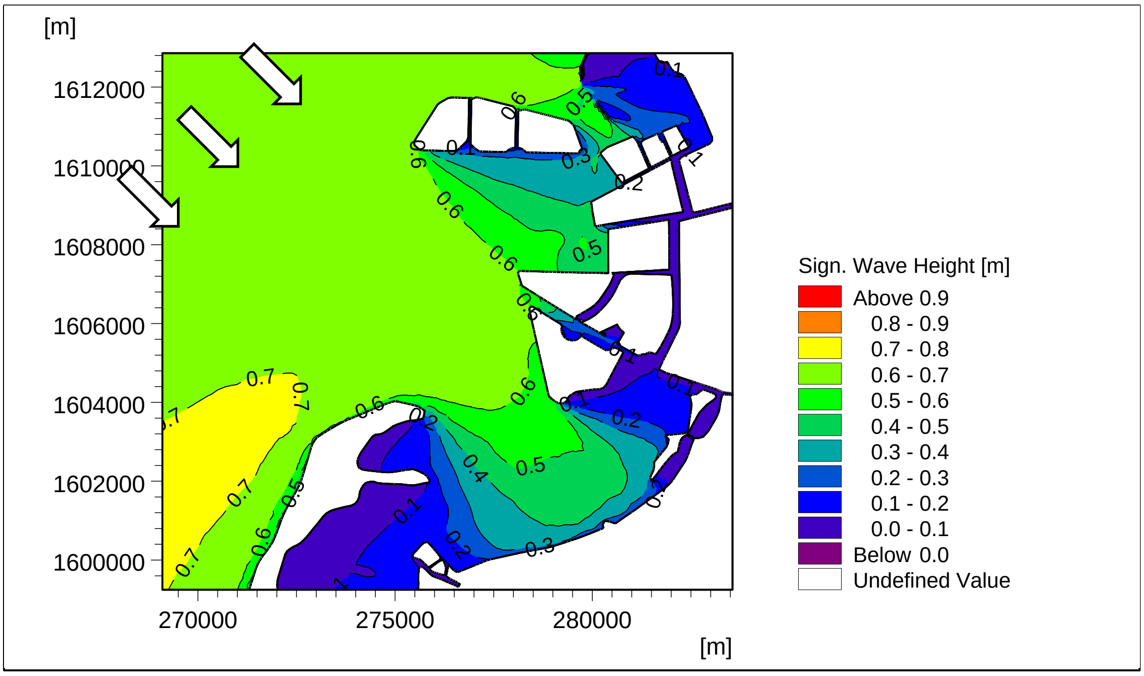


Figure 58. Wave climate due to 5-8 mps surface winds and offshore waves from NW during MHHW for post-development condition

TIDAL CURRENT ANALYSIS

Introduction

Pressure gradients exerted by tide level differences generate currents at the seabed that may affect existing activities and post-development operations within the project's marine area. In this study, these tidal currents were also analyzed within the entire Manila Bay area, with tidal forcing extracted from a regional tidal model applied to the offshore boundary outside of the local model of Manila Bay (Figure 19). The simulation time included one month during a non-typhoon period, namely the month of February, 2016, to minimize meteorological effects on the tidal fluctuations. Hence, no meteorological forcing was applied to this tidal current model. One month was selected to allow for adequate warm-up time of the simulation, and also to ensure two tidal cycles – including the spring and neap tides – are included in the simulation Figure 59. This also served as a calibration run for the model; a statistical comparison of the simulated water surface elevations against actual tide readings acquired from NAMRIA resulted in a coefficient of determination (R2) value of 0.91 at Manila South Harbor.

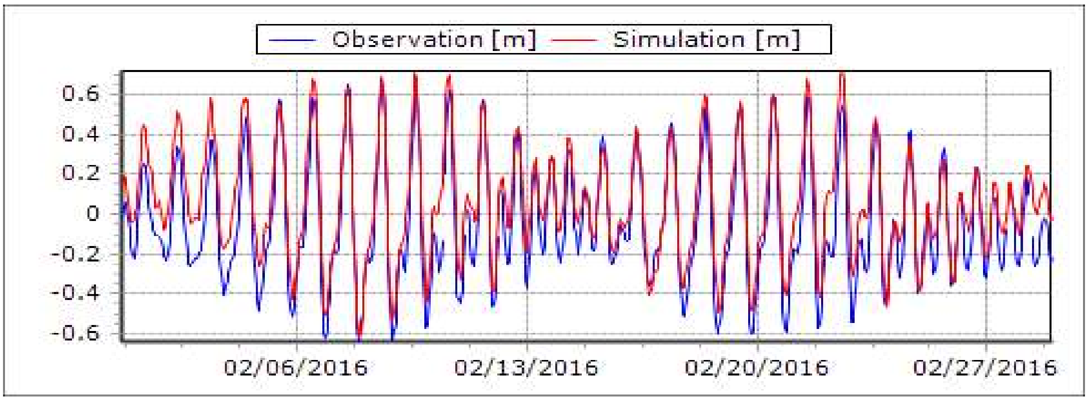


Figure 59. Simulated tide levels at Manila Bay South Harbor

Sample Effects of the Project on Tidal Currents

To better illustrate the effects of the reclamations on the tidal-induced current, snapshots of the current vectors during a spring tide were taken. A spring tide was chosen as this would induce a higher water level difference between high and low tide levels, thus also increasing the current velocity; the effects during neap tide are not shown as the vectors are nearly nil. Two snapshots per scenario were taken, namely during ebb and flow tide.

During ebb flow (Figure 60 for pre-development and Figure 61 for post-development) it can be seen that there has been a significant change at the gap between Islands and Sangley Spit, with the current increasing from ~0.05 mps to ~0.2 mps. Northward of the Islands, however, the area of very low current speed has generally increased, except for the areas directly adjacent of both Islands, with current speeds increasing to ~0.1 mps.

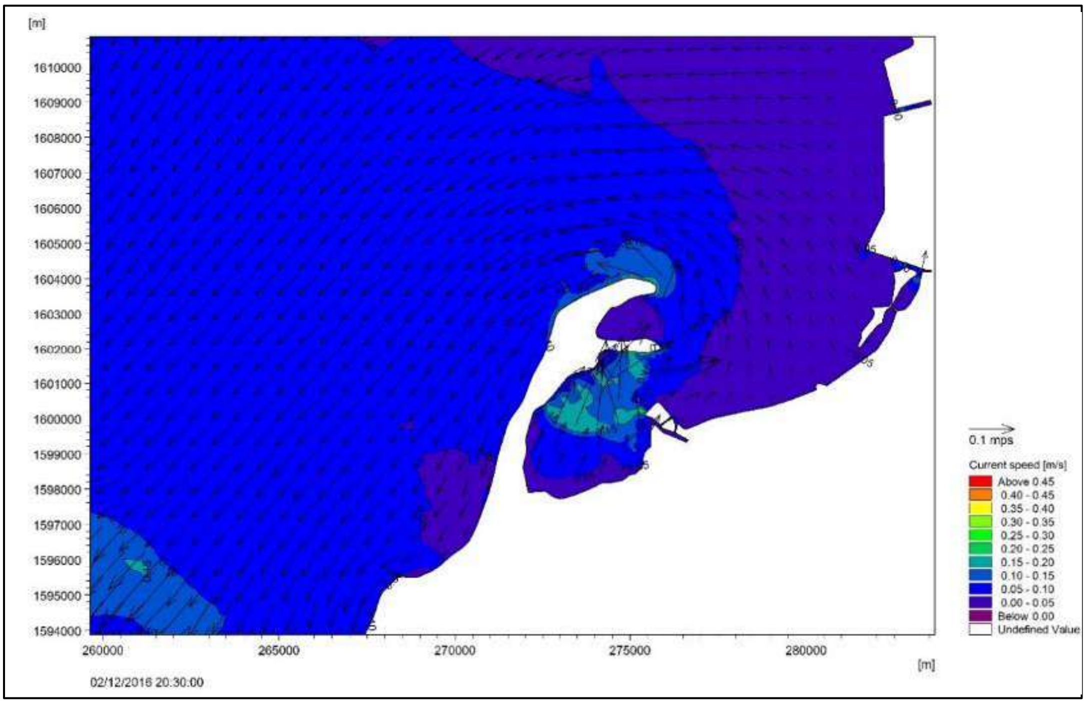


Figure 60. Snapshot of the current magnitude and direction during ebb tide (20:30 February 12, 2016) – Pre-development scenario

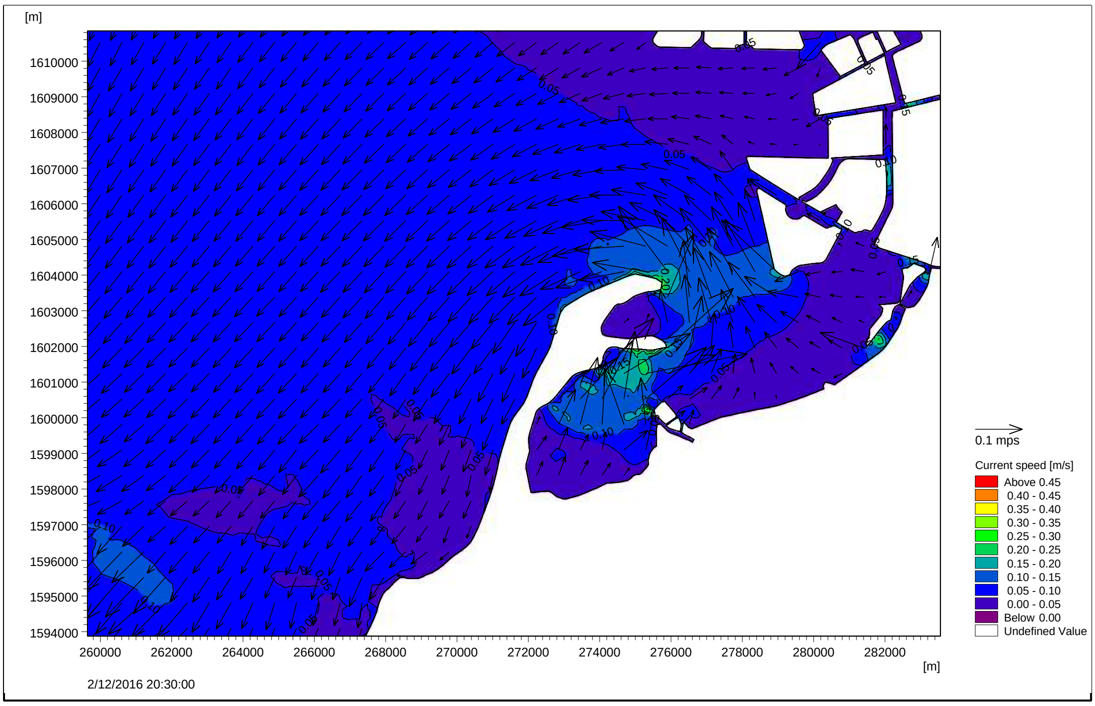


Figure 61. Snapshot of the current magnitude and direction during ebb tide (20:30 February 12, 2016) – Post-development scenario

For the sample flow tide case, the results are similar with current speeds increasing between the gap of Sangley Spit and the Islands, and at the gap between the Islands and Pasay 360.

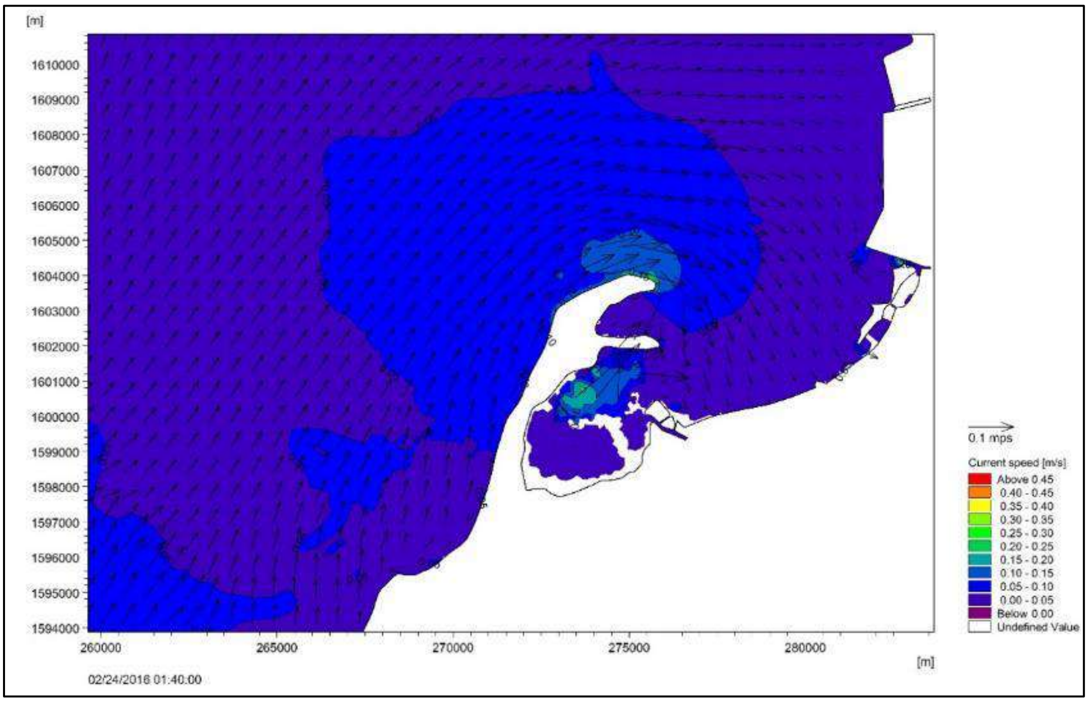


Figure 62. Snapshot of the current magnitude and direction during flow tide (01:40 February 24, 2016) – Pre-development scenario

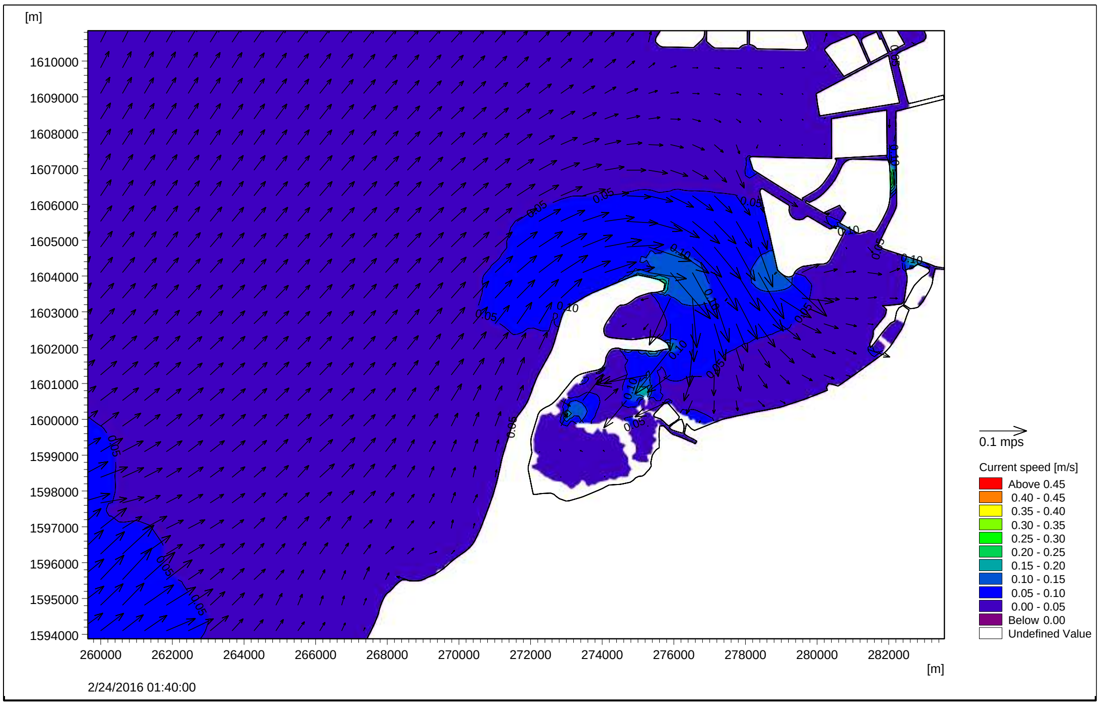


Figure 63. Snapshot of the current magnitude and direction during flow tide (01:40 February 24, 2016) – Post-development scenario

Synthesis of Maximum Currents

The effects of the reclamation projects on the maximum tidal currents within the simulated time frame were also analyzed and can be seen in Figure 64 (pre-development) Figure 65 (post-development). It should be noted that this section and figures herein only take into consideration the maximum magnitude within the simulated time frame (February 2016), and thus does not take into consideration the direction of flow nor the annual average.

In the post-development scenario, various changes in the maximum tidal-induced currents were noted. These changes are specifically:

Decrease in speed north of the reclamation projects
Localized increases in speed between the Islands and Sangley Spit
Increase in speed at the gaps between the Islands and Pasay 360

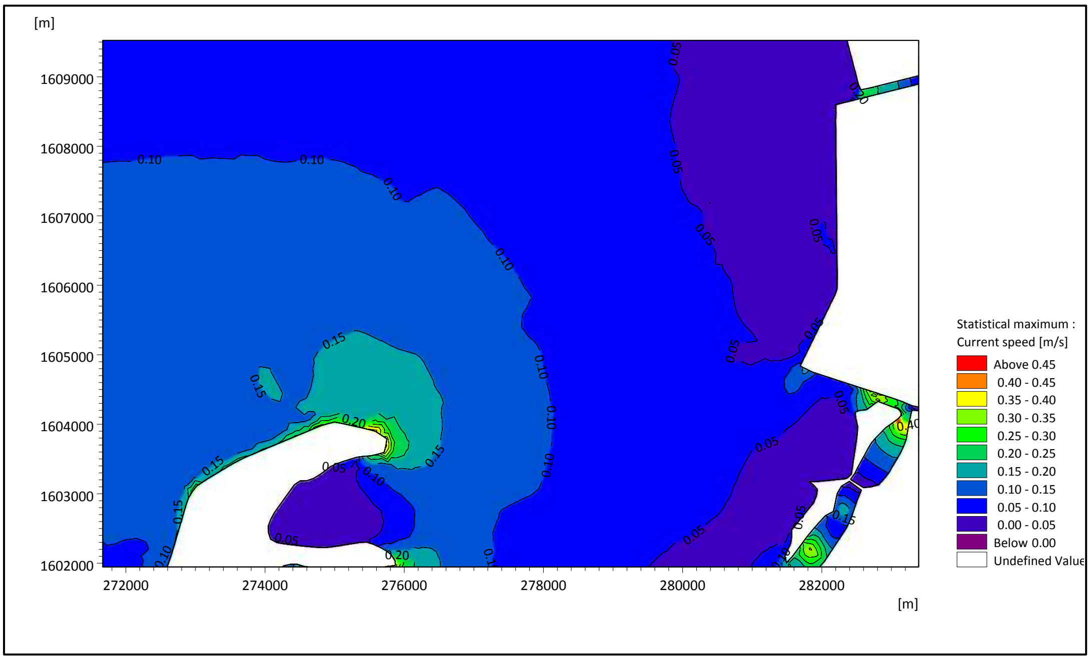


Figure 64. Maximum current (Jan 29, 2016 – February 29, 2016) – Pre-development scenario

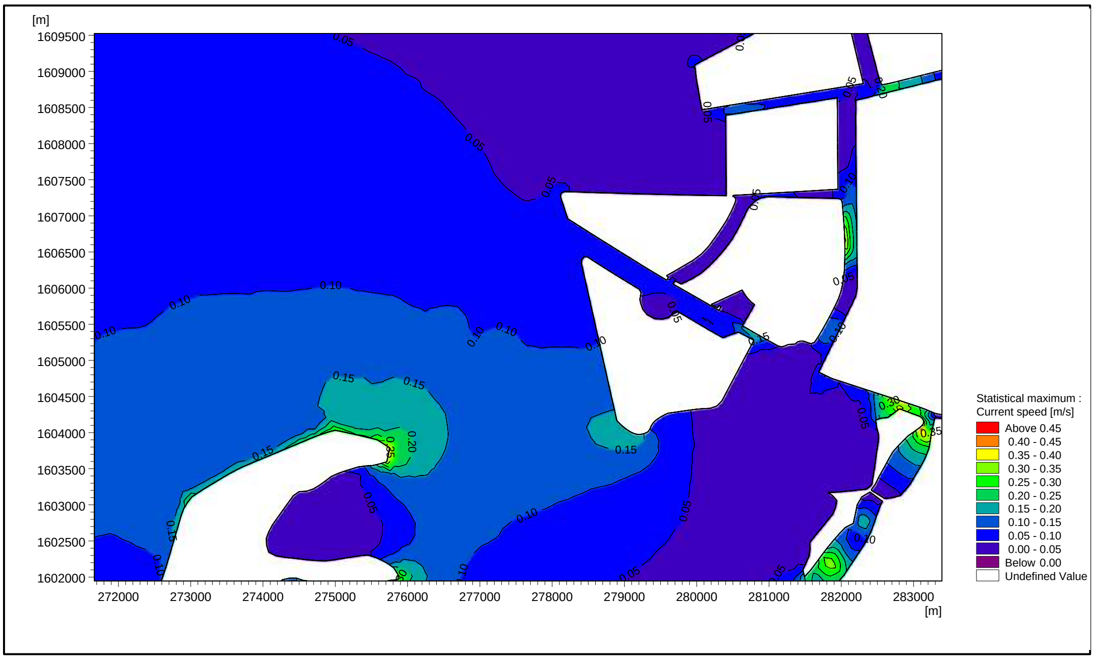


Figure 65. Maximum current (Jan 29, 2016 – February 29, 2016) – Post-development scenario

TIDAL CIRCULATION ANALYSIS

Introduction

Tidal currents generated by pressure gradients due to water surface fluctuations may affect ambient conditions such as the movement of surface runoff from inland and the transport of sediments along the coastline. Even in the absence of wind-induced shear stress on the water surfaces, these currents also impact the viability of operational activities such as river and coastal navigation, mooring of vessels, and offshore anchoring of ships. On the other hand, these currents are important in circulating the water within the wave-sheltered zones so that seawater does not stagnate over extended durations under prevailing winds and tides. The circulatory motion of the waters is also needed for the exchange of water mass and with the offshore area of the adjoining bays, Manila Bay, and Canacao Bay, so that the seawater fronting the project coastline is periodically replenished by these open offshore waters. Finally, a good tidal circulation is necessary to enhance the rejuvenation of water-entrained oxygen in the interior zones of the wave-sheltered zones of the post-development scenario.

Tidal Circulation Characteristics

Time frames of tidal currents are analyzed for the circulatory patterns generated both outside and inside the project nearshore zone during a 15-day window of February 2016, an Amihan month. The results indicate that simulated currents are highly dependent on the tidal amplitudes and phases, depths within the resulting confined waterways, and the plan-forms of the post-development scenario. Chronological snapshots of the water levels and currents field are captured in Figure 66. The currents are shown superimposed on the nearshore zone at ambient tide levels.

A recent study indicates that circulation in an enclosed water body, such as the nearshore zone of a marina or partially enclosed beach coast, is driven mainly by tidal fluctuations and only weakly by surface winds surface (Cruz and Santos, 2018). This means that only a full tidal cycle (15 days), with no particular prevailing non-storm wind forcing, is sufficient to establish the tidal circulation characteristics. Thus the circulation patterns shown in Figure 66 for an Amihan month are also generally applicable to a Habagat season.

The results of analysis of the time-motion of the tidal currents show that the currents around the project island experience directional distribution, meaning the tidal circulation oscillates and reverses with the tidal phase.

Figure 66 shows very specific instances that the flow circulation reverses at various tidal phases, which is desirable to promote the exchange of seawater within narrow waterways of the post-development scenario with the open waters of Manila Bay and Canacao Bay.

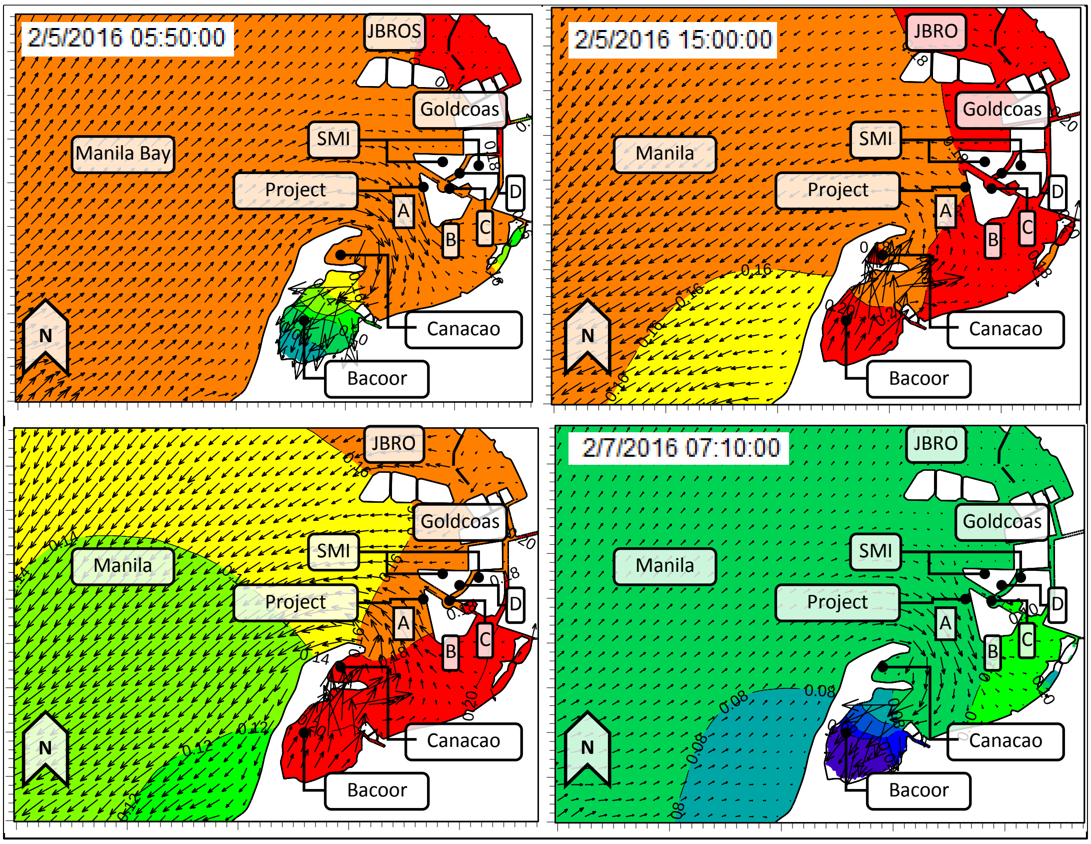


Figure 66. Chronological snapshots of tidal currents during February 2016

Tidal Currents around the Project Area

To track the tidal currents' time histories, a number of monitoring points (MP) are located in the nearshore domain as shown in Figure 67. Seven monitoring locations are selected, namely, reference offshore location 1, Point 2 in largely open water, Points 3 and 4 in partially enclosed waters of zone B, Points 5 and 6 in the constricted waterways, and Point 7 in the waterways' outfall. Figure 68 shows the time series of the tidal current vector at these points over a tidal cycle of at least 15 days.

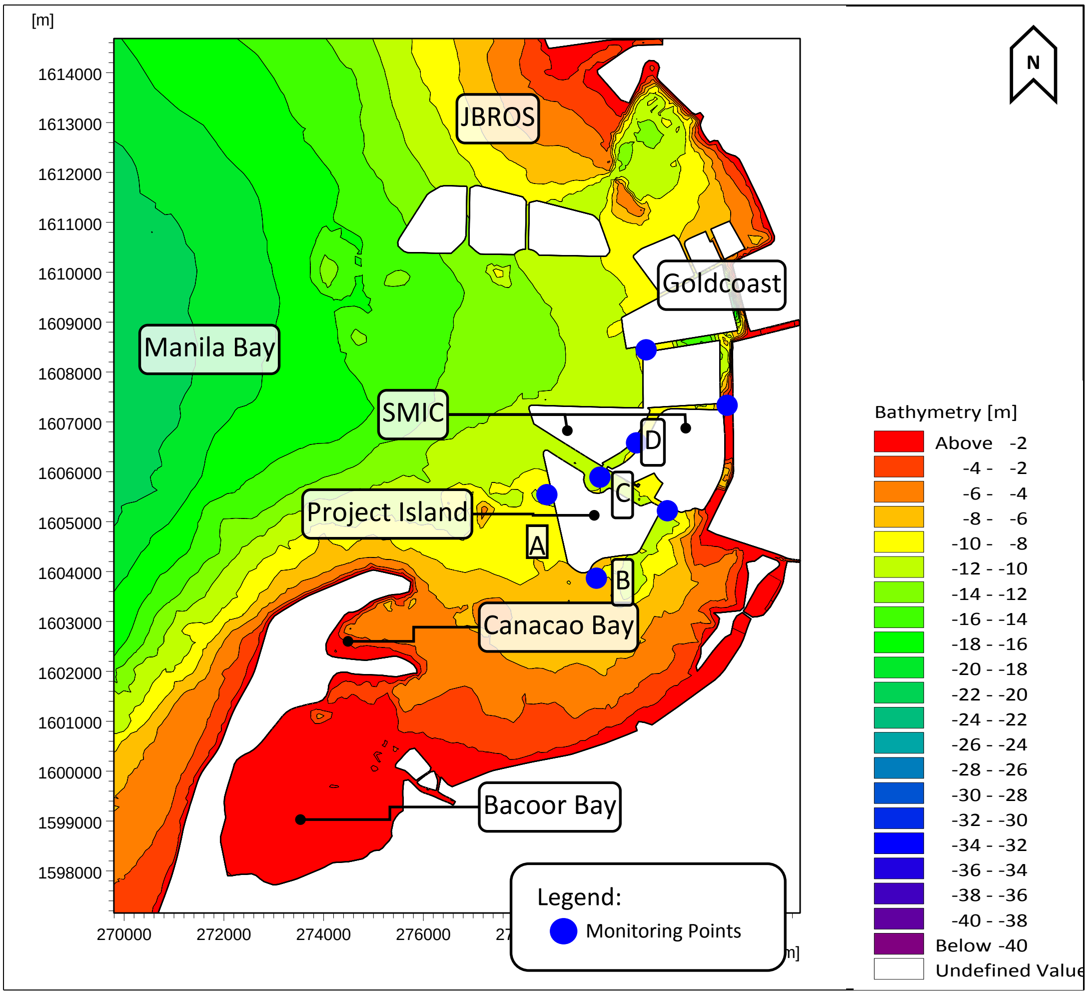


Figure 67. Location of monitoring points

It is seen in that current intensities are about 0.1 mps at the deeper locations 1 and 2, decrease to about 0.02 mps at the partially enclosed locations 3 and 4, and substantially decrease to about 0.01 mps in the constricted waterway points 5 and 6 and at the outfall Point 7.

The vector time plots also show that the currents' directions at Points 3 and 4 oscillate, indicating a desirable directional distribution of flow at these partially enclosed waters. However at Point 4, the currents tend to flow inward most of the time into the waterways, suggesting the likelihood of clogging in this zone when the waterway becomes clogged at location C (Figure 67).

Moreover, the currents' low intensity and limited flow directions at Points 3, 4, 5, and 6 indicate that these constricted waterways will likely be stagnation areas during low tidal amplitudes, e.g. during and around neap tides. This is largely due to the blocking effect of the triangular island of SMIC to the north of the project island. The stagnation potential can be reduced or alleviated by improving the plan-form of the project island, or by moving the project island southward by some distance to allow the currents to circulate enough.

Sediments and solids entrained with the seawater will settle on the bay bed when the current intensities fall below the minimum permissible velocity for sedimentation (MPVS), which is taken to be 0.6 to 0.9 mps for open channels depending on the size and type of entrained solids. In addition, vegetal outgrowth will exist when the currents fall below the minimum permissible velocity for vegetation (MPVV) which is taken to be about 0.75 mps for open channels. In the case of the projects coast, sedimentation is very likely in the channelized waterways and the partially enclosed area around Point 4. It is also likely that vegetation will encroach on the channels and the fringes of the partially enclosed areas to the south of the project coast.

In summary, the tidal currents modified by the post-development scenario will still allow circulation of seawaters within the partially enclosed zone (zone B). However, the close proximity of the project island to the other (future) reclaimed lands to its east and north will impede the currents through the constricted waterways and likely promote stagnated channel waters and the settlement of water-entrained sediments.

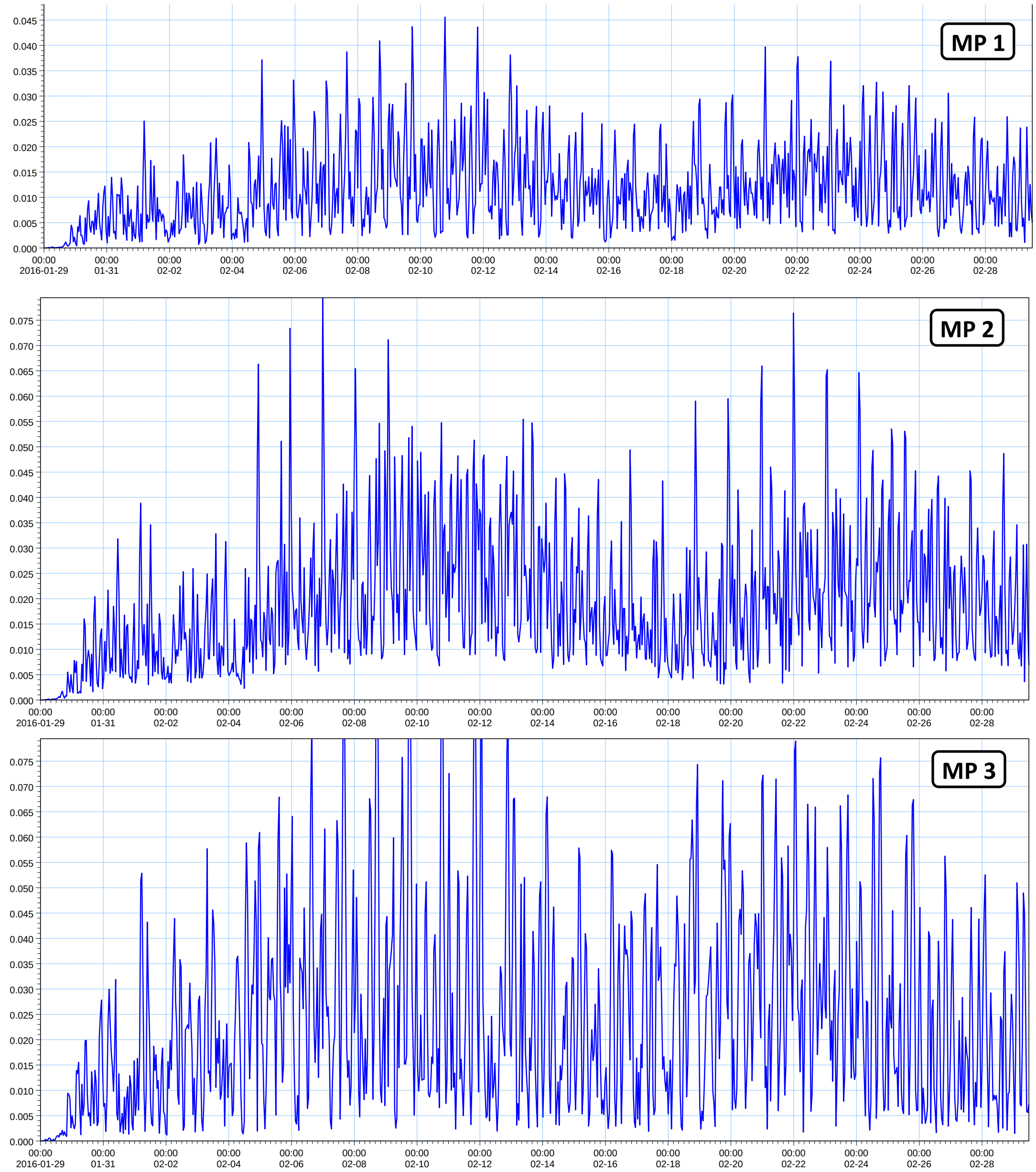


Figure 68. Tidal current time histories over 15 days at the monitoring points

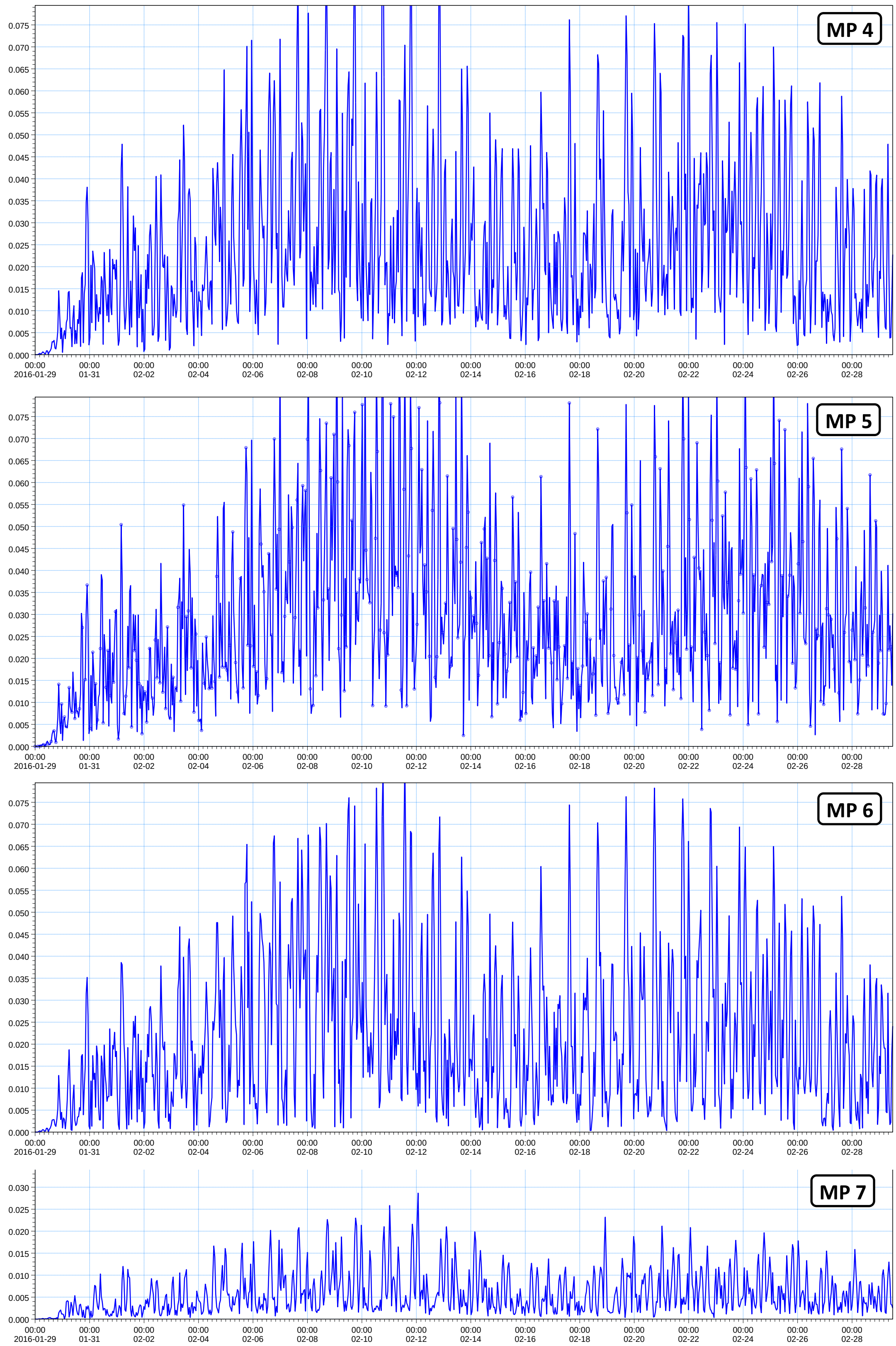


Figure 69. Tidal current time histories over 15 days at the monitoring points

STORM CONDITION ANALYSIS

Introduction

A storm surge is defined by a change in water level due to atmospheric disturbances such as low pressure areas and extreme wind continuously blowing over a body of water, both of which occur during typhoons. Storm surges should not be confused with the astronomic tide levels (MHHW, MHW, MTL, MLW, and MLLW) which are caused by the combined effects of the gravitational forces between the earth, sun, and moon. They should also not be confused with tsunamis which are caused by a sudden displacement of water due to seabed displacements usually caused by offshore seismic events.

When the storm's center is in the oceans, these effects are generally small on account of the large depth of water to mobilize and the vast expanse of water. However, these effects are quickly amplified when the storm reaches the shallow water. As the storm reaches the coasts the small depth of water in the coastal areas and the flow-impeding effect of land boundaries cause a pronounced elevation of the mean sea surface. These result in the rise of the mean sea surface, which is termed "storm surge". The combined level of storm surge and the astronomic tide at time of the storm's landfall is referred to as "storm tide".

Waves, with a period of about 10 to 15 seconds are also generated by the storms and ride on the storm tides on landfall. Unlike the organized and long-crested waves induced by prevailing winds in deep water, these storm-induced waves are generally scattered in various directions from the storm's center. The highest level of the sea surface inclusive of these higher-frequency storm-induced waves is the maximum elevation of the water surface at landfall.

Wind Storm Surge is the component of storm surge that is induced by wind gusts acting on the surface of the sea, imparting shear stresses that raise the water as it tracks toward land boundaries. The area within the radius of maximum wind speed and the immediate outside vicinity of this radius experience the highest wind storm surge. Pressure Surge is the phenomena wherein the low pressure zone in the middle of a tropical cyclone induces a suction action of the water below. As the cyclone moves generally westward towards land, the water surface is uplifted particularly in near the coasts where water is shallow. This pressure storm surge is highest near the storm's center

It should be noted, however, that the typhoon tracks shown in Figure 9 - Figure 13, may not necessarily cause the most critical storm tide at the project site, as wind speed alone is not the only factor.

The relative track of the typhoon (north or south), closest distance to the site, and astronomic tides all factor in to determining the historical tide level specifically at the site. For example (Figure 70), a typhoon can cause a storm surge of 1 m, which would ride on top of the astronomic tide; in the case of the figure the storm surge and high tide coincide in time, causing a net higher storm tide level (STL). If, on the other hand, the storm surge occurs at a low tide (below Mean Sea Level), the overall net storm tide can be smaller. Considering the tidal range of the project site is 1 m, the timing of the astronomic tides play a large role in determining the overall storm tide; thus a detailed numerical model was used to determine how these factors affect each other.

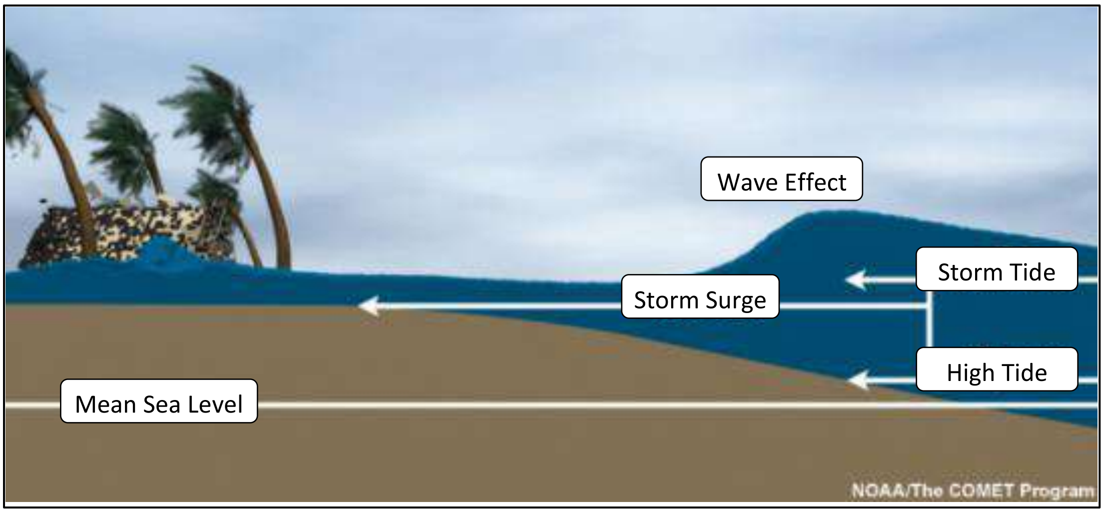


Figure 70. Illustration of the Combined Effects of Astronomic Tide and Storm Surge (NOAA)

Synthesis of Storm Tide Levels

From the list of typhoons in Figure 8, further analyses resulted in the narrowing down to three (3) potentially critical typhoons as shown in Table 11. The following figures (Figure 71 - Figure 76) show the maximum storm tide elevation (i.e. astronomic tide plus storm surge) for pre and post-development conditions for all three typhoons.

Table 11. Simulated typhoons at the project site

Typhoon	**Year**	**Vmax (kph)**	**Rmax (km)**	**Pc (hPa)**	**Relative Track to the Site**
Rita (*Kading*)	1978	203	14	905	N
Patsy (*Yoling*)	1970	192	17	920	N
Xangsane (*Milenyo*)	2006	101	27	980	S

For the pre-development scenario (Figure 71) Typhoon Rita caused a storm tide level of roughly 1.2 m – 1.3 m at the Islands, with the higher storm tides manifesting closer to the shore. This range did not increase significantly for the post-development scenario (Figure 72), except that the spatial coverage of the 1.4 m storm tide level within South Harbor has been reduced.

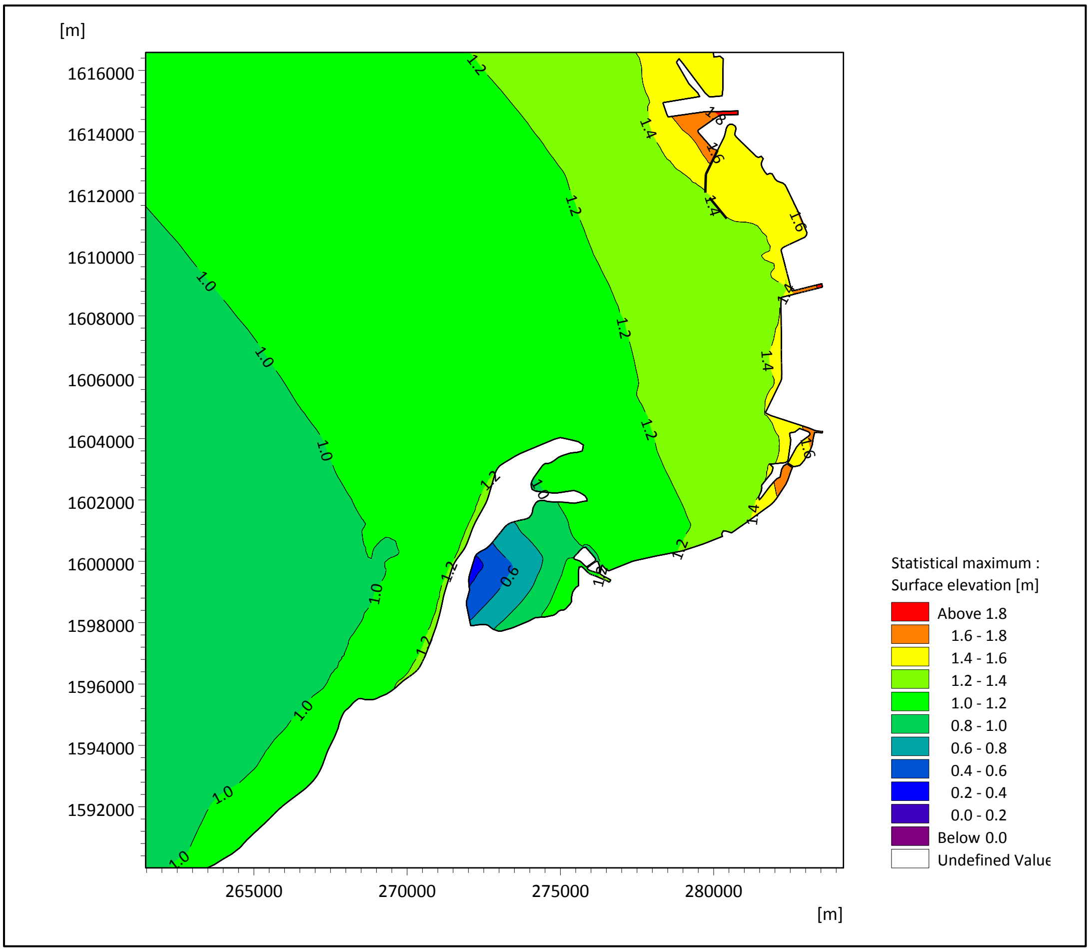


Figure 71. Simulated storm tide level for Typhoon Rita/Kading (1978) – Predevelopment

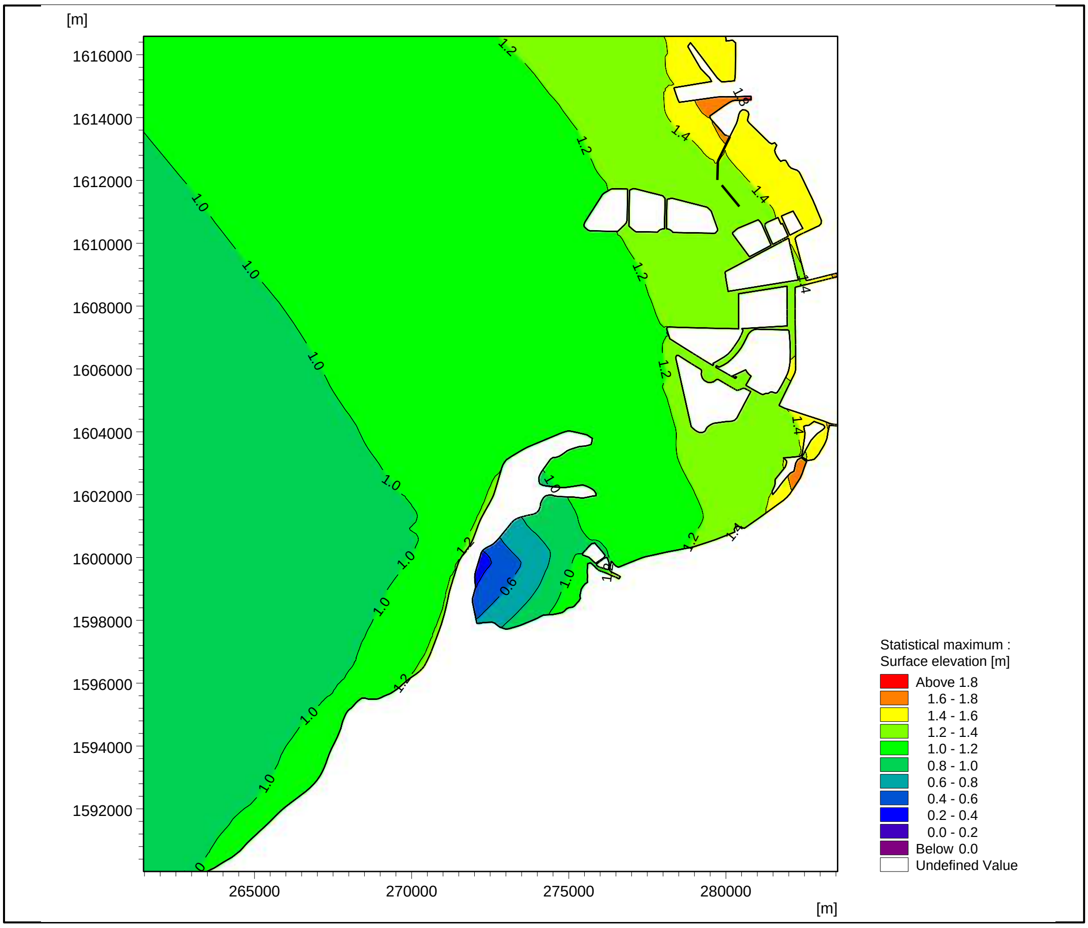


Figure 72. Simulated storm tide level for Typhoon Rita/Kading (1978) – Postdevelopment

For the pre-development scenario, the storm tide levels generated by Typhoon Patsy (Figure 73) average at roughly 1.0 m for all the islands, the storm tide level increasing northward. The post-development scenario, shows that the storm tide level (Figure 74) the within Manila South Harbor is marginally reduced.

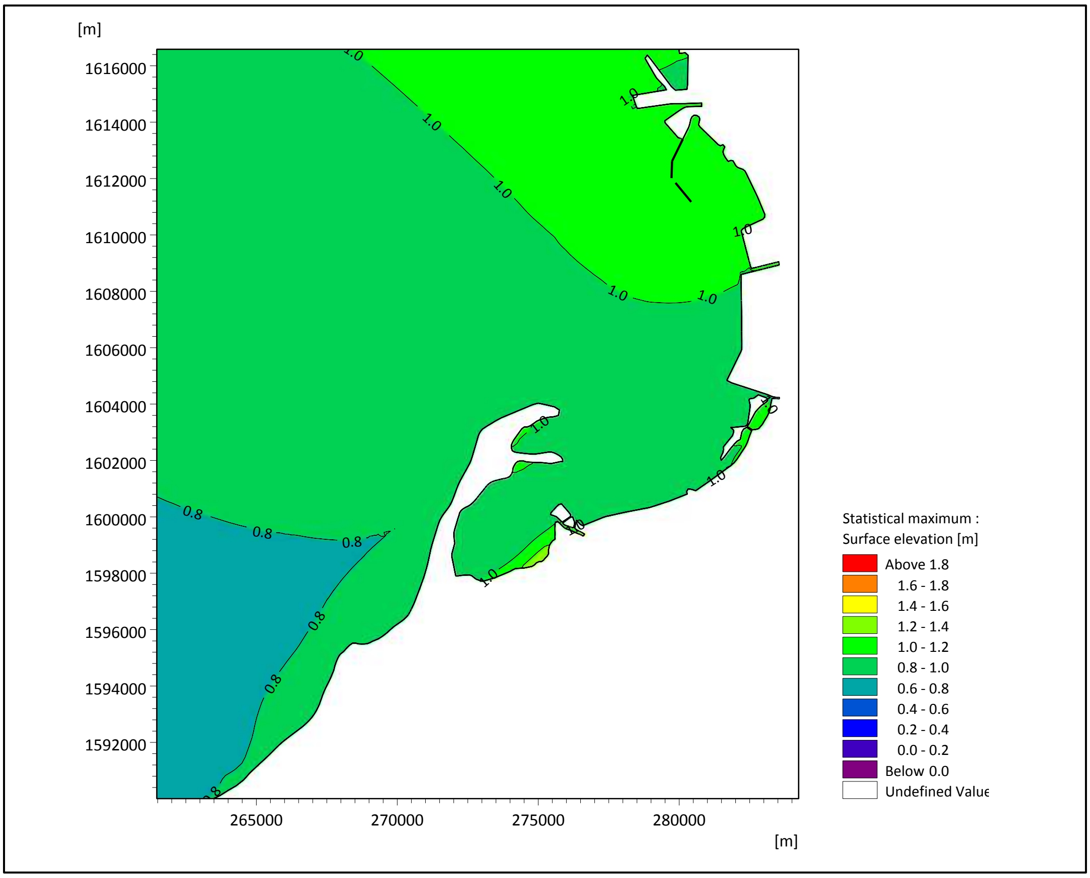


Figure 73. Simulated storm tide level for Typhoon Patsy/Yoling (1970) – Predevelopment

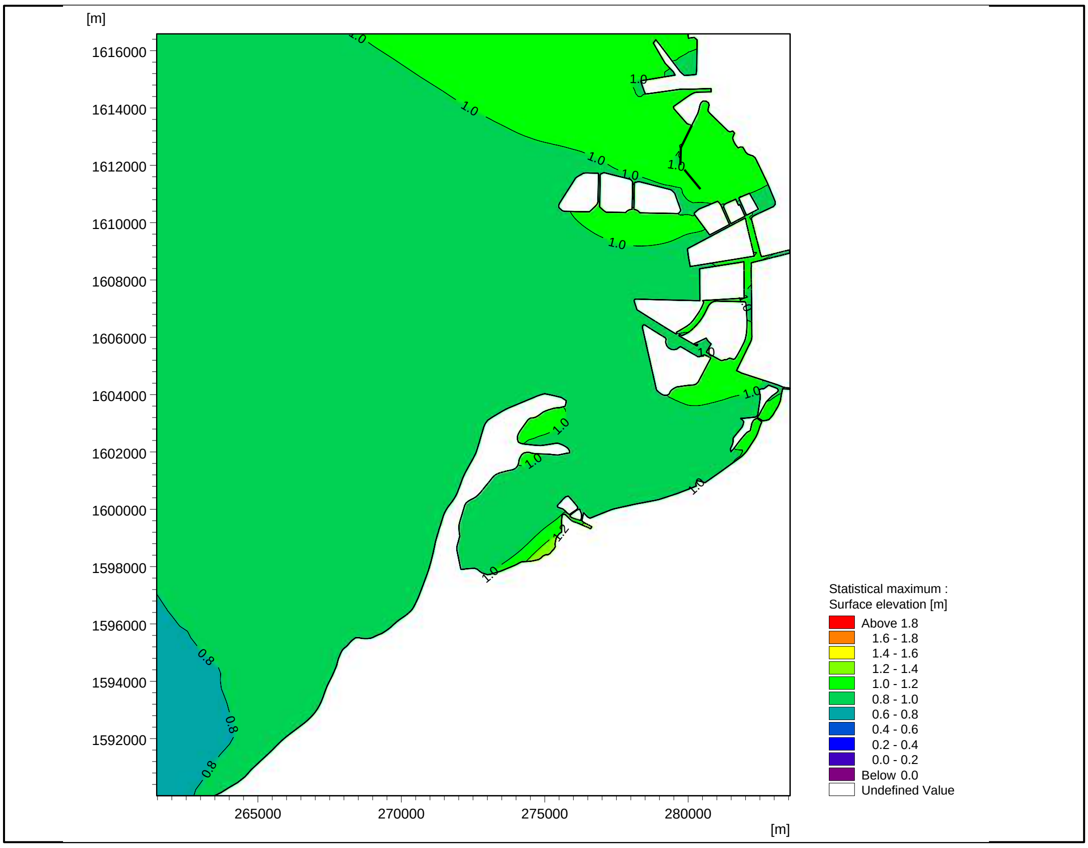


Figure 74. Simulated storm tide level for Typhoon Patsy/Yoling (1970) – Postdevelopment

The storm tide for the pre-development scenario caused by Typhoon Xangsane (Figure 75) is significantly lower than the previous two typhoons, with the storm tide level averaging 0.8 m for all islands. No significant noticeable difference in the magnitude of the storm tide can be seen within the area of the project.

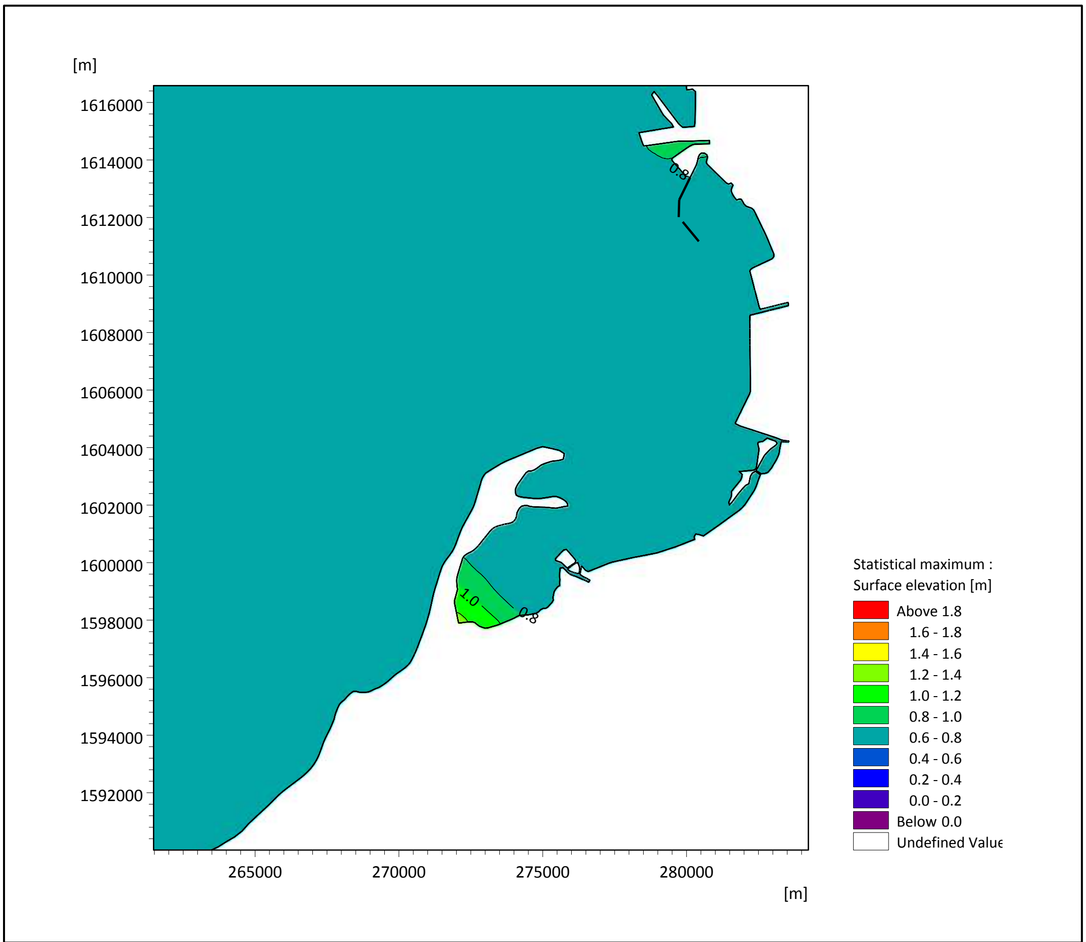


Figure 75. Simulated storm tide level for Typhoon Xangsane/Milenyo (2006) – Predevelopment

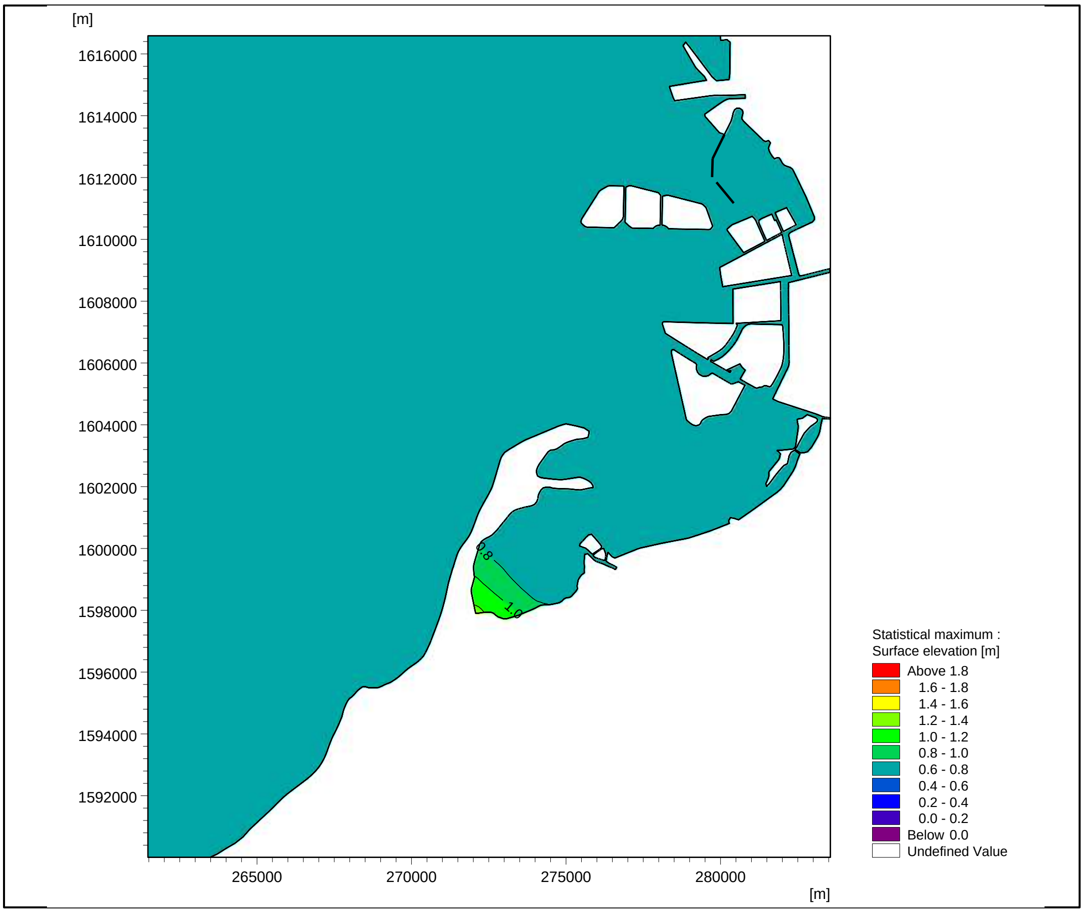


Figure 76. Simulated storm tide level for Typhoon Xangsane/Milenyo (2006) - Postdevelopment

Synthesis of Storm Waves

The surface waves induced by the passage of typhoons are also numerically simulated using the spectral-wave module of the hydrodynamic model, with the results shown in Figure 77 to Figure 82. This module solves the wave action equation that governs the propagation of the spectral components of storm waves, from which various statistics of wave heights and periods, such as the significant wave and maximum wave, are derived. The forces induced by these extreme wave heights should be considered in the detailed design stage.

It should be noted that these simulations are based under the assumption that the reclamation enclosure has been properly engineered to minimize the reflection of incoming waves; the wave climate will change significantly if no mitigating measures will be applied to it, potentially locally increasing wave heights at the seaward faces of the enclosures.

For all three typhoons, it can be seen that the proposed reclamation islands in the post-development scenarios will provide a sheltering effect on all shorelines leeward of the reclamations. For typhoon Rita (Figure 77 and Figure 78) the wave heights at the leeward side of the Islands have dropped significantly from ~4 m to 2~3m. The seaward faces, on the other hand, experience wave heights as high as ~5 m.

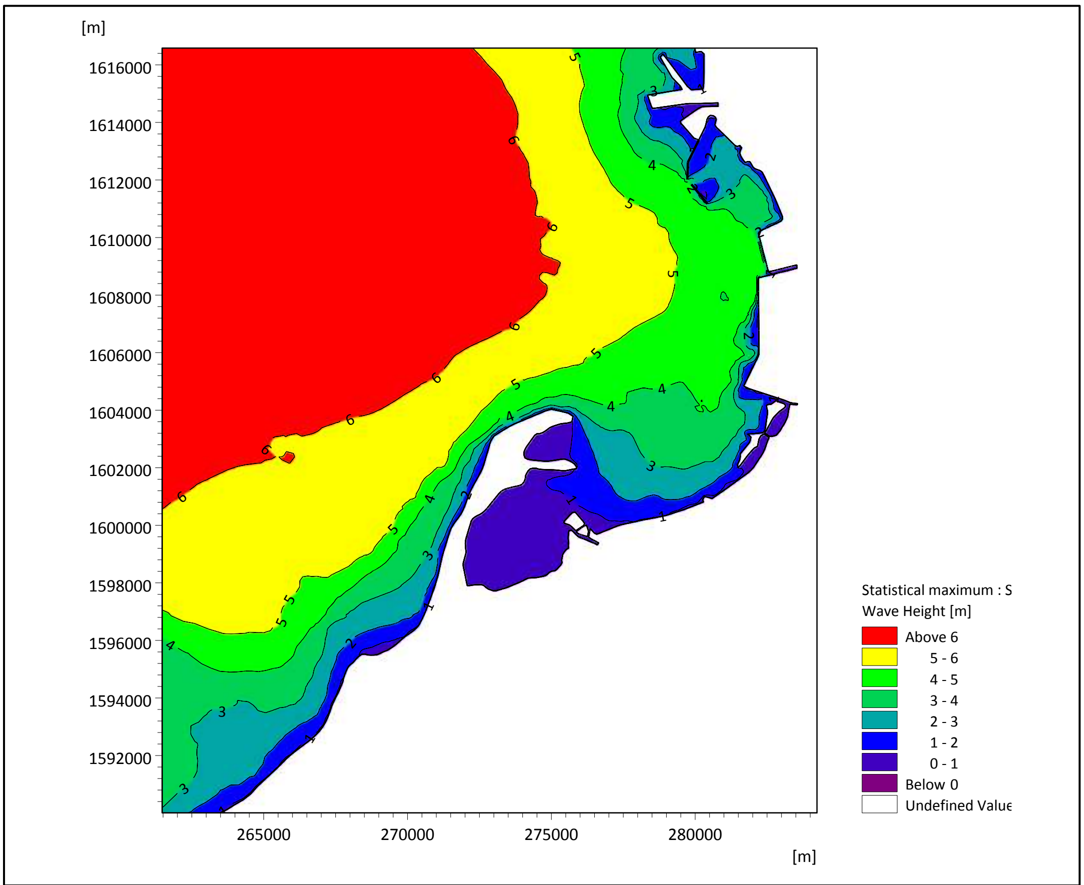


Figure 77. Simulated maximum significant wave heights for Typhoon Rita/Kading (1978) – Predevelopment

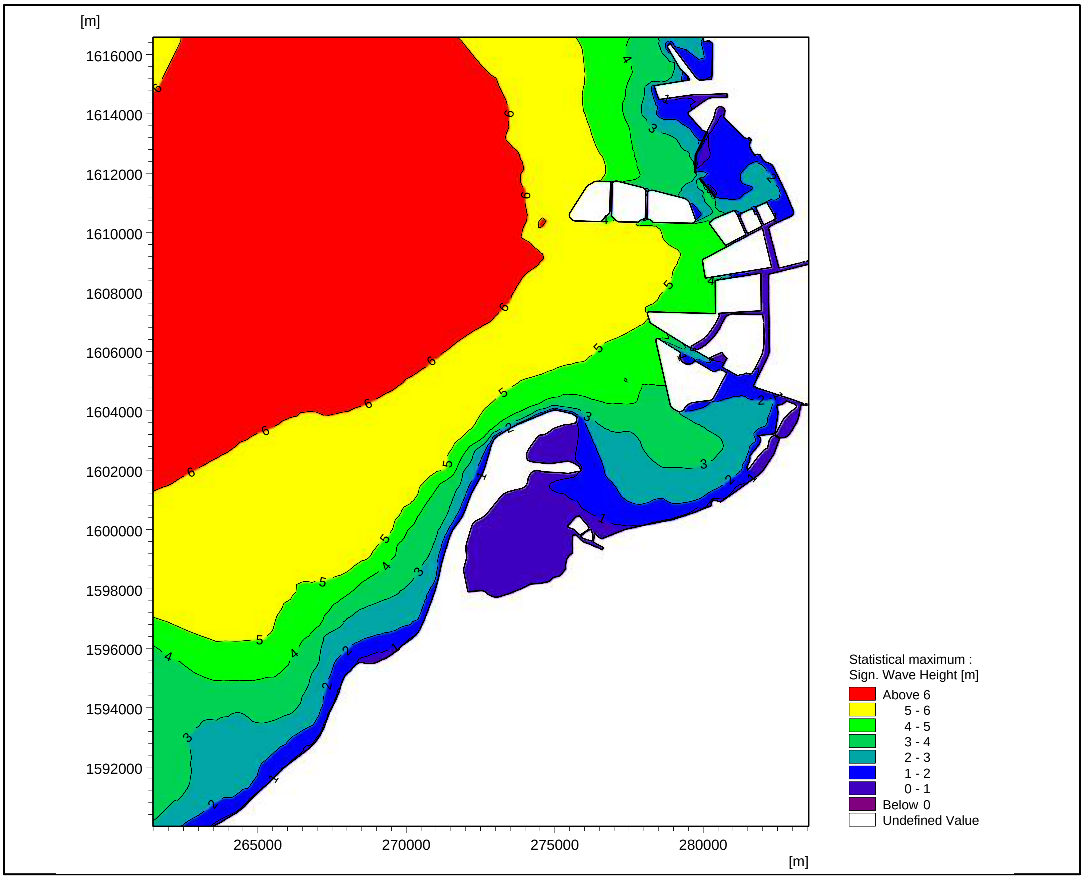


Figure 78. Simulated maximum significant wave heights for Typhoon Rita/Kading (1978) – Postdevelopment

For Typhoon Patsy, the Islands similarly create a sheltering effect for all leeward areas, with wave heights dropping from 3~4 m to only 2~3 m; however some wave penetration is still evident between the Islands and Sangley Spit. Similar to Typhoon Rita, the site can experience wave heights as high as ~5 m.

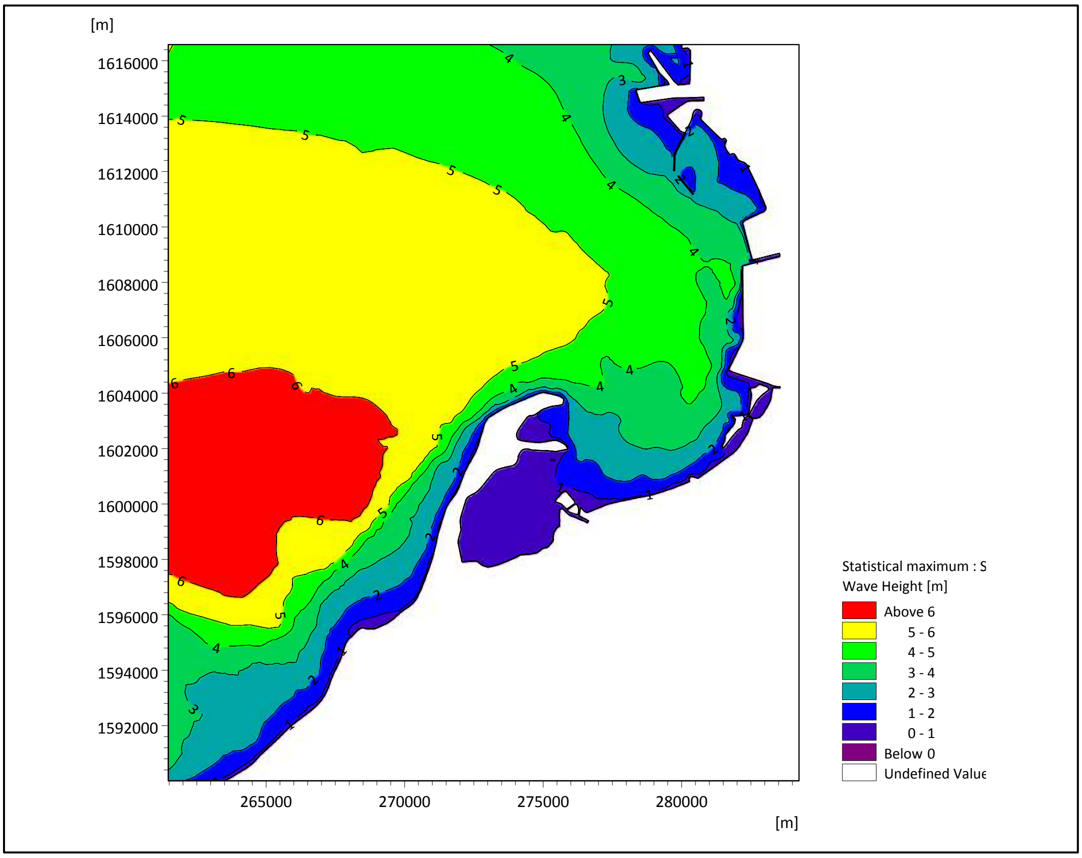


Figure 79. Simulated maximum significant wave heights for Typhoon Patsy/Yoling (1970) – Predevelopment

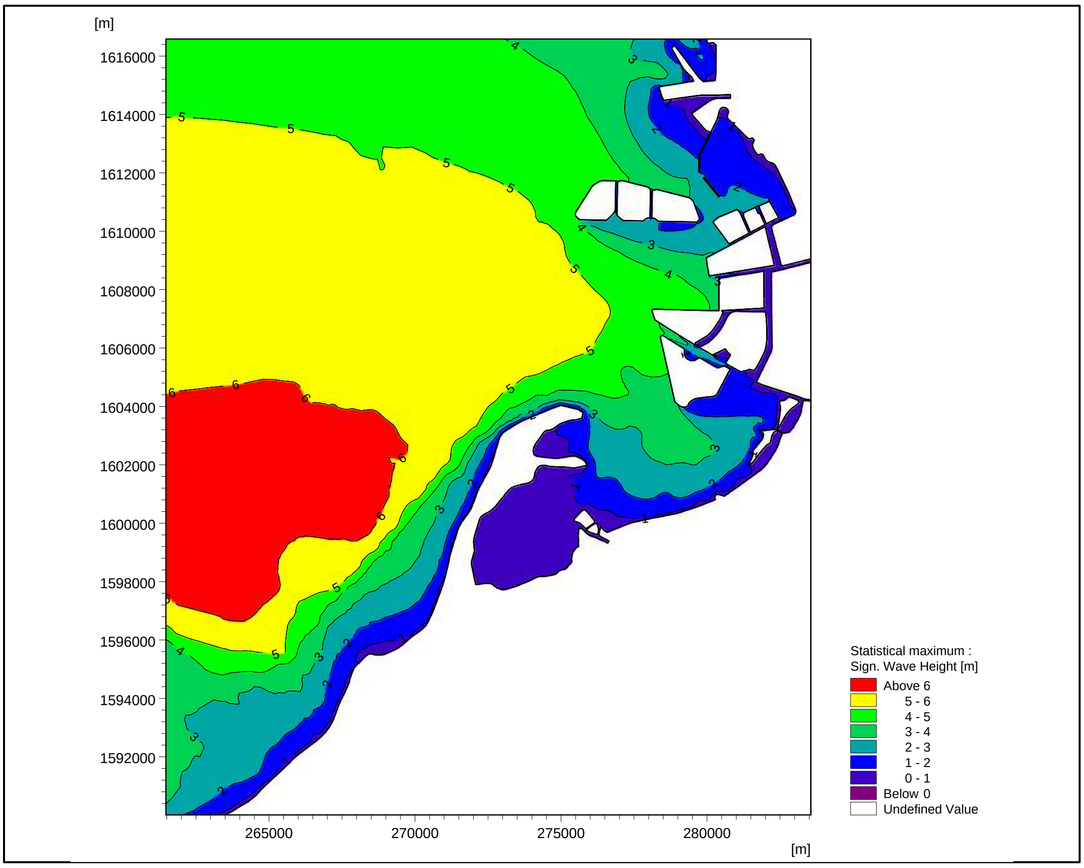


Figure 80. Simulated maximum significant wave heights for Typhoon Patsy/Yoling (1970) - Postdevelopment

The wave climate induced by Typhoon Xangsane is significantly calmer that the previous two typhoons, with the site being exposed to ~2 m high waves. Similar to all previous cases, the Islands significantly reduce the wave heights at their leeside to the east, but with some penetration still evident at the gap between Sangley Spit and the Islands.

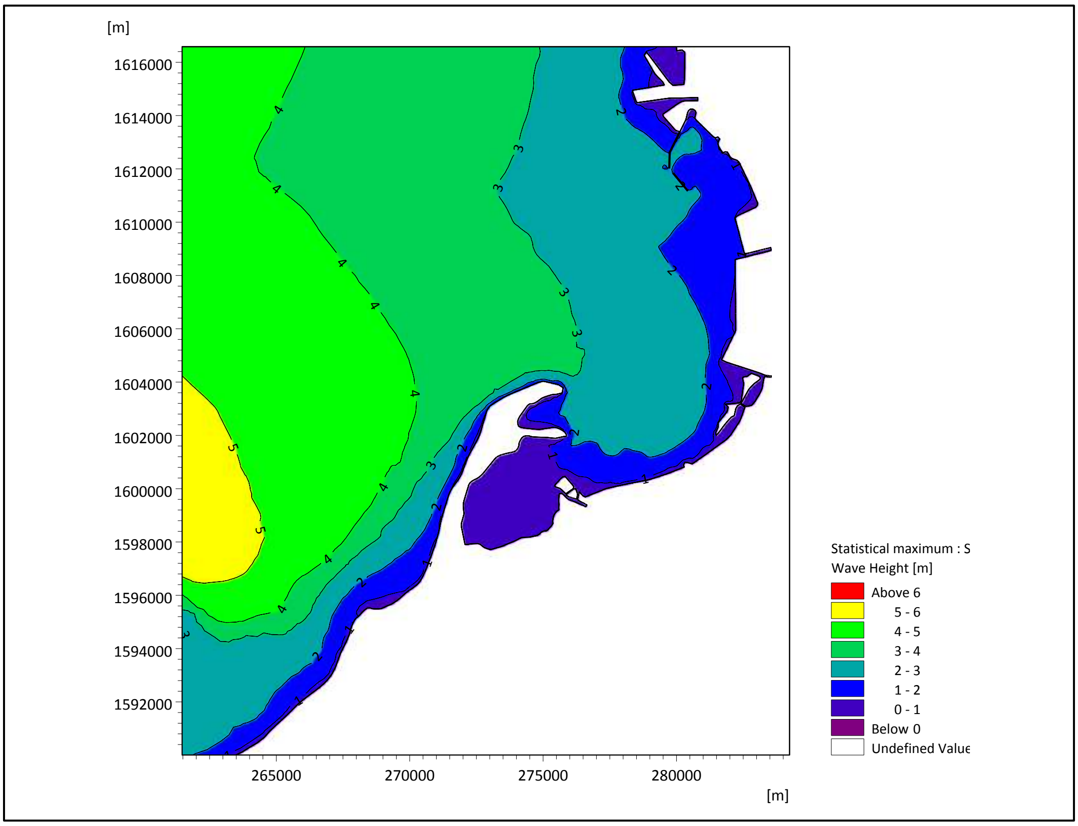


Figure 81. Simulated maximum significant wave heights for Typhoon Xangsane/Milenyo (2006) – Predevelopment

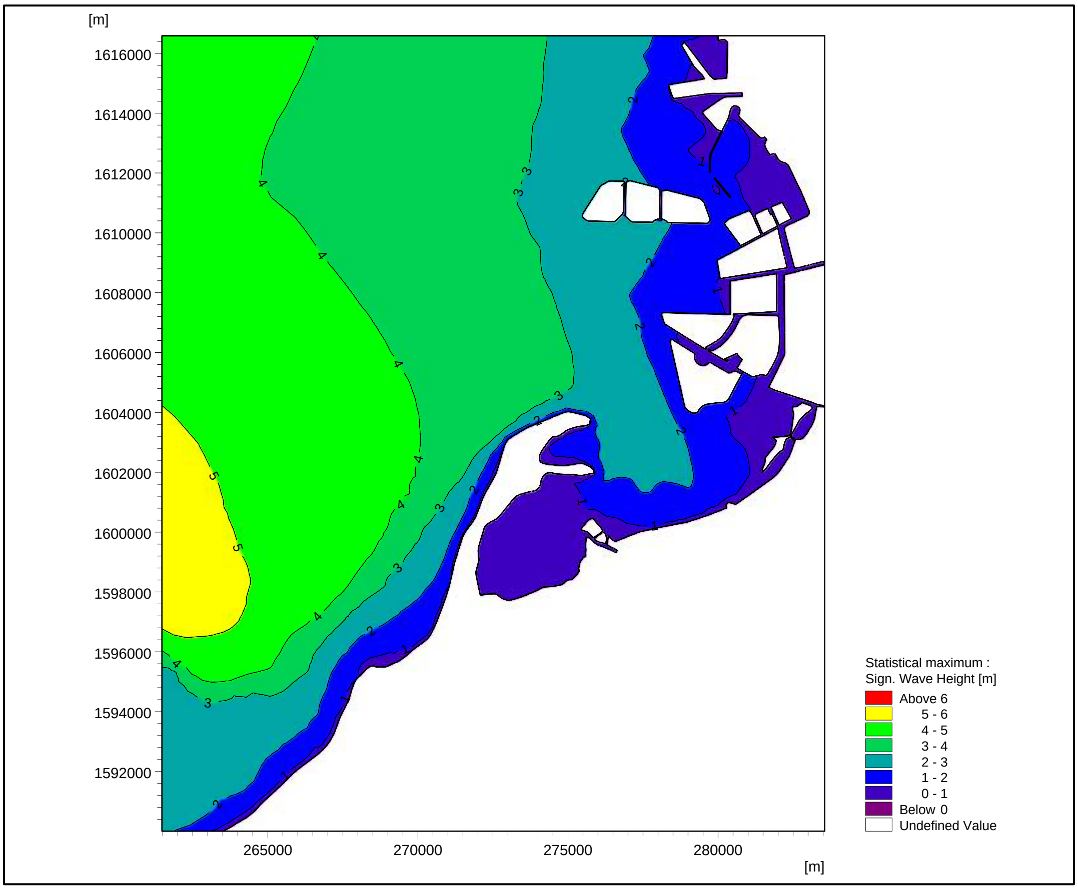


Figure 82. Simulated maximum significant wave heights for Typhoon Xangsane/Milenyo (2006) – Postdevelopment

COMPUTATION OF NON-OVERTOPPING CREST ELEVATION

Introduction

Different structures, such as revetments or sea walls, are built to protect coastal areas from flooding or inundation due to high water levels. To ensure water does not inundate into the protected area, the crest of the structure should be sufficiently higher than the highest water level. This height of the structure is known as the non-overtopping crest elevation (NOCE).The NOCE is obtained by adding two components: (1) the still water level (SWL), or the mean water level associated with astronomical tides and storm surges, and (2) the wave runup, which occurs when the wave impinges and breaks on a sloping structure causing water to rise along the slope.

Wave runup is a complex phenomenon which considers the local water level, the characteristics of the incident wave, and the structure being run up. The computation of the runup is largely empirical; it is based on various laboratory measurements that relates runup to the breaking wave surf similarity parameter ξ to reduce the number of variables. The wave runup for impermeable and permeable slopes are computed as shown below (Delft Hydraulics 1989):

For impermeable slopes:

$$\frac{R_u}{H_s} = \begin{cases} A\xi_{om}, & 1 < \xi_{om} \leq 1.5 \\ B(\xi_{om})^C, & \xi_{om} > 1.5 \end{cases}$$

(1)

For permeable slopes:

$$\frac{R_u}{H_s} = \begin{cases} A\xi_{om}, & 1 < \xi_{om} \leq 1.5 \\ B(\xi_{om})^C, & 1.5 < \xi_{om} \leq (D/B)^{1/C} \\ D, & (D/B)^{1/C} < \xi_{om} \leq 7.5 \end{cases}$$

(2)

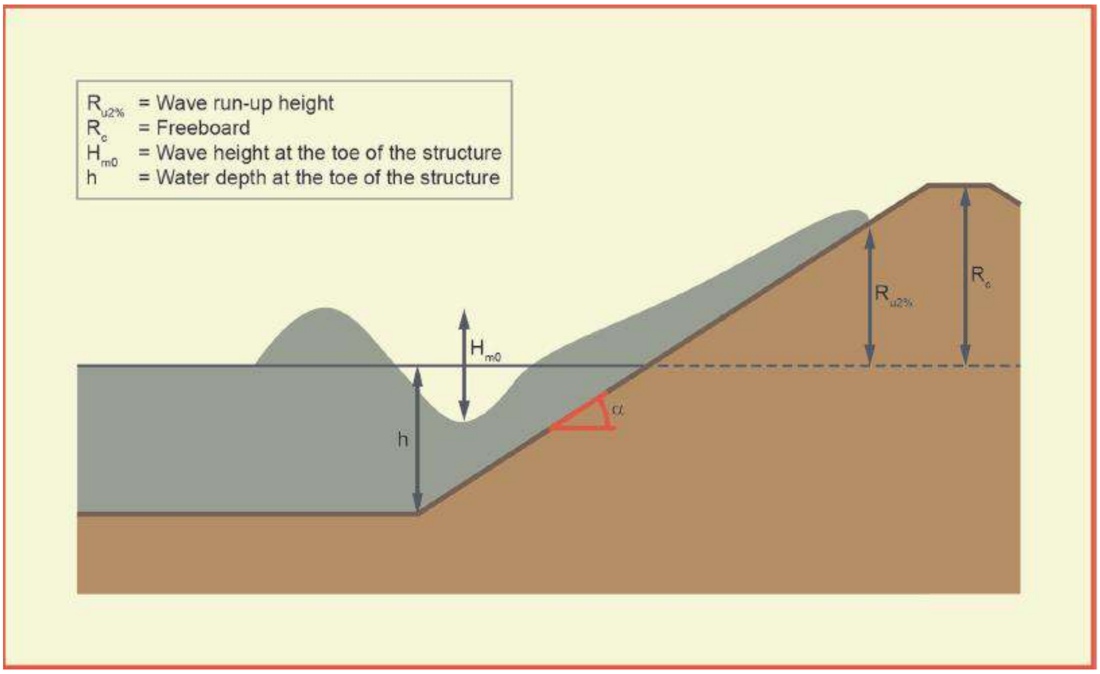


Figure 83. Wave runup on a smooth impermeable slope (Source: EurOtop 2016)

Due to economical, spatial, and other practical considerations, structures are typically built lower than the NOCE, resulting to the highest runup levels exceeding the provided crest freeboard, and water flowing over the structure or wave overtopping. Overtopping discharge rates for different crest elevations should be used as a design parameter to check if the overtopping values are within allowable limits (EurOtop Manual, 2007).

Overtopping discharge caused by wind-generated waves during a storm is unevenly distributed in time and space, and thus information regarding overtopping discharge is given as the time averaged overtopping discharge in terms of m3/s per linear meter of the structure. Methods in obtaining the overtopping discharge are highly empirical and are based from hydraulic model test results for specific structure geometries (CEM, 2006). In general, the overtopping discharge is a function of the wave characteristics as well as the structure geometry.

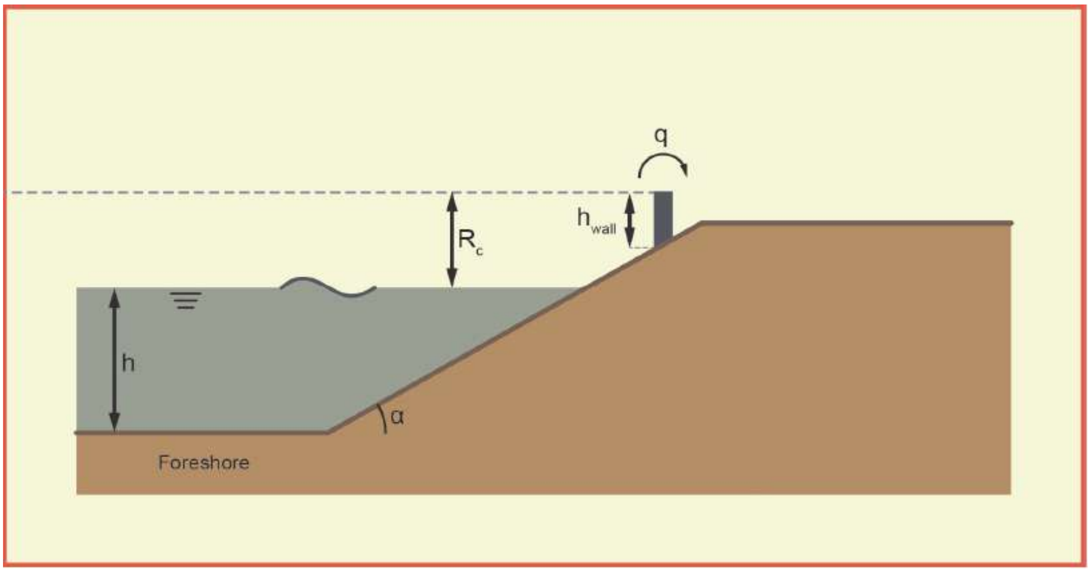


Figure 84. Overtopping discharge of a slope with storm wall (Source: EurOtop 2016)

For the case of the reclamation, the EurOtop (2007) model was implemented for the computation of the overtopping discharge, which is the most flexible of all the models for it is not restrained to a specific structural geometry. The overtopping discharge, q, is a function of the geometry of the structure, wave and tide characteristics, and a series of reduction factors. It is modeled by the equation below:

$$\frac{q}{\sqrt{g \cdot H_{mo}^3}} = \frac{0.026}{\sqrt{\tan\alpha}} \gamma_b \cdot \xi_{m-1,0} \cdot exp\left[-\left(2.5\frac{R_c}{\xi_{m-1,0} \cdot H_{m0} \cdot \gamma_b \cdot \gamma_f \cdot \gamma_\beta \cdot \gamma_v}\right)^{1.3}\right] \qquad (3)$$

with a maximum of:

$$\frac{q}{\sqrt{g \cdot H_{mo}^3}} = \frac{0.1035}{\sqrt{\tan\alpha}} \cdot exp\left[-\left(1.35\frac{R_c}{H_{m0} \cdot \gamma_f \cdot \gamma_\beta \cdot \gamma^*}\right)^{1.3}\right] \qquad (4)$$

Analysis and Results

The methodology used for the calculation of the wave runup is based from Delft Hydraulics as presented in the Coastal Engineering Manual (2006), which requires wave characteristics and structural geometry. From the storm condition analysis, two scenarios are considered in determining the NOCE: the first case is when the SWL is at maximum and the corresponding wave characteristics are taken, and the second case is when the wave height is at maximum and the corresponding SWL and other wave characteristics are used for computation. The higher computed NOCE is considered to be the critical value and is used for the determination of the overtopping discharge. For this project, seven (7) points near the project boundary are taken as points of extraction for the computation of non-overtopping crest elevation, as shown in Figure 85. The computed non-overtopping crest elevations during maximum tide and maximum wave conditions are presented in the following tables.

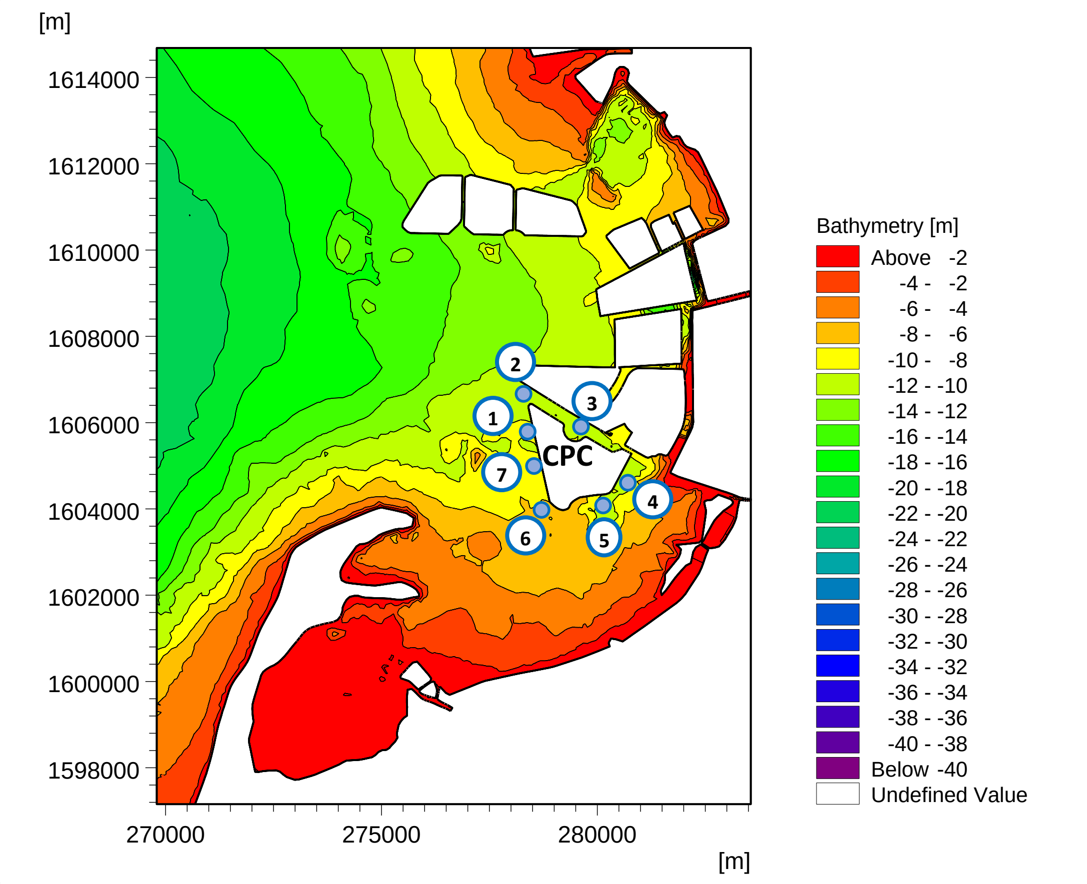


Figure 85. Location of extraction points

Table 12. Non-overtopping crest elevation results during maximum tide conditions

Typhoon	Point	Depth (m)	Time	$Tide_{max}$ (m)	Corresponding		NOCE Result (m)
					Wave (m)	Period (s)	
Rita	Pt. 1	10.27	10/26/1978 18:50	1.24	2.18	5.85	4.66
	Pt. 2	10.64	10/26/1978 18:50	1.26	1.19	5.24	3.27
	Pt. 3	8.89	10/26/1978 18:50	1.31	1.18	3.50	3.00
	Pt. 4	11.25	10/26/1978 18:50	1.28	1.99	3.42	3.78
	Pt. 5	7.82	10/26/1978 18:50	1.23	2.59	3.93	4.50
	Pt. 6	8.16	10/26/1978 18:50	1.20	3.36	5.10	5.71
	Pt. 7	9.95	10/26/1978 18:50	1.20	3.93	5.66	6.53
Patsy	Pt. 1	10.27	11/19/1970 6:30	0.96	0.35	4.39	1.55
	Pt. 2	10.64	11/19/1970 6:30	0.96	0.26	2.76	1.40
	Pt. 3	8.89	11/19/1970 6:30	0.99	0.91	2.46	2.16
	Pt. 4	11.25	11/19/1970 6:30	0.97	0.97	2.37	2.19
	Pt. 5	7.82	11/19/1970 6:30	0.96	1.07	2.54	2.31
	Pt. 6	8.16	11/19/1970 6:30	0.94	1.25	2.68	2.55
	Pt. 7	9.95	11/19/1970 6:30	0.95	1.23	3.17	2.61
Xangsane	Pt. 1	10.27	9/29/2006 18:00	0.68	0.22	4.31	1.06
	Pt. 2	10.64	9/29/2006 18:00	0.68	0.13	4.56	0.89
	Pt. 3	8.89	9/29/2006 18:10	0.68	0.01	5.61	0.70

Typhoon	Point	Depth (m)	Time	$Tide_{max}$ (m)	Corresponding		NOCE Result (m)
					Wave (m)	Period (s)	
	Pt. 4	11.25	9/29/2006 18:10	0.68	0.01	3.98	0.70
	Pt. 5	7.82	9/29/2006 18:10	0.68	0.16	4.52	0.94
	Pt. 6	8.16	9/29/2006 18:10	0.68	0.28	4.73	1.15
	Pt. 7	9.95	9/29/2006 18:00	0.68	0.36	4.56	1.29

Table 13. Non-overtopping crest elevation results during maximum wave conditions

Typhoon	Point	Depth (m)	Time	$Wave_{max}$ (m)	Corresponding		NOCE Result (m)
					Period (s)	Tide (m)	
Rita	Pt. 1	10.27	10/26/1978 18:40	2.19	5.85	1.24	4.66
	Pt. 2	10.64	10/26/1978 18:40	1.20	5.24	1.26	3.27
	Pt. 3	8.89	10/26/1978 19:40	1.21	3.51	1.23	2.95
	Pt. 4	11.25	10/26/1978 19:10	2.00	3.42	1.27	3.78
	Pt. 5	7.82	10/26/1978 18:10	2.67	4.08	1.19	4.60
	Pt. 6	8.16	10/26/1978 16:20	3.90	5.75	1.01	6.35
	Pt. 7	9.95	10/26/1978 16:10	4.42	6.14	0.95	6.99
Patsy	Pt. 1	10.27	11/19/1970 3:00	1.26	4.70	0.25	2.27
	Pt. 2	10.64	11/19/1970 3:00	0.90	3.10	0.28	1.57
	Pt. 3	8.89	11/19/1970 5:30	1.11	2.34	-0.12	1.20
	Pt. 4	11.25	11/19/1970 5:30	1.14	2.46	-0.16	1.26
	Pt. 5	7.82	11/19/1970 3:00	1.81	4.18	0.39	2.93
	Pt. 6	8.16	11/19/1970 3:00	3.70	5.27	0.30	5.22
	Pt. 7	9.95	11/19/1970 3:00	4.27	5.65	0.22	5.89
Xangsane	Pt. 1	10.27	9/28/2006 8:20	0.50	4.49	0.56	1.40
	Pt. 2	10.64	9/28/2006 3:00	0.32	1.74	-0.59	-0.14
	Pt. 3	8.89	9/28/2006 5:40	1.01	2.35	0.04	1.31
	Pt. 4	11.25	9/28/2006 5:50	1.04	2.47	0.14	1.45
	Pt. 5	7.82	9/28/2006 5:40	1.09	2.53	0.03	1.40
	Pt. 6	8.16	9/28/2006 1:10	1.51	4.09	-0.45	1.74
	Pt. 7	9.95	9/28/2006 1:10	1.53	3.83	-0.47	1.67

Table 14. Summary of non-overtopping crest elevation results

Typhoon	Point	NOCE Result (m)		Governing Case
		$Tide_{max}$	$Wave_{max}$	
Rita	Pt. 1	4.66	4.66	Max Wave Height
	Pt. 2	3.27	3.27	Max Wave Height
	Pt. 3	3.00	2.95	Max Tide
	Pt. 4	3.78	3.78	Max Tide
	Pt. 5	4.50	4.60	Max Wave Height
	Pt. 6	5.71	6.35	Max Wave Height
	Pt. 7	6.53	6.99	Max Wave Height
Patsy	Pt. 1	1.55	2.27	Max Wave Height
	Pt. 2	1.40	1.57	Max Wave Height

Typhoon	Point	NOCE Result (m)		Governing Case
		$Tide_{max}$	$Wave_{max}$	
	Pt. 3	2.16	1.20	Max Tide
	Pt. 4	2.19	1.26	Max Tide
	Pt. 5	2.31	2.93	Max Wave Height
	Pt. 6	2.55	5.22	Max Wave Height
	Pt. 7	2.61	5.89	Max Wave Height
Xangsane	Pt. 1	1.06	1.40	Max Wave Height
	Pt. 2	0.89	-0.14	Max Tide
	Pt. 3	0.70	1.31	Max Wave Height
	Pt. 4	0.70	1.45	Max Wave Height
	Pt. 5	0.94	1.40	Max Wave Height
	Pt. 6	1.15	1.74	Max Wave Height
	Pt. 7	1.29	1.67	Max Wave Height

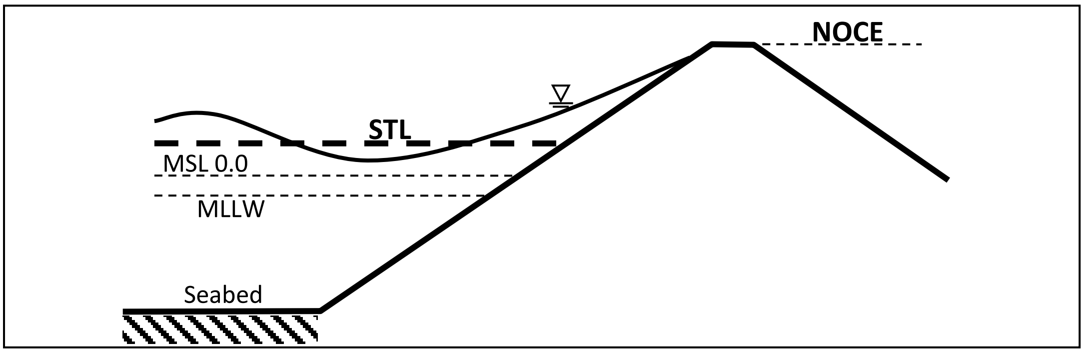


Figure 86. NOCE illustration

As shown in Table 14, highlighted cells denotes the case that governed, i.e. the greater value obtained from the two cases considered. For a 1:2 embankment slope with rock armor, the critical NOCE obtained is 6.99 m based on Typhoon Rita and located on extraction point 7, which is the south-western corner of the CPC reclamation. On the other hand, Typhoon Patsy and Typhoon Xangsane resulted to lower maximum non overtopping crest elevations of 5.89 meters and 1.74 meters, respectively.

Wave overtopping occurs when the structure crest elevation is lower than the wave runup level. With computed NOCE of 6.99 m, wave overtopping is acceptable because building the required crest elevation would entail massive construction costs and spatial requirements. For the computation of the overtopping discharge, the procedures from EurOtop Manual on Wave Overtopping of Sea Defences and Related Structures are used. This is applicable for dikes and sea embankments with smooth or rough armored slopes. To further reduce the average overtopping discharge, the influence of the addition of a wall on top of the slope is included in the computation considerations, as shown in Figure 84. The following table summarizes the obtained overtopping discharge per meter length for various crest elevations. These values are based on critical case obtained from Typhoon Rita, in which the highest value of NOCE was obtained.

Table 15. Overtopping discharge results

q ($m^3/s/m$)		Reclamation Backfill Elevation (maMSL)		
		+3.0	+3.5	+4.0
h_{wall} (m)	1.0	0.066	0.034	0.017
	1.5	0.021	0.010	0.005

The computed overtopping discharge may be compared with the tolerable overtopping discharges from various field studies. This provides a rough guideline for the structural safety for a given value of the discharge. However, it must be noted that the intensity of water hitting a specific location is still dependent on the geometry and distance from the structure and thus maximum intensities locally may be over the obtained overtopping discharge.

In terms of design, the Coastal Engineering Manual (CEM) recommends a range of critical values of average overtopping discharges for various coastal structures considering structural safety and the safety of traffic (Table 16). For example, for an embankment seawall, it expects damage to the structure if its crest is not protected if an overtopping discharge of 0.002 to 0.02 cms/m is experienced. Following CEM, Table 17 summarizes the expected damage condition and range of overtopping discharges q for embankment seawall and building structures. For example, damage to an embankment seawall occurs if the back slope is not protected and the overtopping rate is between 0.02 – 0.005 cms/m. By using the lowest value q in this table together with various Reclamation Backfill Elevations (RBE) and the simulated wave conditions and storm tide corresponding to the critical NOCE condition, the required minimum elevation hmin of a vertical wall on top of the sloping embankment can be computed. Table 18 summarizes the results of these computations based on Eq. (4) under the above conditions

Table 16. Critical values of average overtopping discharges (Source: Coastal Engineering Manual)

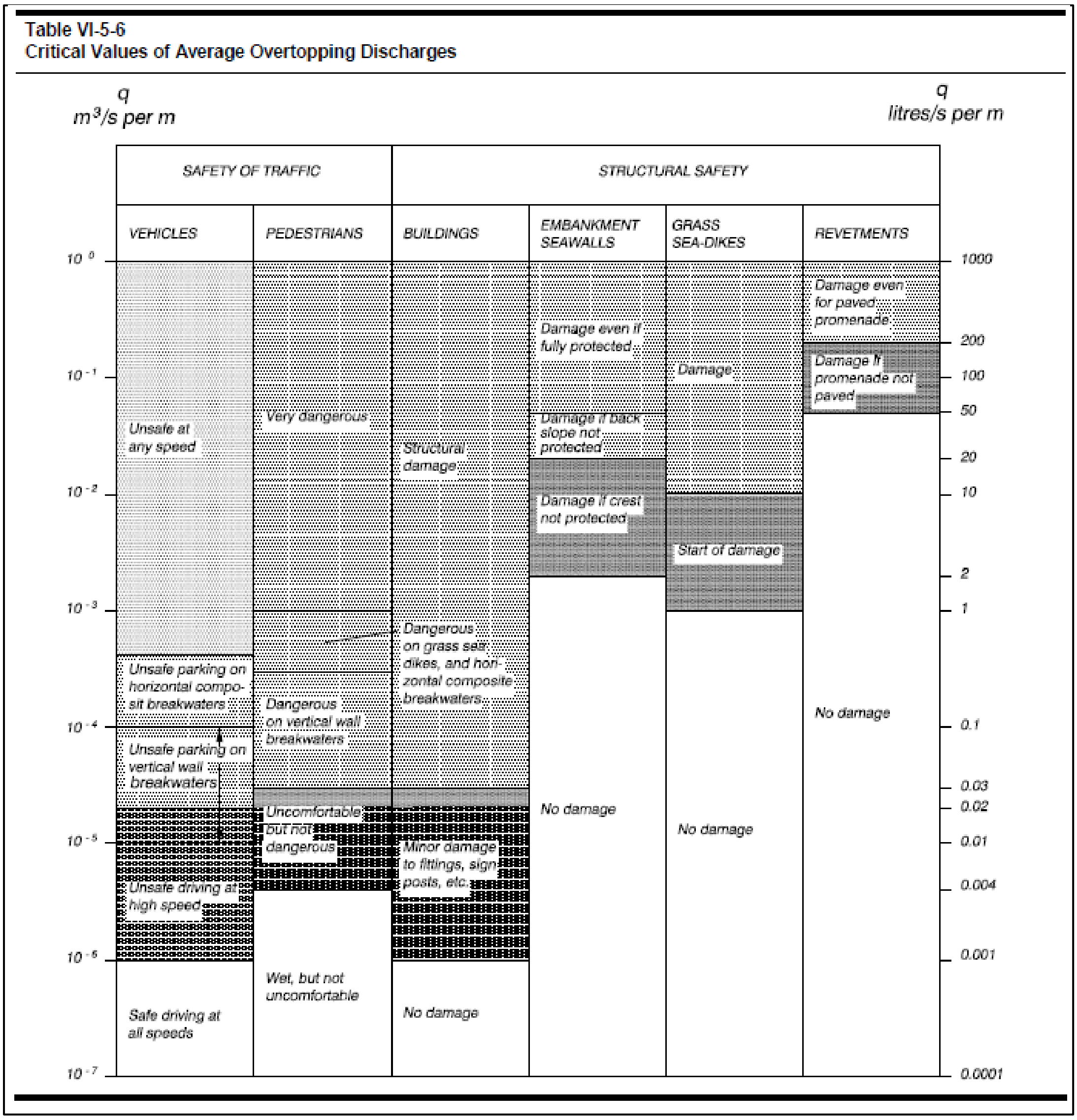


Table 17. CEM stipulated overtopping rates for various structures.

Structure	Range of average *q* (cms/m)	Damage Condition
Embankment Seawall	0.02 – 0.05	Damage if back slope not protected
	0.002 – 0.02	Damage if crest is not protected
Buildings	0.000001 – 0.00002	Minor damage to fittings, sign posts, etc.

Table 18. Synthesized NOCE of project islands.

RBE (maMSL)	Required Minimum Wall Height (m)		
	q=0.02 cms/m	*q*=0.002 cms/m	*q*=0.000001 cms/m
3.0	1.515	2.418	4.988
3.5	1.222	2.136	4.725
4.0	0.921	1.847	4.456

TSUNAMI HAZARD

Introduction

Coastal sites are exposed to hazards associated with extraordinary events in the oceans, such as tsunamis, especially for a seismically active and archipelagic country like the Philippines. Tsunamis are surface water waves generated by the displacements of the ocean floor and are characterized by a long wave period, or the time for two successive wave crests to pass a fixed location. Tsunami periods can be of the order of 5 minutes to 1 hour, depending on the nature, location, and characteristic magnitude of the generating source.

Compared with the usual sea waves, tsunamis have long wavelengths, typically of the order of several kilometers in the deep oceans, and a few kilometers in the coastal area. Such long wavelength is one cause of concern for the potential damage that can be brought onto the coastal area by a tsunami. Since tsunamis have low wave steepness (ratio of the wave height to the wavelength), they propagate to the shore largely without breaking.

Wave breaking is a physical process that naturally dissipates much of the energy of incoming waves. Without breaking, tsunami energy can only be damped, usually insignificantly, by seabed friction. In addition, being long-period waves, tsunamis exert much higher dynamic pressures on solid surfaces they impinge, compared to the usual surface waves of the same height. These two prominent characteristics of tsunamis are the bases for the potentially catastrophic damage associated with their incursion into the coastal area.

Tsunami Susceptibility of the Project Area

The project site lies along a coastline that has been classified by PHIVOLCS (Philippine Institute of Volcanology and Seismology) as prone to trench related local tsunamis (Figure 87). The site's location in Manila Bay is proximate to the Valley Fault System, a known seismic generator which runs from Bulacan all the way to Laguna and is located about 9 km east of the project area. Moreover, the project site is about 190 kilometers away from Manila Trench (Figure 88), which has several earthquake-triggered tsunami occurrences associated with it and can generate a M8.3 earthquake. The site thus lies in a water body that is susceptible to tsunami events.

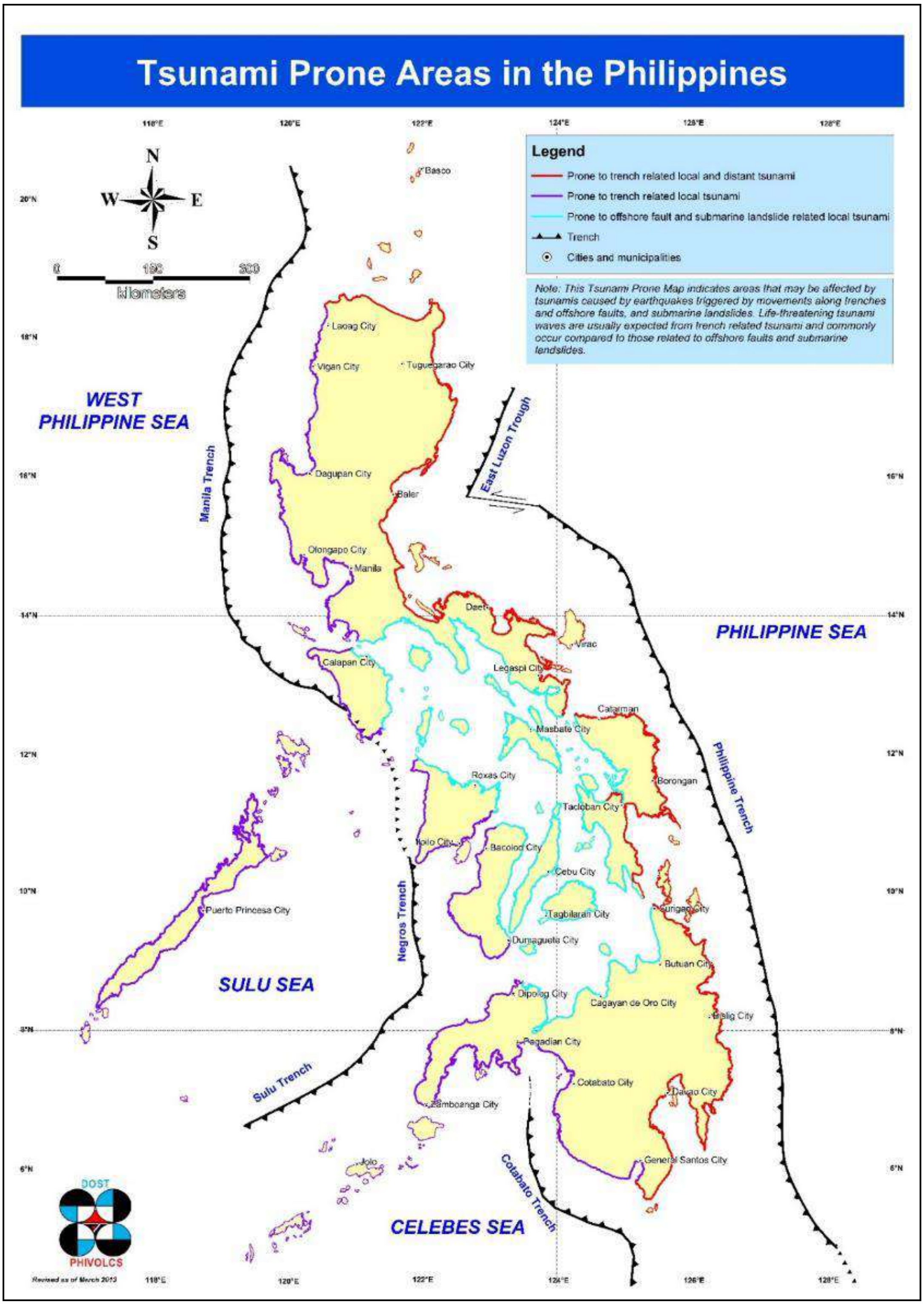


Figure 87. Tsunami Prone Areas Map (Source: PHILVOLCS)

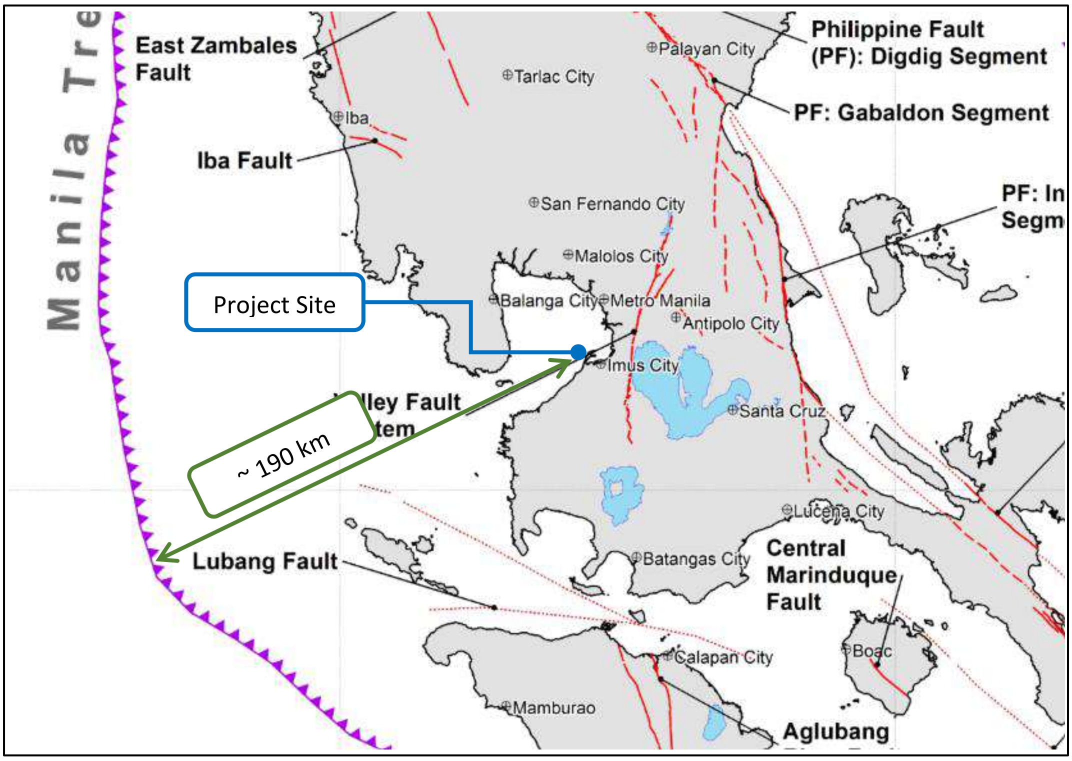


Figure 88. Active faults and trenches in the Philippines (Source: PHILVOLCS)

Historical Tsunami Data

The project site lies along the coastline of Manila Bay which is near sources of tsunamigenic earthquakes recorded by National Center of Environmental Information (NCEI, formerly NGDC, National Geophysical Data Center) of the United States National Oceanic and Atmospheric Administration (see References). A local search in the center's database returned 11 tsunami events near the project area as shown in Figure 89. A parallel search for tsunami-induced runup observations returned thirty-one (31) data as shown in Figure 90.

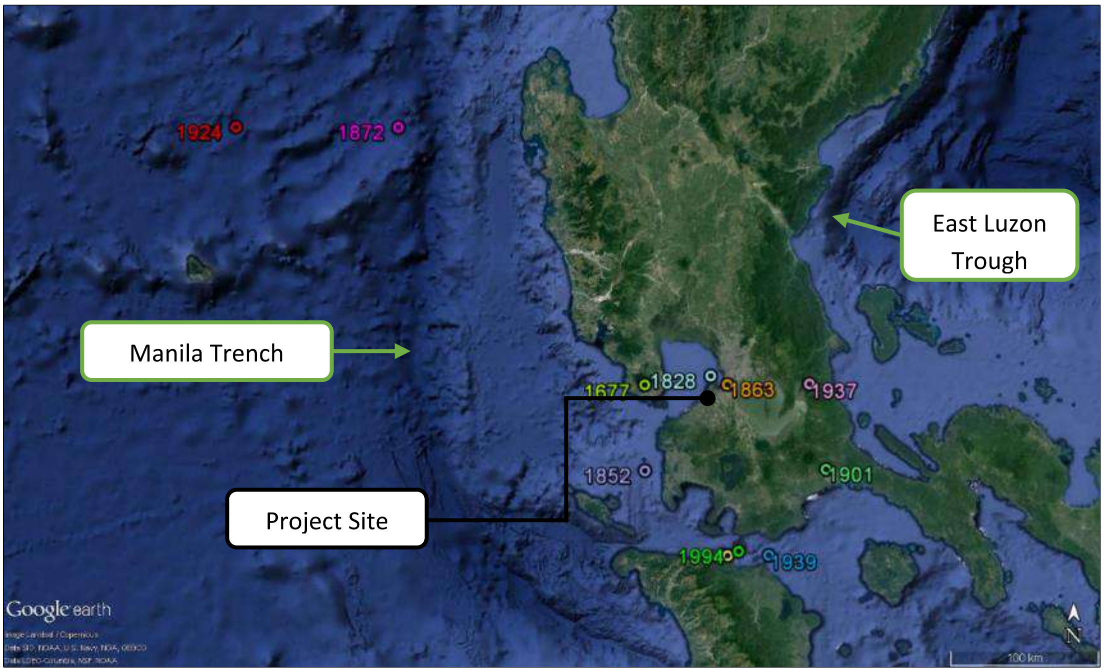


Figure 89. Nearby historical tsunamigenic events (NCEI - NOAA)

The six (6) potentially critical tsunamigenic events are summarized in Table 19. These events were attributed to seismic events that generated earthquake magnitudes of at least 6.0. Though these events are temporally far apart (with the earliest record dating as far back as 1677), there is no indication that the sources of the seismic activity has become inactive, as exemplified in the more recent 1994 event that triggered numerous tsunami runup observations in neighboring coastlines.

Table 19. Historical tsunamis (Source: NOAA-NCEI)

Year	EQ Magnitude	Focal Depth (m)	Tsunami Event			Max Water Height	# of Runup Data
			Location	Latitude	Longitude		
1828	7.5	-	W. Luzon Island	14.55	120.50	-	1
1852	7.5	-	W. Luzon Island	14.00	120.50	-	1
1872	6.0	-	W. Luzon Island	16.00	119.00	-	1
1889	6.8	-	Mindoro Island	13.50	121.00	-	1
1924	6.5	33	W. Luzon Island	16.00	118.0	-	1
1994	7.1	32	Philippine Islands	13.53	121.07	7.3	24

Figure 90. Tsunami-induced runup observations (NCEI-NOAA)

For the same area of search, the NCEI database returned thirty one (31) observations of tsunami runup heights, but almost all the runup data were associated with the 1994 tsunami event that resulted in numerous fatalities. The 1828 and 1852 tsunamis have higher magnitude compared to the 1994 tsunami, however, no runup values are recorded for the said events. Table 20 shows the runup locations and observed runup heights for the corresponding tsunamigenic events listed in Table 19. It should be noted that the runup elevation is based on various sources such as field survey, printed media, or published papers; some tsunami runup events thus may not have data.

Table 20. Location of Runup Points (NCEI - NOAA)

Year	Latitude	Longitude	Location	Coastal Distance (m)	MTL Elevation (m)	Runup Elevation (m)
1828	14.55	121.00	Pasig River, Manila Bay	2,047	10	-
1852	14.55	121.00	Pasig River, Manila Bay	2,047	10	-
1872	16.12	119.80	Agno, Pangasinan	2,420	10	-
1889	14.60	10.98	Manila	2,346	17	0.1
1924	16.12	119.80	Agno, Pangasinan	2,420		-
1994	13.75	121.04	Batangas Port	160	5	1.25
	13.41	121.12	Baco	90	7	1.46
	13.63	121.22	Lagadlarin	10	3	3.37
	13.63	121.21	Lagadlarin	100	7	3.63
	13.41	121.12	Baco	100	7	3.57
	13.23	121.09	Verde Island	20,500		2.81
	13.41	121.14	Pampisan	30	7	2.17
	13.41	121.13	Pampisan	100	7	2.99
	13.55	121.09	Verde Island	70	41	3.55
	13.47	121.16	Baco Island	110	30	6.14
	13.41	121.05	Wawa Island	130	51	3.51
	13.41	121.05	Wawa Island	11	16	3.82
	13.43	121.19	Calapan	15	6	2.74
	13.44	121.02	San Teodoro	110	8	3.87
	13.42	121.18	Calapan	8	5	3.14
	13.41	121.18	Calapan	65	5	2.41
	13.45	121.00	Villaflor	30	8	2.9
	13.41	121.14	Wawa	15	5	2.07
	13.41	121.14	Wawa	10	5	2.59
	13.40	121.14	Wawa	1240	10	3.23
	13.41	121.14	Baruyan	370	4	2.77
	13.41	121.15	Charico	5	9	1.97
	13.41	121.16	Charico	55	6	2.36
	13.42	121.16	Balete	65	12	2.39
	12.33	121.08	San Jose	380	4	0.01
	13.63	121.20	Lobo	110	6	2.68

LONGSHORE SEDIMENT TRANSPORT

Introduction

Knowledge of the movement and transport of sediments along the project coasts is important in assessing the long-term stability of beach coastlines. In particular, the direction of the net transport of sediments is important in the planning of permanent coastal infrastructures, such as reclamations. Knowledge of longshore movement of littoral drift is also important in determining maintenance schedule and inspection of reclamation structures such as bulkheads, revetment and/or seawalls.

The region within which littoral drift is most actively entrained and transported is the surf zone, which spans from the wave breaking point to the swash zone in a beach coast. The main driver of littoral drift within the surf zone is the longshore currents generated by the wave breaking process. Currents from channel flow carrying surface runoff from inland usually cause additional influx of sediments and transport driving forces, but they are usually limited to a region around the outfall in the bay or sea.

The littoral zone is that swath of the coast where sediment materials are transported by waves and currents. The transported material, called littoral drift, affects the vertical profile and plan forms of the coast, causing deposition in certain reaches and erosion in others. The longshore volumetric transport rate Q is the rate (in units of volume/time) at which littoral drift is moved parallel to the shoreline. If one looks out to the sea from land, the longshore transport rate to the right is denoted by Q+, considered positive, and the rate to the left by Q- which is considered negative. The algebraic sum of Q+ and Q-, or the net longshore transport rate Qn, can be positive or negative, and indicates the direction and magnitude of longshore transport. The total or gross transport rate Qt is the sum of the magnitudes of the right and left transport rates.

The total transport rate is normally used to predict the rates of shoaling or accumulation of littoral drift in sea inlets that are not controlled, e.g. without engineered entrances. It also serves as an upper limit to the magnitudes of the other transport rates. The net transport rate is used in determining the occurrence of beach erosion along an open coast, and in the design of engineered or protected inlets. For the Century Peak Corporation (CPC) reclamation coast, the actual rates of both directional and total transport rates are affected by the sediment influx of the outfalls of different waterways, which should be assessed and quantified in longshore sediment transport model to provide a more realistic and seasonal variation of sediment movement along the project coast.

The directional transport rates Q+ and Q- are applied in the design of jetties (defined here as inlet stabilization structures, not as piers) and impoundment basins at the lee of weir jetties (USACE, 2005). As reference values, gross transport rates typically fall within 100 to 250 mcm/yr (million cubic meters per year) for open coasts in the United States (CERC, 1984).

Longshore Sediment Transport Rates along the Project Coast

Following the methodology of CERC (1984), which is widely applied in U.S. beach coasts, an analysis of the longshore transport rates along the CPC reclamation coast was undertaken and the results reported herein. The methodology requires input of the following data:

Beach morphology based on the mean shoreline;
Distributions of deepwater wave heights Ho with offshore approach directions; and
Annual occurrence frequencies of Ho.

The methodology is based on the application of the wave energy flux in conjunction with shallow-water breaking criterion (also called breaker index) for the transformation of waves in the breaking zones. It is implicitly assumed in the methodology that the surf zone has a monotonic seabed profile such that breaking continues to the coastline once initiated.

For the project coast, since measured wave heights are not available, they were determined from the surface wind data and the effective wave fetches reckoned from the deepwater depth contour using fetch-limited and wind speed-limited hindcasting formulas (CERC, 1984).

Due to the long and complicated shoreline at the project coast, fifty-eight (58) stations of varying tributary lengths are considered in the analysis, as annotated in Figure 91 to Figure 94 with the directions of the shore-normals. For ease of discussion, the stations will be subdivided into three groups: northern stations composed of Sta. 01 – Sta. 18, middle stations composed of Sta. 19 – Sta. 36, and the western stations composed of Sta. 37 – Sta. 58. The longshore sediment transport rates at these stations are computed under two conditions, the baseline and the modified condition, to assess the possible effects of the development to the transport of sediments.

For the baseline or existing condition, Table 21 summarizes the computed directional transport rates Q+ and Q-, net longshore transport rate Qn, and total longshore transport rate Qt, all in units of tcm/yr (thousand cubic meters per year). It is seen that for the northern stations the Q+ values are generally moderate ranging from 5 to 27 tcm/yr, the Q- values are generally lower ranging from 3 to 19 tcm/yr, resulting to a generally positive Qn values of 1 to 19 tcm/yr, and Qt in 9 to 41 tcm/yr. For the middle stations, the directional, net, and gross transport rates are generally low ranging from -2 to 5 tcm/yr. Furthermore, for the western stations Q+ values are generally high ranging from 8 to 62 tcm/yr, Q- values are moderate ranging from 2 to 13 tcm/yr, resulting to high positive Qn values of 2 to 50 tcm/yr, and an even higher Qt of 11 to 74 tcm/yr. The high transport rates along western stations can be attributed to higher effective wave fetches than the stations located inside the Manila Bay and Bacoor Bay.

The computed net transport rates for the baseline condition are plotted graphically and approximately to scale at the stations in Figure 91. It is seen that the net transport rates for the northern stations are generally directed to the north with the direction changing at Sta. 17. For the middle stations, the net transport rates are low and the direction greatly varies because of the complicated shoreline. However, for the western stations, the net transport rates are high and all directed to the north and east.

Table 22 summarizes the annual transport rates under modified condition, which considers the future reclamations along the project coast. For the northern stations fronted by future reclamations sites (Sta. 3 to Sta. 8), the transport rates decreased greatly to less than 1 tcm/year. It is seen that for the rest of the northern stations, Q+ rates and Q- rates both decreased significantly, now ranging from 0 to 7 tcm/year and 0 to 12 tcm/year, respectively. This results to a reversal of net transport direction to some of the northern stations, where Qn rates are from -4 to 3 tcm/yr, and the total transport rates are from 0 to 17 tcm/yr. For the middle stations, the modified condition resulted to directional, net, and gross transport rates all now ranging from -2 to 5 tcm/yr. Furthermore, for the western stations, only the transport rates at Sta. 37 to Sta. 40 are affected by the development; the transport rates for the rest of the western stations remain unchanged from the baseline condition. The Q+ rates of Sta. 37 to Sta. 40 are relatively unchanged ranging from 8 to 17 tcm/yr, while the Q- rates decreased to 1 to 6 tcm/year. This results to higher Qn values ranging from 5 to 11 tcm/yr but similar Qt rates from 9 to 23 tcm/yr. Figure 92 and Figure 94 graphically plot the transport rates at the 58 stations.

Table 21. Annual longshore sediment transport rates – Baseline Condition

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
(deg, from N)		m	(1000m3 / yr)	(1000m3 / yr)	(1000m3 / yr)	(1000m3 / yr)
246	1	1000	19.09	15.68	3.41	34.78
246	2	1000	21.53	19.61	1.92	41.14
330	3	1000	10.52	0.48	10.04	11.00
255	4	1000	23.28	12.51	10.78	35.79
255	5	1000	19.46	12.90	6.57	32.36
269	6	1000	18.35	8.25	10.10	26.60
269	7	1000	27.48	8.87	18.61	36.35
269	8	1000	8.30	7.39	0.90	15.69
297	9	875	12.22	7.41	4.81	19.63
199	10	875	0.29	8.19	-7.90	8.49
349	11	875	5.25	0.33	4.92	5.59
278	12	750	5.52	6.30	-0.78	11.82
354	13	750	7.38	0.99	6.39	8.38
302	14	1125	8.80	7.80	1.00	16.61
325	15	1200	5.76	5.61	0.15	11.38
345	16	1000	5.65	3.39	2.26	9.04
339	17	1050	3.90	5.24	-1.33	9.14
345	18	1000	4.38	4.69	-0.32	9.07
346	19	1125	1.81	3.51	-1.70	5.32
37	20	1125	3.50	0.89	2.61	4.39
47	21	1250	2.39	1.98	0.41	4.37
272	22	1500	0.78	0.37	0.42	1.15
342	23	1375	0.53	0.34	0.19	0.87
330	24	1375	0.39	1.24	-0.85	1.63
31	25	1500	0.95	0.64	0.31	1.59
66	26	1500	0.48	1.80	-1.33	2.28
103	27	1500	0.96	1.14	-0.19	2.10
139	28	1250	4.14	0.15	4.00	4.29
130	29	1250	3.30	0.58	2.72	3.88
92	30	1500	0.18	2.32	-2.14	2.50
157	31	1250	1.56	0.91	0.65	2.47
237	32	1000	0.59	0.13	0.46	0.72
2	33	1250	0.22	0.92	-0.70	1.14
127	34	1500	2.83	0.10	2.73	2.93

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
163	35	1125	4.01	0.28	3.73	4.29
108	36	750	2.35	1.97	0.37	4.32
2	37	750	8.32	2.36	5.96	10.68
338	38	750	8.91	7.03	1.88	15.94
338	39	750	16.39	7.35	9.04	23.74
336	40	750	17.83	7.95	9.87	25.78
285	41	875	47.20	9.56	37.64	56.76
304	42	1000	39.12	10.40	28.71	49.52
283	43	1000	47.77	9.55	38.22	57.32
304	44	1000	41.58	11.27	30.31	52.84
282	45	1000	47.29	9.67	37.62	56.96
287	46	1000	43.08	10.30	32.78	53.38
293	47	1000	51.92	11.04	40.88	62.96
317	48	1000	34.98	11.15	23.83	46.13
0	49	1000	9.09	2.70	6.39	11.78
313	50	1000	39.68	12.39	27.29	52.07
282	51	1000	42.00	10.07	31.93	52.07
295	52	1000	61.71	12.11	49.60	73.82
308	53	1000	59.29	12.18	47.11	71.48
329	54	1000	24.55	10.81	13.74	35.36
310	55	1000	47.24	13.00	34.25	60.24
314	56	1000	37.32	13.05	24.26	50.37
322	57	1000	29.71	12.61	17.09	42.32
348	58	1000	14.08	7.22	6.86	21.30

Table 22. Annual longshore sediment transport rates – Modified Condition

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
(deg, from N)		m	(1000m3 / yr)	(1000m3 / yr)	(1000m3 / yr)	(1000m3 / yr)
246	1	1000	1.87	4.74	-2.87	6.61
246	2	1000	6.64	10.51	-3.87	17.16
330	3	1000	0.17	0.24	-0.07	0.41
255	4	1000	0.05	0.05	0.01	0.10
255	5	1000	0.70	0.38	0.32	1.08
269	6	1000	0.13	0.04	0.09	0.17

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
269	7	1000	0.12	0.05	0.07	0.16
269	8	1000	0.37	0.07	0.30	0.44
297	9	875	0.77	0.10	0.67	0.87
199	10	875	0.29	2.04	-1.76	2.33
349	11	875	0.22	0.03	0.20	0.25
278	12	750	1.76	0.35	1.41	2.11
354	13	750	1.00	0.10	0.89	1.10
302	14	1125	3.50	1.02	2.48	4.52
325	15	1200	4.05	1.05	3.00	5.10
345	16	1000	3.67	1.05	2.61	4.72
339	17	1050	2.50	1.81	0.69	4.30
345	18	1000	1.95	1.86	0.09	3.81
346	19	1125	1.38	1.65	-0.26	3.03
37	20	1125	1.81	0.76	1.05	2.57
47	21	1250	1.02	1.84	-0.81	2.86
272	22	1500	0.78	0.37	0.42	1.15
342	23	1375	0.53	0.34	0.19	0.87
330	24	1375	0.39	1.24	-0.85	1.63
31	25	1500	0.95	0.64	0.31	1.59
66	26	1500	0.48	1.80	-1.33	2.28
103	27	1500	0.96	1.14	-0.19	2.10
139	28	1250	4.14	0.15	4.00	4.29
130	29	1250	3.30	0.58	2.72	3.88
92	30	1500	0.18	2.32	-2.14	2.50
157	31	1250	1.56	0.91	0.65	2.47
237	32	1000	0.54	0.11	0.43	0.65
2	33	1250	0.18	0.45	-0.27	0.62
127	34	1500	2.36	0.10	2.26	2.46
163	35	1125	4.01	0.28	3.73	4.29
108	36	750	1.26	1.81	-0.55	3.06
2	37	750	7.95	1.28	6.68	9.23
338	38	750	11.46	5.64	5.81	17.10
338	39	750	16.38	6.14	10.24	22.52
336	40	750	15.10	7.48	7.63	22.58
285	41	875	47.20	9.56	37.64	56.76

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
304	42	1000	39.12	10.40	28.71	49.52
283	43	1000	47.77	9.55	38.22	57.32
304	44	1000	41.58	11.27	30.31	52.84
282	45	1000	47.29	9.67	37.62	56.96
287	46	1000	43.08	10.30	32.78	53.38
293	47	1000	51.92	11.04	40.88	62.96
317	48	1000	34.98	11.15	23.83	46.13
0	49	1000	9.09	2.70	6.39	11.78
313	50	1000	39.68	12.39	27.29	52.07
282	51	1000	42.00	10.07	31.93	52.07
295	52	1000	61.71	12.11	49.60	73.82
308	53	1000	59.29	12.18	47.11	71.48
329	54	1000	24.55	10.81	13.74	35.36
310	55	1000	47.24	13.00	34.25	60.24
314	56	1000	37.32	13.05	24.26	50.37
322	57	1000	29.71	12.61	17.09	42.32
348	58	1000	14.08	7.22	6.86	21.30

In order to see the local changes of the rates, Table 23 summarizes the variations of the rates at the 58 stations, i.e. MC rates – BC rates. . It can be observed that for most of the northern and middle stations, the modified condition resulted to a decrease in directional, net, and gross transport rates (i.e. negative ΔQn), while for most of the western stations, the transport rates remain unchanged.

Table 23. Differences of Transport Rates (Modified Condition-Baseline Condition)

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
(deg, from N)		m	(1000m3 / yr)	(1000m3 / yr)	(1000m3 / yr)	(1000m3 / yr)
246	1	1000	-17.22	-10.94	-6.27	-28.16
246	2	1000	-14.89	-9.10	-5.79	-23.99
330	3	1000	-10.35	-0.24	-10.11	-10.59
255	4	1000	-23.23	-12.46	-10.77	-35.69
255	5	1000	-18.77	-12.52	-6.25	-31.28
269	6	1000	-18.22	-8.21	-10.01	-26.43
269	7	1000	-27.36	-8.82	-18.54	-36.19
269	8	1000	-7.93	-7.33	-0.60	-15.25
297	9	875	-11.45	-7.31	-4.15	-18.76
199	10	875	0.00	-6.15	6.15	-6.15

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
349	11	875	-5.03	-0.31	-4.72	-5.34
278	12	750	-3.76	-5.95	2.20	-9.71
354	13	750	-6.39	-0.89	-5.50	-7.28
302	14	1125	-5.31	-6.78	1.48	-12.09
325	15	1200	-1.71	-4.57	2.85	-6.28
345	16	1000	-1.98	-2.34	0.36	-4.32
339	17	1050	-1.41	-3.43	2.03	-4.84
345	18	1000	-2.43	-2.84	0.41	-5.26
346	19	1125	-0.43	-1.87	1.44	-2.30
37	20	1125	-1.69	-0.13	-1.57	-1.82
47	21	1250	-1.36	-0.14	-1.22	-1.51
272	22	1500	0.00	0.00	0.00	0.00
342	23	1375	0.00	0.00	0.00	0.00
330	24	1375	0.00	0.00	0.00	0.00
31	25	1500	0.00	0.00	0.00	0.00
66	26	1500	0.00	0.00	0.00	0.00
103	27	1500	0.00	0.00	0.00	0.00
139	28	1250	0.00	0.00	0.00	0.00
130	29	1250	0.00	0.00	0.00	0.00
92	30	1500	0.00	0.00	0.00	0.00
157	31	1250	0.00	0.00	0.00	0.00
237	32	1000	-0.05	-0.03	-0.02	-0.08
2	33	1250	-0.05	-0.47	0.42	-0.52
127	34	1500	-0.47	0.00	-0.47	-0.47
163	35	1125	0.00	0.00	0.00	0.00
108	36	750	-1.09	-0.17	-0.92	-1.26
2	37	750	-0.36	-1.08	0.72	-1.44
338	38	750	2.55	-1.39	3.94	1.16
338	39	750	-0.01	-1.21	1.20	-1.22
336	40	750	-2.73	-0.48	-2.25	-3.21
285	41	875	0.00	0.00	0.00	0.00
304	42	1000	0.00	0.00	0.00	0.00
283	43	1000	0.00	0.00	0.00	0.00
304	44	1000	0.00	0.00	0.00	0.00
282	45	1000	0.00	0.00	0.00	0.00

Shore-normal	Station ID	Tributary length	Q+ (to right)	Q- (to left)	Qn (net)	Qt (gross)
287	46	1000	0.00	0.00	0.00	0.00
293	47	1000	0.00	0.00	0.00	0.00
317	48	1000	0.00	0.00	0.00	0.00
0	49	1000	0.00	0.00	0.00	0.00
313	50	1000	0.00	0.00	0.00	0.00
282	51	1000	0.00	0.00	0.00	0.00
295	52	1000	0.00	0.00	0.00	0.00
308	53	1000	0.00	0.00	0.00	0.00
329	54	1000	0.00	0.00	0.00	0.00
310	55	1000	0.00	0.00	0.00	0.00
314	56	1000	0.00	0.00	0.00	0.00
322	57	1000	0.00	0.00	0.00	0.00
348	58	1000	0.00	0.00	0.00	0.00

Figure 91. Directions and magnitudes of annual net longshore transport Qn for Baseline Condition

Figure 92. Directions and magnitudes of annual net longshore transport Qn for Modified Conditions

Figure 93 and Figure 94 graphically show the total transport rates Qt at all stations under Baseline and Modified Conditions. It is clear that Qt decreases at the locations where the shoreline is fronted by the proposed reclamation, i.e. parts of the northern stations and middle stations.

Figure 93. Directions and magnitudes of annual gross longshore transport Qt for Baseline Condition

Figure 94. Directions and magnitudes of annual gross longshore transport Qt for Modified Conditions

FINDINGS AND RECOMMENDATIONS

Effects on Prevailing Waves

Comparing the prevailing wave climate results under the pre-development and post-development scenarios, it can be seen that the waves are relatively calm, with wave heights below 0.9 m in the vicinity of the CPC reclamation. The reclamation islands generally induced lower wave heights in its vicinity, which may be attributed to a significant amount of wave energy being blocked by the islands. In some of these cases, the calm wave climate may cause potential water stagnation issues, especially on the areas in between the reclamation islands.

Effects on Storm Surge

Storm tide levels of 3 potentially critical typhoons, Rita, Patsy and Xangsane, were simulated at the vicinity of the project site. The effects of the reclamation to the storm tide levels vary.

Typhoon Rita caused storm tide levels of roughly 1.2 m – 1.3 m at the Islands, which did not increase significantly for the post-development scenario. Typhoon Patsy caused storm tide levels of roughly 1.0 m for all islands and the reclamation resulted to a marginal reduction in storm tide levels within the Manila South Harbor. Lastly, typhoon Xangsane resulted in the lowest storm tide levels at roughly 0.8 m for all islands and the reclamations did not change the result significantly.

Effects on Storm Wave

Simulative analyses of storm waves generated by 3 historical typhoons were carried out. The storm wave heights induced by these typhoons ranges from 0.0 m to 4.0 m at the harbor and along the coastline. For all three typhoons, it can be seen that the proposed reclamation islands in the post-development scenarios will provide a sheltering effect on all shorelines leeward of the reclamations.

Required Reclamation Crest Elevation

The structure crest elevation which is not overtopped by typhoon waves depends highly on the design of the reclamation wall structure in terms of seaward slope, hydraulic roughness, profile, and armor unit type and geometry. For a 1:2 embankment slope with rock armor, the critical non-overtopping crest elevation obtained is 6.99 m based on Typhoon Rita. With the obtained required elevation not viable, wave overtopping is to be expected for lower design crest elevations, and thus a slope with seawall on top was considered. Setting the FGL at 3 m to 4 m and wall heights of 1 to 1.5 m, the obtained wave overtopping discharge ranges from 0.005 to 0.066 $m^3/s/m$. With these obtained values, it is recommended to protect the embankment crest based from the critical values of overtopping discharges from the Coastal Engineering Manual.

Possible Combinations of Reclamation Backfill Elevation and Embankment Seawall Height

To satisfy CEM code requirements specifying damage condition for a protective coastal structure such as an embankment seawall, combinations of minimum seawall height and RBE (reclamation backfill elevation, or height of fill above MSL) were computed to meet the maximum wave overtopping discharge for the damage condition (Table 18). For example, in order not to damage the embankment seawall assuming no additional protection of the crest, the required minimum height is +1.85 m for a RBE of +4.0 m.

Effects on Tidal Currents

In the post-development scenario, various changes in the maximum tidal-induced currents were noted, including a decrease of current speed north of the reclamation projects, localized increases in speed between the islands and Sangley Spit, and an increase in speed at the gaps between the CPC island and Pasay 360.

Effects on Tidal Circulation

The tidal currents modified by the post-development scenario will still allow circulation of seawaters within the partially enclosed zone (zone B). However, the close proximity of the project island to the other (future) reclaimed lands to its east and north will impede the currents through the constricted waterways and likely promote stagnated channel waters.

Effects on Longshore Sediment Transport

In the pre-development condition, the net transport rates at the coast are generally positive, ranging from 3 to 19 tcm/yr for northern stations, -2 to 5 tcm/yr for the middle stations and higher values of 2 to 50 tcm/yr for western stations. This indicates that the sediment transport is generally directed to the right. The gross transport rates follows the same trend, with low rates for the middle stations and higher values for western stations. For the post development condition, it can be observed that for most of the northern and middle stations, the modified condition resulted to a decrease in directional, net, and gross transport rates (i.e. negative ΔQ_n), while for most of the western stations, the transport rates remain unchanged.

Effects on Tsunami

The site lies in a water body that is susceptible to tsunami events. There have been nearby tsunamigenic events in the coastline in the vicinity of the project. These events triggered runup observations in nearby coastlines, with recorded tsunami runup values, mostly from the 1994 tsunami event, that went as high as 6.14 m. These tsunami heights shall be considered in the design of the crest height of the coastal structure.

REFERENCES

AMH Philippines, Inc. (2015) Coastal Sediment Transport Analysis Report, Godofredo R. Ramos Airport Coastal Study.

Coastal Engineering Research Center (CERC, 1984) Shore Protection Manual, Volumes I and II, U.S. Government Printing Office

Cruz, E.C. (2003). Combined simulation and visualization system for coastal structure-wave interaction. Proceedings, 4th Joint Symposium on Information Technology in Civil Engineering, ASCE, Nashville, Tennessee, U.S.A., 1-14

Cruz, E.C. (2007) Wave climate studies in coastal harbors. Proceedings, 33rd Phil. Inst. Civil Engineers National Convention, Mandaue City, Cebu, 27-29 Nov 2007, WRE 1-10.

Digital Typhoon: Typhoon Images and Information. (2001-2011) Kitamoto Asanobu/National Institute of Informatic (NII). http://agora.ex.nii.ac.jp/~kitamoto/.

EurOtop (2016). Manual on wave overtopping of sea defences and related structures. An overtopping manual largely based on European research, but for worldwide application. www.overtopping-manual.com

Google TM Earth software. Version 7.1.1.1888. http://earthgoogle.com

Iida, K. (1963): On the heights of tsunamis associated with distant and near earthquakes. Proceedings of the Tsunami Meetings Associated with the Tenth Pacific Science Congress, IUGG, Monograph No. 24, 105-123.

Iida, K. (1970): The generation of tsunamis and the focal mechanisms of earthquakes, Tsunamis in the Pacific Ocean, Ch. 1, East-West Center Press, Honolulu, Hawaii, 3-18.

NGDC/WDS Global Historical Tsunami Database. National Centers for Environmental Information. https://www.ngdc.noaa.gov/hazard/tsu_db.shtml. United States National Oceanic and Atmospheric Administration (NOAA). Date accessed April, 2017

Shore Protection Manual, Second Edition (SPM, 1984) Volumes I and II. United States Army Corps of Engineers.

Tide and Current Tables – Philippines. National Mapping and Resource Information Authority (NAMRIA), 2014

United States Army Corps of Engineers (USACE, 2005) Coastal Engineering Manual.

Cruz, E.C. and J.C.E.L. Santos (2018). Numerical analysis of nearshore seawater circulation around a protected beach zone. Proceedings, 8th Regional Symposium on Infrastructure Development in Civil Engineering, October 2018, Quezon City, Philippines.

Department of Public Works and Highways (DPWH, 2015). Design Guidelines, Criteria and Standards.

ANNEX 2.2-B

CRL Environmental Corporation

04 October 2017

Technotrix Consultancy Services, Inc.
305, FMSG Bldg., cor. 3rd St., Brgy. Mariana, Balete Dr.
New Manila, Quezon City

ATTN: **Dr. Edgardo G. Alabastro**

Project Name: PARAÑAQUE RECLAMATION PROJECT
Lab. Nos.: P00073566-01/07

Enclosed are the results for samples received by CRL Environmental Corporation and tested for the parameters in the enclosed chain of custody.

Our DENR Recognition with C. R. No. 023/2015, will expire on June 01, 2018.

Likewise, our DOH Accreditation with Accreditation No. 03-001-17-LW-2, is valid from January 01, 2017 until December 31, 2019.

Please note that any unused portion of the sample/s will be discarded 30 days after the date of this report, unless you have requested otherwise.

Thank you for the opportunity to service the needs of your company. Please feel free to call us at (045) 599-3943 or (02) 552-5100 if we can be of further service to you.

Very truly yours,

MARIA CARMELA Q. CAPULE
Chief Operating Officer

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Wet Chemistry-						
Hexavalent Chromium**	< 0.003	mg/L	Diphenylcarbazide, Colorimetric Method (SM3500-Cr B)	08/04/17	WBD	

>>> end of result set for Sample No.:P00073566-03 <<<

Sample No.: P00073566-04
Sample ID: PRW 1
DateSampled: 08-02-17 16:20
Matrix: River Water

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Metals-						
Lead**	< 0.05	mg/L	Flame AAS	08/09/17	RDD	
Mercury	< 0.0002	mg/L	Manual Cold Vapor AAS	09/12/17	-	
-Microbiology-						
Total Coliforms**	920,000	MPN/100mL	Multiple Tube Fermentation Technique	08/04/17	GTY	
Fecal Coliforms**	920,000	MPN/100mL	Multiple Tube Fermentation Technique	08/04/17	GTY	
-Wet Chemistry-						
pH**, Laboratory @ 25.0ºC	7.9	-	Electrometric Method	08/04/17	LCM	
Dissolved Oxygen**	5.4	mg/L	Winkler/Titrimetric	08/04/17	LCM	
Biological Oxygen Demand**	9	mg/L	Azide Modification Winkler (SM 5210B)	08/04/17	MLJ	
Chemical Oxygen Demand**	19	mg/L	Open Reflux Method (SM5220B)	08/07/17	BKTB	
Total Suspended Solids**	133	mg/L	Gravimetry (SM2540 D)	08/04/17	VCZ	
Oil & Grease	0.5	mg/L	Gravimetry (n-Hexane Extraction)	08/06/17	SEZS	
Hexavalent Chromium**	< 0.003	mg/L	Diphenylcarbazide, Colorimetric Method (SM3500-Cr B)	08/04/17	WBD	

>>> end of result set for Sample No.:P00073566-04 <<<

Sample No.: P00073566-05
Sample ID: PRW 2
DateSampled: 08-02-17 16:20
Matrix: River Water

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Microbiology-						
Total Coliforms**	2,400,000	MPN/100mL	Multiple Tube Fermentation Technique	08/04/17	GTY	
Fecal Coliforms**	2,400,000	MPN/100mL	Multiple Tube Fermentation Technique	08/04/17	GTY	
-Wet Chemistry-						
pH**, Laboratory @ 24.9ºC	7.4	-	Electrometric Method	08/04/17	LCM	
Dissolved Oxygen**	< 2.0	mg/L	Winkler/Titrimetric	08/04/17	LCM	
Biological Oxygen Demand**	14	mg/L	Azide Modification Winkler (SM 5210B)	08/04/17	MLJ	
Chemical Oxygen Demand**	65	mg/L	Open Reflux Method (SM5220B)	08/07/17	BKTB	

>>> end of result set for Sample No.:P00073566-05 <<<

Sample No.: P00073566-06
Sample ID: PRW 3
DateSampled: 08-02-17 16:20
Matrix: River Water

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Metals-						
Lead**	< 0.05	mg/L	Flame AAS	08/09/17	RDD	
Mercury	< 0.0002	mg/L	Manual Cold Vapor AAS	09/12/17	-	
-Microbiology-						
Total Coliforms**	920,000	MPN/100mL	Multiple Tube Fermentation Technique	08/04/17	GTY	
Fecal Coliforms**	540,000	MPN/100mL	Multiple Tube Fermentation Technique	08/04/17	GTY	
-Wet Chemistry-						
pH**, Laboratory @ 25.0ºC	7.2	-	Electrometric Method	08/04/17	LCM	
Dissolved Oxygen**	2.2	mg/L	Winkler/Titrimetric	08/04/17	LCM	
Biological Oxygen Demand**	10	mg/L	Azide Modification Winkler (SM 5210B)	08/04/17	MLJ	
Chemical Oxygen Demand**	14	mg/L	Open Reflux Method (SM5220B)	08/08/17	BKTB	
Total Suspended Solids**	145	mg/L	Gravimetry (SM2540 D)	08/08/17	VCZ	
Oil & Grease	0.4	mg/L	Gravimetry (n-Hexane Extraction)	08/06/17	SEZS	
Hexavalent Chromium**	< 0.003	mg/L	Diphenylcarbazide, Colorimetric Method (SM3500-Cr B)	08/04/17	WBD	

>>> end of result set for Sample No.:P00073566-06 <<<

Sample No.: P00073566-07
Sample ID: PSW 4
DateSampled: 08-02-17 16:00
Matrix: Seawater

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Metals-						
Lead**	< 0.05	mg/L	Flame AAS	08/09/17	RDD	
Mercury	< 0.0002	mg/L	Manual Cold Vapor AAS	09/12/17	-	
-Microbiology-						
Total Coliforms**	350,000	MPN/100mL	Multiple Tube Fermentation Technique	08/04/17	GTY	

CRL Environmental Corporation

■ Sales Office: Unit 609 Cityland 10 Tower 1 * 6815 H.V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http://www.crllabs.com
■ Laboratory: Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park
Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

Certified by:

Geraldine T. Yabut
PRC License No.: 0027218
Microbiological Testing

Date: 10/04/17

Ronald G. Espiritu
PRC License No.: 9248
Chemical Testing

Date: 10/04/17

Juliana C. Oriña
PRC License No.: 8774
Chemical Testing

Date: 10/4/17

Chas C. Arroyo
PRC License No.: 6701
Chemical Testing

Date:

SN: F00044212.002

CRL Environmental Corporation

■ Sales Office: Unit 609 Cityland 10 Tower 1 * 6815 H.V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http://www.crllabs.com
■ Laboratory: Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park
Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

CRL Environmental Corporation

25 September 2018

Technotrix Consultancy Services, Inc.
305, FMSG Bldg., cor. 3rd St., Brgy. Mariana, Balete Dr.
New Manila, Quezon City

ATTN:	**Dr. Edgardo G. Alabastro**
Project Name:	PARAÑAQUE RECLAMATION PROJECT
Lab. Nos.:	P00075191-01/06

Enclosed are the results for samples received by CRL Environmental Corporation and tested for the parameters in the enclosed chain of custody.

Our DENR Recognition with C. R. No. 023/2015, which expired on June 01, 2018, has already been applied for renewal.

Likewise, our DOH Accreditation with Accreditation No. 03-001-17-LW-2, is valid from January 01, 2017 until December 31, 2019.

Please note that any unused portion of the sample/s will be discarded 15 days after the date of this report, unless you have requested otherwise.

Thank you for the opportunity to service the needs of your company. Please feel free to call us at (045) 599-3943 or (02) 552-5100 if we can be of further service to you.

Very truly yours,

MARIA CARMELA Q. CAPULE
Chief Operating Officer

■ **Sales Office:** Unit 609 Cityland 10 Tower 1 * 6815 H.V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http: www.crllabs.com
■ **Laboratory:** Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park, Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Wet Chemistry-						
Phosphate - P**	0.1	mg/L	Stannous Chloride Method (SM4500-P D)	10/07/17	RDD	

>>> end of result set for Sample No.:P00075191-03 <<<

Sample No.: P00075191-04 — **DateSampled: 10-05-17 17:00**
Sample ID: P4 — **Matrix: Surface Water**

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Metals-						
Cadmium	< 0.001	mg/L	ICP - OES	10/12/17	PPG	
Lead	< 0.005	mg/L	ICP - OES	10/12/17	PPG	
Arsenic	< 0.008	mg/L	ICP - OES	10/12/17	PPG	
-Microbiology-						
Fecal Coliforms**	13	MPN/100mL	Multiple Tube Fermentation Technique	10/07/17	GTY	
-Wet Chemistry-						
pH**, Laboratory @ 25.0°C	8.1	-	Electrometric Method	10/07/17	MLJ	
Color**	10	TCU	Visual Comparison	10/07/17	RDD	
Dissolved Oxygen**	10	mg/L	Winkler/Titrimetric	10/07/17	MLJ	
Total Suspended Solids**	50	mg/L	Gravimetry (SM2540 D)	10/09/17	VCZ	
Nitrate - N**	< 0.02	mg/L	Colorimetry - Brucine	10/09/17	ANBB	
Phosphate - P**	0.09	mg/L	Stannous Chloride Method (SM4500-P D)	10/07/17	RDD	

>>> end of result set for Sample No.:P00075191-04 <<<

Sample No.: P00075191-05 — **DateSampled: 10-05-17 17:00**
Sample ID: P5 — **Matrix: Surface Water**

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Metals-						
Cadmium	< 0.001	mg/L	ICP - OES	10/12/17	PPG	
Lead	< 0.005	mg/L	ICP - OES	10/12/17	PPG	
Arsenic	< 0.008	mg/L	ICP - OES	10/12/17	PPG	
-Microbiology-						
Fecal Coliforms**	<1.8	MPN/100mL	Multiple Tube Fermentation Technique	10/07/17	GTY	
-Wet Chemistry-						
pH**, Laboratory @ 24.9°C	7.9	-	Electrometric Method	10/07/17	MLJ	
Color**	10	TCU	Visual Comparison	10/07/17	RDD	
Dissolved Oxygen**	10	mg/L	Winkler/Titrimetric	10/07/17	MLJ	
Total Suspended Solids**	52	mg/L	Gravimetry (SM2540 D)	10/09/17	VCZ	
Nitrate - N**	0.02	mg/L	Colorimetry - Brucine	10/09/17	ANBB	
Phosphate - P**	0.09	mg/L	Stannous Chloride Method (SM4500-P D)	10/07/17	RDD	

>>> end of result set for Sample No.:P00075191-05 <<<

Sample No.: P00075191-06 — **DateSampled: 10-05-17 17:00**
Sample ID: P6 — **Matrix: Surface Water**

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
-Metals-						
Cadmium	< 0.001	mg/L	ICP - OES	10/12/17	PPG	
Lead	< 0.005	mg/L	ICP - OES	10/12/17	PPG	
Arsenic	< 0.008	mg/L	ICP - OES	10/12/17	PPG	
-Microbiology-						
Fecal Coliforms**	2.0	MPN/100mL	Multiple Tube Fermentation Technique	10/07/17	GTY	
-Wet Chemistry-						
pH**, Laboratory @ 25.0°C	8.1	-	Electrometric Method	10/07/17	MLJ	
Color**	8	TCU	Visual Comparison	10/07/17	RDD	
Dissolved Oxygen**	12	mg/L	Winkler/Titrimetric	10/07/17	MLJ	
Total Suspended Solids**	32	mg/L	Gravimetry (SM2540 D)	10/09/17	VCZ	
Nitrate - N**	0.04	mg/L	Colorimetry - Brucine	10/09/17	ANBB	
Phosphate - P**	0.07	mg/L	Stannous Chloride Method (SM4500-P D)	10/07/17	RDD	

>>> end of result set for Sample No.:P00075191-06 <<<

>>> end of result set for Lab No.:P00075191; Total no. of samples analyzed: 6 <<<

**PAB approved parameter/s

MPN = Most Probable Number

Results are reported "as received basis".

CRL Environmental Corporation

■ **Sales Office:** Unit 609 Cityland 10 Tower 1 * 6815 H.V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http: www.crllabs.com
■ **Laboratory:** Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park
Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

Certified by:

Geraldine T. Yabut
PRC License No.: 0027218
Microbiological Testing

Date: 09/27/18

Ronald C. Espiritu
PRC License No.: 9248
Chemical Testing

Date: 09/27/18

Juliana C. Oriña
PRC License No.: 8774
Chemical Testing

Date: 9/27/18

Chas C. Arroyo
PRC License No.: 6701
Chemical Testing

Date: 9/27/18

SN: F00045790.001

CRL Environmental Corporation
■ Sales Office: Unit 609 Cityland 10 Tower 1 * 6815 H.V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http://www.crllabs.com
■ Laboratory: Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park
Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

CRL Environmental Corporation

07 March 2019

Technotrix Consultancy Services, Inc.
305, FMSG Bldg., cor. 3rd St., Brgy. Mariana, Balete Dr.
New Manila, Quezon City

ATTN: **Dr. Edgardo G. Alabastro**

Project Name: PARAÑAQUE RECLAMATION PROJECT
Lab. Nos.: P00089387-01/06

Enclosed are the results for samples received by CRL Environmental Corporation and tested for the parameters in the enclosed chain of custody.

Our DENR Recognition with C. R. No. 023/2018, will expire on September 24, 2021.

Likewise, our DOH Accreditation with Accreditation No. 3-001-17-LW-2, is valid from January 01, 2017 until December 31, 2019.

Please note that any unused portion of the sample/s will be discarded 15 days after the date of this report, unless you have requested otherwise.

Thank you for the opportunity to service the needs of your company. Please feel free to call us at (045) 599-3943 or (02) 552-5100 if we can be of further service to you.

Very truly yours,

MARIA CARMELA Q. CAPULE
Chief Operating Officer

■ **Sales Office:** Unit 609 Cityland 10 Tower 1 * 6815 H V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http://www.crllabs.com
■ **Laboratory:** Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park, Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
Sample No.: P00089387-03			**DateSampled: Not Supplied**			
Sample ID: PNQ 3			**Matrix: Marine Water**			
-Metals-						
Arsenic	< 0.008	mg/L	ICP - OES	02/26/19	PPG	
Cadmium	< 0.001	mg/L	ICP - OES	02/26/19	PPG	
Lead	< 0.005	mg/L	ICP - OES	02/26/19	PPG	
Mercury**	< 0.0002	mg/L	Manual Cold Vapor AAS	02/26/19	JLJ	
Selenium	< 0.01	mg/L	ICP - OES	02/26/19	PPG	
-Microbiology-						
Total Coliforms**	49	MPN/100mL	Multiple Tube Fermentation Technique	02/21/19	CBS	
Fecal Coliforms**	49	MPN/100mL	Multiple Tube Fermentation Technique	02/21/19	CBS	
-Wet Chemistry-						
Dissolved Oxygen	< 2	mg/L	Winkler/Titrimetric	02/21/19	MDLL	
Chemical Oxygen Demand**	130	mg/L	Open Reflux Method (SM5220B)	03/01/19	LCM	
Total Suspended Solids**	31	mg/L	Gravimetry (SM2540 D)	02/21/19	MLJ	
Oil & Grease	< 0.41	mg/L	Gravimetry (n-Hexane Extraction)	03/04/19	PMAS	
Ammonia - N**	0.4	mg/L	Phenate Method (SM4500-NH3 F)	02/24/19	NGCM	
Sulfate**	2,590	mg/L	Turbidimetric Method	02/21/19	MPY	
Hexavalent Chromium**	< 0.002	mg/L	Diphenylcarbazide, Colorimetric Method (SM3500-Cr B)	02/22/19	PMAS	
Boron	3.9	mg/L	Curcumin Method	02/21/19	ANBB	
Fluoride	1.1	mg/L	SPADNS Method (SM4500-F D)	02/21/19	ANBB	

>>> end of result set for Sample No.:P00089387-03 <<<

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
Sample No.: P00089387-04			**DateSampled: Not Supplied**			
Sample ID: PNQ 4			**Matrix: Marine Water**			
-Metals-						
Arsenic	< 0.008	mg/L	ICP - OES	02/26/19	PPG	
Cadmium	< 0.001	mg/L	ICP - OES	02/26/19	PPG	
Lead	< 0.005	mg/L	ICP - OES	02/26/19	PPG	
Mercury**	< 0.0002	mg/L	Manual Cold Vapor AAS	02/26/19	JLJ	
Selenium	< 0.01	mg/L	ICP - OES	02/26/19	PPG	
-Microbiology-						
Total Coliforms**	<1.8	MPN/100mL	Multiple Tube Fermentation Technique	02/21/19	CBS	
Fecal Coliforms**	<1.8	MPN/100mL	Multiple Tube Fermentation Technique	02/21/19	CBS	
-Wet Chemistry-						
Dissolved Oxygen	< 2	mg/L	Winkler/Titrimetric	02/21/19	MDLL	
Chemical Oxygen Demand**	236	mg/L	Open Reflux Method (SM5220B)	03/01/19	LCM	
Total Suspended Solids**	54	mg/L	Gravimetry (SM2540 D)	02/21/19	MLJ	
Oil & Grease	0.44	mg/L	Gravimetry (n-Hexane Extraction)	03/04/19	PMAS	
Ammonia - N**	0.3	mg/L	Phenate Method (SM4500-NH3 F)	02/24/19	NGCM	
Sulfate**	2,520	mg/L	Turbidimetric Method	02/21/19	MPY	
Hexavalent Chromium**	< 0.002	mg/L	Diphenylcarbazide, Colorimetric Method (SM3500-Cr B)	02/22/19	PMAS	
Boron	3.9	mg/L	Curcumin Method	02/21/19	ANBB	
Fluoride	1.2	mg/L	SPADNS Method (SM4500-F D)	02/21/19	ANBB	

>>> end of result set for Sample No.:P00089387-04 <<<

Test Description	Results	Units	Test Methods	Date Analyzed	By	Ref*
Sample No.: P00089387-05			**DateSampled: Not Supplied**			
Sample ID: PQR1 US			**Matrix: Marine Water**			
-Metals-						
Arsenic	< 0.008	mg/L	ICP - OES	02/26/19	PPG	
Cadmium	< 0.001	mg/L	ICP - OES	02/26/19	PPG	
Lead	< 0.005	mg/L	ICP - OES	02/26/19	PPG	
Mercury**	< 0.0002	mg/L	Manual Cold Vapor AAS	02/26/19	JLJ	
Selenium	< 0.01	mg/L	ICP - OES	02/26/19	PPG	
-Microbiology-						
Total Coliforms**	160,000	MPN/100mL	Multiple Tube Fermentation Technique	02/21/19	CBS	
Fecal Coliforms**	160,000	MPN/100mL	Multiple Tube Fermentation Technique	02/21/19	CBS	
-Wet Chemistry-						
Dissolved Oxygen	< 2	mg/L	Winkler/Titrimetric	02/21/19	MDLL	
Chemical Oxygen Demand**	169	mg/L	Open Reflux Method (SM5220B)	03/04/19	LCM	

CRL Environmental Corporation

■ Sales Office: Unit 609 Cityland 10 Tower 1 * 6815 H.V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http: www.crllabs.com
■ Laboratory: Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park
Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

Certified by:

Geraldine T. Yabut
PRC License No.: 0027218
Microbiological Testing

Date: 03/07/19

Ronald G. Espiritu
PRC License No.: 9248
Chemical Testing

Date: 03/07/19

Juliana C. Oriña
PRC License No.: 8774
Chemical Testing

Date: 3/7/19

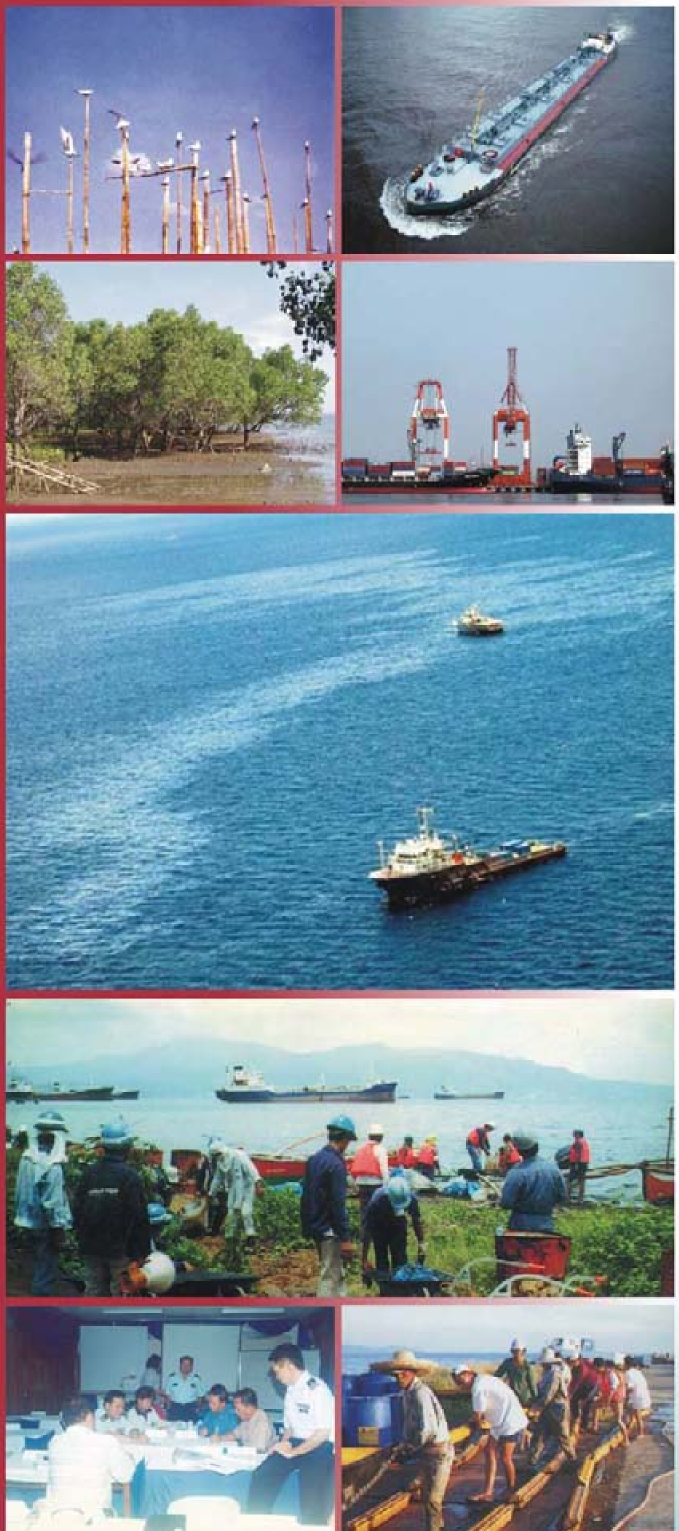
Chas C. Arroyo
PRC License No.: 6701
Chemical Testing

Date: 3/7/19

SN: F00059603.002

CRL Environmental Corporation
■ Sales Office: Unit 609 Cityland 10 Tower 1 * 6815 H.V. dela Costa, Ayala Ave., North * Makati City, Philippines 1226
Tel: (632) 840-4071; (632) 817-5307 * Fax: (632) 816-0329 * E-mail: crl@crllabs.com * http: www.crllabs.com
■ Laboratory: Bldg. 2, Berthaphil Compound 1, Berthaphil Inc. Industrial Park
Jose Abad Santos Ave., CFZ Pampanga, Philippines
Tel: (6345) 599-3943 * (6345) 499-6529 * (632) 552-5100 * Fax: (6345) 599-3963

ANNEX 4-A



Manila Bay Oil Spill Contingency Plan

November 13, 2006

GEF/UNDP/IMO Regional Programme on
Partnerships in Environmental Management
for the Seas of East Asia

Philippine Coast Guard

Department of Environment
and Natural Resources

The Manila Bay
Oil Spill Contingency Plan

13 November 2006

GEF/UNDP/IMO Regional Programme on Partnerships in
Environmental Management for the Seas of East Asia (PEMSEA)

MISSION STATEMENT

The Global Environment Facility/United Nations Development Programme/International Maritime Organization Regional Programme on Building Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) aims to promote a shared vision for the Seas of East Asia:

> "The resource systems of the Seas of East Asia are a natural heritage, safeguarding sustainable and healthy food supplies, livelihood, properties and investments, and social, cultural and ecological values for the people of the region, while contributing to economic prosperity and global markets through safe and efficient maritime trade, thereby promoting a peaceful and harmonious co-existence for present and future generations."

PEMSEA focuses on building intergovernmental, interagency and intersectoral partnerships to strengthen environmental management capabilities at the local, national and regional levels, and develop the collective capacity to implement appropriate strategies and environmental action programs on self-reliant basis. Specifically, PEMSEA will carry out the following:

- build national and regional capacity to implement integrated coastal management programs;
- promote multi-country initiatives in addressing priority transboundary environment issues in sub-regional sea areas and pollution hotspots;
- reinforce and establish a range of functional networks to support environmental management;
- identify environmental investment and financing opportunities and promote mechanisms, such as public-private partnerships, environmental projects for financing and other forms of developmental assistance;
- advance scientific and technical inputs to support decision-making;
- develop integrated information management systems linking selected sites into a regional network for data sharing and technical support;
- establish the enabling environment to reinforce delivery capabilities and advance the concerns of nongovernmental and community-based organizations, environmental journalists, religious groups and other stakeholders;
- strengthen national capacities for developing integrated coastal and marine policies as part of state policies for sustainable socioeconomic development; and
- promote regional commitment for implementing international conventions, and strengthening regional and sub-regional cooperation and collaboration using a sustainable regional mechanism.

The 12 participating countries are: Brunei Darussalam, Cambodia, Democratic People's Republic of Korea, Indonesia, Japan, Malaysia, People's Republic of China, Philippines, Republic of Korea, Singapore, Thailand and Vietnam. The collective efforts of these countries in implementing the strategies and activities will result in effective policy and management interventions, and in cumulative global environmental benefits, thereby contributing towards the achievement of the ultimate goal of protecting and sustaining the life-support systems in the coastal and international waters over the long term.

Dr. Chua Thia-Eng
Regional Programme Director
PEMSEA

TABLE OF CONTENTS

APPENDICES: DATA DIRECTORY

ACRONYMS AND ABBREVIATIONS

AOR	-	Area of Responsibility
ATON	-	Aids To Navigation
CCDC	-	City Disaster Coordinating Council
CGD NCR-CL	-	Coast Guard District National Capital Region- Central Luzon
CGOF	-	Coast Guard Operating Forces
CPCG	-	Commandant, Philippine Coast Guard
DA	-	Department of Agriculture
DA - BFAR	-	DA – Bureau of Fisheries and Aquatic Resources
DENR	-	Department of Environment and Natural Resources
DENR-EMB	-	DENR – Environmental Management Bureau
DENR-PAWB	-	DENR – Protected Areas and Wildlife Bureau
DILG	-	Department of Interior and Local Government
DOH	-	Department of Health
DOTC	-	Department of Transportation and Communications
EO	-	Executive Order
LGUs	-	Local Government Units
MARINA	-	Maritime Industry Authority
MARPOL	-	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 (MARPOL 73/78)
MBOSCP	-	Manila Bay Oil Spill Contingency Plan (2006)
MC	-	Memorandum Circular
MEPCOM	-	Marine Environmental Protection Command
MMDA	-	Metro Manila Development Authority
MOA	-	Memorandum of Agreement
MOU	-	Memorandum of Understanding
NDCC	-	National Disaster Coordinating Council
NOCOP	-	National Operations Center for Oil Pollution
NRFS	-	Not ready for Sea
OPRC	-	International Convention on Oil Pollution Prevention Preparedness, Response and Co-operation (1990)
OSC	-	On-Scene Commander
OSPAR	-	Oil Spill Preparedness and Response
OSRAP	-	ASEAN Oil Spill Response Action Plan
OSRT	-	Oil Spill Response Team
PAF	-	Philippine Air Force
PAGASA	-	Philippine Atmospheric Geophysical and Astronomical Services Administration
PCG	-	Philippine Coast Guard
PCGA	-	Philippine Coast Guard Auxiliary

PD	-	Presidential Decree
PDCC	-	Provincial Disaster Coordinating Council
PEMSEA	-	GEF/UNDP/IMO Partnership in Environmental Management for the Seas of East Asia
PN	-	Philippine Navy
PNP	-	Philippine National Police
POLREP	-	Pollution Report
PPA	-	Philippine Ports Authority
PSG	-	Presidential Security Group
RA	-	Republic Act
RFS	-	Ready for Sea
SALVTUG	-	Malayan Towage and Salvage Corporation
SAR	-	Search and Rescue
WISE	-	Waterborne Industry Spill Equipment

1.0 INTRODUCTION

Manila Bay is the economic gateway of the Philippines because of the fact that the majority of the economic activities of the Philippines take place in Metro Manila and its environs. The major mode of transporting goods and cargo from Manila to other parts of the country and to other countries is sea transportation. An average of 30,000 vessels a year enter Manila bay and call on its ports. A majority of these vessels, which include tankers, passenger and cargo ships, either utilizes oil as fuel or carries it as their cargo. Ship-sourced pollution may result from either accidental or illegal operational discharge of these vessels.

Oil spills can also emanate from the oil refineries within the bay during the loading and unloading of petroleum products. A number of depots can be found in Manila Bay's shoreline namely:

a. Petron Depot in Rosario, Cavite, and LImay, Bataan;
b. Total Depot in Tondo, Manila,and Mariveles; Bataan
c. Unioil Depot in Lucanin, Mariveles, Bataan
d. Jetti Depot in Naic, Cavite
e. Bataan Petroleum Terminal Inc. in Limay Bataan
f. Total Liquigaz in Barangay Alas-asin, Mariveles, Bataan

Aside from these depots that dot the Manila Bay coast, a large depot could also be found in Pandacan, Manila. Even though the depot is located inside the Pasig River and is kilometers away from the bay itself, the amount of petroleum store in its tank farms could pose a significant threat to Manila Bay.

From February 1998 to December 2004 a total of 18 oil spills occurred within Manila Bay. Out of the 18 spills, nine happened in the Province of Bataan, namely in the ports of Limay and Mariveles with a total volume of 789,751.00 liters. It should be noted that most spills occurred where vessels traffic is heavy.

1.1 AIM OF THE PLAN

The Manila Bay Oil Spill Contingency Plan, referred here as the Plan, aims to outline the multi-sectoral arrangement for responding to oil spills in Manila Bay, with the end in view of protecting the Bay from oil pollution or, where this is not possible, to minimize it effects.

It also aspires to ensure a timely, measured and effective response to oil spill incidents of tier 1 or tier 2 magnitudes which may occur within the Manila Bay.

1.2 SHORT TITLE

The Manila Bay Oil Spill Contingency Plan shall have a short title of MBOSCP.

1.3 POLICY REVIEW

1.3.1 International Conventions

Table 1 shows the list of international conventions in which the Philippine is a signatory and party to**.**

Table 1: International Conventions

Convention	Objective
1. MARPOL 73/78	This Convention replaced the 1954 International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL 54). o It sets out a wide range of procedures and ship design and operating requirements aimed at reducing pollution of the sea from ships. o Annex I deals with oil pollution.
2. London Dumping Convention 1972	This Convention regulates the discharge of wastes, including oily wastes, at sea.
3. International Convention on Oil Pollution Prevention Response and Co-operation (OPRC) 1990	This Convention makes provision for contingency plans for ships, offshore platforms, coastal terminals and ports, and for the development of national response plans. o The Convention also encourages the development of international cooperation in spill preparedness and response. (The Phil. is signatory to this Convention, but it is still subject for ratification by the Philippine Senate.)
4. International Convention on Civil Liability for Oil Pollution Damage (CLC), 1992	This Convention provides for compensation for damage, or response costs incurred, due to spills of persistent oils within a member nation's territorial sea or EEZ. Claims are made against the vessel owner and insurers. o CLC is based on the principle of "strict liability", i.e., the vessel which spilled the oil will pay regardless of fault. o Liability is also limited, i.e., the costs recoverable are capped (maximum of 59.7 million SDRs or US$81 million).
5. International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (FUND), 1971 and 1992	This Convention provides for the establishment of the International Oil Pollution Compensation (IOPC) Fund, maintained by oil cargo interests, for the purpose of providing additional compensation to the victims of pollution damage in cases where compensation under CLC is inadequate or unobtainable, e.g., because the limit of the CLC is exceeded or because the owner of the vessel cannot be identified. o limit of 135 million SDRs (US$194 million)

1.3.2 National Legislations

Under Presidential Decrees Nos. 600, 601, 602 and 979 the Philippine Coast Guard is tasked to develop and maintain oil spill combating capabilities and formulate and enforce rules and regulations concerning Marine Pollution (Table 2). Part of capability development is contingency planning. In 1975, the first National Oil Spill Contingency was created, in which the PCG took the lead in formulating the NOSCP. The plan was then revised in 2002 to address the growing threat of oil spills to the marine resources of the Philippines.

Table 2: National Legislations

Republic Act /Presidential Decree	Objective
1. Republic Act No. 5173 – The Coast Guard Law (October 1967)	• Law creating the Philippine Coast Guard • One of the mandated function of the PCG is Marine Environmental Protection
2. Presidential Decree (P.D.) 600 – Marine Pollution Decree (December 9, 1974).	• Presidential Decree mandating the protection of the Marine Environment.
3. P.D. 601 – Revised Coast Guard Law of 1974 (December 9, 1974)	• Presidential Decree strengthening the PCG • Further clarified the PCG mission of promoting safety of life at sea, environmental protection and maritime law enforcement
4. P.D. 602 – National Oil Pollution Operations Center Decree (December 9, 1974)	• Presidential Decree Creating the National Operations Center for Oil Pollution within the PCG • Mandated the PCG to develop oil spill combating capabilities
5. HPCG Memorandum Circular 01-2001	• Requires vessels, oil companies and other facilities who utilizes “black products” to maintain a contingency plan
6. P.D. 979	• Revision of P.D. 600 governing marine pollution

1.4 RELATIONSHIP OF THE MBOSCP TO OTHER CONTINGENCY PLANS

The Manila Bay Oil Spill Contingency plan aims to create a response mechanism for oil spill within the Manila Bay area only. It would form as part of the Coast Guard District NCR/CL’s oil spill contingency plan, which in turn is part of the National Oil Spill Contingency Plan. It shall deal with a tier 1 or tier 2 oil spill. In case the spill escalates to a tier 3 spill, the NOSCP will take effect. The MBOSCP shall only be applicable to spills which will occur within the Manila Bay area. If the spill spreads outside the geographical scope of the plan, the District Contingency Plan of the Coast District NCR-CL shall be put into action.

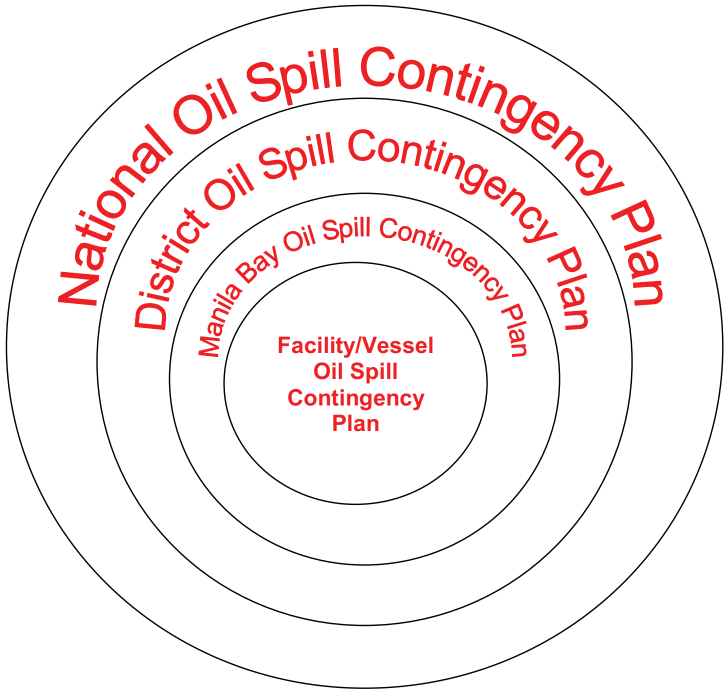


Fig. 1: RELATIONSHIP OF THE MBOSCP TO OTHER CONTINGENCY PLANS

1.4.1 Facility Contingency Plans

PCG Memorandum circular No. 01-2001 requires that the following parties shall prepare individual oil spill contingency plans:

- Oil refineries, terminals and depots
- Oil exploration and production activities
- Power plants and power barges
- Manufacturing plants and other establishments using persistent oil
- Shipping companies (Shipboard Oil Pollution Emergency Plans)
- Shipyards

1.4.2 Coast Guard District Contingency Plan

All Coast Guard Districts are expected to prepare oil spill contingency plans for their area of responsibility, taking into consideration all local and special conditions of the area. The contingency plan shall generally follow the same structure as the national plan.

1.4.3 Ports and other facilities

All ports, oil companies and other installation operating with in the Manila Bay area and its tributaries are required to submit the same, incorporating their response mechanism together with arrangement for tier 2 type of incidents.

All oil spill contingency plans shall be submitted for approval to MEPCOM. All the approved contingency plans must at all times be available at the MEPCOM headquarters, as well as at the relevant Coast Guard District Headquarters.

1.5 SCOPE OF THE PLAN

The Manila Bay Oil Spill Contingency Plan outlines the combined stakeholder arrangements designed to allow rapid and cooperative response to marine oil spills in Manila Bay.

1.6 GEOGRAPHICAL LIMITATION OF PLAN

This plan covers all sea, ports, harbours, and adjoining shorelines including all coastal municipalities and cities along Manila Bay (as shown in Fig. 2).

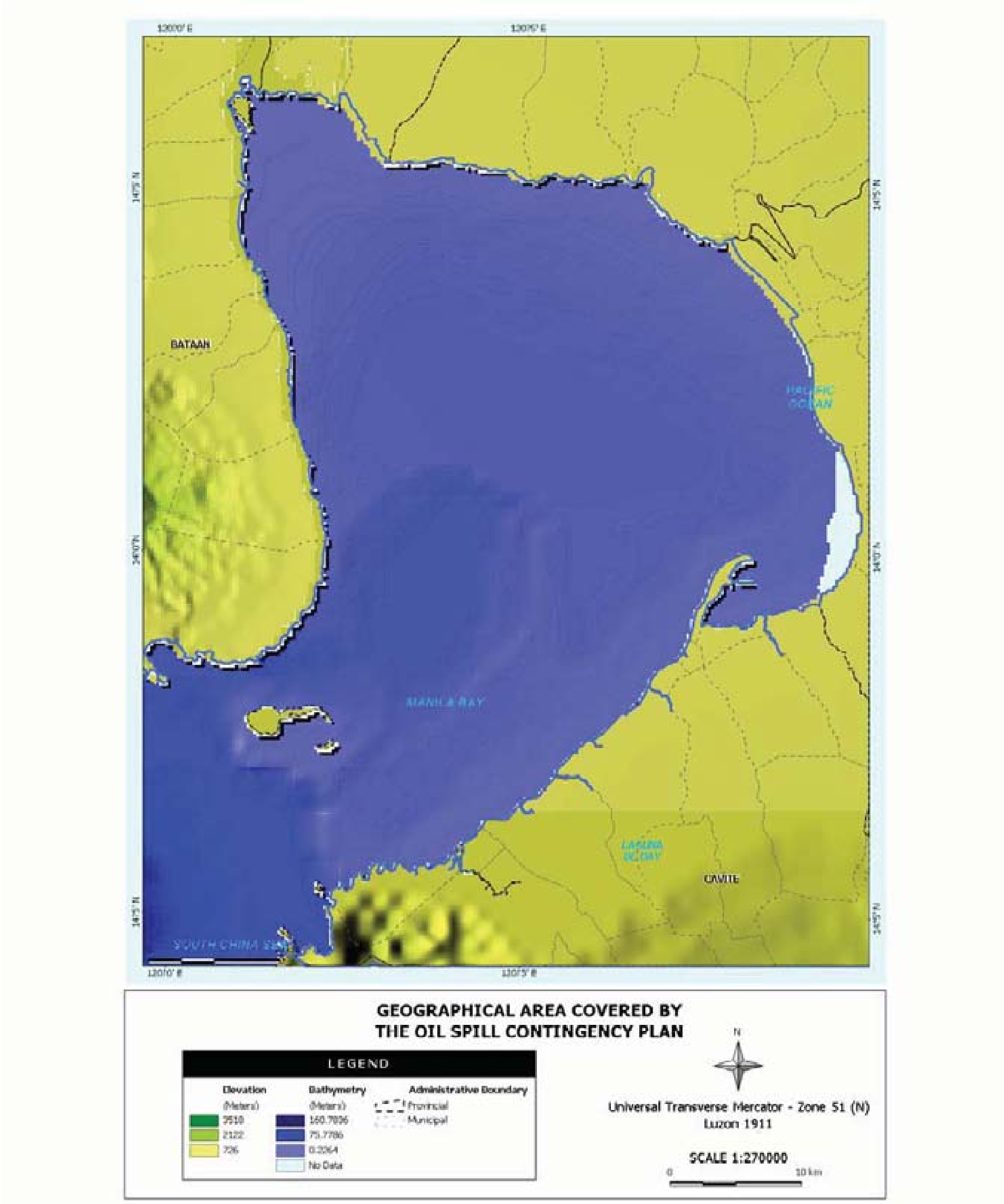


Figure 2. Geographical area covered by this plan

STRATEGY SECTION

2.0 OIL SPILL RISK ASSESSMENT

Oil spill risk assessment involves the identification of areas, resources and socioeconomic activities that are likely to be affected by oil spills. Identification of the risk-causing factors and impact areas will enable the determination of corresponding response strategies and actions required during oil spill incidents.

2.1 RISK FACTORS

The following risk factors are identified as existing in Manila Bay waters:

a. ***Risk-causing factors***

The following factors may cause oil spill incidents:

- Collision
- Grounding
- Hazards to navigation
- Unseaworthiness of vessels
- Negligence and incompetence of the owner/operator, Master or crew
- Improper stowage and control of cargoes
- Presence of oil terminals and depots
- Aging of the fleet of vessels at sea
- Size/type of vessel and operation
- Heavy vessel traffic

b. ***Factors affecting risk***

The assessment also took into consideration the following factors that may increase the risk.

<u>Shipping-related risks</u>

- Density and movement of ships including concentration of fishing and tourist vessels
- Areas that pose a high level of difficulty to safe navigation
- Commercial cargo shipping size, frequency, trading patterns and amounts of oil carried as bunker fuel
- Oil tanker frequency, sizes, shipping patterns and quantities shipped
- Properties of oil shipped as cargo
- Terminal/port design
- Type/amount of oil carried

Environmental factors

- Sea conditions including tidal flow, weather, current, wind, temperature, sea state
- Type of shoreline

Other factors

- future trends, including proposed new ports and projected changes to trading patterns
- presence of oil terminals and depots
- capacity and capability of response team

2.2 IDENTIFICATION OF PROBABLE SOURCES OF OIL SPILLS

The following are activities that may cause oil spill.

a. *Shipping-related*

1) **International Tanker traffic** - For the year 2003 a grand total of 8,495 tankers entered Manila Bay. Three thousand seven hundred nine of (3,709) of this tankers proceeded to Terminal Management Office, Pasig while four thousand seven hundred eighty six (4,786) docked at the port of Limay in the province of Bataan. These tankers include Very Large Crude Carriers and Large Range Tankers which can carry up to 1 million barrels of oil.

2) **Internal tanker traffic -** There is a total of 127 domestic tankers with an average displacement of 300 G.T. home ported in Manila. These tankers mainly carry petroleum products between the oil depots located in within the Bay, such as the Pandacan Manila Oil Depot, Total Depot and Unioil. They also transport refined products to depots throughout the country. They make use of existing sea lanes in going in and out of the bay. These tankers may pose a risk of a tier 2 to 3 oil spill.

3) **Other ship traffic -** The South and North Harbours, and Manila International Container Terminal in Manila, and the Port of Lamao in Limay, Bataan are among the busiest in the country. In 2003 these harbours catered to a total 9,617 of both cargo and passenger ships with a total tonnage of 32,998,758 GRT. These ships use bunker oil or diesel oil as their main fuel. A ferry terminal is also located inside the CCP complex in Pasay. The boats operating from this terminal transport passengers to and from Port of Orion, Bataan. Aside from these, several privately-operated ports for shipping raw materials and products dot the coast of the Bay. Through these ports and terminals, an average of 30,000 ships arrives and departs annually. There are also fish ports located around the bay. Transport through and from these ports poses great risk from operational as well as accidental discharges from vessels. Oil spills may occur in these areas during bunkering or fuel-transferring operations. There is a risk of tier 1 to 2 oil spills from these vessels.

Appendix A shows the density and vessel traffic in the major ports. The navigational routes and location of ports and terminals are shown in **Appendix B**.

b. ***Other socioeconomic activities***

The nature of the activities being carried out in these areas/industries may pose a threat of oil spill incidence: stockpiling of petroleum products, ship repairs, refuelling of vessels, fuel/cargo tank cleaning and operational discharge.

1) **Petroleum Refining -** There is only one refinery located within Manila Bay. This is the Petron Bataan Refinery located in Limay Bataan. It has a total production capacity of 180,000 barrels per day.

2) **Oil terminals and depots-** There are several oil depots located within the Manila Bay namely, Pandacan oil terminal in the City of Manila, Oil Depots in Bataan and Oil Depots in Cavite. These oil depots can be a source of a tier 2 to tier 3 oil spill.

3) **Manufacturing -** oil spills may occur in factories and establishment using bunker, Diesel, heavy fuel oil etc. as a fuel for their machineries and equipment. There is a risk of a tier 1 spill from these factories.

4) **Power Generation -** a power plant of the National Power Corporation and a number of private power barges operate within Manila Bay which mostly use bunker oil or diesel oil as their fuel. These power barges are located in Navotas and Manila. There is a risk of a tier 1 to tier 2 oil spill from these power barges.

5) **Naval Base and shipyards** - Fort San Felipe located at Sangley Point, Cavite serves as the only naval shipyard that operates within the Bay area. However, several shipyards along Navotas and Bataan coast service a hundred of vessel annually. Used oil from tank cleaning operation during dry docking of vessels serves as the source of oil from these facilities.

2.3 OIL SPILL INCIDENCE IN MANILA BAY

Location and volume of oil spills

From February 1998 to December 2004, a total of 18 oil spills occurred within Manila Bay (does not include incidents in Pasig River), which resulted into over 1.2 million L of oil being spilt into the bay (Table 3). Out of the 18 spills, nine happened in the Province of Bataan, namely in the ports of Limay and Mariveles with a total volume of 789,751 L. The largest oil spill that occurred in Manila Bay happened in Mariveles, Bataan during the MT Mary Anne oil spill incident with a total volume of 747,991 L. The second largest spill occurred in South Harbor Manila during the MT Sea Brothers incident, with a total volume of 420,000 L. It should be noted that most spills occurred where vessels traffic is heavy, such as ports and harbors.

Based on historical data on the frequency of oil spills and the amount of tanker activity in the area, the possibility of a tier 3 spill can occur in the following areas:

1. Port of Lamao in Bataan
2. South Harbor, Manila
3. Port of Mariveles in Bataan

Table 3: Location and Volume of Oil Spills

Spiller	Volume (L)	Location	Date
M/T Mary Anne	747,991	Mariveles, Bataan	23-Jul-99
M/T Sea Brothers	420,000	SH Manila	19-Mar-99
M/T Bocaue	40,000	Limay, Bataan	9-Feb-99
Tacoma Port Svcs Inc.	840.00	TMO Pasig	5-Jul-03
PBRC Limay Bataan	600.00	Limay, Bataan	31-Mar-98
MV New Vigor	500.00	Limay, Bataan	10-Feb-03
M/T Christian Albert	400.00	SH Manila	4-Jan-00
MT Sea Mark	300.00	Limay, Bataan	25-Aug-01
MV Super Ferry	210.00	NH Manila	21-Jul-01
MT Deborrah Dos	200.00	Limay, Bataan	8-Aug-02
MV Piya Bhum	200.00	MICT Manila	29-Jan-04
Super Ferry 5	150.00	NH Manila	7-Jun-03
MV Princess of New Unity	100.00	NH Manila	22-Nov-01
MT Pulilan	100.00	Limay, Bataan	26-Aug-02
MV Hanjin Kwangyang	50.00	MICT Manila	15-Feb-04
Herma Shiping	30.00	Limay, Bataan	17-May-98
M/T Ocean Pride	30.00	Limay, Bataan	29-May-98
Baseco Shipyard		Engr Island, Mnl	25-May-00

Type of Oil Spilled

In Manila Bay, the typical types of oil spilled were diesel, crude oil, intermediate fuel oil and heavy fuel oil (Table 4). Diesel and other finished petroleum products would dissipate and evaporate in relatively short span of time. However, lubricating oil, intermediate fuel oil, heavy fuel oils and crude oil tend to persist in the environment. These types of oil may cause significant damage to shorelines if left unattended.

Table 4: Physical properties of petroleum products spilled in Manila Bay

Oil Type	Density	Viscosity (cP)	Sources
Diesel	0.82-0.84	2-6	Fuel oil spills from smaller vessels, ferries, etc.
Crude oil (Mainly Arabian)	0.85-0.95	10-200	Cargo spills from tanker traffic, terminals

Intermediate fuel oil	0.9-0.95	200-2000	Fuel oil spills from intermediate – large vessels, refineries, land-based establishments
Heavy fuel oils	0.95-0.99	4000 – 20.000	Fuel oil spills from larger vessels, refineries, land-based establishments

2.4 PROBABLE FATE OF OIL SPILLS

Once oil is spilled into the sea or marine waters, its transformation depends on the properties and composition of the oil, parameters of actual oil spill and environmental conditions. The main characteristics of oil transformation are dynamism, and the interaction to physical, chemical and biological mechanisms of dispersion and degradation up to the complete disappearance as original substance.

The spread of oil spilled on the sea surface occur under the influence of gravity, controlled by oil viscosity and surface tension of water. This is further affected by meteorological, hydrological factors, and the power and direction wind, waves and current.

Determining the spread of oil spilled would enable, among others the identification of appropriate responses and recovery of the oil. For Manila Bay, an oil spill trajectory and fate model, SpillSim®, has been developed. The SpillSim® is generalized spill model combining a number of high resolution hydrodynamic models coupled with a spill motion and fate model that yields the volume of distribution of the material or spilled oil as a function of time after the spill. The spill module incorporates factors such as transport by current, diffusion, surface spreading, evaporation, vertical dispersion and emulsification. The model also takes into account shoreline absorption.

In running the model, data or information needed includes the following:

- Commodity or type of oil spilled
- Spill location
- Initial release date and time
- Total release volume
- Total particles
- Air temperature
- Water temperature
- Horizontal diffusion coefficient
- Time step and integration interval
- Time series observation on wind and current speed and direction

Refer to the *SpillSim User Manual* for details in running the model.

2.5 AREAS SENSITIVE TO OIL SPILL

Categories of risk areas

Areas and resources at risk are categorized based on ecological, economic and social importance as well as sensitivity to oil spills. These areas are illustrated in **Appendix C**. Data/information from the component activities of the Manila Bay Environmental Management Program, such as Risk Assessment, Integrated Environmental Monitoring Program, Environmental and Resource Valuation, Integrated Information Management System for Manila Bay and Manila Bay Atlas, were used in the assessment of risk areas.

a. **Ecologically important areas**

1) ***high***

- **Mangroves and mudflats**. Mangroves are woody, seed-bearing plants that thrive well on mudflats and brackish water. The mangrove ecosystem is extremely productive and supplies resources, such as wood, fish, shellfish and crustaceans. They also protect our shorelines from strong winds, waves and floods. Some species even have medicinal value. In Manila Bay, 16 mangrove species were identified. For the remaining 413.7 ha of mangroves, the average annual value of direct uses amount to PhP7.9 million while the indirect uses amount to PhP161 million.

  Benthic species, shellfish and crustaceans are found in mudflats. They also serve as feeding grounds of migratory birds. The bird sites located along Manila Bay are found in Navotas, Parañaque-Las Piñas, Bataan and Cavite. Around18,656 birds belonging to 87 species were counted. Among these species is the endangered Chinese Egret. Another significant species recorded is the Blacked-winged Cuckoo-shrike, which is the first record of the country. Parañaque-Las Piñas area has the highest diversity with 65 species while Navotas has the highest bird count with 5,840 followed closely by Bataan with 5,543.

- **Seagrass beds**. Seagrasses are the only submerged flowering plants in the marine environment. They flower, develop fruit, produce seeds, and are often found between coral reefs and mangrove forests. Seagrass meadows provide refuge, spawning and nursery grounds for shrimps, sea cucumbers, sea urchins, mussels, crabs and other fishes. In Manila Bay, patches of seagrass beds can be found in Cavite and Bataan.

2) ***moderate***

- **Coral reefs**. Known as the ‘rainforests of the sea’, coral reefs are home to many different species of fish, mollusks, crustaceans, algae, sponges and reptiles. In Manila Bay, coral reefs can be found in Corregidor Island, Carabao Island, Maragondon and Ternate, Cavite. It takes years for reefs to increase in size, thus damage to a reef may take decades to recover, if at all. The average annual value of the coral reef (37.25 ha) found in Carabao Island in Cavite amount to PhP0.4 million.

- **Sheltered rocky shores**. Rocky shores comprise a wide variety of different habitats and communities, and vary greatly in their sensitivity to and recovery from oil spills. Seaweeds or algae are a common feature of rocky shores, and they are a major source of organic material for other marine life. There are rocky shores in portions of Maragondon and Ternate in Cavite, and Mariveles, Bataan.

- **Sandy beach**. Sandy beach areas can be found in Mariveles (Bataan), and Ternate, Maragondon, Naic, Tanza, and Corregidor Island (Cavite).

- Gravel beaches and riprap

3) ***low***

- **Exposed rocky cliffs, seawalls and wave cut platform**. These are found in Cavite and NCR.

b. **Economically important areas**

1) ***high***

- **Oil refinery and depots**. The Petron Oil Refinery and three oil depots (Petron, Total-Philippines and Unioil) are located in Limay, Bataan. The oil depots of Petron and Jetti are located in Rosarion and Naic, Cavite, respectively. The oil depots of Shell and Caltex are located in Pandacan, Manila along the Pasig River.

- **Fisheries and aquaculture**. Municipal and commercial fisheries are principal activities in Manila Bay, and offers livelihood and income opportunities for communities around the bay. This sector generates on average PhP641 million in net revenues annually. Aquaculture farms, found along the coast of Manila Bay, contribute on average PhP5 billion worth of net revenues annually. Spills may impact fishery resources in the following ways: direct effect on the fish (lethal or sub-lethal); direct effects on fisheries (tainting and interference with fishing activities); and indirect effects through ecosystem disturbance (e.g., impacts on food chains).

- **Ports**. There are seven commercial ports in Manila Bay: North Harbor (Manila), South Harbor (Manila), Manila International Container Terminal (Manila), Ferry Terminal at the CCP Complex (Manila), Port of Lamao (Limay, Bataan), Port of Mariveles (Bataan), and Port of Orion (Bataan). Fish ports are found in Navotas, Parañaque City, Rosario and Tanza (Cavite), Hagonoy (Bulacan), and Orani (Bataan). There are also private ports, such as the Manila Bay Yacht Club, and those operated by industries in Bataan. The net revenues from ports and shipping industry amount to PhP 865,884,407 on average annually.

- **Sea lanes.** A traffic separation scheme is being implemented at the mouth of Manila Bay. The domestic vessels enter into and exit from the bay using the route at the Cavite side or the south channel. The foreign/international vessels use the Bataan side or north channel in entering and exiting the bay. There is also a traffic separation scheme near the port area in Manila. However, there is no vessel traffic scheme within Manila Bay.

- **Power plants**. The National Power Corporation has Build-Operate-Own (BOO) contracts with private companies for the operation of a diesel power barge in Navotas and also the North Harbor Diesel Power barges. Some manufacturing establishments also have their own power plants.

2) ***moderate***

- **Manufacturing**. There are manufacturing establishments located along the coast of Bataan and the National Capital Region (Navotas and Manila)

- **Shipyards**. There are private shipyards located in Navotas, Malabon, Manila and Mariveles, Bataan. The naval shipyard is located in Fort San Felipe in Cavite City.

- **Naval installations**. A naval base is located at Sangley Point, Cavite City while a marine base is located at Ternate. Cavite.

c. **Socially important areas**

1) ***high***

- **Tourist and recreational sites**. These are found in the National Capital Region, Corregidor Island and Cavite. The annual average net revenues from tourism industry amount to PhP 2 billion.

- **Cultural and historical sites**. National Capital Region, Bataan, Corregidor Island and Cavite

2) ***moderate***

- **Residential areas**. There are settlements found along the coast of Manila Bay. There are also illegal/informal settlements on the seawalls and breakwater.

2.6 PRIORITIES FOR PROTECTION OF SHORELINE RESOURCES

Whenever total protection of all vulnerable environmental resources is unrealistic, priorities for protection should be based on the sensitivity and resource valuation of the resources in question. In order to prevent conflicts as to which areas should be immediately protected, a Priority for Protection list shall be formulated by the multi-sectoral oversight committee.

3.0 ADMINISTRATION

3.1 OVERALL ORGANIZATION AND RESPONSIBILITIES

The PCG through the CGD NCR-CL shall be the primary agency in administering, managing and maintaining this Plan. A multi sectoral oversight committee will be formed to assist the CGD NCR-CL in maintaining, updating the plan and ensuring the preparedness of all involved stakeholders,

3.2 MULTI-SECTORAL OVERSIGHT COMMITTEE

The main function of the multi-sectoral Oversight Committee is to assist the CGD NCR-CL through the District MEP Units, in maintaining and updating the MBOSCP and ensuring preparedness among stakeholders. Among its key functions are:

- ✓ Developing Inter- Agency cooperation
- ✓ Inter-Agency policy agreement
- ✓ Ensuring integration of all Manila Bay wide response arrangements
- ✓ Pre-Commitment of resources
- ✓ Clarification of agency responsibility

3.3 COMPOSITION OF THE MULTI-SECTORAL OVERSIGHT COMMITTEE

Chairman: Coast Guard District - NCR/CL

Members: Undersecretary/Asst. Sec, Water Sector, DENR
Undersecretary/Department of Energy
Asst. Sec, Department of Health
Director, PCG NOCOP
Regional Executive Directors (REDs) of the DENR Regional Offices in NCR, Regions 3 and 4
Director, DENR - Environmental Management Bureau
Director, DA - Bureau of Fisheries and Aquatic Resources
PG-ENROs of: Bataan, Bulacan, Pampanga and Cavite
ENROs of: Navotas, City of Manila, Pasay City, Parañaque City and Las Piñas City
Oil Companies: Shell, Caltex, Petron, Total and Unioil

3.4 MULTI- SECTORAL AGREEMENT

The duties and responsibilities of all stakeholders shall be governed and defined by a *multi-sectoral Memorandum of Understanding* (MOU), which will bind all signatories to abide by the provisions of this plan.

3.5 MEETING SCHEDULE

The Oversight Committee shall meet on the second Friday of June and December of every year at an appropriate venue to be designated by the Chairman. The Chairman may call an emergency meeting as the need arises.

3.6 TRAINING

The PCG will conduct programmed training and exercises for personnel likely to be engaged in oil spill response activities. This programmed training is envisioned to increase the number of personnel and enhancing their knowledge and skills in oil spill response operations. This includes training for first responder, on-scene commander/supervisor and administrators. Stakeholders will be involved in these training and exercises to reinforce their skills and knowledge on spill response operation.

Facilities/ vessel operators are expected to conduct in-house training and related activities to orient, refresh and update those personnel directly involved during a spill incident within their area of operation.

3.7 OIL SPILL RESPONSE EXERCISE

An annual exercise will be conducted, as far as practical, to test the operationality of this Plan.

3.8 MAINTENANCE OF EQUIPMENT

To ensure the equipment's operability during response operations, PCG, oil companies and other facilities with spill-combating resources should periodically conduct maintenance check on their equipment according to an Inspection and Maintenance Program that they should develop.

Maintenance procedure should include actual deployment of spill equipment to a body of water to test their functionality on actual sea operation. The maintenance program should include after use and storage check as well as replacement of spare parts that would be damaged due to the equipment's normal wear and tear characteristics.

4.0 PREPAREDNESS

4.1 DIVISION OF RESPONSIBILITY

In order to adequately define the roles and responsibilities of every stakeholder, this Plan defines the following:

- ✓ Primary National Response Organization as the NOCOP,
- ✓ District Response Organization as 1st Marine Environmental Protection Unit;
- ✓ First Responders pertains to in house/vessel response organizations of oil company and vessel;

Support agencies include NGOs/Private Entities/Government agencies that are identified in the Plan**.**

4.1.1 Primary National Response Organization

The National Operations Center for Oil Pollution (NOCOP) of the Philippine Coast Guard is the Primary National Response Organization. As such it is responsible for:

- ✓ Maintaining all national oil spill response resources.
- ✓ Ensure that all contingency plans are updated and in compliance with the PCG approved format and adequate enough to protect affected areas

4.1.2 District Response Organization

The CGD NCR/CL through the 1st Marine Environmental Protection Unit shall:

- ✓ Maintain the MBOSCP as well as the CGD NCR-CL oil spill contingency plan;
- ✓ Maintain spill response capability stipulated in this Plan;
- ✓ Ensure that all contingency plans in their Area of Responsibility are updated and in compliance with the PCG approved format and adequate enough to protect affected areas;
- ✓ Shall be the lead agency during Tier 2 response efforts.

4.1.3 Oil Companies/Vessel Response Organization

As stated in HPCG Memorandum Circular 01-2001, Oil Companies and Vessels shall maintain an oil spill response capability to handle Tier 1 spills emanating from their operations. As such they are responsible to undertake the following:

- ✓ Develop and maintain an oil spill contingency plan for their facilities;
- ✓ Develop and maintain on board a Shipboard Oil Pollution Emergency Plan (SOPEP);
- ✓ Maintain oil spill equipment capable of addressing spills from their facilities/vessels;
- ✓ Train enough number of personnel to mount an effective oil spill response operation;

- ✓ Vessel owner/operator should coordinate with their respective insurer on matters concerning claims for damage resulting from the spill incident.

4.1.4 Ports and Terminals

Port authorities, including private ports, are encouraged to maintain an oil spill contingency plan for possible spills in their port facilities and initiate response efforts for spills occurring within their port facilities

4.1.5 Support Agencies

Support agencies are agencies that are, although not mandated to respond to an oil spill, but because of their inherent interest in protecting the marine resources of the bay, should contribute to the oil spill preparedness and response activity stated in the MBOSCP.

The identified support agencies/organizations/entities and their possible roles in oil spill preparedness and response are summarized **Table 5**.

4.1.6 Volunteer Organizations

The Multi-sectoral Oversight Committee will determine volunteer organizations, which can provide assistance during oil spills and will provide a list of said organizations.

Table 5: Roles and Responsibilities of Support Agencies/Sectors

Agency/Sector	Incident Role	
Department of Environment and Natural Resources – Environmental Management Bureau (DENR-EMB) and its regional offices at NCR, Regions 3 and 4	Primary	Government agency responsible for environmental management
	Preparedness	Provides lists and data of resources within the Manila Bay
	Response	- Shall provide expert advice on sensitive resources - Assist the On-Scene Commander on specimen laboratory evaluation and analysis. - Issue permit on dumping of oily solid debris on land. - Identify waste disposal facilities - Provide necessary assistance to the OSC as requested during clean up operation. - Supervise ground dumping
Department of Environment and Natural Resources - Protected Areas and Wildlife Bureau (DENR PAWB) and its regional offices at NCR, Regions 3 and 4	Preparedness	Provides lists and data of resources and habitats within the Manila Bay
	Response	Shall be responsible for: - protected area, habitat and wildlife response. - rehabilitation and restoration of damaged/affected habitats and flora and fauna.

Agency/Sector	Incident Role	
Local Government Units (LGUs)	Primary	Mandated to manage coastal resources of municipal waters
	Preparedness	- Identify sensitive resources - provide additional labor - prepare *local oil spill contingency plans*
	Response	Provide: - disposal facility - additional manpower for clean-up operation - transportation requirements - heavy equipment during shoreline clean up - billeting spaces for responders - logistical support to the response effort
Metro Manila Development Authority (MMDA)	Primary	Mandated to provide metro-wide services, which have metro-wide impact and transcend legal political boundaries, such as development planning, transport and traffic management, solid waste disposal and management, flood control and sewerage management, zoning, land-use planning, health and sanitation, urban protection, pollution control and public safety (RA 7924)
	Preparedness	- Provide additional labor, heavy equipment. - Formulate and implement programs and policies and procedures to achieve public safety, especially preparedness for preventive and rescue operations during times of calamities and disasters.
	Response	Provide: - disposal facility - additional manpower for clean-up operation - transportation requirements - heavy equipment during shoreline clean up - logistical support to the response effort vehicular traffic direction
Philippine Ports Authority (PPA)	Primary	Government agency primary responsible for government port facility operations
	Preparedness	Develop and maintain an oil spill contingency plan for its port facilities covered under this Plan
	Response	- Initiate oil spill response in their facilities - Assist PCG in providing berthing and storage space for foreign vessel with equipment and response team
Philippine Coast Guard Auxiliary (PCGA)	Primary	A volunteer organization dedicated to assist the PCG in fulfilling its mandated functions
	Preparedness	Assist the PCG in conducting lecture and training of their members who are directly involved on activities/industries covered by this

Agency/Sector	Incident Role	
		plan
	Response	Provide: - additional manpower for clean-up operation - provide transportation (aerial and sea-borne surveillance and response) requirements
Local Shipping Lines	Primary	Under the Polluters Pay Principle owner of vessels are responsible for the funding of response efforts to spills from their vessels
	Preparedness	Prepare Shipboard Oil Pollution Emergency Plan
	Response	- Respond to oil spills emanating from their vessels. - Availability of their vessels/facilities to transport MARPOL equipment to spill site on call/request - Assist vessels under distress
Maritime Industry Authority (MARINA)	Preparedness	- Maintain database/inventory of Philippine registered vessels. - Set safety standards for vessels in accordance with applicable conventions and regulations. - Require all domestic ship operators to comply with operational and safety standards for vessels set by applicable conventions and regulations, maintain its vessels in safe and serviceable condition, meet the standards of safety of life at sea and safe manning requirements, and furnish safe, adequate, efficient, reliable and proper service at all times.
	Response	- Require any domestic ship operator to provide shipping services to any coastal area, island or region in the country where such services are necessary for the development of the area, to meet emergency sealift requirements, or when public interest so requires.
Department of Energy (DOE)	Preparedness	Take the lead in Oil Spill Prevention, Control and Response Training to review oil spill prevention measures and ensure preparedness of energy industry players in dealing with oil spill incidents.
Department of Agriculture - Bureau of Fisheries and Aquatic Resources (DA-BFAR)	Response	Assist in determining and identifying fishing grounds and other aquaculture sites that are vulnerable to oil spills Monitoring of fish; determination of food safety
Bureau of Customs (BUCUS)	Response	Assist the PCG in the expeditious clearing of response equipment from foreign sources

Agency/Sector	Incident Role	
Bureau of Immigration	Response	Assist the PCG in the clearing of foreign oil spill response crew/ technical personnel for further attachment to the On Scene Commander
Philippine Navy (PN)	Response	Assist in providing: - additional manpower for clean-up operation - transportation requirements - heavy equipment during shoreline clean up - billeting spaces for responders - logistical support to the response effort - security
Philippine Air Force (PAF)	Response	Assist in providing: - additional manpower for clean-up operation - transportation requirements - heavy equipment during shoreline clean up - billeting spaces for responders - logistical support to the response effort, e.g., air surveillance, etc.
Salvage Companies	Preparedness	Maintain tug boats and barges that could be utilized as oil spill equipment platforms
	Response	Provide vessels for logistical and oil spill response activities
Department of Health (DOH)	Response	Provide: - advise on health safety issues - medical services and practitioners to ensure health safety of clean-up personnel and affected residents.
Disaster Coordinating Councils - cities (CDCCs); - Provincial (PDCCs); - Regional (RDCCs) for NCR, Regions 3 and 4	Response	- Act as coordinating and monitoring body during response operations in their respective jurisdictions in coordination with the PCG.
Department of Interior and Local Government (DILG)	Preparedness and Response	- Establish a system of coordination and cooperation among the citizenry, local executives (LGUs) and DILG to ensure effective and efficient delivery of basic services to the public.

4.2 MBOSCP INCIDENT RESPONSE ORGANISATION

4.2.1 Oil Spill Incident Control Management Team (OSICMT)

During an oil spill response the On-Scene Commander shall have control of all oil spill response operations supported by an *Oil Spill Incident Control Management Team* (OSICMT) composed of the following:

- Operations Manager
- Planning Manager

- Logistics Manager, and
- Finance and Administration Manager.

Members of this team are selected from the identified support agencies.

4.2.2 Functions of the OSICMT

Commander, CGD NCR-CL (CCGD-NCR-CL)

- Over-all command & control of the crisis situation.
- Apprise the Commandant PCG of the crisis situation.
- Recommend to the CPCG the release of appropriate PCG funds to support the operation.

Commander, MEPCOM (CMEPCOM) / Director NOCOP

In the event that the spill shall escalate to a tier three spill, the CPCG through MEPCOM/Director NOCOP shall assume all responsibilities of the Commander, CGD NCR-CL.

- Evaluate reports;
- Designate alert conditions;
- Advise the CCGD-NCR-CL on appropriate course of action in combating the spill;
- Dispatch available resources;
- When necessary, call out the supporting elements;
- Recommend to CMEPCOM the suspension or termination of any operation;
- Liaise with the spiller or his insurer;
- Make recommendations to the port authorities regarding port closure or traffic limitations in the affected area;
- Prepare press releases;
- Prepare other public information material;
- Perform other tasks as directed by CPCG.

On-Scene Commander

The On-Scene Commander shall be the Station Commander of CGS Manila.

- Evaluate spill or potential spill reports;
- Designate the severity of the spill;
- Activate response team and conducts containment, recovery and clean-up operations;
- Sends Pollution Reports (POLREP) to NOCOP;
- Ensure that communication facilities are manned at all times and maintain communication with personnel in charge of assisting response team, support elements and the NOCOP;
- Coordinates all activities at the scene;

- In the event of inclement weather, recommends suspension of operation to NOCOP;
- Recommend termination of any operation;
- Submit post-operation report.

Operations Manager

The Operations Manager shall be the Operations Officer of CGD NCR-CL and shall deploy the MEPU NCR-CL to augment manpower and provide technical skills in oil spill response operation. He shall be responsible for the conduct of the following:

- water operation
- shoreline protection
- shoreline clean up
- air operation
- special operations
- Prepare reports based on received information
- Convey information within and/or outside the Center.

The Operations Manager shall be assisted by a team composed of personnel from the following agencies/entities:

a) Spiller
a) Philippine Navy (PN)
b) Philippine Air Force (PAF)
c) LGUs concerned
d) DENR-PAWB (NCR, R-3 & R-4 PAWCZMS)
e) BFAR (NCR/Region 3,4)
f) PNP - Maritime Group (Manila Bay area)
g) DOH of affected area
h) BFP of affected area

Planning Manager

The Planning Manager shall be the Plans and Programs Officer of the CGD NCR-CL and shall act as the Team Leader of the Planning Unit and will be responsible for the:

- Preparation of a list of all available personnel qualified and trained for the different function
- Coordination for additional labour
- Coordination for the assistance of external consultants and advisors in fields within which limited experience and expertise is available at PCG
- Request for assistance of local government or private agencies.
- Liaison with representatives of supporting elements.
- Coordination with the action of various agencies in supplying needed assistance.

- Establishment of communication with foreign contacts, disseminating appropriate information and request for assistance if required.

The Planning Manager shall be assisted by a team composed of personnel from the following agencies:

a) Spiller
b) PCG
c) PN
d) PAF
e) LGUs concerned
f) PNP

Logistics Manager

The Logistics Manager shall be Logistic Officer of CGD NCR-CL, and shall act as the Team Leader of the Logistics Unit and will be responsible to:

- Ensure immediate availability of needed equipment, supplies and materials.
- Ensure adequate transportation.
- Ensure adequate and effective communication.
- Ensure adequate personnel.
- Ensure that communication equipment is reliable.
- Assist the OSC in disseminating information.

- Assess health and safety hazards related to potential spill response efforts.
- Designate exclusion zones
- Ensure availability of medical assistance and Personnel Protective Equipment (PPE)

The Logistics Manager shall be assisted by a team composed of personnel from the following agencies:

a) Spiller
b) Department of Finance
c) Department of Budget Management
d) PN
e) PAF
f) LGUs concerned

Finance and Administration Manager

The Finance and Administration Manager shall be the Administrative Officer of CGD NCR-CL, and shall act as the Team Leader of the Finance and Administration Unit, and will be responsible to:

- Ensure the availability of funds to support the operations.

- Ensure that financial documentation is prepared.
- Maintain accounting records.
- Record, collate, reproduce, disseminate and secure all relevant documents pertaining to the spill incident.
- Ensure that continual scientific environment quality assessments are carried out and documented.
- Ensure that investigations, inspections and summary adjudication proceeding are conducted and documented.

The Finance Manager shall be assisted by a team composed of personnel from the following agencies:

a) Spiller
b) Department of Finance (DOF)
c) Department of Budget Management (DBM)
d) PCG
e) PN
f) PAF
g) concerned LGUs

4.3 RESPONSE LEVELS: TIER CLASS DEFINITIONS

In order to plan for the appropriate response efforts that are to be mounted, the concept of *Tiered response* has become common internationally. Oil spills and the responses they require are classified according to the size of the spill and the proximity to a response center. The spill dimensions associated with the individual Tier classes are defined in Table 6.

- **Tier 1** - normally associated with small local events for which response resources should exist locally. Examples are spills associated with transfer of fuel or bunker at a terminal, and smaller harbour spills. There will normally be no need to involve external resources for a Tier 1 spill.

- **Tier 2** - a larger spill than tier 1 that may occur in the vicinity of a response centre or smaller spills at distant locations for which resources from several sources may be required; for instance industry and governmental resources.

- **Tier 3** - response is dimensioned for the largest spills, such as large tanker accidents or offshore blowouts. Tier 3 arrangements will usually call for the entire oil spill response resources in a nation and may also call for international assistance.

Table 6: Tier Classification

Tier	Amount	Response
1	Up to 10 m^3	Company or Ship Response Organization/ District Response Organization
2	Up to 1000 m^3	First Tier Response plus National Response Organization
3	> 1000 m^3	The total national resources, with the addition of foreign resources

4.4 CONTROL

4.4.1 Tier 1 spill

The spiller has the prime responsibility of conducting immediate oil spill response operations. However, when the spiller is either unknown or has no capacity to adequately respond to a tier 1 oil spill, the District Response Organization assumes control. The MBOSCP is part of the tier 2 response system.

4.4.2 Tier 2 spill

The District Response Organization assumes control during tier 2 spills. The MBOSCP is also part of the tier 2 response system.

4.4.3 Tier 3 spill

The National Response Organization assumes control during tier 3 spills.

4.5 OIL SPILL INCIDENT CONTROL ROOM AND FACILITIES

The Incident Control Room is located at Headquarters, Coast Guard District-NCR-CL at Coast Guard Base Farola, Muelle de la Industria, Binondo, and Manila. The incident control room is equipped with the necessary radio (VHF-UHF, SSB) and telephone (Facsimile, Internet connection, hotline) communication, oil spill simulation software and hardware, Geographic Information System (GIS), and audio-visual equipment.

4.6 FIELD COMMUNICATION EQUIPMENT

During an event of an oil spill, the PCG OSRT members responding to the spill are provided with radios as their primary means of communication with the OSICMT at the OSICR Channel 16 of the Marine Band will be used as calling channel and channel 88 as the operational channel during spill response operations. Cellular phones are also considered as a means of relaying relevant information to the OSICMT.

4.7 REPORTS

The attached formats (**Appendix D**) for the pollution reports (POLREP) shall be used by the OSRT or personnel responsible for reporting, updating and recording of the incident.

4.8 EQUIPMENT, SUPPLIES AND SERVICES

Equipment is mainly available from three sources, namely: Philippine Coast Guard, Waterborne Industry Spill Equipment (WISE) and private oil companies. List of available equipment is attached as **Appendix E**.

4.8.1 Philippine Coast Guard

Oil Spill Response Equipment of the PCG is stockpiled at the Headquarters of the Marine Environmental Protection Command.

4.8.2 Oil Industry (Petron, Caltex and Shell)

- Petron Corporation has spill equipment located within their facilities in Limay, Bataan and Rosario, Cavite.
- The spill equipment of Shell and Caltex are located in Pandacan, Manila and is being managed by Pandancan Depot Services Inc.

4.8.3 Waterborne Industry Spill Equipment (WISE)

A complete list of available equipment from WISE and their location is shown on **Appendix E**. Although located outside the Manila Bay area, they are available within 24 hours.

4.8.4 Availability of Vessels

PCG has three (3) Search and Rescue Vessels, one (1) buoy tender and several small crafts operating within the Manila Bay. These vessels are on standby status 24 hours a day.

Oil Spill Response Tugboat vessel of the Waterborne Industry Spill Equipment can be tapped upon arrangement. A list of available PCG vessels can be seen in **Appendix E**.

4.8.5 Hiring Of Other Response Vessels

Should the spiller be unable to mount sea operations, the PCG shall hire/contract vessels who can undertake such operations. The spiller will pay for the cost of hiring the vessel. Likewise, should a Coast Guard or Naval Vessel be used during the operations, its logistical and operational expenses will be shouldered by the spiller.

5.0 RESPONSE

5.1 DIVISION OF RESPONSIBILITY

5.1.1 Primary National Response Organization

As the Primary National Response Organization during an oil spill incident, the National Operations Center for Oil Pollution (NOCOP) of the Philippine Coast Guard is responsible for:

- ✓ Over-all command and control of a national oil spill response to a tier 3 spill.
- ✓ Initiating a tier three response
- ✓ Making available all national oil spill response resources
- ✓ Ensure there is adequate spill response actions to protect affected areas
- ✓ Shall be the lead agency during national response efforts

5.1.2 District Response Organization

The CGD NCR/CL, through the 1st Marine Environmental Protection Unit, shall be responsible for a Tier 2 response. In the event that the spiller has no capacity to adequately respond to a Tier 1 incident, it shall:

- ✓ Take over all command and control of Tier 1 and 2 spill response; Initiate a district oil spill response to a Tier 2 spill.
- ✓ Make available all district oil spill response resources;
- ✓ Ensure there is adequate spill response actions to protect affected areas of the CGD NCR/CL;
- ✓ Shall be the lead agency during district response efforts.

5.1.3 In-House/Vessel Response Organization

Oil Companies and vessels are required to mount a first response to a tier 1 spill emanating from their facilities/vessels as such they are responsible for:

- ✓ Responding to spills resulting from their operations;
- ✓ Reporting such incidents to the PCG/ NOCOP;
- ✓ Providing financial assistance to the whole response effort;
- ✓ Pay damages to affected stakeholders.

5.1.4 Support Agencies

Role of support agencies, organizations and other entities during response operation are listed in Section 3 of this Plan/MBOSCP.

5.2 RESPONSE STRATEGIES

5.2.1 General Philosophy and Objectives

Knowing the socio-economic contribution of Manila Bay and its resource to the provinces and cities located within its shores, the preservation of marine resources are of paramount importance. The key objectives of this plan are:

- ✓ Preservation of the viability of Manila Bay to sustain marine life in support of mariculture/aquaculture and fishery activities
- ✓ Protection of cultural and heritage sites in Manila Bay
- ✓ Protection of human life from the harmful effects of oil spills
- ✓ Preservation of amenity and recreational areas within the bay that contribute to the economy of the locality wherein they are located
- ✓ The safety of life and property are of vital importance during an oil spill response operation.
- ✓ Oil response operation should always result in a higher Net Environmental Benefit (see **Appendix F** for Guidelines on Net Environmental Benefit Analysis or NEBA)

5.2.2 Strategy for Open Sea

If a spill will occur in open waters and because of the semi-enclosed nature of the bay, the likelihood that it will reach shore is very high. Shoreline clean-up is more costly and labor intensive than to contain and recover the spilled oil in open sea. It is therefore prudent that, if ever possible the spill be contained and recovered near the source and prevented from reaching shore. With this in mind the following strategies will be adopted:

a) Mechanical containment and recovery
b) Chemical dispersion

5.2.3 Strategy for Coastal Zones

The coastal zone is defined here as the transition zone between open water and the shoreline. Many of Manila bay’s coastal zones are utilized as mari-culture areas and ecologically important areas that are sensitive to most oil spill response operations. These areas do not normally allow the use of large recovery systems as in open water, but may still be manoeuvrable by smaller boats.

The main strategies for coastal zones are:
a) Mechanically contain and recover
b) Deflect from sensitive resources
c) Use of sorbents for sensitive coastal zone
d) Chemical dispersion for non-sensitive coastal zone

5.2.4 Strategy for Shoreline Response

Shoreline response strategies that are to be taken should take into account each shoreline type’s ability to naturally assimilate and disperse oil.

Response methods to be adopted are:

a) Deflect from sensitive resources
b) Manual sorbents application
c) Manual removal of oiled material (hand, shovels, rakes)
d) Manual cutting of vegetation
e) Low pressure flushing at ambient temperature
f) Warm water/low pressure washing
g) High pressure flushing
h) Manual scraping
i) Beach cleaners
j) Bioremediation
k) Dispersants (chemical beach cleaning agents)
l) Natural cleaning

5.2.5 Strategy for Oil and Waste Storage and Disposal

Oil and oil-contaminated waste must be disposed through the PCG/EMB-DENR accredited contractors or as may be determined by the OSC/Stakeholders. A list of accredited oily waste collectors/transporters/treaters can be seen in **Appendix G**.

5.2.6 Do Nothing Approach

If the monitored spill trajectory and nature of the spilled oil would indicate that it will not impact any sensitive resource, it is suggested that the spilled oil be left to weather naturally but with constant monitoring.

5.2.7 Steps in determining appropriate spill response

The diagram in **Figure 3** details the steps to taken in determining the appropriate response strategy.

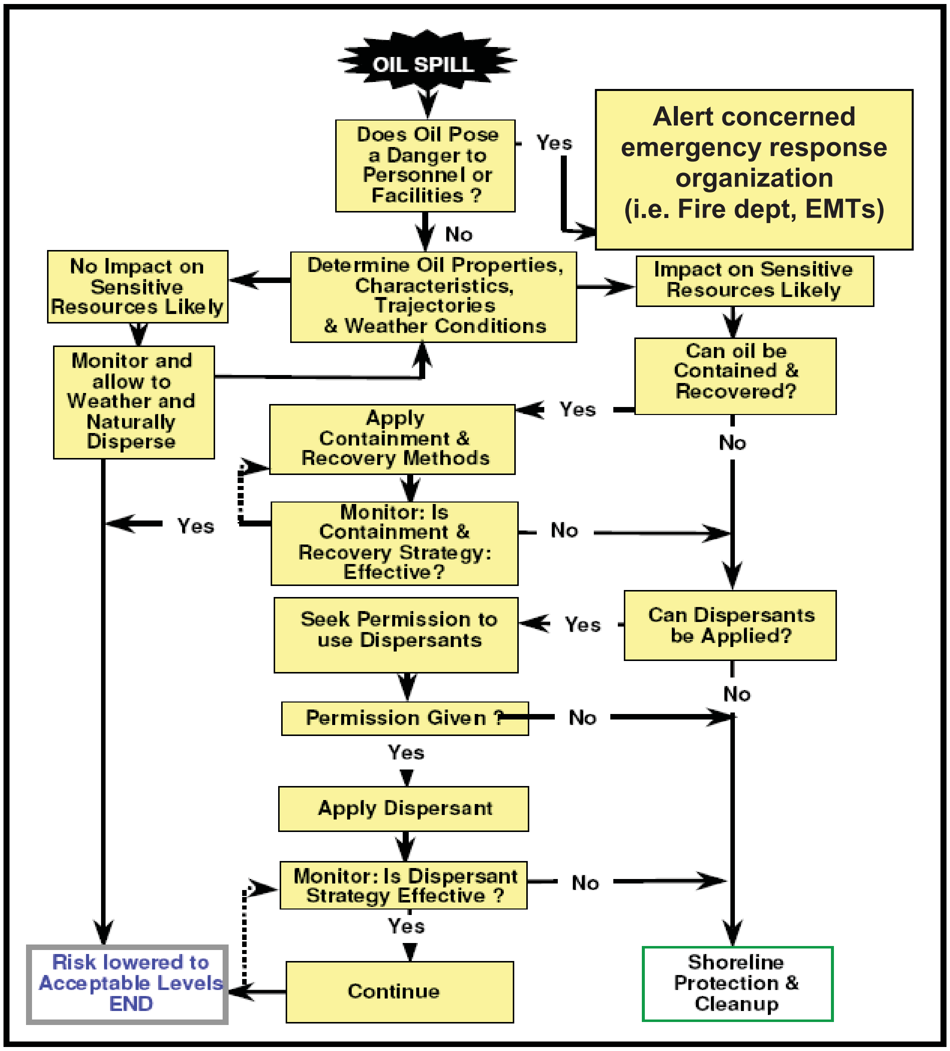


Figure 3: Steps in Determining Appropriate Spill Response

5.3 PHASES OF INCIDENT RESPONSE

Marine pollution response proceeds through a number of stages (**Figure 4**), although the duration of each, and the effort expended, varies greatly according to the scale and nature of the incident. The procedures to be followed in each of these are outlined in this Plan/ MBOSCP.

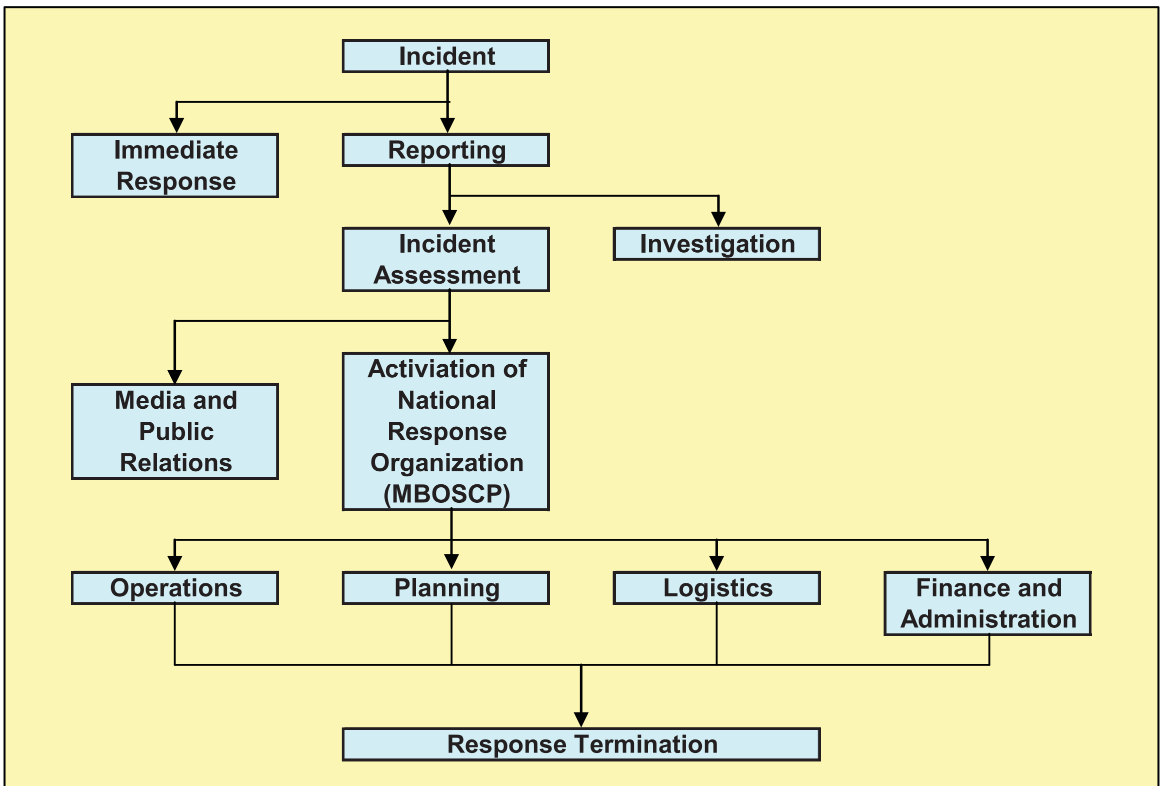


Figure 4: Stages of Oil Spill Response

5.3.1 Reporting

The rapid and accurate reporting of spills is important in enabling a rapid mobilization of an appropriate response.

5.3.1.2 *All Spills*

All oil spills must be reported to the Director, National Operations Center for Oil Pollution.

5.3.1.3 *Spills from Vessels*

All spills into marine waters must be reported immediately to the National Operation Center for Oil Pollution. This reporting is the responsibility of the Master of the Vessel. Spills can also be reported to the nearest Coast Guard Unit. A list of the PCG units and their contact numbers can be found on appendix H

MARINE ENVIRONMENTAL PROTECTION COMMAND/ NATIONAL OPERATIONS CENTER for OIL POLLUTION CONTACT NUMBER, Telefax: 063-2-243-0463

A list of contact numbers of all stakeholders that would be involved in a response can be seen on **Appendix H**.

Important Note: Facility Oil Spill Contingency Plans (OSCPs), and vessel's Shipboard Contingency Plans must clearly indicate the reporting procedures that are applicable within their area of operations. The OSCPs must also clearly assign responsibilities for reporting pollution incidents.

5.4 IMMEDIATE RESPONSE

Parties responsible for spills and discharges must take all actions needed to safely:

- Ensure the safety of workers and the public.
- Make the vessel or facility safe.
- Notify the Philippine Coast Guard
- Prevent further release of oil or chemical.
- Limit the spread of oil or chemical.
- Recover spilt oil or chemical.
- Mobilise available resources for any ongoing response.

5.5 INCIDENT ASSESSMENT

Incident assessment may require a number of tasks:

- Investigation of spill source. (This will be conducted by the PCG.)
- Spill location, observation and monitoring.
- Assessment of required level of response. This task is addressed below.

5.5.1 Responsibility for Determining the Response Tier

Tier 1 status is generally determined by the Facility Response Organization Head or Master of the vessel in consultation with the PCG. However, if both parties are unable to determine the tier level or the spiller is unknown the PCG will determine the appropriate spill response level. For spills that require more than a Tier 1 response, a Tier 2 or Tier 3 status is determined by the Philippine Coast Guard.

5.6 ACTIVATION OF THE OIL SPILL INCIDENT CONTROL MANAGEMENT TEAM (OSICMT)

If a response is required, the Commander, CGD NCR-CL shall mobilize a suitable OSICMT. Personnel who can man the different functions are shown in **Figure 5**. The size of the OSICMT will depend on the nature and scale of the incident.

If industry is involved in the spill, a representative from the responsible company will be part of the OSICMT. The distribution and the functions within the OSICMT are described in section 3 of this plan.

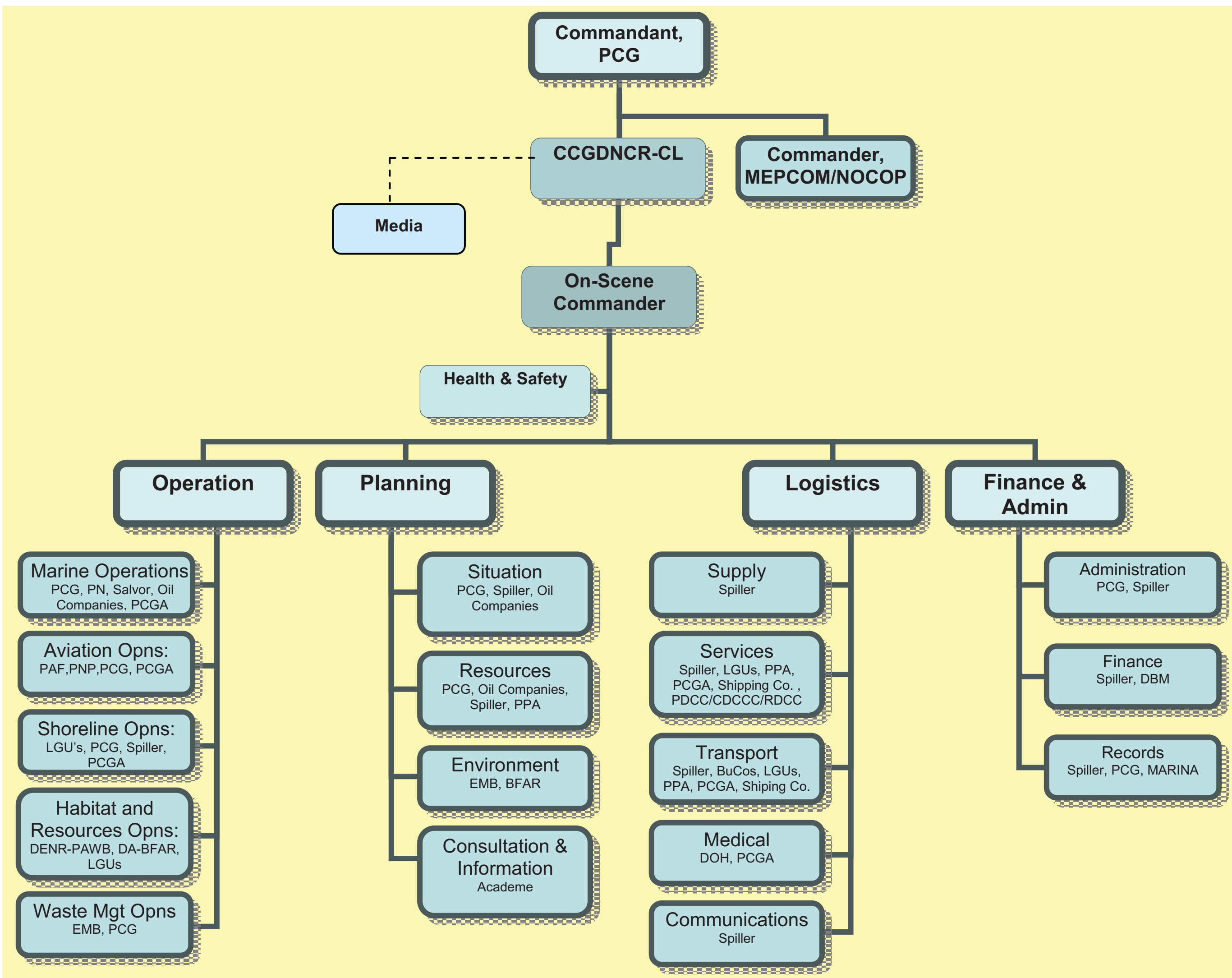


Figure 5: Oil Spill Incident Control Management Team

5.7 MEDIA AND PUBLIC LIAISON

Management of public information and the media will be handled by the Director, NOCOP, through the Public Information Officer of the PCG.

5.8 OPERATIONS

5.8.1 Operational Priorities

For most spills the operational response priorities will be

- Monitoring; natural weathering and dispersal.
- Containment and recovery.
- Use of dispersants.
- Protection of shorelines and other sensitive natural, cultural or socio-economic resource
- Shoreline cleanup.

5.8.2 Monitoring

The behavior and trajectory of oil slicks can be determined by direct observation (surveillance), manual calculation, or through computer modeling. The Aerial Surveillance Manual provides guidelines for this.

5.8.2.1 *Predicting Spill Trajectory*

Manual Calculation:

The trajectory of a spill can be roughly calculated by adding the surface current velocity to 3% of the wind velocity.

Computer Modeling:

Spill trajectory modeling software is available at the PMO, Manila Bay Environmental Management Program and is part of the Integrated Information Management System administered by the PMO, MBEMP. The model requires the supply of current on site wind data (if available) and past, current and future wind data from PAG-ASA.

5.8.2.2 *Identification of Resources at Risk* (refer to Section 2)

5.8.2.3 *Slick Parameters*

Estimating the oil slick area, oil thickness and possible volumes is important in determining the appropriate response strategies and resource requirements.

Estimates of spill volumes can often be made on the basis of the cause and duration of the spill. It is also possible to estimate the volume of a slick on the basis of its appearance at sea, and the area covered.

5.8.3 Containment and Recovery

Effective containment of spilt oil limits the extent of any potential environmental harm. Effective containment of spilt oil limits the extent of any potential environmental harm and will facilitate the recovery of the oil. Containment of an oil spill relies on the effective and efficient deployment of booms. Effective recovery requires the deployment of suitable skimmers and adequate containers for storage of recovered oil.

5.8.3.1 *Constraints*

As noted in Table 7, this response strategy is constrained by a number of environmental and logistics considerations.

Table 7: Constraints to Response Strategies

Response Strategy		Constraints				
		Sea State[1]	Current (knots)[2]	Wind (knots)	Oil Viscosity[3]	Others
Boom	Containment	3-4	1.0	14-22	-	Vessel availabilit
	Deflection	3-4	2.0	14-22	-	
Skimmers	Weir	1	1.0	7	<1000[4]	Recovere waste of storage availabilit
	Disc	2-3	1.0	11-14	<1000[4]	
	Mop/Belt	3-4	1.0	14-22	<1000[4]	
	Vacuum	1	1.0	7	-	
Physical Break-up[4]		-	-	-	-	Oil type
Dispersants	Vessels	4	-	22.0	<2000[4]	-
	Aircraft	5	-	27.0	<2000[4]	Range
Monitoring		-	-	-	-	Visibilit

(1) Beaufort scale

(2) 1 knot = 0.5m/second or 1.8 km per hour approximately

(3) cSt = centistokes

(4) This method should ***not*** be used on fresh spills of light crude or condensate. All light oils should be allowed to weather for at least for a few hours.

The effectiveness of some equipment is restricted to a particular range of oil types (usually, viscosity is the constraint) or sea states. It is important therefore that the characteristics of the spilled oil and weather conditions are known before equipment is activated. The strategy is also unsuitable for use on very light oils and condensates.

5.8.4 Use of Dispersants

Dispersants act to "break up" surface slicks and will result in oil becoming mixed into the upper layers of the water column (i.e., 0-5m depths).

5.8.4.1 *Considerations and Constraints*

Dispersants should be used to:

- Reduce the fire risk posed by spills of light to moderate crude oils or diesel.
- Facilitate the breakup of spills of dispersable oils.

Dispersants should be used when there is a net environmental benefit, i.e. when the potential harm, done by dispersed oil is less than untreated oil.

Caution: Dispersants should not be used unless authorized by the Philippine Coast Guard. Responders must first seek the approval of the PCG.

The decision as to whether to use dispersants is based on a number of considerations such as:

- Health and safety aspects of handling dispersants must be managed.
- Environmental risks must be assessed.
- Spotter aircraft are required to assist vessels to locate the oil, (unless the oil slick is thick).

5.8.4.2 *Application Methods*

Dispersants may be applied by:

- Vessels equipped with dispersant spray booms: This is a relatively slow method but is particularly applicable for small spills of oil close to the source.
- Helicopter and spray buckets.
- Fixed wing aircraft.

5.8.5 Shoreline Response

When spilled oil cannot be contained and recovered nor dispersed it should be deflected to less sensitive areas and shoreline operations undertaken.

5.8.5.1 *Considerations and Constraints*

Shoreline cleanup strategies must be developed in consideration of shoreline characteristics, such as:

- Substrate type and shoreline type
- Exposure to wave action
- Biological, social or economic resources
- Access available
- Nature of the oil (viscosity etc.)
- Amount of oil present
- Distribution of oil on the beach, and in the sediments
- Available equipment and labor
- Available waste storage areas.

5.8.5.2 *Methods*

Table 7 indicates suitable cleanup methods for various shoreline types. Methods used should be based on a sound assessment of the factors listed above.

Table 7: Clean-up Methods

Cleanup Methods	Shoreline Type[1]													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Natural Processes	R	R	F	F	F	R	F	R	C	C	C	C	C	R
Manual Cleanup	F	F	R	R	R	R	R	C	C	C	C	C	R	R
Trenching				F	F	F	F							
Mechanical Sediment Removal						F	R	C						
Mech. Sediment Reworking						R								
Water Washing (Deluge)		F	F	F	F	R	F	F	F	F	F	C	C	
Water Washing (Low P)[2]		F					F	R	F	F	F	C	C	
Water Washing (High P)[2]	C	C	C	C	R	F								F
Hot Water Washing (Low P)[2]	C													F
Hot Water Washing (High P)[2]	C													F
Sand Blasting/Steam Cleaning	C													F
Vacuum Recovery	F	F	F	F	F	F	R	R	C	C	C	C	R	C
Sed't Excavation/Cleaning/Replac't				F	F	F								
Cutting Oiled Vegetation	C	C	C	C	C	C	C		C	C			C	C
Chemical Cleaning	C	C	C	C	C	C								C
Bioremediation: Nutrient Enhancement				C	C	C	C		C	C				
Bioremediation: Microbial Addition				C	C	C	C	C	C	C	C	C	C	

R *Recommended – preferred option.*
F *Feasible, but not preferred option. Assessment needed.*
NA *Feasible but not available because of location of resources or other logistics constraint.*
C *Conditional. Possibly useful or may be considered but may have adverse effects or result in damage. Assessment and approval required.*
NR *Not required. Oil not expected to persist.*
(shaded) *Not recommended – either not feasible, not safe or has significant adverse effects.*

(1) *A=* *Exposed Bedrock Cliff/Seawalls*; *B=* *Exposed Bedrock Platform/Reef*; *C=* *Sheltered Bedrock Platform/Reef*; *D=* *Exposed Boulder/ Cobble and Rip rap*; *E=* *Sheltered Boulder/ Cobble and Rip rap*; *F=* Pebble Beaches; *G=* Sand Beaches; *H=* Intertidal Mud/Sand Flats; *I=* Mangroves; *J=* Saltmarshes; *K=* Seagrass (Shallow/Intertidal); *L=* Shallow/Intertidal Corals; *M=* Natural Inlets/ Channels; *N=* Marinas/ Artificial Waterways

(2) *Low P = <50 PSI, High P = >50 PSI*

5.8.6 Wildlife Response

Wildlife, particularly birds, may be severely impacted by spilled oil. Migratory birds are especially susceptible to oiling. The DENR PAWB shall be responsible for wildlife response.

5.8.7 Waste Management

Wastes generated by marine containment and recovery, or by shoreline cleanup, must be stored, transported and disposed of according to DENR-EMB guidelines. While this remains the responsibility of the spiller, the DENR-EMB maintains a list of companies licensed to transport, store and dispose of wastes. The DENR EMB or the concerned local government unit will assist the On Scene Commander in the temporary storage and transport of wastes and will assist responsible parties in identifying potential waste storage and disposal contractors.

5.9 RESPONSE TERMINATION

5.9.1 Responsibility

The decision to terminate a Tier 1 response is taken by the District Response Organization in consultation with the affected stakeholders. The OIC of the 1 MEPU will then inform the Director, NOCOP of the group's decision to terminate the response effort. Higher tiered responses can be terminated only on the authorization of the Director, NOCOP in consultation with concerned LGU, DENR-EMB, BFAR, and other concerned agencies as appropriate.

5.9.2 Conditions for Termination

There are no "rules" for deciding when a response should be terminated.

Generally, the decision to stop active cleanup is taken when efforts are not returning any tangible benefit. This decision is rarely made at the same time for all components of the response and some Units will be reduced in size, or demobilized, earlier than others.

5.9.2.1 *Marine and Aerial Response*

Marine Response Operations are stood down when:

- All oil has been recovered; or
- The oil slick has dissipated (broken up); or
- The oil slick has gone out to sea and is beyond the range of response options and is unlikely to return; or
- All oil has impacted shorelines and is unlikely to be refloated. In this case some marine response resources would remain on standby until shoreline response has been terminated.
- The oil has otherwise ceased to be a threat to the environment.

5.9.2.2 *Shoreline Response*

Shoreline cleanup operations may be terminated when:

- All accessible shorelines are clean or
- Cleanup is having no further beneficial effect, or
- Cleanup is having deleterious effects on the shoreline or associated plants or animals, or

- The extent and degree of oiling is judged to be acceptable or as having little or no adverse effects.

5.9.2.3 *Wildlife*

Wildlife response may continue for some time and will generally only cease when all affected animals are cleaned and rehabilitated. Although the wildlife response may continue after the demobilization of the rest of the OSICMT, it is important that NOCOP maintain records so that costs can be claimed where applicable.

5.9.2.4 *Waste Management*

In a major spill the management of wastes may continue for a considerable time beyond the demobilization of field operations. The responsibility for this would generally rest with the Spiller or, if the Spiller is unknown, responsibility lies with the Local Government Unit.

5.9.2.5 *Logistics*

Logistics function will continue until all equipment is recovered, cleaned and returned to its source.

5.9.2.6 *Finance and Administration*

The Finance Unit will be retained until all claims are processed and costs are determined. This may be some time after demobilization of the OSICMT.

5.9.3 Debriefing

The PCG will hold a post-spill debriefing for any spill for which a response was activated. This should be held within 14 days of termination of the response. The debriefing should address:

- Spill causes (if known).
- Speed of response activation.
- Effectiveness of tactics and strategies.
- Equipment suitability.
- Health and Safety issues (if any).
- Communications
- Integration of plan and procedures with other response agencies.
- Possible improvements in plans, procedures strategies or response methods.

5.9.4 Incident Report

The Director, NOCOP shall prepare an incident report, the contents of which should include response cost and damage assessment.

5.9.5 Cost Recovery

Marine pollution incidents can result in expensive cleanup costs and damages.

5.9.5.1 *Response Costs*

All records of response costs must be collated and submitted to the Director of NOCOP for claims recovery. The PCG will process these costs and collate for possible recovery from the Responsible Party.

5.9.5.2 *Compensation Claims*

Members of the public or commercial operators who have incurred costs or damages resulting from an oil pollution incident from a vessel can apply for compensation from the vessel's P&I Club. In large responses, the vessel's insurers shall establish a *Claims Office* located near the incident control room where claims can be lodged.

In the case of spills from other sources, claims should be sent to the Responsible Party (i.e., the spiller). The PCG may collate such claims for presentation to the Responsible Party or their insurers.

<u>The 1992 Civil Liability Convention</u>

Under the 1992 Civil Liability Convention (CLC), claims for compensation for oil pollution damage caused by persistent oil may be made against the registered owner of the ship from which the oil that caused the damage originated (or his insurer).

The shipowner is liable to pay compensation for pollution damage caused by escape or discharge of persistent oil from his ship even if the pollution was not due to any fault on his part. The shipowner is exempt from his liability only in very special circumstances.

The shipowner is entitled to limit his liability to an amount calculated on the basis of the tonnage of the ship. The shipowner is deprived of the right to limit his liability, however, if it is proved that the pollution damage resulted from his personal act or omission, committed with the intent to cause pollution damage, or recklessly and with knowledge that such damage would probably occur.

<u>The 1992 Fund Convention</u>

The 1992 Fund was established in 1996 under the 1992 Fund Convention, and is financed by companies and other entities in Member States that receive certain types of oil carried by sea. The Fund is an intergovernmental organization set up, and governed by States.

Under the 1992 Fund Convention, additional compensation is made available by the 1992 Fund when claimants do not obtain full compensation under the 1992 CLC. The maximum compensation payable by the 1992 Fund for any one incident is 203 million SDR (US$310 million) whatever the size of the ship.

DATA DIRECTORY SECTION

Appendix A
DENSITY AND VESSEL TRAFFIC

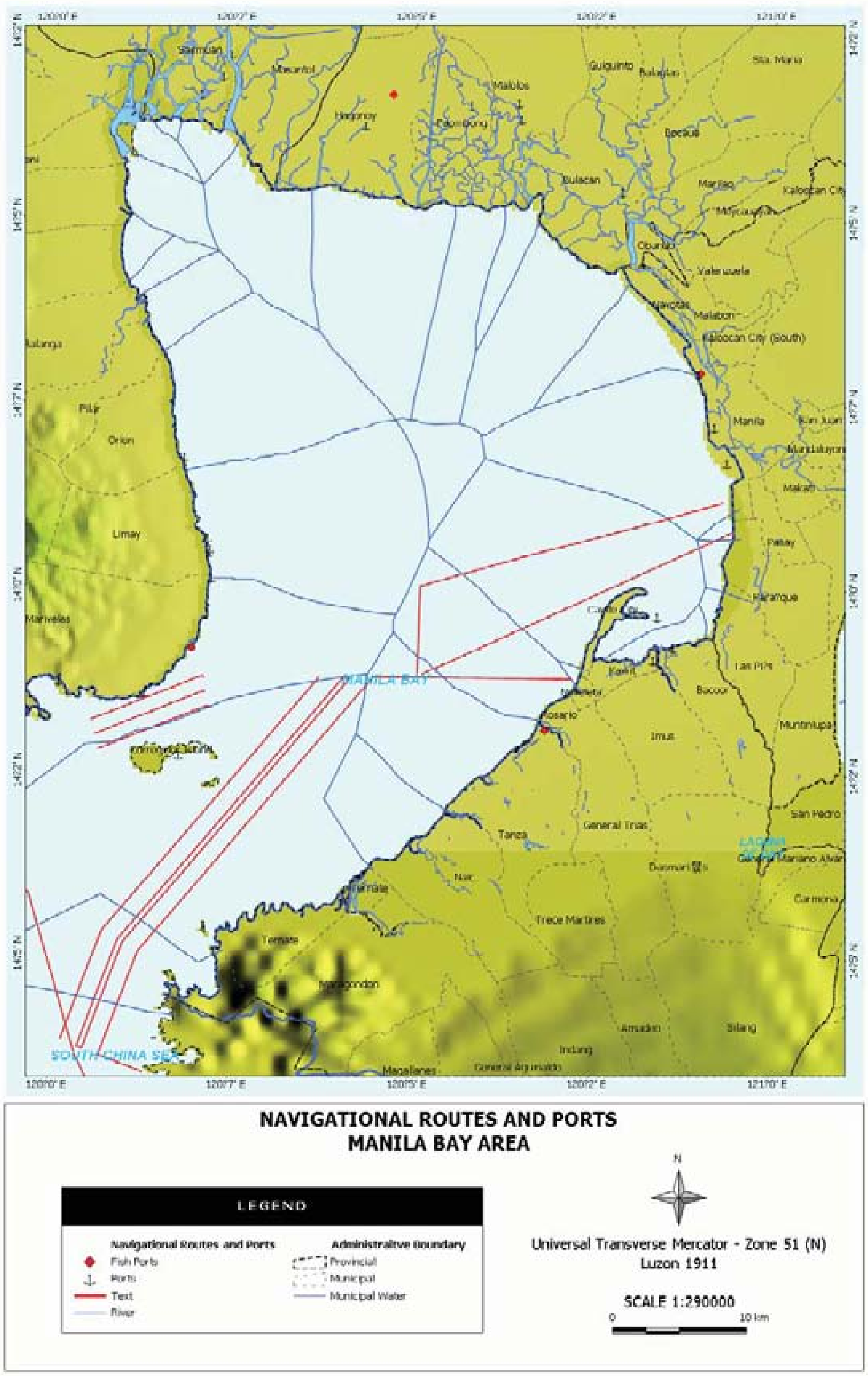
PMO : NORTH HARBOR (MANILA)			
AT BERTH ONLY			
2004			
PARTICULARS			TOTAL
	Number of Vessels		6,292
		Domestic	6,026
		Foreign	266

PMO : LIMAY			
AT BERTH AND ANCHORAGE			
2004			
PARTICULARS			TOTAL
	1. Number of Vessels		11,368
		Domestic	10,841
		Foreign	527

PDO MANILA: MANILA INT'L CONTAINER TERM. FIELD OFFICE			
AT BERTH AND ANCHORAGE			
2004			
PARTICULARS			TOTAL
	1. Number of Vessels		2,061
		Domestic	4
		Foreign	2,057

PMO : SOUTH HARBOR (MANILA)			
AT BERTH AND ANCHORAGE			
2004			
PARTICULARS			TOTAL
	1. Number of Vessels		10,135
		Domestic	8,329
		Foreign	1,806

Appendix B
NAVIGATIONAL ROUTES AND PORTS


NAVIGATIONAL ROUTES AND PORTS
MANILA BAY AREA
LEGEND
Navigational Routes and Ports
Fish Ports
Ports
Text
River
Administrative Boundary
Provincial
Municipal
Municipal Water
Universal Transverse Mercator - Zone 51 (N)
Luzon 1911
SCALE 1:290000
0
10 km
N
MANILA BAY
SOUTH CHINA SEA
Malolos
Guiguinto
Sta. Maria
Bulacan
Marilao
Valenzuela
Navotas
Malabon
Kaloocan City (South)
Manila
Makati
Pasay
Paranaque
Las Pinas
Bacoor
Muntinlupa
Imus
Rosario
General Trias
Tanza
Naic
Ternate
Maragondon
Trece Martires
Carmona
San Pedro
Amadeo
Silang
Indang
Magallanes
Pilar
Orion
Limay
Mariveles

Private Ports in Bataan

STORAGE FACILITIES (PRIVATE PORTS /TERMINALS IN BATAAN)

LOCATION	TYPE	CAPACITY
a. LIMAY		
Petron Bataan Refinery	Crude Oil Storage Tanks	1,000,000 barrels
	LPG Storage Tanks	100,000 barrels
PPI/ Limay Bulk	Warehouse	53,000 Metric Tons
	Open Storage Area	180,000 m
PNOC PDC	Warehouse	3,000 m
	Open Stacking Area	4,000 m
OILINK	Storage Tanks	455,000 barrels
	Open Storage Area	10,000 m
MARIVELES		
Total-Liquigaz	Storage Tanks	180,000 barrels
	LPG Storage Vessels	12,000 metric tons
SMC-BMT	Vertical Silos	18,000 metric tons
	Star Bins	2,500 metric tons
	Intermediate Bins	320 metric tons
	Loading Bins	120 metric tons
ATI-MGT	Vertical Silos	110,000 metric tons
	Warehouse	50,000 metric tons

PORT SERVICES

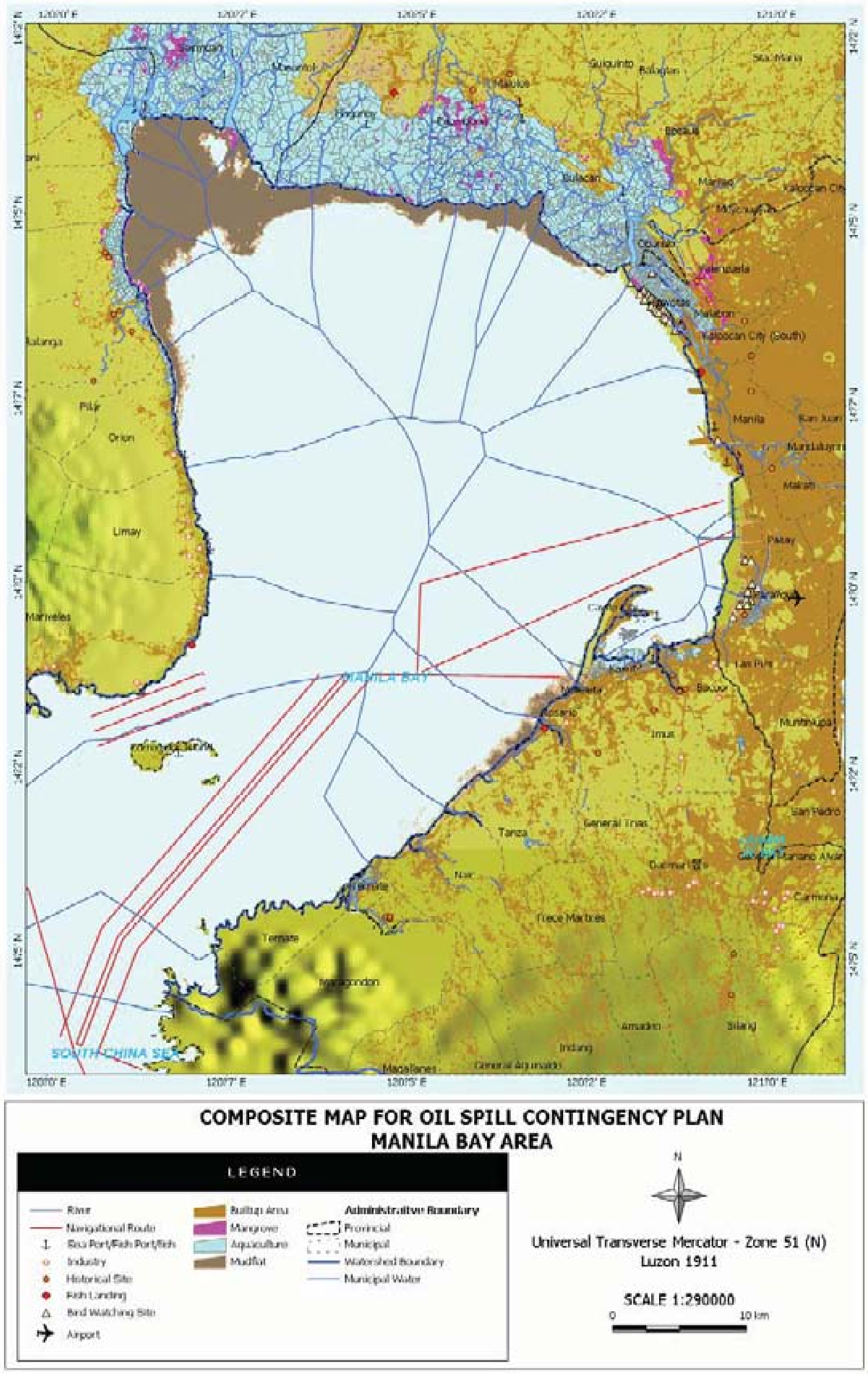
a. CARGO-HANDLING SERVICES

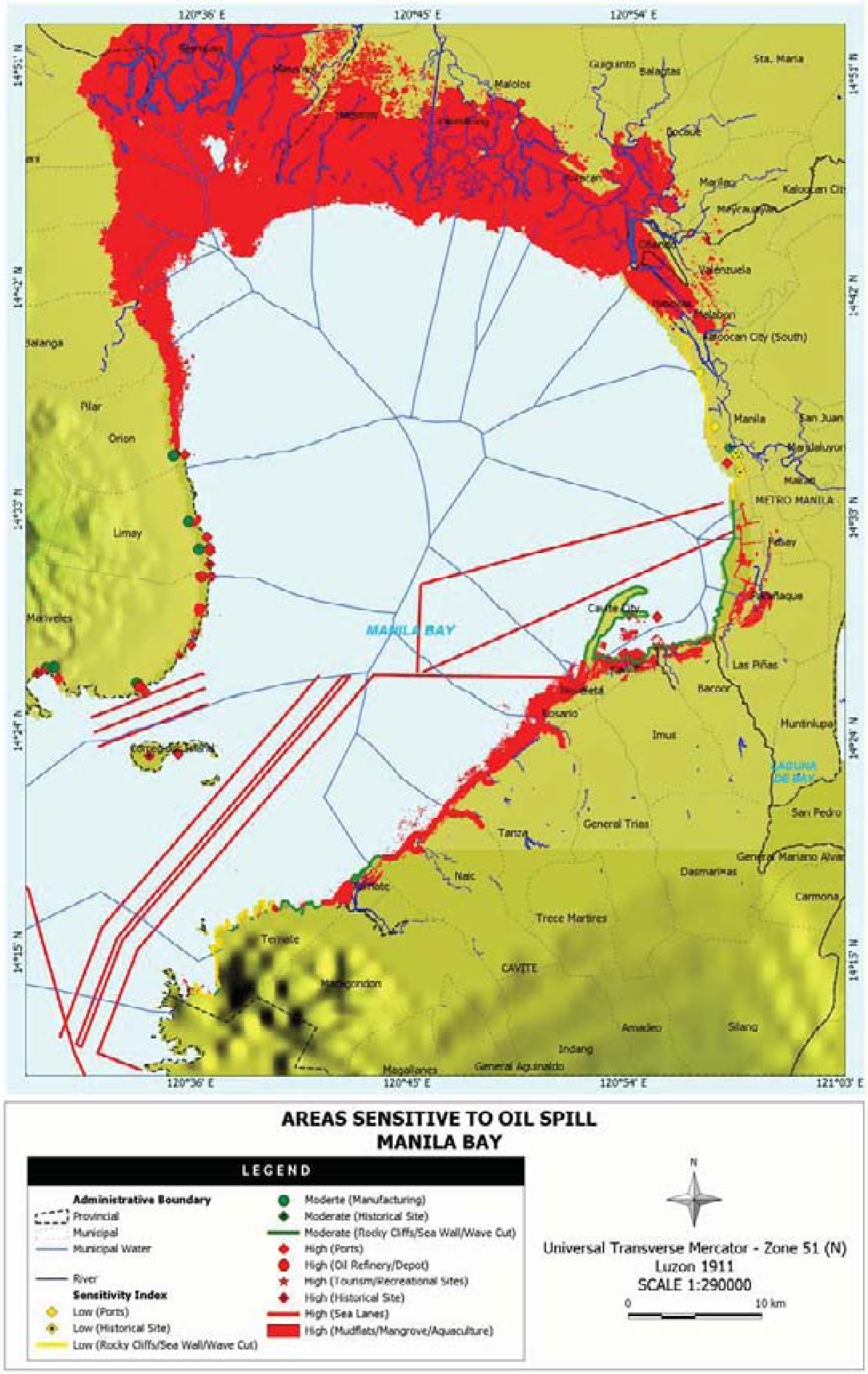
Name of Cargo Handler	Area of Operation	Type of Equipment
DJ Roque const.Co.Inc.	Lamao Anchorage	Special equipment for stevedoring work
Ace Technical	Mariveles Anchorage	Equipment for bulk cargo and grains
Herma Port Terminals	Mariveles	Equipment for explosives and dangerous cargoes
PBR	Limay	Special equipment for petroleum products
PPI	Limay	Shovel grab, conveyors
Oilink International Corp.	Lucanin	Pipelines, storage tanks
Total-Liquigaz	Alas-asin	Pipelines, storage tanks
Bataan Malt Terminal	Mariveles	Unloaders, conveyors, silo
Mariveles Grains Terminal	Mariveles	Unloaders, conveyors, silo

b. BERTHING FACILITIES: (PRIVATE PORTS/TERMINALS IN BATAAN)

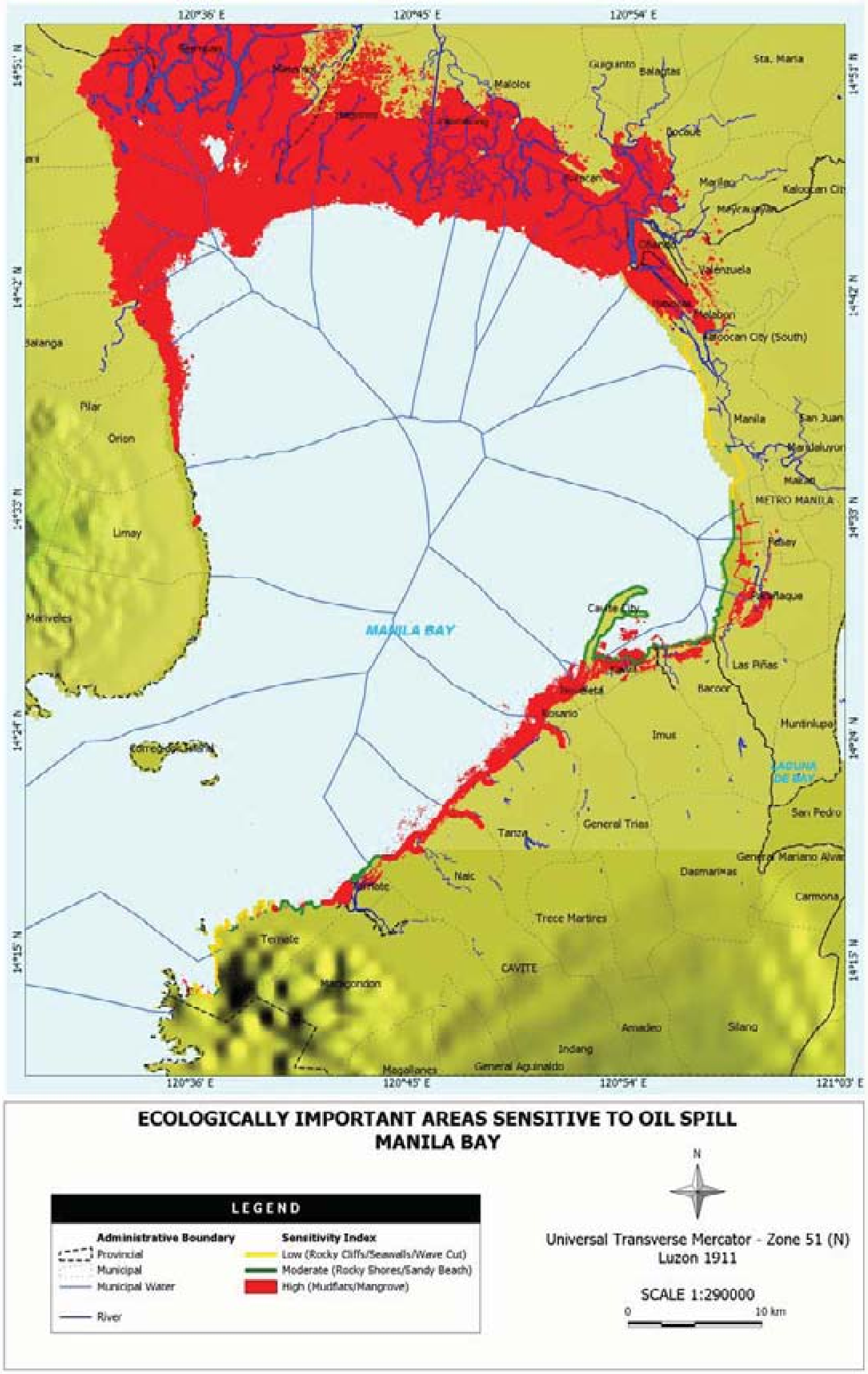
Pier/Terminal	Length & Width	Ave. Draft	Berth	Cargo System
b. PBR				
Product Pier	439 m. x 15.90 m.	3.98-13 m.	8	Loaders/ Pipelines
Causeway	85.36 m.			
LPG Pier	24.6 m x 3.0 m.	5.40 m.	1	Loaders/ Pipelines
CBM	305 m. x 49 m.	15.85 m.	1	Submarine Pipes
SBM	341.38 m. x 53.35 m.	22.86	1	Submarine Pipes
c. PPI/ LBHTI				
T-pier	426.7 m. x 411.4 m.	14.0 m.	2	Unloader/ Conveyor
Causeway	299 m. x 4.5 m.	4.50 m	1	Pipelines
d. PNOC/PDC				
Causeway	13 m. wide			
Pier Head	178 m. x 5.0 m.	14.0 m	2	Loading Platform
Protective beam	18.0 m. x 20.0 m.			
e. OILINK				
Sea berth	260.0 m. x 40.0 m.	11.0 m.	1	Pipelines/tanks
Finger pier	60.0 m. x 4.0 m.	3.50	2	Pipelines/tanks
f. Total-Liquigaz	530.0 m. x 5.0 m.	20.0 m.	3	Pipelines/ tanks
g. Edison Bataan	50.0 m x 6.0 m.	6.0 m	1	Pipelines
h. Robust Rocks	200.0 m x 7.0	6.0 m	4	Loading Ramps
i. Herma Port	358.0 m x unlimited	7.50 m.	3	Graving dock/crane
j. SMC-BMT	217.0 m x 15.0	14.50 m	1	Portalino unloader
k. ATI-MGT	156.0 m. x 10.0 m	14.50	2	Vacubators/silos

Appendix C
OIL SPILL SENSITIVITY INDEX MAPS

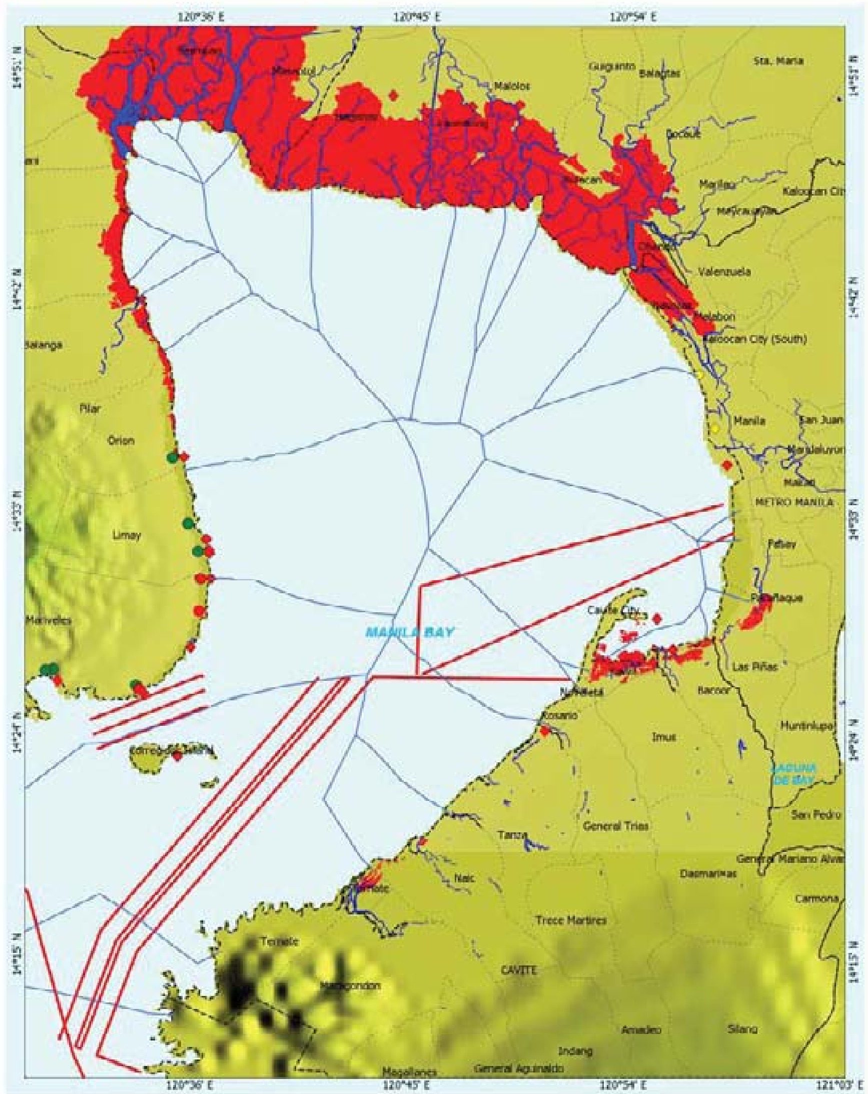

COMPOSITE MAP FOR OIL SPILL CONTINGENCY PLAN
MANILA BAY AREA
LEGEND
River
Navigational Route
Industry
Historical Site
Fish Landing
Bird Watching Site
Airport
Builtup Area
Mangrove
Aquaculture
Mudflat
Administrative Boundary
Provincial
Municipal
Watershed Boundary
Municipal Water
N
Universal Transverse Mercator - Zone 51 (N)
Luzon 1911
SCALE 1:290000
0
10 km
MANILA BAY
SOUTH CHINA SEA
Manila
Bulacan
Limay
Orion
Pilar
Mariveles
Tanza
General Trias
Ternate
Naic
Indang
Amadeo
Silang
Imus
Bacoor
Malabon
Navotas
Valenzuela
Kaloocan City (South)
Pasay
Makati
Muntinlupa
San Pedro
Carmona
Trece Martires
Maragondon
Magallanes
Rosario
Obando
Meycauayan
Marilao
Bocaue
Malolos
Calumpit
Guiguinto
Balagtas
Sta. Maria
Hagonoy
Paombong
Macabebe
Lubao
Sasmuan
120°0' E
120°7' E
120°15' E
120°22' E
121°0' E



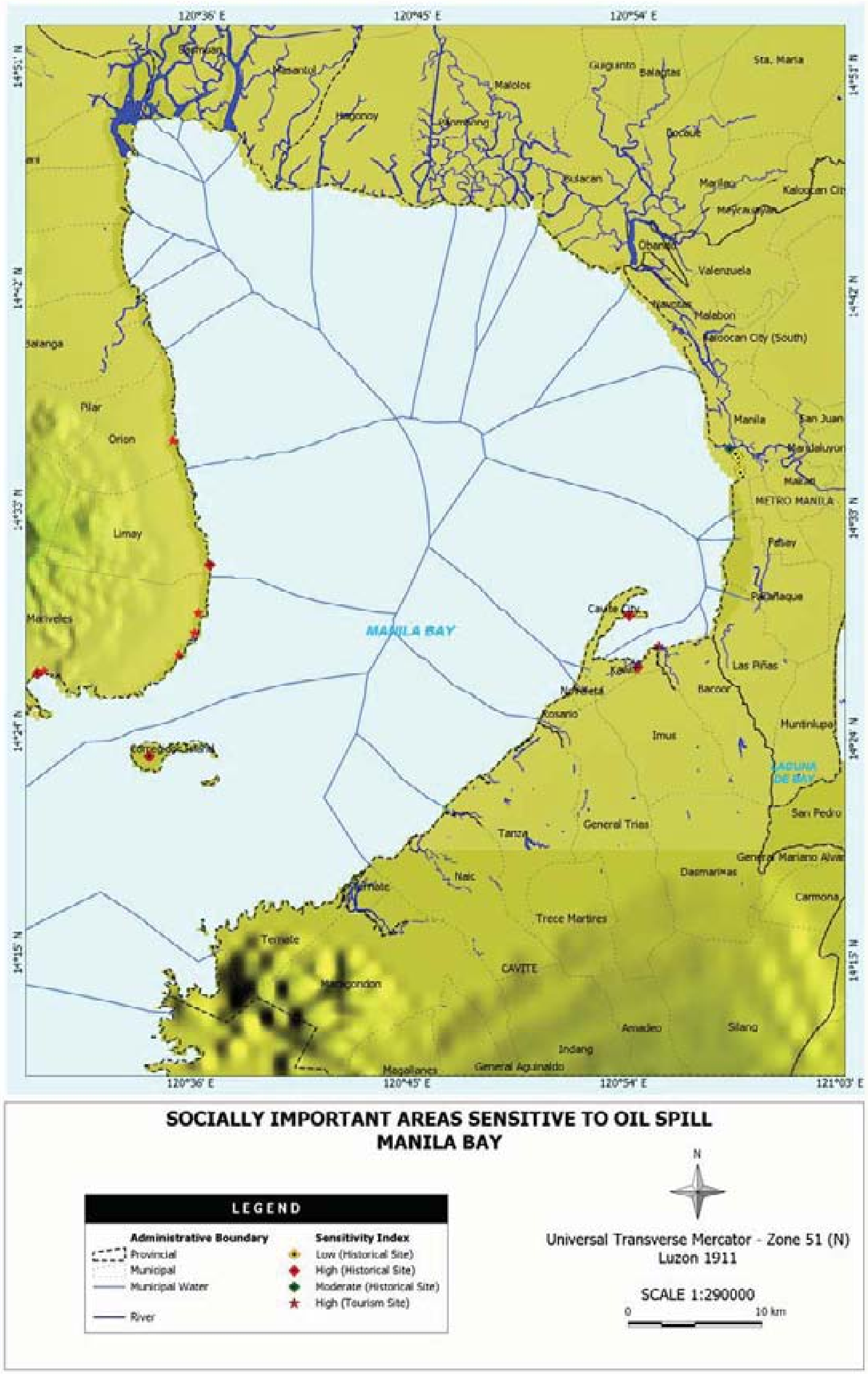
120°36' E
120°45' E
120°54' E
121°03' E
14°51' N
14°42' N
14°33' N
14°24' N
14°15' N
Malolos
Guiguinto
Balagtas
Sta. Maria
Bocaue
Marilao
Meycauayan
Valenzuela
Malabon
Kalookan City (South)
Manila
San Juan
Mandaluyong
Makati
METRO MANILA
Pasay
Parañaque
Las Piñas
Bacoor
Muntinlupa
Imus
LAGUNA DE BAY
San Pedro
General Trias
Tanza
Rosario
Cavite City
Dasmariñas
General Mariano Alvarez
Carmona
Naic
Ternate
Maragondon
Trece Martires
CAVITE
Amadeo
Silang
Indang
General Aguinaldo
Magallanes
Balanga
Pilar
Orion
Limay
Mariveles
MANILA BAY
AREAS SENSITIVE TO OIL SPILL
MANILA BAY
LEGEND
Administrative Boundary
Provincial
Municipal
Municipal Water
River
Sensitivity Index
Low (Ports)
Low (Historical Site)
Low (Rocky Cliffs/Sea Wall/Wave Cut)
Moderte (Manufacturing)
Moderate (Historical Site)
Moderate (Rocky Cliffs/Sea Wall/Wave Cut)
High (Ports)
High (Oil Refinery/Depot)
High (Tourism/Recreational Sites)
High (Historical Site)
High (Sea Lanes)
High (Mudflats/Mangrove/Aquaculture)
N
Universal Transverse Mercator - Zone 51 (N)
Luzon 1911
SCALE 1:290000
0
10 km



ECOLOGICALLY IMPORTANT AREAS SENSITIVE TO OIL SPILL
MANILA BAY



ECONOMICALLY IMPORTANT AREAS SENSITIVE TO OIL SPILL
MANILA BAY



SOCIALLY IMPORTANT AREAS SENSITIVE TO OIL SPILL
MANILA BAY

Appendix D
POLLUTION REPORT
(POLREP)

Name of vessel/source of spill ……………………………………………………………………….

Date/time of incident……………………..……………………………

Date/time of
report………………………………………………………...………

Location of incident:
bearing/distance………………………………..……………..…

Lat: ……………………….............................. Long: ………………………..............................

Source of
report………………………………………………………………..................................………

Contacts: Phone …………..……….……....................... Fax ..……..……

Nature of incident and spill source…………...…………….………………..…
…………………………………………………………………………....................................……..…

Confirmed: Yes/No

Point of discharge…………………………………………………………......................................………

Oil type or description ……………………………………………………….................................…..

Identity and position of ships in vicinity ……………………………….….......................................

Cause of discharge………………………………………………….……..

Nature and extent of pollution…………………………………………….......................................
……………………………………………………………………………………....................................

Drift and rate of pollution…………………………………………………..

Has discharge ceased ……………....................…. Weather/sea state/tide ……..................………

Samples/photographs taken ….…….................… Agency/organization ……..........................…..…

Details of Film/Roll/Frame number ………………………………...………

Contacts details: Phone ……………..................……… Fax ………………………………..................

Action(s) taken…………………………………………..…………….……
……………………………………………………………………………………......................................

Details of equipment use…………………………………………......................................…………
……………………………………………………………………………………....................................…

Additional information ……………………………………………...........................………….
…………………………………………………………………………………….......
...............................…………………………………….………………………………….......

Appendix E
LIST OF EQUIPMENT

I. PHILIPPINE COAST GUARD (LOCATED AT HMEPCOM/NOCOP)

Unit Description		Quantity
1.	Oil boom (inflatable)	2 sets
2.	Oil boom (solid) including extra	1 set
3.	Oil skimmer Mitsui-COV E3	1 set
4.	Oil tank	1 set
5.	Mitsui transfer Pump	1 set
6.	Dispersant Pump & Spraying System	1 set
7.	Dispersant	12 drums
8.	Sorbents	50 bales

II. OIL INDUSTRY SPILL EQUIPMENT (within Manila Bay Area)

A. LOCATED IN PANDACAN, MANILA

1. CALTEX

Unit Description		Quantity
1.	Slickbar, oil spill containment boom with accessories	4 units
2.	HUTCMNSON oil spill control boom with accessories	5 units
3.	Yamaha speed boat motor	1 unit
4.	Small tug boat 70 HP (low speed)	1 unit
5.	Portable oil recovery system	1 set
6.	Portable dispersant sprayer	1 unit
7.	Corexit dispersant	25 pails
8.	Dascs chemical dispersant	38 pails
9.	Lighted buoy (amber)	3 units

2. SHELL

Unit Description		Quantity
1.	13-ft pollution boat (110 HP)	1 units
2.	Skimmer pump	1 unit
3.	Slick bar oil spill control boom – 193 meters long	1 unit
4.	YOSHII hand sprayer for oil dispersant	2 units
5.	20 D oil dispersant	18 pails
6.	Life jackets	9 pcs.

3. PETRON

Unit Description		Quantity
1.	150-ft long oil spill boom	1 units
2.	50 HP Yamaha outboard motor (speed boat)	1 unit
3.	skimmer pump	1 unit
4.	suction hoses 3”-dia x 10-ft long	7 pcs
5.	discharge hoses 3:-dia x 20-ft long	4 pcs
6.	Back pack sprayer	1 unit
7.	Corexit 9527 dispersant	4 drums

B. LOCATED IN LIMAY, BATAAN

PETRON BATAAN MACHINERY CORPORATION

Unit Description		Quantity
1.	Slickbar oil boom	2000 ft
2.	Vacuum truck	1 unit
3.	Air driven saucer pump for oil recovery	1 unit
4.	Portable back pack dispersant sprayer	15 pails
5.	1 ½” foam eductor type branch-pipe for nozzle dispersant saparyer	5 units
6.	Corexit 9527 dispersant	24 drums
7.	Powered pollution boat	1 unit
8.	work barge	1 unit

III. OIL INDUSTRY SPILL EQUIPMENT INVENTORY
(Outside Manila Bay Area but can be available within 24 hours)

A. PILIPINAS SHELL REFINERY (Tabangao, Batangas City)

	Unit Description	Quantity
9.	Inflatable Boom with accessories	set 1
10.	Skimmer, Disc 12K Komara,	set 1
11.	Dispersant, VDC	20 drums
12.	Sprayer, Dispersant, Back pack type	12 sets
13.	Fast Tank, 1,500 Gallons	2 sets
14.	Shovels	24 pcs
15.	Rakes	24 pcs
16.	Pails	24 pcs
17.	Boat, Fiber Glass w/60 HP Outboard Motor	1 unit
18.	Boat, Mooring/Utility 50 ft. Twin Engine w/ Communication Radio VHF Marine	1 unit
19.	Bag Plastic	100 pcs
20.	Dispersant Sprayer, Diesel Driven Hand Start, Air-cooled Honda D320 Engine	1 unit
21.	Boom, Ro-boom model 800 15 dia. Setrom w/Towing Equipment, Portable Water Pump	2 unit
22.	Boom, Ro-boom Bridle 0610 12 x 25m Satrom with wheels, Air Blower & Towing Equipment	12 sets
23.	Buoy Marker	24 pcs
24.	Drums, Empty	24 pcs
25.	Sorbents	6 pcs
26.	Boat, Tug 3500 with Firefighting Capabilities	1 unit

B. CALTEX (PHILIPPINES) INC. (Batangas Refinery)

1.	Fiberglass Speed Boat - 18 Ft. S/B HABAGAT 200 HP OUTBOARD GASOLINE ENGINE	unit	1
2.	Fiberglass Rowboat	unit	1
3.	Life jackets	pcs	40
4.	Life Buoy Ring	pcs	4
5.	Motorola VHF Mobile type Base radio	unit	1
6.	Motorola VHF Potable Radio Model P200	units	11
7.	Slickbar containment boom		
	a) Boom Trailer	units	3
	b) Boom Marker Float	sets	18

8.	Vacuum Truck	unit	1
9.	VIKOMA 12K M" Oil Skimmer System		
10.	Dynamic Inclined Plane Model 400(Port-A-Dip)		
11.	Sorbents Materials		
	a) Metasorb pads M-70 (18 " square/pad at 200 pads/bale)	bales	94
	b) Metasorb Pillows M-65 (5" x 8" x 21" at 10 pillows/bale)	bales	67
12.	Corexit 9527 — 5 gallon palls	gals	110
	55 gallon drums	gals	1,100
13.	Basic Slickgone		
	5 gallon pails	gals	595
	25 liter pails	gals	594
14.	Seaspray 11 Meter Controlled Dispersant Spray System	unit	1
15.	6 Meter Spray Ann Geoform GRP Type with 2 sets of nozzles for neat chemical and up to 18% sea water chemical mixture spraying	sets	2
16.	5 FW Diesel Driven Electric Start Pump fitted w/Hypro Series & rated at 150 LPM @ 7 Bar maximum pressure, and Chemical Educator rated at 30 LPM @ 3 Bar maximum	unit	1
17.	Backpack Sprayer	sets	13
18.	Handline Type Applicators		
	a) PRYNE FB-5X Foam Nozzle w/pick-up tube & the following accessories:	sets	4
	- 2-1/2" x 1-1/2" Gated Wye	pcs	2
	- 2-1/2" x 50 ft. coiled Fire Hose	lengths	4
	- 1-1/2" x 50 ft. coiled Fire Hose	lengths	4
	- Hose Spanners	lengths	4
	b) PRYNE FB-5X Foam Nozzle w/o pick-up tube	pcs	4
19.	"STAR" High Pressure Washer Trailer Jet Model HC-2 I 00 NCT, with 18 HP Diesel Engine, 2, I 00 PSI. max. output pressure, 3.5 GPM (13 LPM) water delivery, and 98 C (208 F) max. water temp., and 1,000 liter capacity	unit	1

20.	55 gallon Drums (Open Yellow Colored)	drums	4
21.	Wheelbarrows	units	12
22.	Shovels	units	15
23.	Rakes	pcs	60
24.	Push Brooms	pcs	8
25.	Rubber Mallet	pcs	4
26.	Sledge Hammer	pcs	4
27.	Wooden Poles w/Hook	pcs	12
28.	Crow Bars	pcs	4
29.	Nylon Ropes		
	a) 112" x 50 Ft.	lengths	2
	b) 518" x 100 Ft.	lengths	5
30.	Rubber Boots	pros	20
31.	Chemical Apron	pcs	20
32.	Working Gloves	pcs	50
33.	Chemical Gloves	pros	50
34.	Plastic Bags (30" x 48" x 4 mils)	pcs	1,000
35.	Hand Cleaner	pcs	72
36.	Portable Lantern (Rechargeable battery type-stored at Firehouse/Emergency Control Center)	units	4
37.	Portable Floodlight fitted w/Two-220 VAC mercury lamps	unit	1
38.	Automotive Battery Charger	unit	1
39.	Dispersant Station (Foam Station w/ RP-6 foam Nozzle Reconnected LP-6A line proportioner via hydrant branch off	pc	
40.	1-112" x 50 Ft. colled Fire Hose	lengths	3
41.	COREXIT 9527 Dispersant (5 gal./pail)	pails	4
42.	Hose Spanners pcs		4
43.	METASORB SORBENT PADS M-70	bales	4
44.	METASORB SORBENT PILLOWS M-65	bales	2
45.	Plastic Bags (30" x 48" x Mils)	pcs	100

C. ISLAND WHARF EQUIPMENT:

1 . Dispersant Station (Handline Cart):

a) 2-1/2" x 50 ft. coiled Fire Hose	lengths	2
b) 2-1/2" x 50 ft. coiled Fire Hose	lengths	4
c) 1- 1/2" Water Nozzle	pc	1
d) JS-10 Foam Nozzle	pc	1
e) LP-9A Line Proportioner	pc	1
f) Gated Wye 2-1/2" x 1-1/2"	pc	1
g) COREXIT 9527 Dispersant (5 gal./pail)	pails	4
h) Hose Spanners	pcs	4

2. METASORB SORBENT PADS M-70	bales	4
3 .METASORB SORBENT PILLOWS M-65	bales	2
4. Plastic Bags (30" x 48" x 4 Mils)	pcs	100

Appendix F
GUIDELINES FOR PERFORMING NET ENVIRONMENTAL BENEFIT ANALYSIS

Guidelines for performing Net Environmental Benefit Analysis

The following describes the elements of a NEBA according to the IPIECA report "Choosing Spill Response Options to minimise damage" (Jennifer M. Baker, Tim Lunel, IPIECA 2000). The below is only an extract, and the
complete report should be consulted for details:

Net Environmental Benefit Analysis

After an oil spill, urgent decisions need to be made about how to minimize environmental and socioeconomic impacts. The advantages and disadvantages of different responses need to be compared with each other and with natural clean-up. This process is called Net Environmental Benefit Analysis. The process must take into account the circumstances of the spill, the practicalities of clean-up response, the relative impacts of oil and clean-up options, and some kind of judgement on the relative importance of social, economic and environmental factors. Decisions are best and most rapidly made if contingency planning has included reviews of environmental and socioeconomic information, and consultations and agreements by appropriate organizations.

Aims of spill response

The aims are to minimize damage to environmental and socioeconomic resources, and to reduce the time for recovery. This can involve guiding or re-distributing the oil into less sensitive environmental components removing oil from the area of concern and disposing of it responsibly. Initiation of a response, or a decision to stop cleaning and leave an area for natural clean-up, should be based on an evaluation made both before the spill (as part of the contingency planning process) and after.

The evaluation process

Evaluation typically involves the following steps:

- Collect information on physical characteristics, ecology and human use of environmental and other resources of the area of interest.
- Review previous spill case histories and experimental results that are relevant to the area and to response methods that could be used.
- On the basis of previous experience, predict the likely environmental outcomes if the proposed response is used, and if the area is left for natural clean up.
- Compare and weigh the advantages and disadvantages of possible responses with those of natural clean up.

Conclusions of the IPIECA report

Some damage caused by specific response options may be justifiable if the response has been chosen for the greatest environmental and socio-economic benefit overall.

- Groundwork for evaluation of response options is best done before a spill as part of contingency planning.
- The advantages and disadvantages of different responses should be weighed up and compared both with each other and with the advantages and disadvantages of natural clean up.
- Response options need to be reviewed when a spill occurs, and such a review should be an ongoing process in cases of lengthy clean-up operations.
- Offshore and near shore dispersant spraying can lead to an outcome of least environmental harm.
- For onshore evaluation, it is necessary to consider both the shore in itself, and systems, which interact, with the shore.
- In many cases of oiling there is no long-term ecological justification for clean up.
- For extremely oiled shores, moderate clean up can facilitate ecological recovery, but aggressive clean up may delay it.
- In most cases of shore oiling where moderate clean-up is considered likely to reduce the damage to socio-economic resources, wildlife or near-shore habitats, this will not make a significant difference to the shore ecological recovery times.

Selection of response method in open sea

Several methods exist to combat oil spilled on water. The method to apply for specific case must be considered based on the environmental conditions and the type of natural resources to be protected against the oil spill. The methods must also be compared to the no-response alternative and be selected so that a net environmental benefit is achieved.

Mechanical recovery

Mechanical recovery constitutes the most common approach for combat of marine oil spills. The mechanical recovery operation will typically involve the following components:

Booms for containment of oil
Skimmers for recovery of oil
Pumps
Oil/water separators
Temporary Storage
Vessels for towing of booms and operation of recovery units

The operation may involve three or two vessels, depending on how the boom is deployed. The purpose of the boom is to concentrate the oil to a thick enough layer for effective recovery to take place. The effectiveness of booms to accumulate the oil is highly dependent on wave conditions, tow speed, boom configuration and oil properties. It is commonly assumed that booms lose oil by entrainment at relative speeds exceeding 0,7 knots, even though some novel inventions show promise for higher speeds.

A variety of skimmers exist, each type being suited for different conditions. Roughly, skimmers can be divided into concepts based on weir-principle, suction, adhesion or mechanical lifting/submersion. The main parameters affecting the performance of skimmers are slick thickness, wave conditions and a number of oil parameters; the main parameters being viscosity, density and amount of water in emulsion. When a thick oil layer can be accumulated in the boom configuration, the weir skimmer concept is often considered the most versatile. However this concept depends on the oil flowing to the skimmer and is therefore not suited for highly viscous oils. It also depends on the skimmer being equipped with the necessary facility for removal of free water recovered with the oil, as the weir skimmer concept will recover large volumes of water whenever the oil slick thickness is reduced below a certain limit. Table 1 indicates how different skimmer concepts are affected by wave conditions and oil viscosity.

Table 1. Skimmer types and how these are affected by sea states and oil viscosity

Skimmer Type	Operating Principle	Adapted to High Sea States	Oil Viscosity		
			L	M	H
Weir	Overflow to sink	Fair	Good	Good	Poor
Sorbent Belt	Adhesion	Poor	Fair	Good	Fair
Paddle belt	Mechanical lifting	Poor	Poor	Fair	Good
Brush	Adhesion/lifting	Fair	Fair	Good	Good
Disc	Adhesion	Fair	Fair	Good	Poor
Drum	Adhesion	Poor	Fair	Good	Poor
Mop	Adhesion	Fair	Fair	Good	Poor

The effectiveness of mechanical recovery operations is highly dependent on sea states. At wave heights exceeding 3 meters, booms lose significant oil quantities by oil drainage under the boom and by droplet entrainment by oil breaking off from the oil slick. Figure 1 shows the relationship between wave height and effectiveness, as recognised for the oil spill preparedness offshore Norway. This assumes that the sufficient number of recovery systems is available and the relationship can be seen as natural limitations of a mechanical recovery operation.

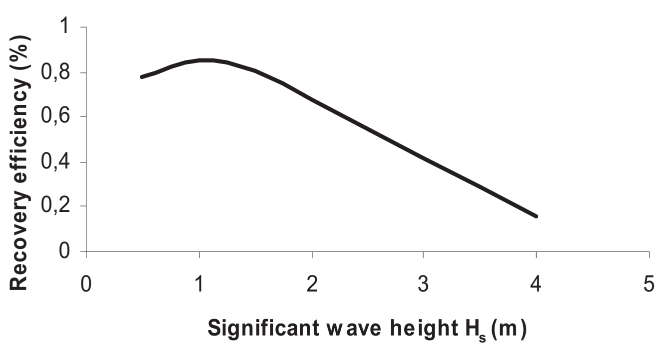


Figure 1. Indication of relationship between wave height and recovery efficiency

The relationship in Figure 1 assumes sufficient visibility. It is assumed that light conditions better than dusk/twilight, defined by the sun being over -6^o relative to the horizon, is sufficient for an oil spill combat operation to take place. During nighttime the recovery effectiveness may vary from zero to close to full effectiveness when appropriate surveillance equipment is provided. Sometimes IR cameras mounted on aerostat or helicopter are used to monitor the spill and guide recovery operation during dark periods.

Chemical dispersion

Dispersants contain chemicals, which reduce the surface tension between oil and water and therefore result in the break-up and dispersal of the slick throughout the water column under the action of waves and turbulence. The break-up of the oil into small droplets promotes the biodegradation, oxidation and other oil weathering processes. It may also prevent oil from being driven to the shore by the surface current. Dispersants can remove oil from the water surface and may reduce immediate damage to waterfowl and other wildlife that could be adversely affected by surface oil.

In most cases, however, the decision on whether to use dispersants is a trade-off between the possible short-term impact of dispersed oil in the water masses and the comparatively long-term impact of oil stranded on the shoreline.

The effective use of dispersants relies on the energy provided by dynamic sea being sufficient to break oil off the slick and entrain it in the water masses. In many cases, even with waves, the slick will have to be agitated to get sufficient energy to disperse the oil, for instance by water cannons.

Older dispersant contained large proportions of inherently toxic hydrocarbon-based solvents which, when applied to an oil slick, increased the volume of hydrocarbon pollutants present in the water. Dispersants have, however, developed towards much less toxic components, making the use of such chemicals more accepted in many countries.

The application of dispersants will normally take place by two basic methods:

- Application from workboat
- Aerial application (aeroplane or helicopter)

The dosage varies greatly with 1:10 as a typical rule of thumb. The logistical complications with filling/refilling and application are significant for chemical dispersion as a large-scale response option. Droplet size of the dispersant when applied is crucial to effectiveness, with small droplets being most effective but more liable to excessive wind drift.

Dispersants do not work with all oil types and in all conditions. As a general rule dispersant effectiveness fall rapidly with viscosities exceeding 2000 cP. The chemical treatment should therefore take place relatively short time after the oil is released to the sea, as emulsification and weathering may increase the oil viscosity above this limit within a couple of hours, depending on sea state.

Table 2. Oil Spill Dispersants

Advantage	Disadvantage/considerations
Removes/reduces surface oil Enhances biodegradation Can be applied by aircraft	Impact on fish and aquatic organisms Additional pollution Logistical complications Limited to low viscosities Relatively short window of opportunity

In situ burning

In situ burning involves the controlled combustion of spilled oil. Typically oil is contained in a fire-resistant boom and ignited using a hand-held igniters or a helicopter-deployed ignition system. Burns may also be conducted within natural barriers formed by the shoreline. The technique will only work with a minimum oil slick thickness, commonly assumed to be 2 mm for fresh oil. With a relatively thick layer (> 5 cm) of oil, a large fraction, up to 95 %, may be removed by burning. After burning is completed, burn residues may sink and the opportunity to recover these residues is limited. Burning will have relatively localised air quality impacts.

In situ burning does not work on emulsion with water content above a certain limit, depending on the oil. Commonly 20% water content is used as a rule of thumb. The window of opportunity for the application of this technique may therefore be limited to a few hours, depending on oil type and weather conditions. The sea should also be relatively calm, with short-period wind-waves of less than 1 m.

Table 3. In Situ- Burning

Advantage	Disadvantage/considerations
Removes large portions of oil May be logistically simple	Air pollution Does only work on contained slick/ need for fireproof booms Limited to low water contents in emulsion Limited to low sea states Works only on slicks thicker than approximately 2 mm Relatively limited window of opportunity

Selection of methods for shoreline cleanup and protection

Various techniques exist for cleaning of shoreline areas that have been affected by an oil spill. Since shoreline areas often are highly sensitive, special care must be taken in selecting techniques for such areas. Experience has often showed that the cleanup efforts have caused greater damage to the shorelines than the spill itself. As in all oil spill response, the emphasis must be on achieving the greatest net environmental benefit. In many cases this is achieved by a combination of non-aggressive mechanical oil removal techniques and degradation/removal of the oil by natural processes.

Mechanical removal

Shoreline cleanup by mechanical removal involves a wide range of different tools and techniques, reflecting the highly variable conditions that a shoreline area can represent. Techniques may be ranging from manually removal of oil using sorbents or simple tools to the use of more advances beach cleaning machinery. Here is only listed a number of techniques/tools commonly applied to remove oil at a shoreline:

Manual sorbents application
Manual removal of oiled material (hand, shovels, rakes)
Manual cutting of vegetation
Low pressure flushing at ambient temperature
Vacuum trucks
Warm water/low pressure washing
High pressure flushing
Manual scraping
Beach cleaners
Tractor/Ripper, bulldozer, motor grader, elevating scraper, front end loader
Sandblasting
Steam cleaning

Bioremediation

Bioremediation is the application of nutrients (fertilisers containing nitrogen and phosphorus) to the shoreline to accelerate the natural biodegradation of the oil. Oil biodegradation is the natural process by which microorganisms oxidise hydrocarbons, ultimately converting them to carbon dioxide and water. The process is limited by the availability of oxygen, moisture and nutrients needed by microbes.

The use of non-native bacteria is not recommended as most areas have indigenous bacteria that are capable of degrading the oil.

Bioremediation is typically used as a final treatment step after completing conventional shoreline treatment or in areas where other methods are not possible or recommended. Pooled oil or tar balls should be removed manually before applying nutrients.

Data collected to date indicate that when proper guidelines are followed, the environmental risk associated with bioremediation is negligible.

Natural cleansing

Oil is left to degrade by natural processes. The no-response method is typically used on high-energy beaches, primarily cobble, boulder and rock, where wave action is assumed to remove most of the oil in a short period of time or where active cleaning is expected to have unacceptable effects. The disadvantage is apparently that the area may take an extended period to recover. Also, unwanted additional spreading of the oil may occur as oil is washed back into water.

Any cleaning technique should be compared to the natural cleaning option before being applied.

In situ burning

In situ burning is carried out at shorelines by igniting the upwind end of the oiled area and allowing the oil to burn downwind. The method is typically used on substrate or vegetation where sufficient oil has collected to sustain ignition, if oil is of a type that will sustain burning and local air pollution regulations allow. The method will kill surface organisms in burn area and the residue may be somewhat toxic. The method will also cause local and time-limited air pollution and may result in erosion if root systems are affected.

Selection of combat methods for specific habitats

This section discusses the considerations that should be made in selecting combat method for different habitats. Before any clean-up measure is attempted, an assessment should be made of the net environmental benefit in employing the method as compared to allowing natural processes to work on the oil pollution. Clearly, there are great variations within each habitat type and the considerations here are only meant as guidelines that may assist in selection of the appropriate response option.

Response measures are discussed in terms of:

- Protective measures (measures to prevent or reduce amount of oil reaching a habitat or a resource)
- Cleanup measures (measures employed after oil has polluted an area)

Methods are classified as:

- Preferred - has little environmental impact, should be the first selection
- Viable - may be used after careful consideration of environmental impact
- Avoid - will likely have significant adverse environmental impact

The information in this section is largely based on recommendations by IMO /4/ and IPIECA /5/.

<u>Open water</u>

The open water environment includes offshore, nearshore and enclosed waters and may be neighbouring various other habitats, which will be treated in later sections. Clean-up techniques for open water also act as a protection technique for other habitats. The selection of combat methods to be employed in open water is often a question of how to most effectively prevent damage to vulnerable natural resources along shoreline areas that may be affected by the slick.

Mechanical recovery is the most common response option in open water, but is somewhat limited by sea state. This method is the only option that may allow near complete prevention of environmental damage and is the preferred option when conditions allow effective operation. In general, sea-conditions in Philippine waters are in favour of mechanical recovery since significant wave heights seldom exceed 3 m, which is considered the limit for modern recovery systems.

Leaving the oil to be naturally dispersed is an option when oil drift simulations exclude oil affecting the shoreline and weather conditions are such that natural dispersion will occur effectively.

Chemical dispersion is another viable option, but must be applied within a few hours after the spill before weathering renders the oil undispersable. Chemical dispersion is a likely choice if drift is towards the shoreline and weather conditions are unfavourable for mechanical recovery. In all cases the potential environmental impact on subsurface organisms must be considered.

In situ burning is a viable option but is very limited to sea states and water content in emulsified oils. Fire-proof booms must likely be used for effective burning to take place and mechanical recovery of the oil may appear to be a more natural option once the oil is contained.

Table 4. Open water response

Response options in Open water		
Preferred	**Viable**	**Avoid**
Mechanical recovery Natural processes	Chemical dispersion In situ burning	

Rocky shorelines

Rocky shores comprise a wide variety of different habitats and communities and vary greatly in their sensitivity to and recovery from oil spills. In general, the least sensitive shores, and those with the greatest potential for natural recovery are found on wave-exposed coasts. However, exceptions from this rule are numerous. Rocky shoreline areas are often crucial nesting sites for sea birds. Rocky coasts in more sheltered areas are generally more sensitive to oil spills and also more sensitive to damage from clean-up measures.

The preferred method for protection of such coastlines is by recovery of oil in open water at safe distance from the coast. Protection of areas by deflecting booms closer to the shore is an option but is often ineffective due to harsh wave and current conditions.

In many cases the no-response approach is preferred for rocky shores due to effective natural removal of oil by waves in such areas. Other viable options for the cleanup of stranded oil are the use of suction devices, low pressure flushing by cold water or manual removal. More aggressive methods that may be used are: hot water washing, high pressure/hot water washing or steam cleaning. Such methods may, however, lead to the complete destruction of the natural biological community and should be avoided unless a clear net environmental benefit is achieved.

Table 5. Measures for rocky shores

Protective measures for rocky shores		
Preferred	**Viable**	**Avoid**
Mechanical recovery in open water Chemical dispersion	Deflecting booms closer to shore	
Clean-up measures for rocky shores		
Preferred	**Viable**	**Avoid**
Natural processes Manual removal/ suction devices Low pressure/high flow/ cold water flushing	Dispersants Sorbents Burning	How water /high pressure washing Steam cleaning

Coral reefs

Coral reefs are productive areas supporting a diverse group of organisms. They are also important as barriers reducing coastal erosion. Commercially, reefs are often important for local tourism. Coral reefs are easily damaged when oiled and may take long to recover. Cleaning of the reef itself is practically impossible to conduct.

Natural dispersion of oil in coral reef areas may be great due local wave breaking, thus exposing the coral reefs to the oil droplets. In general the bulk of a surface oil slick will float over reefs without affecting them. However, some reef areas are exposed to the air at low tides and can get in direct contact with an oil spill

Field studies indicate that chronic minor oiling can lead to significant decline of nearby coral community. This situation may occur as a result of a surface oil slick passing the submerged reef and stranding in nearby shores, followed by long term leaching of oil absorbed in the shoreline material.

Best protection of coral reefs is achieved by mechanically recovering the oil in open water, outside the reef area. If sea states allow, booms may be applied nearby the reef to contain oil for recovery or deflection to less sensitive areas. Care must be taken not to damage reefs with anchors and boats.

Alternatively the use of dispersants is recommended to avoid large concentrations of oil in contact with the reefs and to enhance biodegradation. Dispersion should, preferably be carried out in deeper water to allow proper dilution and as low an oil concentration as possible in the water column before entering the reef area. Dispersants should ideally not be used over and near the reef, unless this is essential for the protection of more sensitive areas inshore from the reef area, such as mangrove swamps.

Cleaning of the reef is very difficult or often impossible to conduct. Any operation in the area may damage the reef physically and may also be dangerous to carry out. In some cases a low energy method, such as low pressure flushing may be used as a cleaning method.

Table 6. Coral reefs

Protective measures for coral reefs		
Preferred	**Viable**	**Avoid**
Mechanical recovery in open water Chemical dispersion in deep water	Deflecting booms close to reef area	Chemical dispersion in reef area
Clean-up measures for coral reefs		
Preferred	**Viable**	**Avoid**
Natural processes	Manual removal/ suction devices Low pressure/ cold water flushing	Hot water /high pressure washing Steam cleaning Burning

<u>Mangroves</u>

Mangroves are found on sheltered shores and in estuaries, often adjacent to coral reefs, seagrass beds and tidal marshes. Mangrove areas are highly productive and provide habitats for a large variety of organisms as well as serving as nursery ground for many fish and crustacean species. Mangroves also have an anti-erosion effect. It is generally agreed that mangroves are particularly sensitive to oiling and that they are priority areas for protection.

Oil slicks may enter mangrove forests when the tide is high and be deposited on the roots and sediment surface as the tide recedes. Mangroves may be killed by oil covering the breathing pores, or by the toxicity of oil components. Oil may further penetrate into the sediments and may kill a variety of organisms.

Mangroves with oiled aerial roots can be saved if cleaned short after contamination. However, as mangrove forests can be virtually impenetrable, large-scale cleanup after an oil spill in such areas is operationally difficult, very labour demanding and may damage the area greatly.

Preventing oil from reaching mangrove areas is especially important given the difficulties involved in cleanup in such areas. The preferred protective approach is mechanical recovery of oil in open water, alternatively chemical dispersion of oil in as deep waters as possible.

Booms may be used in relatively calm waters closer to the mangroves to prevent oil to enter the area. Oil may be contained and recovered or deflected to less sensitive areas.

Studies indicate that mangroves tolerate dispersed oil better than untreated oil. However, the dispersed oil may more adversely affect many organisms living in the mangrove area. A net environmental benefit must justify the use of dispersants close to mangrove areas.

Sorbents booms or pads may be effective as physical barriers to prevent oil from contacting mangroves.

Any attempted cleaning after oiling of mangroves has occurred must be started as soon as possible to minimise oil penetration into sediments and absorption into aerial roots. Possible methods may be low-pressure flushing, use of sorbents, vacuum pumping and manual removal.

Table 7. Mangroves

Protective measures for mangroves		
Preferred	**Viable**	**Avoid**
Mechanical recovery in open water	Deflecting booms close to mangrove area Chemical dispersion outside mangrove area	
Clean-up measures for mangroves		
Preferred	**Viable**	**Avoid**
Natural processes	Manual removal/ suction devices Low pressure, cold water flushing Sorbents	Hot water /high pressure washing Steam cleaning Burning

Saltmarshes

Tropical saltmarshes often occur in conjunction with mangroves, usually in the upper intertidal zone. Salt marshes are typically poor in plant species. Fauna includes crabs and worms and the area may be important as feeding and roosting ground for birds.

Saltmarshes are typically found in sheltered areas and the vegetation and sediments have normally large oil holding capacities making saltmarshes effective oil traps. Recovery times vary greatly, from one or two years to decades. This depends on a number of factors, the longest recovery times being associated with thick smothering deposits on the marsh surface and substantial sub-surface penetration into sediments. Salt marshes are usually assumed to recover more rapidly than mangroves.

The main protection technique is by oil recovery in open water outside marsh areas, as described in other sections. Dispersants will likely not be effective in the calm waters nearby salt marshes, but may be a viable protective measure used in open water before oil enters the shoreline. The use of booms and skimmers in sheltered areas nearby salt marshes may be considered, as can sorbents material in the shape of booms, blankets or pads.

Case histories have showed that many marsh areas have recovered successfully by natural means. Cleanup operations may often be damaging to the areas and the no-response option may often be the best choice. If it is decided to intervene, little intrusive methods may be preferred, such as the use of a limited crew and avoiding heavy machinery. Viable methods are pumping of pooled oil and the use of booms and skimmers, use of sorbents and low-pressure flushing.

In situ burning has showed some promise as a method for removal of oil in marshes. The method is likely to kill all life in the immediate vicinity of the burning area. The underground part of most plants will likely survive provided there is enough water and/or soil for protection.

Table 8. Salt marshes

Protective measures for salt marshes		
Preferred	**Viable**	**Avoid**
Mechanical recovery in open water	Booms for protection of area Chemical dispersion in open water	
Clean-up measures for salt marshes		
Preferred	**Viable**	**Avoid**
Natural processes	Manual removal/ pumping of oil Low pressure, cold water flushing Sorbents Burning of pooled oil	Hot water /high pressure washing Steam cleaning

<u>Seagrass beds</u>

Seagrass beds dominate many areas of tropical shoreline and tend to be found in sheltered regions, often close to mangrove and coral reefs. Seagrass beds are highly productive and provide habitats for a large variety of organisms as well as serving as nursery ground for many fish and crustacean species. Seagrass beds occur both in intertidal zones and in shallow sub tidal areas. In intertidal seagrass beds, oiling will likely occur by direct contact with surface oil as water level goes down. For sub tidal seagrass, chronic leaching from the neighbouring intertidal areas may be more damaging.

The best protective option is the recovery of oil in open water outside the area or the use of dispersants in deeper waters.

As seagrass beds usually are located in calm areas, booms and skimmers may in some cases be operated in the vicinity of the areas or in the area itself. Oil should be prevented from entering intertidal seagrass beds. Dispersants are not likely to be effective in such areas due to lack of mixing energy.

Cleanup of oiled seagrass in the intertidal area is difficult. Possible viable options are low-pressure flushing, use of sorbents and skimmers. However, natural cleansing is often the best option.

Table 9. Seagrass beds

Protective measures for seagrass beds		
Preferred	**Viable**	**Avoid**
Mechanical recovery in open water	Booms for protection of area Chemical dispersion in open water	
Clean-up measures for seagrass beds		
Preferred	**Viable**	**Avoid**
Natural processes	Booms and skimmers in area Low pressure, cold water flushing Sorbents	Hot water /high pressure washing Dispersion Burning

<u>Sandy shores</u>

Sandy shores have high value as recreational/tourist sites and are ecologically important as a habitat for a variety of organisms.

Oil will generally accumulate on the sediment surface in the upper intertidal zone and may also penetrate below the surface. The degree of penetration is influenced among other factors by sediment grain size, water content of sediments and the properties of the oil, with the combination of coarse sediments and low oil viscosities allowing most penetration.

Oil persistence on the beach is also determined by wave action. Oil that is washed out by waves may be redeposited offshore, potentially having an adverse effect on seabed organisms.

Beaches are best protected by oil recovery in open water outside the beach area. Booms and skimmers may potentially be used along the shores to recover oil, depending on wave conditions in the area. Booms may also be used to divert oil to less sensitive areas. Dispersants may be used in open water outside the beach (as deep as possible and as far away from the beach as possible). Oil may in some cases be incorporated in the sediments after use of dispersants.

Natural cleansing may be suitable for beaches with high wave energy. However, beaches may be important recreational areas or nesting ground for turtles, imposing a pressure on responders to actively clean up the beach. Also, even though wave action effectively may wash oil back into the sea, a band of oiled sediments or tarballs may be formed in the upper tidal zone.

Methods for the cleanup of beaches involve a variety of mechanical techniques ranging from manual removal by the use of shovels and rakes to the use of heavy beach cleaning machinery. The feasibility of using heavy machinery, such as tractors and bulldozers depend on whether the sediments can support the weight of such machinery.

Sediment removal may be an option where oiling is substantial, but oil has not penetrated deeply. The upper sand layer may be scraped off using graders if the beach is uniform enough to allow this. Front-end loaders may also be used but are likely to remove excessive sediment quantities. The decision is often made to move oiled sediments from the upper part of the beach to lower parts of the intertidal zones, allowing for a higher degree of natural dispersion of oil.

Often substrate mixing is used as a method to enhance aeration and evaporation after most of the oil has been removed by other methods. Various types of machinery for this purpose are available.

Sediment removal may not be recommended on sheltered shores since such beaches usually are richer in organisms and sediment profile re-establishing will be slower.

Dispersants are not generally used for cleaning of sand because they can accelerate penetration of oil into the substrate. The same consideration may be made for in-situ burning since oil heating will lower the oil viscosity, potentially enhancing penetration into sediments

Table 10. Measures for sandy shores

Protective measures for sandy shores		
Preferred	**Viable**	**Avoid**
Mechanical recovery in open water	Booms for protection of area Chemical dispersion in open water	
Clean-up measures for sandy shores		
Preferred	**Viable**	**Avoid**
Natural processes	Manual removal Beach cleaning machinery Sediment removal Displacement of sediments from upper to lower intertidal zones to enhance natural cleaning Low pressure, cold water flushing Sorbents Substrate mixing	Hot water /high pressure washing Dispersion Burning

Muddy shores

Muddy shores often occur in sheltered areas, in many cases close to mangroves and salt marshes. The areas are often important feeding grounds for birds. Muddy shores tend to be waterlogged which reduces oil penetration.

Muddy shores can be virtually impossible to clean up because the sediments are too soft to allow access. Therefore, protective measures are highly important. Protection is best carried out in open water outside the area. Often waters are calm nearby muddy shore areas allowing effective use of booms and skimmers, while dispersants may be ineffective due to the lack of mixing energy. Dispersed oil may increase oil incorporation in sediments. Deflective booms or sorbent booms may be effective at preventing the oil from reaching muddy shores.

Clean up of muddy shores may be difficult to accomplish and natural cleansing may be the only feasible option. If the sediments are rigid enough to support cleanup work, feasible methods may be low-pressure flushing, manual removal, use of sorbents and vacuum pumps.

Table 11. Muddy shores

Protective measures for muddy shores		
Preferred	**Viable**	**Avoid**
Mechanical recovery in open water	Deflecting booms or sorbent booms for protection of area Chemical dispersion in open water	
Clean-up measures for muddy shores		
Preferred	**Viable**	**Avoid**
Natural processes	Low pressure, cold water flushing Sorbents Manual removal Pumping of pooled oil	Hot water /high pressure washing Dispersion

Appendix G
LIST OF ACCREDITED OIL WASTE COLLECTORS/TRANSPORTERS

Name / Address / Tel. no.	Permit issued
International Towage & Transport Corp. 2868 Lamayan St., Sta. Ana, Manila Tel #: 521-0911	Oil Waste collector
G & G Marine Anti-Pollution Service 9 Eliseo St., Concepcion Subd., Valenzuela, M.M. Tel #:	Oily waste transporter
Sea Clean Anti-Pollution Services 1195 Maria Orosa St., Ermita, Manila Tel #: 810-0503	Waste transporter
Rapid Ports Utilities Corporation 603 Ermita Center Bldg. 1350 Roxas Blvd., Ermita, Manila Tel #: 522-9984; 536-0509	Waste collector
Gluekauf Marine Anti-Pollution Services Rm. 704 VIP Bldg., Plaza Ferguson Roxas Blvd., Ermita, Manila Tel #: 521-1365; 521-1751; 521-7520	Marine anti-pollution sludge collection services
Maharlika Marine Anti-Pollution Services Naval St., Navotas, M.M. Tel #:	Sludge collection contractor
Enviroconsult Marine Services Manila Tel #:	Waste collection contractor

Appendix H
LIST OF CONTACT NUMBERS

Agency	Address	Tel. No.
Philippine Coast Guard		
Marine Environmental Protection Command	Coast Guard Base, Farola, Binondo, Manila	Tel: 243-0463
National Operations Center for Oil Pollution	Coast Guard Base, Farola, Binondo, Manila	Tel: 243-0463
Coast Guard Action Center	HPCG, 139 25^{th} St. Port Area Manila	Tel: 527-3873
Coast Guard District NCR-CL	Coast Guard Base, Farola, binondo, Manila	Tel: 243-0474 or 243-0465
Port State Control Manila	HPCG, 139 25^{th} St. Port Area Manila	
Coast Guard Station Manila	North Harbor, Tondo, Manila	Tel: 245-3035 or 245-3072
Coast Guard Station Pasig		562-0178
Coast Guard Station Laguna		652-5155
Coast Guard Station Corregidor		0927-3812092
Coast Guard Detachment Navotas		0928-7009989
Coast Guard Detachment Lamao		(047) 244-6936
Oil Companies		
Petron Corporation (Head Office)		Tel: 886-3780
Petron Bataan Refinery		Tel: 886-3187
Petron Pandacan		Tel: 563-8521
Petron Rosario (Cavite) Terminal		Tel: (046) 438-1996
National Agencies		
Bureau of Fisheries and Aquatic Resources	860 Arcadia Bldg. Quezon Ave, Quezon City	Tel: 3725057 Fax: 3725048
Environmental Management Bureau	DENR Compound Visayas Ave. Diliman QC	Tel: 929-6626
Metro Manila Development Authority	MMDA Bldg. EDSA	Tel: 8824151 to

	cor Grease St. Guadalupe, Metro Manila	66 280-0283
Philippine Ports Authority	Port Area, Manila	Tel: 527-8356; 530-1256
Department of Health	San Lazaro Compound, Rizal Ave., Sta. Cruz Manila	Tel: 743-8301 loc. 1132 Fax: 743-1829
Department of Energy	PNPC Complex Fort Bonifacio, Metro Manila	Tel: 840-2286 Fax: 840-1731
Maritime Industry Authority	PPL Bldg, 1000 UN Ave. Cor. San Marcelino St Manila	Tel: 521-0107 Fax: 524-2746
National Disaster Co-ordinating Council (NDCC)		Tel: 911-5061 to 65 Fax: 911-1406; 912-5668; 912-0984
National Disaster Co-ordinating Council Regional Office		Tel: 912-6675
Philippine National Police (DILG)		Tel: 721-8598
Bureau of Customs (BUCUS)		Tel: 526-6355 Fax: 527-4511
Bureau of Air Transportation (ATO)		Tel: 832-0906
Bureau of Quarantine and International Health Surveillance		Tel: 527-4655 ; 527-4654
Bureau of Immigration		Tel: 527-3260 ; 527-3248
General Headquarters, Armed Forces of the Philippines (AFP)		Tel: 911-7996
Local Government Units		
Municipality of Samal, Bataan	Samal, Bataan	Tel: (047) 451-1521
Bataan Provincial Government Environmental and Natural Resources Office	Provincial Capitol Balanga City, Bataan	Tel: (047)-2372946
Bataan ICM Program	Provincial Capitol	Tel: (047)-

	Compound Balanga City, Bataan	2371012
Bulacan Provincial Government Environmental and Natural Resources Office	Capitol Bldg. Malolos, Bulacan	Tel/fax: (044) 791-6365
Cavite Provincial Government Environmental and Natural Resources Office	Cavite Provincial Capitol, Trece Martires City, Cavite City	(046) 419-0916
Pampanga Provincial Government Environmental and Natural Resources Office	San Fernando, Pampanga	(045) 961-4713
Office of the Mayor, City of Manila	Manila City Hall	527-5004
Office of the Mayor, City of Parañaque	Parañaque City Hall	826-8244
Office of the Mayor, City of Pasay	Pasay City Hall	832-7676
Office of the Mayor, Municipality of Navotas	Navotas Municipal Hall	281-8861/282-6195
Office of the Mayor, City of Las Piñas	Las Piñas City Hall	871-4343
Office of the Mayor, City of Malabon	Malabon City Hall	281-3598/281-3405
DENR Regional Offices		
DENR Region-3	San Fernando, Pampanga	Tel: (045)-961-4236
DENR Region-4	Roxas Blvd., Manila	Tel: 405-0050; 405-0002
DENR NCR	Roxas Blvd., Manila	Tel: 435-2509
Others		
Malayan Towage and Salvage Corp.	2/F La Paz Center Building, Herrera cor. Salcedo St. Makati City	Tel: 818-3702
UP- Marine Science Institute (UP-MSI)	University of the Philippines, Diliman Q.C.	922-3959
Manila Bay Integrated FARMC	Samal, Bataan	Tel: (047) 451-1521
Sagip Pasig Movement		Tel: (6347) 237-

		1012/ 791-6174

ANNEX 4-B

JAN DE NUL GROUP

PROJECT:

<INTERNATIONAL PROJECTS>

DOCUMENT TITLE:

OIL SPILL PREVENTION & RESPONSE PLAN

Document no.: **JDN.PSM.43.01**

Prepared by: **HSE Department of Jan De Nul**

03	10-Oct-10	Re-Issued for Use	CHL	DIV	
02	14-Sep-09	Re-Issued for Use	CHL		
01	29-Nov-04	Issued for Use	CHL		
Rev.	Date	Description of revision	Prepared	Checked	Approved
			Jan De Nul		

DOCUMENT DISTRIBUTION

The latest approved version of this document is accessible to all members of JAN DE NUL and to all members of the Project Management Team on the network server or by CD-ROM.

All project staff is notified of this latest revision by means of internal memo per internal e-mail. The controlled document will be made available on the server at the discretion of all involved personnel.

REVISION CHANGE DETAILS

Revision	Location	Brief description of change
02	Throughout the document	Various changes to layout and wording
02	Chapter 3.2	Including definition of spill/release
02	Chapter 4.2.5	New chapter: Management of hydrocarbon products on deck of vessels
02	Chapter 4.3	New chapter: Steps to control discharge on an ISM vessel
02	Chapter 4.5.2	Impact Assessment: revision of spill scenarios
02	Chapter 4.6	New chapter: Preventive / Planned Maintenance
02	Chapter 4.7.1.2	Additional information on Bunker Procedure
02	Chapter 4.8.2	Change of response tier definition from letters in numbers
03	Throughout the document	Various changes to document numbering, layout and wording

TABLE OF CONTENTS

LIST OF TABLES

1 SCOPE & PURPOSE

1.1 General

This HSE plan covers all activities and services associated with JAN DE NUL that are related to the international Project works. Furthermore, it complies with standard statutory and contractual requirements.

This HSE plan describes how JAN DE NUL will manage oil spill prevention and response during the construction phase of the project. This plan includes a review of oil spill risks, identifies the sensitive receiving environments, a description of some relevant safe work practices, as well as describing the organisation, communication, response equipment, procedures and actions that will be implemented in the event of an oil spill.

1.2 Purpose

The purpose of this plan is to define clear guidelines for the personnel of JAN DE NUL to prevent oil spills and to take the necessary actions after a calamity.

The procedure is an integral part of the Environmental Management System of the Project.

2 REFERENCE

2.1 Codes, Standards and Guidelines

(1) ISO 14001:2004 Standard

ISO 14001:2004	§ 4.4.6	Operational Control

Table 2-1: ISO 14001 Elements

(2) VCA/VCA(B) 2004/04 (~SCC)

(3) IMO publications:
- MARPOL 73/78
- ISM Code

2.2 JAN DE NUL's documents

Latest revisions of:

(4) Project Environment Manual JDN.PSM.41.01

(5) Emergency Response Plan JDN.PSM.24.01

(6) Waste Management Plan JDN.PSM.42.01

(7) ISM documents of Jan De Nul Group JDN.SP.08.09 - ensure safe bunkering

3 TERMS & DEFINITIONS

3.1 Abbreviations

Abbreviation	Written in Full
HSE	Health, Safety and Environment
IOPP	International Oil Pollution Prevention Certificate
IMO	International Maritime Organization
ISM	International Safety Management Code
MARPOL	International Convention for the Prevention of Pollution from Ships
PHSER	Project HSE Representative
PSP	Project Health, Safety & Environmental Procedures and Instructions
PM	Project Manager
SOPEP	Shipboard Oil Pollution Emergency Plan

Table 3-1: Abbreviation

3.2 Definitions

Term	Definition
PRINCIPAL	CLIENT or MAIN CONTRACTOR
Oil	'Oil in any form, including crude and fuel, all types of petroleum products, synthetic solvents and other hydrophobic liquids.'
MSDS	'Material Safety Data Sheets (MSDS), Document provided by Vendor / manufacturer to indicate substance features, chemical composition and safety precaution for usage.'
SPILL/RELEASE:	'Any uncontrolled spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, dumping, or disposing of materials, in this case, to the marine environment. This includes releases onto jetty construction structures or deck / dock surfaces. They have potential of reaching sea water.'

Table 3-2: Definitions

4 OIL SPILL PREVENTION AND RESPONSE

4.1 Responsibilities

Reference is made to the overall Project Organisation Chart and the Project Environment Plan. In addition, an Emergency Response Organisation Chart is established under the HSE document 'Emergency Response Plan'.

The responsibilities below are detailed for the activities under this plan and in addition to the duties defined in the other HSE documents.

a) Project Manager

The PM is responsible to ensure that this Oil Spill Prevention & Response plan is being developed and implemented on all operations and it is being properly followed by all working personnel involved in the project, including sub-contractors. He shall approve the plan.

In accordance with the ISM procedure (for vessels only), the PM is appointed as Duty Manager in case of Emergency Response. However, the PM can delegate this function to other members of the Project Management Team and the function 'Duty Manager' can be organised in a rotating system (see 'Emergency Response Plan').

b) Project HSE Representative

- develop and update the Oil Spill Prevention & Response Plan;
- liaise with local authorities to optimise the response system;
- continuous monitoring of the implementation of this plan through regular inspections / audits. He will advise the PM whenever this plan fails to achieve its goal;
- organise and follow up on drills and trainings to exercise the response system;
- execute desktop checks of the response procedures;
- member of the Emergency Response Team, supporting the Duty Officer during emergency response cases.

c) Master

The Master is responsible for the safety of the marine crew, vessel and marine activities.

The Master shall:
- enforce that the Oil Spill Prevention & Response plan and the relevant procedures under ISM are being followed by all personnel on the vessel;
- ensure that the crew is adequately trained for there their functions during emergency response cases;
- plan, organise and follow up on drills on his ship;
- ensure regularly monitoring of emergency response equipment.

d) Chief Engineer

The Chief Engineer is responsible for activities related to the engine room as well as for the bunkering procedure.

The Chief Engineer shall:
- enforce that the Oil Spill Prevention & Response plan and the relevant procedures under ISM are being followed by all personnel under his command;
- ensure regularly inspection of emergency response equipment;
- ensure that bunkering operations take place safely and in accordance with the relevant procedures.

e) Fuel Supplier (Sub-contractor)

A dedicated service company shall be selected and contracted for the supply of fuel and oil during the working operations.

The fuel supplier shall be selected upon effective evidences of Statutory Authorisations to operate within the relevant country / region as well as to be capable of providing safe and environmental services as required by the applicable legal requirements.

4.2 Oil spill prevention and response principles and approach

4.2.1 JAN DE NUL's Approach

JAN DE NUL is committed to prevent and control pollution. JAN DE NUL recognises the necessity of implementing extra measures to avoid pollution and contamination.

JAN DE NUL further recognises that the event of an oil and / or fuel spill may lead to severe adverse environmental impacts if not carefully managed. By performing all activities in line with international best practice, the aim is for zero spills, nevertheless the basic principles in planning the spill prevention and response measures has three components:

- Spill prevention;
- Minimise the volume of any potential spill;
- Contingency planning in the event of a spill.

JAN DE NUL shall obtain all mandatory approvals or contractual agreements required to meet the requirements of the local and federal governments. JAN DE NUL ensures that it adheres, as well as its sub-contractors, to all applicable laws, regulations, Codes of Practice, etc. relevant to Oil Pollution Prevention and incorporates best practice environmental principles into all its activities.

Vessels shall comply with MARPOL Convention Requirements which imposes statutory requirements on ships for the prevention of marine pollution.

JAN DE NUL requires all its employees concerned by the Project Works to adhere strictly to this Oil Spill Pollution Prevention & Response Plan. All employees shall undergo an appropriate environmental awareness training (including Prevention & Response) as part of the HSE training.

4.2.2 MARPOL Requirements

International Convention for the Prevention of Pollution form Ships / MARPOL 73/78: Vessels above 400 tons gross tonnage shall possess an 'International Oil Pollution Prevention certificate' (IOPP). Internal audits by JAN DE NUL's corporate HSE Department and yearly / intermediate external audits by Bureau Veritas are being performed in order to check the conformance with the statutory requirements. It is JAN DE NUL's policy that vessels not carrying valid certificates are not allowed to work / sail.

Concerning oil spill prevention and response, following documents are compulsory for these vessels:
i) Shipboard Oil Pollution Emergency Plan (SOPEP)
ii) Oil Record Book

4.2.3 ISM procedures onboard of JAN DE NUL's vessels

Reference is made to the ISM codes and standards.

Several documents under the ISM system cover environmental issues onboard of the particular vessel. These vessel specific instructions and procedures stay in place unless otherwise defined by the PHSER. Following ISM procedures concern Oil Spill Pollution Prevention & Response:

- JDN.SP.08.09 - ensure safe bunkering
- JDN.IP.08.12 - oil pollution

The controlled versions of these documents can be found onboard of the vessels.

To minimise the risk of oil spill, following measures will be taken onboard JAN DE NUL's vessels:

a. Every three months "SOPEP" exercises will be organised. During those exercises all warning signals and emergency stops will be tested.
b. Depending on the ship construction, all equipment that could lead to an oil pollution, such as the oily water separator, bunker piping, sludge and dirty oil pump and discharge pipes, is monitored on continuous bases and/or checked weekly. Maintenance history is kept in the AMOS system and identified actions are included in work orders. Results of all oil or sludge transfer will be noted in the oil record book.
c. Prior to commencement of bunkering, the responsible engineer will perform a system check. This person will be closely monitoring the whole bunkering process.
d. Whenever possible valves on tanks, not in use, will be closed.

Vessel specific 'Bunker Checklists' are used before and during bunkering of the vessel. A designated person (e.g. Chief Engineer) will be in charge of the bunkering.

Each discharge operation of oil shall be recorded in the 'Garbage Record Book' and signed for on the date of discharge by the officer in charge.

4.2.4 Training

JAN DE NUL requires all its employees involved in the Construction Works shall undergo an appropriate environmental awareness training (including Oil Spill Prevention and Response) as part of the HSE training.

At least one person of each work group will be trained in the correct use of spill equipment.

This Environmental awareness training shall involve the on-site education of the project personnel with the aim of instilling an understanding of the environmental impacts of their daily work practices and activities and to encourage alternative practices where feasible.

Environmental awareness training will be implemented with the intention of:

- Achieving all the objectives of the Project Environment Manual and supporting Plans/Procedures;
- Minimising the adverse environmental impacts associated with the project works;
- Encouraging and facilitating responsible work practices.

The following subjects will be covered during the awareness training:

- Significant environmental aspects and impacts arising from construction activities;
- Relevant (international/local) parts of environmental legislation applicable to construction activities;

- Air emissions;
- Water consumption and saving;
- Discharges to land and water;
- Waste management (collection and segregation, storage, disposal) procedures;
- Waste minimisation;
- Hazardous chemical management;
- Use of energy and resources;
- Oil spill prevention and response;
- Biodiversity.

At regular intervals (monthly), a Toolbox meeting is held on this in order to emphasis the importance of pollution prevention and adaquate response. If neccesary additional toolbox meetings are held for special activities (bunkering,…).

Additionally, drills (oil spill on deck / oil spill from engine room or tanks) are organised in (accordance with ISM) to practice on spill response.

If required, an oil spill response training shall be organised for the possible members of the emergency response team. The course shall provide practical tools for an effective response to oil spills.

The training course shall cover:

- Use of dispersants
- Dispersant application methods
- Booming techniques
- Hazards to oil spill response personnel
- Recovery equipment
- Shoreline clean-up
- Temporary storage, transportation, disposal.

4.2.5 Management of hydrocarbon products on deck of vessels or on site

Hydrocarbons stored above deck or on site will be bunded with sufficient capacity.

Maintenance of hydrocarbon bearing equipment will be done in suitably designed areas on the work deck or inside workshops. These areas are protected to prevent spillage to the sea water and oil spill equipment and fire extinguishers are available in the vicinity of the works.

Contaminated drainage on vessels and pontoons will be contained and diverted to tanks / bilges, or will be mopped up to prevent overboard discharge. To achieve this, vessels and pontoons will have scupper plugs available to block overboard drains, and will have absorbent booms and clean-up materials readily available so that any spill on deck can be rapidly contained. Drip trays will be used to capture oily material.

4.3 Steps to control discharge on an ISM vessel

Ship personnel will most probably be in the best position to take quick action to mitigate or control the discharge of oil from their ship. Therefore, the SOPEP provides the Master with clear guidance on how to accomplish this mitigation for a variety of situations.

It is the Master's responsibility to initiate a response in the event of a discharge of oil or substantial threat of discharge-actual or probable-into the waters. In no case action should be taken that in any way could jeopardize the safety of personnel either onboard or ashore.

Special consideration is to be taken in case of the necessity to transfer fuel into another compartment onboard regarding the compatibility of the material to be transferred and the material of pipes and tanks to be used for such action.

The following enumeration specifies different kinds of possible operational spills with regard to reactions to be taken.

4.3.1 Operational Spills

4.3.1.1 Operational Spill Prevention

Crew members shall maintain a close watch for the escape of oil during bunker or loading/discharging operations.

Prior to bunker transfer the competent crew members should mobilize spill equipment and place it close to the planned operation, e.g. along the railing on the side at which bunker operation takes place.

Before bunker handling commences, all deck scuppers and open drains must be effectively plugged. Accumulations of water should be drained periodically and scupper plugs replaced immediately after the water has run off. Any free floating substances should be removed prior to draining.

Bunker tanks which have been topped should be checked frequently during the remaining operations to avoid an overflow.

Unless there are permanent means for retention of any slight leakage at ship/shore connections for bunker transfer, it is essential that a drip tray is in place to catch any leaking substance.

(more details see SWP Bunkering as well as further in this document)

4.3.1.2 Pipeline Leakage

If a leakage occurs from a pipeline, valve, hose or metal arm, operations through that connection should be stopped immediately until the cause has been ascertained and the defect remedied.

The defective pipe section should be isolated. Affected sections should be drained down to an available empty or slack tank.

If there is any possibility of released vapours entering an engine room or the accommodation intake, appropriate preventive steps must be taken quickly. If a leakage occurs from a hydraulic pipeline, operations should be stopped immediately.

Initiate clean-up procedures.

The removed substances and the used clean-up material should be retained on board until it can be discharged to a reception facility.

Inform all parties interested about Pipeline Leakage and the actions taken so far.

4.3.1.3 Tank Overflow

If there is a tank overflow all bunker operations should be stopped immediately and should not be restarted until the fault has been rectified and all hazards from the released substances have been eliminated.

If there is any possibility of released vapours entering an engine room or the accommodation intake, appropriate preventive steps must be taken quickly.

As far as the substance permits in view of the material compatibility of tanks/pipes, shift liquid from the tank overflowed to an available empty or slack tank or prepare pump(s) or transfer the excess ashore.

Initiate clean-up procedures.

The removed substances and the used clean-up material should be retained on board until it can be discharged to a reception facility.

Inform all parties interested about Tank Overflow and actions taken so far.

4.3.1.4 Hull Leakage

Identify leaking tank; consider diver if necessary and possible.

Reduce level in relevant tank well below sea level.

If it is not possible to identify the leaking tank, reduce level in all tanks in vicinity. In this case give careful consideration to hull stress and stability. Emergency dump of sand / rock could be considered to reduce the vessel's draft.

If there is a spillage due to suspected hull leakage reduce the head of liquid and, as far as the substance permits in view of the material compatibility of tanks/pipes, transfer the liquid to an available empty or slack tank or, if berthed, discharge ashore in suitable barges/tanks.

If there is any possibility of released vapours entering an engine room or the accommodation intake, appropriate preventive steps must be taken quickly.

Inform all parties interested about Hull Leakage and the actions taken so far.

4.3.1.5 Spills caused by Equipment in Machinery Spaces

If operational spills are caused by a failure of equipment in machinery spaces any further operations of this equipment should be stopped immediately or measures are to be taken to avoid a spill.

Such equipment may be:

- Oily-water separating equipment or oil filtering equipment to de-oil bilge water from the engine room bilges
- Valves in pipes connecting ballast/bilge systems
- Cooling pipes in cooler systems
- Gearing of bow thrusters
- Stern tubes

4.3.2 Spills resulting from casualties

In the event of a casualty the master's first priority is to ensure the safety of the vessel's personnel and to initiate actions which may prevent escalation of the incident and marine pollution.

4.3.2.1 Ship grounded/stranded

The Master should ensure that he receives detailed information about the damage that the ship has been sustained ASAP, in order to determine remedial action to be taken for ensuring the safety of the ship and it's crew.

Furthermore, the Master should also consider
- Emergency dump of sand / rock to reduce the vessel's draft
- Danger to the ship's complement if the ship should slide off grounding site
- Danger to the ship being shattered by heavy seas or swell
- Health hazards to the ship's crew and surrounding population due to release of hazardous substances or vapour in dangerous concentrations
- That fires may start due to released flammable substances and uncontrolled ignition sources
- Should the damage which the ship has sustained be of such an extent that the stability cannot be computed on board, the Master should seek assistance from the damage stability and hull stress calculation

Also, the ship's Master shall take into account the following considerations:
- Is the vessel constantly being struck in the seaway?
- Is the vessel exposed to torsion?
- Is there a large difference in the tidal rangers at the grounding site?
- Are there strong tidal currents in the grounding area?
- May the vessel drift further up on the shore, due to high tides, wind and waves?

4.3.2.2 Prevention of Fire and Explosion

If the ship is aground and therefore cannot manoeuvre, all possible sources of ignition should be eliminated and action taken to prevent flammable vapours from entering the machinery spaces or the accommodation.

a) Extension of Hull Damage

First, a visual inspection should be carried out.

Check for visible oil along hull or in wake of the ship during day time. At night a stick with white cloth (or sheet of absorbent) around it may be lowered into the water alongside the ship to check for oil leakages.

All ballast/bunker tanks to be sounded (ullage).

All other compartments which may have contact with the sea should be sounded to ensure that they are intact.

Soundings of ballast/bunkers tanks are to be compared with last soundings to check for possible leaks.

Sounding to be taken around the ship establish the ship's position on the grounding area.

When the ship is aground, due regards should be given to the indiscriminate opening of ullage plugs, sighting ports etc. as loss of buoyancy could be the result of such actions.

Any list of the ship shall be noted and included in the report for assistance.

b) Procedures to Reduce or Stop Outflow of Oil

The Master should assess the possibility of damage to the environment and whatever action can be taken to reduce further damage from any release, such as:

Emergency dump of sand / rock to reduce the vessel's draft.
- Transfer of bunkers internally, provided shipboard piping system is in an operational condition and in careful view of the compatibility of the substance and the tanks/pipes used for transfer, and taking into account the impact on the ship's overall stress and stability
- Isolate damaged/penetrated tank(s) hermetically to ensure that hydrostatic pressure in tanks remains intact during tidal changes
- Evaluate the necessity of transferring bunkers to barges or other ships and request such assistance accordingly
- Evaluate the possibility of additional release of oil in close co-operation with coastal states.

In case of large differences between the tide levels, the Master should try to isolate the damaged tank(s) to reduce additional loss of substances.

c) Refloating by own Means

The Master should also evaluate the question of refloating the vessel by own means. (details on actions: see vessel's SOPEP)

d) Securing the Ship

If the risk of further damage to the ship is greater in an attempt to refloat the ship by own means, than the vessel shall remain aground until professional assistance has been obtained. (details on actions: see vessel's SOPEP)

e) Fire/Explosion

Should an explosion and a fire occur on board, sound the GENERAL ALARM immediately. Further actions should be initiated in accordance with the ship's Muster List.

In case of fire and explosion the following priorities exist:
- Rescuing lives
- Limiting the damage/danger to the ship

- Preventing environmental pollution

Steps to control the discharge of oil will depend largely on the damage to the ship. Special information thereto is contained in subparagraphs below.

Inform in line with the chapter on 'Operational Spills' to all parties interested about the Fire/Explosion and the actions taken so far.

4.3.2.3 Collision

Should the ship be involved in a collision with another ship, the Master should as soon as possible identify the extent of damage to his own vessel.

When a collision occurs, the GENERAL ALARM should be sounded immediately for the personnel to muster at their designated Muster Stations.

The following check list should assist the Master in assessing the situation:
- Are any tanks penetrated above or below the waterline?
- If ships are dead in the water and interlocked, what is most prudent, to stay interlocked or separate?
- Is there any spill at present – small or large? Will a separation of the interlocked ships create a larger spill than if the ships stay interlocked?
- If there is a spill, will the separation of the ships cause sparks that can ignite the spilled material or other flammable substances leaked out from the ships?
- Are the ships creating a greater danger to other traffic in the area if they are interlocked than if separated?
- Is there a danger to either ship of sinking after being separated?
- If the ships are separated, how is the manoeuvrability of the own ship?

Shut down all none essential air intakes.

Isolate damaged/penetrated tank(s) by hermetically closing the tank(s), if possible.

When it is possible to manoeuvre, the Master, in conjunction with the appropriate shore authorities, should consider moving his ship to a more suitable location in order to facilitate emergency repair work or lightening operations, or to reduce the threat posed to any sensitive shoreline areas.

Inform in line with the chapter on 'Operational Spills' to all parties interested about the collision and the actions taken so far.

4.3.2.4 Hull Failure/Containment Failure

Should the ship lose one or more shell plating, develop major cracks, or suffer severe damage to the hull, the Master should immediately sound the GENERAL ALARM to call the crew members to their Muster Stations, and inform them of the situation, and prepare lifeboats for launching if necessary.

The Master should then asses the situation, and confer with his senior officers.

The Master should obtain the latest weather forecast and asses its impact on the present situation.
Furthermore, the following questions should be considered:

- Is the ship in any immediate danger of sinking or capsizing?
- Will and emergency dump of sand / rock reduce the vessel's draft and stabilise the ship?

If yes:
- Send distress message
- Immediately abandon the ship

If no:
- Can the vessel manoeuvre on it's own?
- Has the ship lost buoyancy?
- If the ship has a list due to loss of ballast, sand/rock, bunker or buoyancy, is it necessary and possible to rearrange the bunker or ballast by internal transfer operation in order to bring the ship to an even keel?
- Is it necessary to dump sand/rock in order to maintain stability without changes the stress situation?
- Is there any abnormal change in the ship's stability and stress situation?
- Can the change in the ship's stability and stress situation be monitored and calculated on board? If not, the Master should seek assistance according to subparagraph 4.3.6.
- Does the ship need assistance or escort to nearest port of refuge or repair port?
- Might it be prudent to salve part of the crew members in case the situation should worsen, or is it necessary to abandon the ship totally?

Inform in line with the chapter on 'Operational Spills' to all parties interested about the Hull Failure and the actions taken so far.

4.3.2.5 Excessive List

Should the ship for some reasons suddenly start to list excessively during discharging/loading operations, or bunkering, all ongoing operations should be stopped immediately until the cause has been determined.

The Officer on Duty should inform the Master and/or Chief Officer without delay.

The Master should try to determine the reason for the excessive list, and take steps to rectify the situation and to stabilize the ship's condition:
- Check reason(s) for list
- Emergency dump of sand / rock could be considered to reduce the vessel's draft
- Soundings/ullage to be taken in all tanks
- Bunker/ballast pumps to be made ready
- Consider measures to minimize list in transferring liquid from one compartment to another
- Ensure water tightness of empty spaces
- Close all opening
- Secure vent pipes to avoid ingress of water
- If bunkering: change to corrective tanks for rectifying the situation
- If ballasting/de ballasting: change to corrective tanks to rectify the situation
- If there is reason to believe that the list may cause any spill, notify as per the chapter on 'Operational Spills'
- If the ship's crew is in jeopardy, prepare lifeboats for launching, and notify as per the chapter on 'Operational Spills'.

If the situation is brought under control, inform all parties interested.

4.3.2.6 Ship submerged/foundered/wrecked

If the ship is wrecked to the extent that it or parts of it are submerged, take all measures to evacuate all persons on board. Avoid contact with any spilled oil. Alert other ships and/or the nearest coastal state for assistance in rescuing lives and the ship as far as possible.

4.3.3 Priority Actions

Top Priority shall in all cases of casualty be put on the safety of the persons onboard and to take actions to prevent escalation of the incident. Immediate consideration should be given to protective measures against fire, explosions and personnel exposure to toxic vapour.

Detailed information about the damage sustained to the ship and its containment system has to be obtained. On the basis of the information the Master can decide next actions for the protection of lives, the ship and the environment. The Master should take into account the following when he is determining whether salvage assistance will be needed or not:
- Emergency dump of sand / rock could be considered to reduce the vessel’s draft.
- Nearest land or hazard to navigation
- Vessel’s set and drift
- Estimated time of casualty repair
- Determination of nearest capable assistance and its response time.

In case of necessary movement of cargo (sand or rock) within the ship careful consideration is to be given to hull strength and stability as well as to the compatibility of all material (sand/rock, tanks, coating, piping) in view of any transfer actions planned.

Prior to commence the works, all vessels that contain rock / sand should select a location for emergency dumps. This location shall be fixed in coordination with the management and, in case it is outside the project area, also in coordination with the relevant authorities. The location shall be indicated on the vessel’s dredge computer and navigation screens.

Plans/tables about the location and specification of the current loading of sand/rock as well as bunkers and ballast have to be readily available.

Information about current bunker/ballast distribution and the Data Sheets for the carried hazardous substances are available on board and distributed/updated by the HQ QHSE department on a yearly basis.

4.3.4 Mitigating Activities

If safety of both the ship and the personnel has been addressed the Master shall care for following issues:
- Assessment of the situation and monitoring of all activities as documented evidence
- Care for further protection of the personnel, use of protection gear, assessment of further risk for health and safety
- Containment of the spilled material by absorption and safe disposal within leak proof containers of all used material onboard until proper delivery ashore, with due consideration to possible fire risk
- Decontamination of personnel after finishing the cleanup process.

4.3.5 Transfer of Bunker – Lightening

If the ship has sustained extensive structural damage, it may be necessary to transfer all or part of the bunker to another ship.

In Ship-to-Ship-transfer operations involving a specialized service ship, the Master of that ship will normally be in overall charge.

In the case of non-specialized ships the Master or other person in overall charge of the operation should be mutually agreed and clearly established by the Masters concerned prior to the start of operations.

The actual bunker transfer should be carried out in accordance with the requirements of the receiving ship.

In all cases each Master remains responsible for the safety of his own ship, its crew and equipment and should not permit their safety to be jeopardized by the action of the other Master, his owner, regulatory officials or others.

The Ship-to-Ship-transfer operations should be coordinated with the appropriate responsible local Authority.

4.3.6 Damage Stability and Hull Stress Calculation

The Master is responsible for matters and calculations related to damaged stability and stress considerations. Any internal transfers should be undertaken only with a full appreciation of the likely impact of the ship's overall stress and stability.

If assistance of the HQ Technical Department is required, the Data Check List in SOPEP appendix can be used.

4.4 <u>Type of oils and logistics</u>

4.4.1 Vessel

Three kinds of fuel are used by vessels of JAN DE NUL:
- Heavy fuel (IFO)
- Marine Diesel Oil (MDO)
- Marine Gas Oil (MGO)

Three kinds of bunkering methods can be applied:
a. From shore facility while the vessel is berthed;
b. By means of bunker vessels (fuel supplier) at a recognised anchorage area;
c. Using own bunker barge or multicat.

Under normal circumstances, large vessels (e.g. TSHD, CSD, etc.) need refuelling once every 3 – 4 weeks.

Other hydrocarbon-bearing liquids on board are:
- Sludge
- Dirty Oil

- Coolant
- Hydraulic Oil

4.4.2 Onshore sites / work barges

Onshore sites / work barges can be divided in a Workshop area and Construction areas.

A Workshop area is a designated area for:
- maintenance and repair of land equipment and machines,
- preparation, maintenance and repair of vessel parts and equipment,
- storage of spare parts,
- storage of oil and fuel.

Following types of oil are available at onshore sites:
- diesel / fuel for heavy machinery (e.g. excavators, trucks, etc.),
- lubricant oil / grease,
- waste oil,
- others.

The storage of fuel on onshore sites is done in double walled tanks or in single walled tanks with secondary protection (e.g. bund wall) in place. Refuelling of machinery at Workshop and Construction areas is done on a daily basis or as and when required.

Lubricant oil and / or grease is kept and stored in barrels and drums. Small amounts of fuel could be kept in barrels as well.

Waste oil of land equipment is normally kept in barrels, whereas waste oil of vessels can be kept in large and transportable tanks.

4.5 Impact Assessment

4.5.1 Causes and Likelihood

The most likely causes of an oil spill are:

a. Spills during refuelling (e.g. bunkering hose failure, overfilling of tank, pump malfunction);
b. Spills as a result of an accident (e.g. grounding, collision, fire or explosion);
c. Leaks during maintenance activities;
d. Oil and hydraulic fluid leaks from machinery / storage facilities.

The PHSER shall investigate potential ‘Sensitive Receptor Areas’. Special measures shall be taken in order to prevent oil pollution in these areas. In normal circumstances, onshore construction areas will not be defined as ‘Sensitive Receptor Area’ especially given the small volumes of oils at these sites.

4.5.2 Assessment

Reference is made to the HSE Plan ‘Risk & Impact Management’.

Doc. Number	Title
JDN.PSM.22.01	Risk & Impact Management Plan

The significance of the impact on Environment due to oil spill incidents is assessed. Possible impact on People or on Assets is not considered in this procedure.

This assessment is rather general. JAN DE NUL shall perform a more detailed assessment when this is required under the Contract.

In accordance with Table 4.2 ‘Risk / Impact rating matrix’ of the above-mentioned plan, following spill scenarios and impacts are possible:

Incident case	Magnitude	Likelihood	Impact	Control measures
1. spills from TSHD (type: De Bougainville)				
Grounding of TSHD: Consequence: rupture of fuel tanks (MDO), e.g. 2 aft SB or PS: 200m3 (full tank capacity)	Massive effect > 15.000 l oil (> 750.000 EUR) **5**	Never heard of in the industry **A**	**(5) Low Significant**	ISM procedures in place
Breakdown / leakage of one of hydraulic cylinders that split the barge; total volume of hydraulic oil for hydraulic cylinder is 2m3;	Localised effect < 1.500 l oil or < 75.000 EUR **3**	Incident has occurred in similar company **C**	**(9) Medium Significant**	relative small drop in pressure is monitored and systems shut down; max. spill < 200l; preventive maintenance
Rupture of one of the hydraulic hoses or its connections from the dredging equipment	Localised effect < 1.500 l oil or < 75.000 EUR **3**	Incident has occurred in similar company **C**	**(9) Medium Significant**	drop in pressure will be noticed and systems will be shut down; max. estimated spill < 400l; preventive maintenance
2. spills from SHB (type: Le Sphinx)				
Grounding of TSHD: Consequence: rupture of fuel tanks (MDO), e.g. 2 aft SB or PS: 200m3 (full tank capacity)	Massive effect > 15.000 l oil (> 750.000 EUR) **5**	Never heard of in the industry **A**	**(5) Low Significant**	ISM procedures in place
Breakdown / leakage of one of hydraulic cylinders that split the barge; total volume of hydraulic oil for hydraulic cylinder is 2m3;	Localised effect < 1.500 l oil or < 75.000 EUR **3**	Incident has occurred in similar company **C**	**(9) Medium Significant**	relative small drop in pressure is monitored and systems shut down; max. spill < 200l; preventive maintenance
3. spills from BHD (type: Mimar Sinan)				
Grounding of BHD: Consequence: rupture of fuel tank (MDO), 54,5m3 (full tank capacity)	Massive effect > 15.000 l oil (> 750.000 EUR) **5**	Never heard of in the industry **A**	**(5) Low Significant**	ISM procedures in place
Breakdown / leakage / rupture of one of hydraulic cylinders or hoses of excavator arm; total volume of hydraulic oil for dredging system is 17,2m3	Minor effect < 150 l oil or < 7.500 EUR **2**	Happens several times per year in similar company **D**	**(8) Medium Significant**	hydraulic system is fitted with pilot valves, which close off system for drop in pressure; max. estimated spill < 100l; preventive maintenance
Bunkering of BHD by SHB on site. Consequence: rupture of the fuel hose or one of its connections	Major effect < 15.000 l oil (< 750.000 EUR) **4**	Incident has occurred in similar company **C**	**(12) Medium Significant**	engineer continuously monitors bunker process; rupture is noticed and transfer is stopped; max. estimated spill < 1m3, based on content hose and 3min of fuel transfer
handling of oil drums onboard BHD; Consequence: rupture of one oil barrel due to impact; max. estimated spill < 150l	Minor effect < 150 l oil or < 7.500 EUR **2**	Happens several times per year in similar company **D**	**(8) Medium Significant**	when stored on deck, all oil drums MUST be kept inside secondary containment
4. onshore spills				
Small oil spill onshore (e.g. oil spillage during refuelling of machinery)	Slight effect < 5 l oil (<750 EUR) **1**	Happens several times per year in a location **E**	**(5) Low Significant**	Bunker procedure in place
Serious oil spill onshore (e.g. rupture of diesel storage tank)	Localised effect < 1.500 l oil (< 75.000 EUR) **3**	Heard of in the industry **B**	**(6) Low Significant**	Bunker procedure in place

Table 4-1: Impact Assessment – Oil Spill Scenarios

Conclusion: These assessments result in the definition of the Impact on Environment as 'Medium Significant'.

4.6 Preventive / Planned Maintenance

4.6.1 General

Vessels have a planned maintenance schedule in place, which covers prevention equipment and containment / response equipment.

Results of maintenance activities are kept in the AMOS system or in separate logbooks.

4.6.2 Prevention Equipment

a) Tank Lids, check:

- tank lids sit squarely on the coamings
- packing is in good condition
- cleats have sufficient movement

b) Deck Pipelines (bunker and hydraulic), check:

- condition of deck lines, ensuring that there is no apparent leakage
- temporary repairs to ensure tightness, and that Technical Department is informed of temporary repairs
- couplings for signs of leakage
- deck valves for tightness
- blind flanges are available for all manifolds, and that all fit well with bolts in each hole
- sample cocks are fitted tightly with no leakage from either the sampling end or the end connected to the pipework

c) Hull Plating, check:

- condition of hull for damage or possible weak spots, and notify Technical Department of areas of concern.

4.6.3 Containment Equipment

Check:
- drip trays are sound with no obvious cracks or holes
- that portable pumps and eductors are working satisfactorily
- all drain plugs in drip trays can be shut tight
- there are sufficient quantities of detergent on board, and their location
- there are sufficient quantities of absorbent material on board, and their location
- there are sufficient scoops, buckets and squeegees on board for mopping up operations, and their location
- that pipework and gauges associated with MDO pumps are tight.

4.6.4 Spillage Equipment

Check:
- the detergent is in containers which would make it readily available for use with foam spraying equipment (if allowed under the local legislation)

- foam branch pipes and eductors are in good working order
- portable spraying equipment is readily available and in good working order
- this Shipboard Oil Pollution Emergency Plan is brought to the attention of and understood by all on board
- all methods of communication can be operated effectively

4.6.5 Equipment

Check:
- all components of the bilge oily water system work satisfactorily
- overboard discharge valves are lashed shut when not in use
- all components of the ballast system work satisfactorily

4.7 <u>Good Work Practices</u>

Reference is made to the Safe Work Practice: Bunkering.

Doc. Number	Title
JDN.PSP.23.28	SWP Bunkering

4.7.1 Safe bunkering of vessels

4.7.1.1 General

Bunkering will preferable take place during day daylight. Bunkering is not allowed during adverse weather (e.g. high swell, bad visibility, strong current, etc.) conditions.

Some ports need advance notice in case of bunkering.

Oil spill emergency equipment of JAN DE NUL and bunker supplier (e.g. oil booms, dispersant, absorbent material, etc.) to avoid the spread of the oil spill and to clean it up, will be present in the direct vicinity of the bunkering operation.

Communication (by radio of telephone) between all parties involved, shall be in place and tested.

4.7.1.2 Bunker Procedure

<u>Before Bunkering:</u>
Before ordering the Chief Engineer will discuss with the Master the amount of fuel to order and which tanks will be filled up. The Master will be informed when bunkering operations begin.

In case a JAN DE NUL vessel takes fuel from another vessel, a certified fuel hose must be used. The certificate shall be onboard or kept by the Technical Superintendent.

<u>During Bunkering:</u>
Before the Responsible Engineer starts with the bunker operation he shall monitor the quantity of oil on board.

Prior to the first bunkering operation, a job hazard analysis (JHA) involving all parties involved will be organised by JAN DE NUL's PHSER on site. At this meeting, mitigation procedures will be identified and put in place to reduce all risks of the operation to an acceptable level. All key personnel involved in the operation will be present at this meeting. The JHA shall be refreshed by the crew before each bunkering and the actual conditions shall be assessed.

Drip trays and drip buckets will be positioned to collect any small leaks that may occur from dripping.

A bunker checklist must be filled in.

Material Safety Data Sheets will be available on board the vessels.

The Chief Engineer must control if all ventilating pipes are open, so that all moved air and gasses can escape. He specifies the quantities to be bunkered per tank and indicates the average and maximum loading rate.

The Duty Officer takes care of the following aspects:
- Drains/scuppers and oil containment spaces are well plugged.
- The SOPEP is at hand.
- The "no smoking" signs are posted.
- The oil spill equipment and fire extinguishing equipment is in place and prior to use.
- Cleaning equipment is within reach, ready to be used.
- Assists during mooring in case a barge arrives for delivery of the bunkers;
- Takes care that he can adequate communicate with the barge/shore;
- Informs the barge/shore facility about the maximum allowable rate and pressure during bunkering. All packing used should be in good condition and timely replaced.
- Controls that all connections made between the ship and the shore or barge are reliable and secure to prevent accidental draining.
- Installs the sampling device (along the instructions DNV).
- When all arrangements are made he gives the start signal to the barge/shore.
- Monitors the tank levels and the pressure in the supply lines.
- Provides spill trays under connections or couplings.
- Secures connected flanges of hoses (e.g. with iron wire).
- Opens and closes all necessary valves.
- Orders the barge/ shore facility to slow down the rate topping up tanks and finally stop them.
- Checks the received quantities received on board.

<u>Calamity:</u>
If there is an accidental draining the officer should react according to the emergency procedure as defined in the SOPEP. All relevant authorities should be warned immediately.

4.7.2 Onshore Spill Prevention Measures

Storages shall comply with local requirements and have the relevant licenses.

Tanks on site shall be extra protected against collision, e.g. by means of sand bunds.

The following spill prevention measures apply to the onshore activities:

Physical characteristics:
Oil and fuel will be stored above ground level.

A fuel storage tank will be located within a bunded area. The bund can be made of concrete (base and vertical walls, including a skimmer) or of plastic, which is covered with sand. This bunded area shall have a sufficient capacity to collect the maximum content of the tank.

When the tank exists out of an inside and outside wall (double-walled), it is not required to keep the bouser in a bunded area. In case of a leakage in the inside wall, the outside wall will keep the fuel inside the bouser and there will be no spill. The bouser shall have a liquid level indicator, dip pipe and a free vent.

Diesel dispensing point:
The dispensing point and nozzle shall be protected / covered by a drip tray. The nozzle at the main tanks shall normally be locked.

The connections from the tank to the machinery must be flexible.

A pre-transfer checklist will be completed to prevent any oil spills during fuel transfer from the tank to the machinery.

A dry powder fire extinguisher shall be located nearby every dispensing point.

The relevant safety signs shall be posted in the appropriate languages.

Positioning of Storage Tank and Dispensing Unit:
A distance of at least 6 metres shall separate the diesel storage tank from any adjacent inhabited offices, if feasible.

No doorway or escape exit from such offices shall lead directly onto the diesel storage tank area. No building adjacent to the fuel dispensing area shall have a doorway or emergency exit leading directly onto the dispensing area.

The diesel storage area and the fuel dispensing area shall be kept free of combustible materials. No compressed gas cylinders or any other flammable substance shall be stored near the diesel storage area or fuel dispensing point.

No hot work, i.e. burning, welding or grinding shall take place at the diesel storage area or the fuel dispensing area or in close proximity to them, or on any associated equipment.

All oils, fuels and waste oils will be stored, handled and transported in accordance with the MSDS and product manufacturer requirements.

Refuelling of large equipment and machinery will be carried out by competent personnel at designated (= bunded) areas. The responsibility for overseeing refuelling activities is the responsibility of the Supervisor, or his assistant. Refuelling of smaller equipment (e.g. diesel generators), can take place on site if the necessary preventive measures are taken, i.e. competent persons; temporary spill containers; etc.

Equipment (tank, bouser,…) and machinery will be kept in good working order and will be inspected regularly (weekly).

Major maintenance overhauls of machinery will be conducted off-site at the workshop / garage as appropriate.

4.7.3 Oil Spill response equipment, resources and measures

4.7.3.1 Oil Spill response equipment and resources

Onshore: (quantities and types depending on the activities and the amount and type of equipment)
- Polypropylene Adsorbent Sausage Boom
- Polypropylene Adsorbent Pads
- Polypropylene Adsorbent
- Shovels
- Protective gloves
- Goggles/Safety glasses
- Heavy Duty oil resistant storage bags
- Duct Tape
- Containment Drip Pans
- Absorbent granulate

Offshore:
The available equipment depends on the type and size of the vessel. All oil spill response equipment and resources are described in the vessel's SOPEP. Possible equipment could be:
- Polypropylene Adsorbent Sausage Boom
- Polypropylene Line
- Polypropylene Adsorbent Pads
- Polypropylene Adsorbent Rolls
- Protective gloves
- Goggles/Safety glasses
- Heavy Duty oil resistant storage bags (Polyethylene Drum Liners)
- Containment Drip Pans – for vents
- Scupper Plugs
- floating containment boom (plastic)
- skimmer

Picture of an containment boom on a reel.

The oil spill equipment will be inspected at regular intervals during safety inspections (monthly) but also tested when using them for drills in accordance to ISM. If any oil spill equipment is missing or is damaged, it will be substituted.

4.7.3.2 Onshore Spill Response Measures

In the event of an onshore oil spill the following measures will be taken:

a. Source of spill identified and controlled.
b. Zone impacted by spill will be minimized by using the available oil spill response equipment to stem the flow and soak up as much of the spill as possible.
c. Onsite equipment will be used, such equipment includes shovels, brooms, empty drums, absorbents (rags), and excavators.
d. Soil contaminated as a result of the spilled fuel / oil will be excavated, stored and then disposed of in accordance with the requirements of the Waste Management Plan.

4.7.3.3 Offshore Spill Response Measures

In the event of an oil spill, the vessels will follow this OSRP, their vessel SOPEP and associated oil spill response procedures that typically form part of the vessel HSE systems.

Reference is made to the ISM documents onboard of the vessel.

4.8 Oil Spill Response

4.8.1 Organisation

Reference is made to the Emergency Response Organisation chart, which is established under the HSE Document 'Emergency Response Plan' and which is attached to this procedure.

Doc. Number	Title
JDN.PSM.24.01	Emergency Response Plan

4.8.2 Response Tier Definition

JAN DE NUL's oil spill response planning is based on a three level or "Tier" approach.

Tier 1
A Tier 1 response is defined as a response that is effectively managed by JAN DE NUL's own facilities (i.e. by means of oil spill equipment onboard of vessels). JAN DE NUL is subject to mandatory notification of the relevant governmental bodies and must keep these agencies informed of the current status of the oil slick and response activities.

Tier 2
In case JAN DE NUL cannot control the spill, then additional resources must be called upon and the response will escalate to a Tier 2. A number of Agencies, support organisations and CLIENT may be mobilised and a "unified command" may be established.

Tier 3
Tier 3 oil spill responses are major responses and would normally be managed by the relevant authorities.

4.8.3 Determining the Response Tier

For offshore spills, the Vessel Master will, in consultation with the TIVM and the Emergency Response Coordinator, determine if the spill can be effectively managed by JAN DE NUL (i.e. a Tier 1 response is required) or whether additional resources are likely to be required (i.e. a Tier 2 or Tier 3 response is required). The final decision as to whether a response requires a Tier 2 or Tier 3 response rests with the Authorities.

4.8.4 Notification, Communication and Reporting

4.8.4.1 Notification and Communication

Notification, communication and reporting will occur in accordance with the vessel's SOPEP (offshore cases) and with the Contract Requirements. As a minimum, the information on an emergency oil spill shall include the following:

- date and time (local);
- location, source and cause of the spill (collision of transports, tank rupture etc.);
- anticipated spill volume and source status (shut-off or continues leaking);
- product type and characteristics (density, viscosity and temperature of yield loss);

- description of spill area, including direction, length, width and expected tier classification;
- hydrometeorological conditions in the spill area;
- actions taken for elimination of the source and containment of oil spill;
- presence of injured persons and possibility of pollution of settlements, life supporting facilities, surrounding natural and industrial objects;
- identification data on initial source of information about the oil spill.

4.8.4.2 Notification of PRINCIPAL

In case of a spill, the Duty Manager will inform the Project Manager (see emergency response organisation form), who will in his turn inform the PRINCIPAL's Site representative, relevant Authorities and corporate coordinators. The relevant formats will be used to do this notification.

Physical actions in case of oil spill will not await any approval, go-ahead or instruction from PRINCIPAL.

4.8.4.3 Formal oil spill containment and response reports

If applicable, an oil spill containment and response report shall be drawn up by the work group assigned by PRINCIPAL.
The Report shall contain the following information:

- Cause and circumstances of the oil spill;
- Condition of the process equipment of the organization engaged in production, processing, transportation and storage of oil, availability of directions from supervisory agencies with regard to the technical deficiencies of the facility, violations of the norms and rules of the facility operation;
- Description and assessment of the actions of management, manpower and resources used for elimination of the leakage source and containment of the oil spill;
- Information on the actual oil spill impact on health of the population, life support facilities and environment;
- Cost of oil spill response including cost of containment, mechanical oil recovery, disposal of oil and cleanup wastes and subsequent rehabilitation of the area (water area) and facilities;
- Extent of residual pollution of the area (water area) and facilities;
- Assessment of efficiency of engaged manpower, special technical aids and technologies;
- Suggestions with regard to additional equipment (re-equipment) of the facility emergency response teams and professional emergency response teams (services).

Oil spill containment and response reports shall be submitted to the appropriate structural subdivisions of the government authorities, to the local government, any other applicable governmental body as well as to PRINCIPAL.

4.8.5 Offshore Oil Spill Tracking

In the event of an offshore oil spill, the spill could be tracked using a combination of stand-by vessels and on-vessel interpretations of weather data such as prevailing winds, tide, currents etc.

4.8.6 Waste Management following an oil spill

Wastes resulting from an oil spill will be managed in accordance with the Waste Management Plan. Wastes that result from an oil spill will be classified as hazardous wastes.

4.8.7 Health and Safety

The safety of personnel will be the primary concern in any spill incident. The Project Health & Safety Manual defines the health and safety requirements for the project. Of particular relevance are the sections of the Project Health & Safety Manual that address Personnel Protective Equipment, first aid, HSE procedures and training.

4.9 Monitoring and compliance with this plan

The implementation of this plan will be checked by the direct supervisor and the Project HSE Representative as per the requirements of the Project Health & Safety Manual and Project Environment Manual.

5 RECORDS

These safety and health records are registered listed on the form JDN.PSF.21.03 ‘HSE Forms and Checklists Register’, which is filed with the Project Environmental Manual. The list will be a **“LIVE”** document.

6 ANNEXES TO BE READ, ATTACHED AND FILED WITH THIS DOCUMENT

The last revision of:

1. JDN.PSF.24.01
   ‘Emergency Response Organisation’

JAN DE NUL GROUP	HSE PROCEDURE
Project: <International Operations>	Number: JDN.PSP.23.23
Title: SWP General Marine Operations	

1 SCOPE & PURPOSE

1.1 General

This Safe Work Practice covers all activities and services associated with JAN DE NUL that are related to the Project works. Furthermore, it complies with all applicable legal and contractual requirements.

1.2 Purpose

The purpose of this procedure is to provide basic knowledge on marine operations and some standard safe work operations. This SWP mainly focuses on non-ISM certified vessels.

2 REFERENCE

- IMO regulations and resolutions (e.g. STCW95, Minimum Safe Manning, etc.)
- SOLAS
- COLREG
- ISM standards
- Project Health & Safety Manual JDN.PSM.21.01
- Safe Work Practices Plan JDN.PSM.23.01

3 TERMS & DEFINITIONS

Term	Definition
BHD	Backhoe Dredger
CSD	Cutter Suction Dredger
FPV	Fall Pipe Vessel
SHB	Split Hopper Barge
TSHD	Trailing Suction Hopper Dredger

Table 3-1: terms & definitions

4 PROCEDURE

4.1 General

All vessels working / sailing for the project have to comply with the local maritime requirements. Some of the requirements are:

- Communication procedures with Port Authorities;
- Anchoring;
- Towing;
- Speed limitation within port;
- Etc.

All vessels / barges must have valid harbour craft licence or equivalent. Official inspections on the vessel regarding its construction and required safety appliances must be carried as per regulations.

Prior to commence operations, all relevant notices (e.g. Notifications to Mariners; Port Marine Notices, …) shall be provided to the Master, who will verify them for implementation.

4.2 Responsibilities and Duties

All personnel are responsible for the safety of themselves and those they work with. They have a duty to take action to prevent accidents at all times, in accordance with accountability for HSE.

The Master of a vessel is responsible for the safety of the vessel and all those on board at all times. He has the authority to decide whether any operations affecting the vessel should proceed or be terminated, and should question any instructions issued to him that create a hazard to the vessel and all those on board.

Emergency response on an ISM certified vessel takes place in accordance with the Muster Roll. The Muster Roll shall show the duties assigned to the different members of the ship's crew.

4.3 Onboard HSE Inductions

All personnel joining the vessel for the first time or who have not been on board within the previous 6 months will be required to undergo HSE induction training (‘Information at recruitment’ resp. ‘Familiarization’) from the Captain or Chief Engineer. Training shall include but not be limited to aspects of living and working on board a vessel or barge:
- Layout of the vessel
- House keeping rules
- Muster Stations
- Emergency Alarms
- Safety Equipment
- PPE
- Emergency Escape Routes
- HSE Management
- Environmental Awareness

Signed function descriptions and records of familiarisation / information at recruitment shall be available onboard.

After boarding a vessel, visitors shall report to the Master who shall give a small induction on the particular dangers and rules on the vessel. Visitors shall always be guided during visits on deck.

4.4 Site basic safety rules

The vessels shall make the necessary communication, depending on the type and operations of the vessel, with other vessels and/or with the Radio Room by means of the VHF channel that has been set op for the project.

Approaching or leaving a jetty or another vessel, shall be done at a low speed, avoiding high waves and thus allowing safe boarding.

Life jackets of the inflatable type or work vest type shall be worn in following situations:
- when boarding / deboarding a vessel / jetty;
- when working near or over the sides of a vessel;
- when there is a danger of falling into the water;
- when working on other locations as specified by your supervisor or safety officer.

Reference is made to the specific SWP for PPE.

Standards for housekeeping on the vessel (e.g. deck, galley, accommodation, etc.) shall be followed.

The crew shall be competent and shall be made familiar with various emergency situations and hazardous applications trough toolbox meetings and drills.

Regular inspections shall be held by the Master, Safety Officer or Chief Engineer. The inspection and the frequency shall depend on the type of vessel.

Mooring to other vessels or to jetties shall be done safely and with correct and sound mooring ropes.

Fishing is not allowed on site.

Smoking is only permitted in designated smoking areas.

Drugs are not permitted on board. Persons taking medication are to advise the medic of their medical condition and show the prescription drugs they are taking.

All crew shall be in possession of a valid medical fitness certificate, correct seaman's book and correct STCW95 certificates for the function they have.

During periods of rough weather the following rules are to be observed:
- Crew shall not work in external areas of the vessel unaccompanied.
- Watertight closures are to be secured and shall be kept clear of obstructions.
- Watertight doors shall always be secured after passing through them (this should be observed in good weather conditions also).
- On vessels with low freeboard working decks such as anchor handlers and tugs where decks are easily awash the following precautions will be taken:
  - Personnel shall not work in external areas of the vessel unaccompanied.
  - Personnel working on external decks shall wear a work vest.

When entering a Port, the vessel shall adhere to the specific Port Regulations, which could handle:
- Pilotage, navigation
- Anchorage, berth, mooring, bunkering
- Security measures
- Arrival and departure procedures

Prior to arrival at a Port, the SOPEP contact list must be available on the bridge.

Reference is made to other SWP that could be applicable to vessel operations:
- Dredging and reclamation
- PPE
- Hot Work
- Lifting

During lifting operations on a vessel, particular attention should be paid to the following factors:
- Wind speed
- Vessel motion
- Visibility
- Suitability, certification and Safe Working Load (SWL) of equipment and rigging to be used

All crane operators shall be competent and authorised.

Rules for cabins:
- Keep your cabin clean.
- Clean your toilet and shower area at regularly.
- Clean the drains very good on regular times.
- Use Biotal 2000 (or similar product) for your toilet and drains.
- When furniture is broken tell Captain or Chief mate.
- Do not Smoke a cigarette on bed, and always use a iron astray.
- Do not keep food in your refrigerator.

4.5 Standard safe work operations:

4.5.1 Mooring and Unmooring

4.5.1.1 General

The deckhands shall be fully acquainted with the mooring procedure and the equipment. The deckhands shall check if the equipment is operational and tested. Mooring wires and ropes shall be replaced when they are damaged to a certain grade (i.e. when damage is more than 10% of the diameter; when a wire is badly kinked; etc.). The decks shall be well illuminated.

The deckhands that handle the ropes / wire shall always wear a hardhat, gloves and safety shoes. They shall be aware that standing in bights or near wires / ropes under tension is not allowed.

The crew shall be aware that, when working over / near water, a life vests needs to be worn. Means of communication shall be available during mooring activities.

4.5.1.2 Mooring of Barges alongside dredger, crane barges or anchored pontoons

Captains of barges approaching alongside dredger, crane barges or anchored pontoons shall be aware of treacherous currents and movements of the other vessel. Only EXPERIENCED skippers shall operate/sail the barges.

For the fastening of barge to the dredger, crane barges or anchored pontoons, the deckhands shall prepare at least 4 m of slack in the wire or use a pendant wire in order to prevent the deckhands on the other vessel from heavy pulling/lifting.

Stepping over wires or ropes when the barge is alongside, especially during rough weather conditions, must be avoided at all times.

4.5.2 Towing

The towing operation shall be in the charge of a competent tow Master and shall be properly planned and prepared in order that the voyage may be made in a safe and efficient manner without presenting a hazard to other shipping or offshore installations.

The selection of a towing vessel is based on its adequacy for the tow in the worst weather conditions to be encountered in the proposed area of operation. The type, specification and bollard pull (BP) of the vessel for a specific tow operation shall be defined. Prior to selection a tow vessel will undergo suitability audit carried out by the technical department in order to ensure that the vessel is fit for the intended work scope.

If required, a Marine Warranty Surveyor shall check the sea fastening of cargo and the setup of the towing arrangements.

4.5.3 Engine and machinery room safety

Some procedures for safe working practices in engine and machinery rooms are defined below. Mechanics, engineers and wipers shall be made familiar with these basic rules.

General:

- Think safety, try to predict, avoid and eradicate hazards.
- The following protection must be worn prior to entering a machine space: Skin protection, protective clothing, footwear with slip and oil resistant soles, ear defenders, and, if applicable, protective gloves and hard hat.
- Check where repair and maintenance work is in progress and ensure correct warning signs are in position.
- Do not run in a machinery space.
- Ensure visitors are suitably dressed, protected and familiar with E.R. procedures. Officers in charge must be informed of their presence.
- Asbestos holding items are removed from the vessel. Alternatively, possible asbestos holding items (of a none-dangerous type) are identified and crew is made aware of correct procedures regarding working with these items.

Unmanned E.R. and machinery spaces:

- Do not enter alone and always notify the officer in charge or the bridge.
- Before entering, ensure reporting and communication procedures are clearly understood.
- Safety procedures must be displayed at all entrances.
- Ensure adequate illumination is provided.
- Be aware that machinery may start and stop automatically.
- Do not attempt to rescue casualties alone, call for the Emergency Team.
- Be aware of toxic and explosive risks in certain machinery spaces.

Main engines and auxiliaries:

- When checking machinery, beware of moving parts and high temperatures.
- Be particularly observant in checking for oil and fuel leaks. These give the highest potential for fire.
- Be aware that some machines start and stop automatically.
- Ensure that all machinery is guarded correctly, especially after maintenance.
- During maintenance of machinery, ensure that all loose parts are securely stored.
- Engine room deck plates, grids and handrails must be securely fixed, clean and free from debris.

- All bilges and mud boxes must be kept clean and free from obstruction.

Boilers:
- All manufacturers' operating procedures must be clearly displayed and observed.
- Correct flashing up procedure must be followed to avoid risk of blowback.
- All escape routes from boiler fronts and firing spaces must be kept clear.
- Ensure uptakes are maintained free from gas leaks.

Workshop and stores:
- All loose items of equipment and spare gear must be securely stored.
- Workshop machinery must be suitably guarded with specific protective equipment available and mandatory signs displayed.
- All consumables must be correctly stored in accordance with suppliers' instructions and ship safety procedures.
- All waste to be correctly packaged for disposal in accordance with MARPOL Annex V or project requirements.
- When using pneumatic or hydraulic equipment, ensure they are set at the correct working pressure and have been checked for serviceability.
- Use welding screens and head shields when arc welding and do not leave hot items unattended.
- Only trained personnel should use metal working machinery.
- Grinding wheel regulations must be observed.

4.5.4 Hatches and doors closed at sea

The risks of open doors:
- unwanted water flow could occur during sailing and stormy weather;
- the compartmentalization is no longer guaranteed during a calamity or collision.

Prevention:
- all watertight doors on deck must be closed and locked during sailing and working;
- doors shall be checked regularly during safety rounds;
- the importance of the closure and locking of doors shall be emphasised during toolbox-meetings.

The risk of open horizontal hatches on deck an inside the ship:
- because of overflow when dredging, water, silt and other (polluted) spoil could flow in rooms, resulting in major damage and pollution;
- unwanted water flow could occur during sailing and stormy weather;
- the compartmentalization is no longer guaranteed during a calamity or collision.

Prevention:
- all hatches must be closed and locked during sailing and working;
- check regularly during safety rounds;
- emphasise the importance of the closure and locking of hatches during toolbox-meetings.

Furthermore, all automatic doors and hatches shall be checked regularly whether they are in good condition. As a minimum, the following items should be checked:
- warning signal (when opening/closing bell and/or revolving light);
- alarm signal to bridge or to engine room;
- availability operating instructions near the door;
- doors and hatches can be easily opened;

- emergency stop;
- condition and watertight function of seals of doors and hatches.

4.5.5 Shipboard food and hygiene

Recommended procedures for health and safety in pantries, galleys and freezers are described below. Cooks and stewards shall be made familiar with these basic rules. Only authorised persons who have undergone food hygiene training and specific medical checks and vaccination shall carry out the preparation and handling of food.

Health and hygiene:
- Hands and fingernails must be kept clean at all times using hot water and anti bacterial soap.
- Wash hands between handling meat, fish, fruit and vegetables or visiting the toilet or blowing your nose.
- Cuts, burns and abrasions must be covered with a suitably coloured waterproof dressing.
- All illnesses to be reported immediately. If dysentery or diarrhoea is suspected, stop work at once.
- No smoking, eating or drinking in food handling areas.
- Clean protective clothing and head covering must be worn at all times to protect food and handler.
- Do not cough or sneeze near food.

Food preparation:
- Do not use the same knife, chopping board or preparation surface for raw meat, fish, cooked food, fresh vegetables and fruit.
- Never use cracked ore broken utensils.
- Use cleaning materials in accordance with manufacturer’s instructions and never allow them to come into contact with food.
- All foods must be thoroughly cooked to a safe internal temperature.
- Separate storage compartments must be used for raw and cooked foods.
- Do not handle food unnecessarily.
- Food must be washed properly where necessary.

Galley and pantry equipment:
- Extreme care must be taken when turning on stoves or deep-fat fryers, especially if oil of gas fired.
- Range guards must be used in rough weather.
- Microwaves must be used in accordance with manufacturer’s instructions.
- Deep-fat fryers must have safety lids which can smother a fire. Never use water to extinguish a fat fire.
- Knives, saws and choppers should be kept sharp and housed in secure racks or safely sheathed. Don not mix with other items when washing-up.
- Do not grab a falling knife.
- Faulty appliances must be reported and taken out of service. A ‘do not use’ notice must be displayed.
- When cleaning or unblocking, ensure equipment is switched off and isolated. All parts in contact with food must be washed, rinsed, sanitised and air-dried.
- Food waste and other garbage must be immediately stored in designated containers and disposed of in accordance with MARPOL Annex V and with the project specific requirements.

Temperature control:

- It is the temperature of the food and not the air temperature of the holding unit that must be maintained.
- Always load the refrigerator in accordance with the manufacturer's instructions.
- Keep the thermometer in the coldest part of the fridge and check regularly that the temperature is between 0°C and 5°C.
- The coldest part of the fridge should contain the most perishable foods such as cold meats.
- All raw or uncooked foods must be wrapped.
- Do not overload or put hot food in the fridge.

Slips, halls and trip hazards:

- Wear slip resistant footwear which offers protection from hot fat or boiling water.
- Decks and gratings must be kept free of grease.
- All spills and breakages must be cleaned-up immediately.
- When using stairs and companionways, keep one hand free to use the handrail.
- Do not carry items in such a way as to obscure you view.
- Wherever possible, ensure all deck coverings are of the anti-slip type, especially outside refrigeration rooms.

Refrigeration, freezer and store rooms:

- All doors must be fitted with both means of opening and sounding alarm from inside.
- The alarm should be tested weekly.
- Personnel using refrigerated rooms must be familiar with operating alarms and handles in darkness.
- Always inform others when entering there areas and take the padlock and key with you.
- Refrigerant leaks must be reported immediately and warning notices posted on outside doors.
- Stores must be stowed securely to prevent movement in rough weather.

4.5.6 Navigation

4.5.6.1 General

Masters shall ensure that their vessels are navigated in full compliance with the International Regulations for Preventing Collisions at Sea, 1972 (COLREG), without exception.

Prior to commencing any voyage Masters must ensure that a passage plan for the voyage has been developed and all Watchkeeping / Navigating Officers are familiarized with it.

Masters must ensure that all necessary charts and nautical publications for the area of operation are carried on board the vessel and that they are up to date with all the latest amendments and corrections. Where the area of operation will include subsea assets and platforms, the Master must also ensure that he has the latest field charts on board the vessel.

Unless advised to the contrary or for safety reasons, vessels shall make best safe economical speed at all times.

Vessels involved will be equipped with bathymetry maps showing areas of sensitivities. Furthermore, these areas will be marked in the dredge survey computer.

Vessels shall anchor at anchoring areas indicated by the port. Alternatively, JAN DE NUL shall define designated safe anchoring zones outside sensitive areas. Vessels will not anchor outside designated anchoring areas unless in an emergency situation.

Latest admiralty charts (ECDIS) will be provided of the working and sailing area to ensure that exclusion zones and sub sea obstructions and installations are known to the officers.

Bridge Watchkeeping:
A safe navigational watch must be kept at all times and every opportunity must be taken to physically check the vessel's electronic position referencing systems against visual observation and charts.

A proper visual lookout shall be maintained at all times and the Officer Of the Watch shall be responsible for taking timely action in order to avoid collision, grounding or close quarter situations.

During periods of reduced visibility, Master's shall ensure that additional lookouts are posted, appropriate sound signals are made and a radar watch is maintained on both long range (12 nm) and short range (6 nm or less).

4.5.6.2 Preparing bridge before sailing

- Check compass error
- Compare gyro compass-reading with magnetic compass-reading
- Ascertain deviation by either adding or subtracting the variation and check outcome with deviation-table
- Put radars on stand by
- Start two steering-pumps
- Check if rudders are free of obstacles and than turn rudders full to SB and PS and check rudder-indicators
- Do this also with only SB and PS pump running
- Switch the Doppler-log on
- Check scanners of both radars and run the "Nucleus"radar and align gyrocourse, set the speed to logspeed and adjust the screenbrilliance / contrast. If the visibility is poor, than also do this with the second radar
- Test the ship's airwhistle and its automatic signal blasting device
- Check if the bottomdoors are fully closed and if the hydraulic pressure switch is set to "high"
- Check navigation-lights (including NUC-lights and X-mass tree) and leave the sailing lights burning
- Check communication with engineroom by telephoning two ways with them and test the telepgraph (you must go to the "engineroom-control to do this) after this return to "bridge-control"
- Check portable radiosets on allowed channels only and hand them out to the fore- and aft mooring party or anchor hewing party
- Check if propellers are clear and when the control is the engine is on bridge-control than try to adjust the pitch slightly ahead and astern prior to unmooring the ship
- Switch on the VHF's on the correct frequencies
- Put the correct nautical charts on the chart table
- Check if the DGPS position readout is correct

- Check if the echosounder is operational and if the reading make sense
- Check the bowthruster by running it slowly PS/SB after you checked if there are no polyprop ropes or rubble floating next to you
- Check window wipers
- Make sure standing orders are available
- Check on the navtex and check if anything important is on the printout
- Check searchlights and torches
- Check if everything is secured on the bridge and check with the dredge master if this is the case on deck
- Check if the pilot ladder is stowed away correctly or lowered to the correct height. In the latter case check if there is a life buoy and a deck light available
- Check the GMDSS radio equipment
- Place minimal two binoculars on the bridge console
- Hoist the appropriate flags for instance the “H” (Pilot on board) or show the appropriate lights if required by harbour rules and regulations (ask the pilot!)

4.5.7 Weather

The Master and/or the Superintendent shall continuously monitor the weather conditions and shall restrict or even interrupt certain works when safe work is not possible.

Adverse Weather
Adverse Weather is defined as environmental conditions that may affect people, equipment or facilities, to such an extent that precautionary measures must be taken to safeguard the vessel or to maintain a safe system of work. Adverse weather includes, snow, ice, fog, hail, lightning, heavy rain, high winds, low cloud base, poor visibility, severe sea states and strong currents. In certain circumstances low/no wind can also be adverse weather. Weather conditions can change quickly and the effects of short term variations such as wind gusts must be considered.

Weather Limits
Weather limits must take into account the location and type of worksite, the nature of the work to be carried out, and the time required to secure the worksite before the onset of adverse weather. Weather limits should be identified in terms of the following categories as appropriate:
- Wind Speed
- Wind Direction
- Sea State
- Air Temperature

Weather Forecasts
Weather forecasts should be obtained on a regular and frequent basis, at least every 12 hours and with a minimum coverage of 36 hours and a 5 day outlook. The forecasts as a minimum should provide the following information:
- Wind speed and direction
- Sig and max wave height
- Swell direction, period and height
- Visibility
- Significant temperature change
- Barometric pressure and tendency
- Risk of weather phenomena such as Fog, Thunderstorms, etc.

Movement Of Personnel During Adverse Weather
Site supervisors should carry out an assessment of the risk to personnel during adverse weather. In addition, supervisors responsible for the area should continue to frequently monitor external and other vulnerable areas throughout periods of adverse weather and put in place any necessary control measures to minimise risk to individuals. They should advise management of the need to review all other work in progress, to assess the impact of the adverse weather, and in particular access to and from modules and worksites. Personnel movement in external areas affected by adverse weather should be limited to the covered, sheltered or leeward areas of the location. Emergency Exit doors may have to be used for access to the leeward side of accommodation modules. Personnel should be made aware of restrictions or the alternatives to normal access routes, by the public address system and by the erection of safety barriers. Provision of guard/restraining lines may be necessary at areas such as walkway corners where wind effects are particularly severe, when such routes have to be used in adverse weather.

In severe weather, there may be occasions when all personnel will have to remain inside. Any operations, which cannot be continued without personnel access to weather affected areas, shall be suspended. 'Weather Watch Inspections' to look for loose items, carry out damage assessment, or perform meteorological observations should only be performed when it is safe to do so and should not be carried out by an unaccompanied individual.

4.6 Basic Safety Equipment

4.6.1 General

In essence, the safety equipment that is required to be onboard of a vessel is reflected in the vessel's safety plan. This safety plan depends on the vessel's class, in compliance with SOLAS regulations, and is required to be approved by the Class surveyor. A copy of the safety plan can be found on various locations on the vessel.

ISM certified vessels have specific procedures and instruction regarding safety equipment within their ISM system. This project procedure provides some information on essential safety equipment onboard of vessels since not all vessels comply with SOLAS / ISM requirements, e.g. small or not self-propelled vessels, which are not sailing/working in international waters.

4.6.2 Inspection of life-saving and safety equipment

The Captain/Senior Dredge Master must make a monthly inspection of all life-saving and safety equipment that it is compulsory to have on board ensuring that it is in the correct location and in good working order. If the equipment is found to be defective, corrective action must be taken. All inspections must be recorded in the ship's log.

Safety equipment to be checked:

- All life rafts and life boats with their equipment. The engines of the motor life boats must be in good working order.
- All lifebuoys and attachments, such as flares and smoke signals.
- Line throwing appliances.
- Rockets for sending distress signals.
- Pilot ladder.
- Navigation lights.

- Safety lamps and signal lamps.
- Emergency shut-off valves on fuel lines.
- All fire extinguishing appliances and compressed-air breathing apparatus.

4.6.3 Survival and/or MOB craft

The survival craft (lifeboat) will be used in case of an abandon ship emergency. The MOB boat will be used for rescuing a Man Over Board victim. The crafts contain survival equipment as specified by the SOLAS convention.

The master will ensure that the crafts are maintained in a fully operation condition. A regular inspection and maintenance schedule shall be executed and records kept for each craft. All officers and crew members shall be familiar with the operation of the crafts in accordance with their function as stipulated on the Muster List. Visitors must be informed on the location of the crafts by the master during their introduction.

Launching, boarding and sailing has to be done following procedures which are defined in the Emergency Procedures Manual and the Vessel Operating Manual.
(The use of equipment on board of the lifeboat will be explained in Training Courses and safety briefings).

4.6.4 Liferafts

In some emergency cases it will be impossible to launch the lifeboats. In these cases liferafts will be used to abandon the ship. The SOLAS convention regulates the construction and the launching equipment of the rafts.

A sufficient number of inflatable liferafts are mounted at convenient locations on the vessels. All officers and crew shall make themselves aware of the locations and operations of the rafts. Visitors must be informed to the master after boarding the vessel.

Launching and boarding has to be done according the procedures which are defined in the Emergency Procedures Manual and Vessel Operating Manual.

4.6.5 Emergency Life jackets

In every cabin there will be at least one SOLAS approved emergency life jacket (type: block vest) for each person staying in that cabin. Near the muster station there will be additional life jackets available.

The SOLAS Convention defines the requirements for the amount of jackets, the type and their location on board.

This type of life jackets must be worn when an emergency alarm sounds (e.g. Abandon Ship or Fire).

Everybody on board shall be made familiar with the use of the jacket.

4.6.6 Work life jackets (work vest)

In normal conditions, a work vest shall be worn when work is being performed near the water side outside the protected area. However, in certain work conditions it is not practical to wear a work life jacket since it can hamper normal work. In this case, other means of protection (life line, net, …) shall be in place.

Sufficient work life jackets shall be available on board.

4.6.7 Life buoys

Life buoys are constructed in accordance with the regulations stipulated by the SOLAS Convention.

Location, configuration (i.e. with smoke, light and / or life line) shall be conform the safety plan.

4.6.8 Gangways, Accommodation ladders and Rope ladders

Gangways and accommodation ladders are used for safe access of the vessel in normal conditions or at berth.

The crew shall adhere to the rules of safe rigging and use of the gangway and accommodation ladder.

The purpose of rope ladders is to provide means to board and deboard ships, even in difficult circumstances. When using the rope ladders, a life jacket shall be worn. A crewmember must be on standby below / above the rope ladder in order to assist for a safe transfer to and from the vessel.

Places of boarding / deboarding shall be well lit at night.

4.6.9 Fire Fighting Equipment

Fire fighting equipment shall be available in accordance with the SOLAS regulations. The type of fire fighting equipment and the location is shown on the safety plan and fire plan. The equipment is subject to regular maintenance and inspection. The crew is trained in using the equipment trough their STCW95 training as well as by regular drills.

Following fire fighting equipment could be onboard:
- fixed fire fighting system (CO2) in engine rooms
- fire flaps
- fire extinguishers
- fire reels and hoses
- hydrants
- fire pump & generator
- fireman’s outfit
- emergency escape breathing devices
- fire / heat / smoke alarms
- fire axe

4.6.10 Life saving signals

Life saving signals shall be available in accordance with the SOLAS regulations. The type of Life saving signals and the location is shown on the safety plan and fire plan. The equipment is subject to regular inspections. Officers are trained in using this equipment.

Following life saving signals could be onboard:
- EPIRB
- Radar transponder
- VHF radio
- Pyrotechnics
- Signal lamp
- Flags

4.6.11 Safety signs

Safety signs shall be posted in accordance with the SOLAS regulations. Crew shall be familiar with the signs and adhere to them. The most important signs shall be explained to visitors during their introduction.

Following types of safety signs are posted onboard:
- Prohibition signs (e.g. 'no smoking')
- Mandatory signs (e.g. 'emergency exit: keep free')
- Direction signs (e.g. 'exit' or 'escape rout')
- Hazard signs (e.g. 'danger: overhead working')
- Fire control / equipment signs (e.g. 'fire alarm')
- Space indicating signs (e.g. 'paint store')
- ISPS signs (e.g. 'restricted area')

4.6.12 Compressed-air breathing apparatus

How compressed-air breathing apparatus is to be tested:

Monthly:
- Open the bottle(s) a half turn and read the pressure on the gauge (must be at least 95% full).
- Close off the bottle(s) again.
- Wait one minute. Meanwhile affix the bracket.
- After one minute there should not have been an appreciable drop in the pressure; if there is, it means there is a leakage somewhere; trace the cause and solve the problem!
- Carefully reduce the pressure in the apparatus.
- Check that the (low pressure) withdrawal alarm is working

Every six months:
- Check the apparatus in accordance with the manufacturer's instructions;
- Pay special attention to all rubber components.
- Recharge the bottles with fresh air.

4.7 Entrances and emergency exits

- Escape routes and emergency exits must be clearly marked and well lit.
- Escape hatches and emergency exits must be marked on both sides with the words 'EMERGENCY EXIT -KEEP CLEAR'.
- Escape hatches and emergency exits must never be locked.
- Keep all means of access and emergency exits, all passageways, workshop floors, platforms, stairways and stairwells, gangways and scaffolding free from obstacles, grease, oil, snow, ice and mud. Never leave tools, ropes, wires and rubbish around but clear up immediately.

- Ensure (if possible) that provision is made for a second escape route wherever men are working.
- Paint all permanent fittings in a conspicuous colour (black/yellow). Be mindful of obstructions such as eye plates on deck, lashing points, projections, raised edges and low ceilings.
- Raised work areas, (such as platforms), must be provided with railings.

4.8 Tanks

4.8.1 Soundings

- The Captain or Chief Officer must ensure that all compartments and buoyancy tanks, including fore- and after- peaks, are sounded regularly.
- These soundings must be recorded in the ship's log and in the engine logbook (by the Chief Engineer)

4.8.2 Ballast tanks

- Ballast tanks must not be emptied or filled without prior permission from the Captain or Chief Officer.
- Adherence to the international ballast water requirements (IMO)

4.8.3 Fuel tanks

- Fuel tanks must be marked with the warning that naked flames and heat are dangerous and there must be safety devices in place to prevent 'overfill'.
- Engine exhausts in the vicinity must be fitted with spark arrestors.

4.8.4 Hatches and tank openings

- Hatches and tank openings must be clearly marked.
- A hatch that is open must be cordoned off.
- All permanent hatches must be fitted with safety devices to prevent them from closing of their own accord.

5 ANNEXES

The last revision of:

None.

Project Name	:	**Proposed 286.86 Hectare Paranaque Reclamation Project**
Project Location	:	**Along Coast of Manila Bay in Territorial Jurisdiction of the City of Paranaque**
ECC Reference No.	:	**None yet**
Proponent	:	**City government of Paranaque**
Pollution Control Officer	:	**Not Applicable**
Tel. No./Fax No./Email	:	**02 820-7783**
Project Type	:	**Environmentally Critical Project in an Environmentally Critical Area (ECP in an ECA)**
Project Status	:	**Pre-construction**

I. PROJECT CONSIDERATIONS

I.1 Size and Type

I.1.1 Size based on number of employees (construction workers)

Specify number of employees: : **For horizontal development : To be determined; approximately 50-100 at a given time 50-70 for the Reclamation Contractor**

I.1.2 Type

ECP in Non-ECA	
ECP in ECA	/
Non-ECP but in ECA	
Non-ECP and Non-ECA	

I.2 Waste Generation and Management

I.2.1 Enumerate Waste Type and Specify Quantity of Wastes generated in your facility. (Identify /Enumerate)

Category	Waste	Type		Quantity
		Hazardous	Non-Hazardous	
Air	None	N.A.	N.A.	
Liquid	Domestic Waste		/	From 50-70 vessel crews Disposed on shore
Solid	Silt	No	/	TBD-dredged materials, variable
	Domestic Garbage		/	From 50-70 vessel crews Disposed on shore

For purposes of the PEMAPS which is "predictive" in nature, the minor and variable quantities of hazardous wastes are not included, e.g. discarded lighting bulbs, spent computer inks, etc. These are generated in small volumes during the reclamation/construction phase.

Wastes during the Operations Phase not included, Operations Phase subject to separate environmental evaluation.

I.3 Pollution Control System (PCS)

I.3.1 Enumerate PCS or Waste Management Method Used in your facility. (Identify /Enumerate)

Category	PCS/Waste Management Method Used	Remarks
Air	Not applicable	Exhaust from vessel equipment are not deemed as wastes

Liquid	Domestic Waste-Temporary Toilet Facilities	Disposed on shore
	Domestic waste from vessel crew Bilge Management	Disposed on Shore
	Built-in Oil Water Separator	Disposed on Shore
Solid	Silt/dredged materials	Disposed in an approved area at Sea Subject to separate permitting Recycling as fill materials
	Domestic Garbage – Compliance to RA 8003	Disposed on shore, in MRF

II. PATHWAYS

II.1 Prevailing wind towards barrio or city? (mark the corresponding point) Yes ____ No ____

Variable : See annual wind rose diagram below.

	1 - 4	Light
	5 - 8	Moderate
	9 - 12	Moderate to Strong
	13 - 16	Strong
	17 - 20	Very Strong

II.2 Rainfall (impacts surface & groundwater pathways) **N/A**

II.2.1 Average annual net rainfall:

Specify amount: **1849.2 mm**

II.2.2 Maximum 24-hour rainfall:

Specify amount:
472.4 mm

II.3 Terrain (select one and mark) Flat ____ Steep ____
Not applicable Project at sea

II.4 Is the facility located in a flood-prone area? (select one and mark) Yes ____ No _/__.
Project is at sea

II.5 Ground Water **N/A Project at Sea**

Depth of groundwater table (meter) (select one and mark)

0 to less than 3	________
3 to 10	________
Greater than 10	________

III. RECEIVING MEDIA/RECEPTORS

III.1 Air (Distance to nearest community) (select one and mark)

0 to less than 0.5 km	________
0.5 to 1 km	________
Greater than 1 km	/

III.2 Receiving Surface Water Body

III.2.1 Distance to receiving surface water: (select one and mark)

0 to less than 0.5 km	________
0.5 to 1 km	________
Greater than 1 km	/

III.2.2 Size of population using receiving surface water

Specify number: **Not Applicable**

III.2.3 Fresh Water N/A

III.2.3.1 Classification of fresh water (select one and mark) **NA**

AA	________
A	________
B	________
C	________
D	________

III.2.3.2 Size of fresh water body **N/A**

Specify size: (units: km²)

III.2.3.3 Economic value of water use (may select more than one of the criteria below) **N/A**

Drinking	________
Domestic	________
Recreational	________
Fishery	________
Industrial	________
Agricultural	________

III.2.4 Salt water

III.2.4.1 Classification of salt water (select one and mark)

SA	________
SB	/
SC	________
SD	________

III.2.4.2 Economic value of water use (may select more than one of the criteria below)

Fishery	/
Tourist zone or park	/
Recreational	/
Industrial	No

III.3 Ground Water **NA**

III.3.1 Distance to nearest recharge area (select one and mark)

0 to less than 0.5 km ____________
0.5 to 1 km ____________
Greater than 1 km ____________

III.3.2 Distance to nearest well used **N/A**

0 to less than 0.5 km ____________
0.5 to 1 km ____________
Greater than 1 km ____________

III.3.3 Groundwater use within the nearest well (may select more than one of the criteria below)

N/A

Drinking ____________
Industrial ____________
Agricultural ____________

III.4 Land **N/A Project is Water based**

III.4.1 Indicate current/actual land uses within 0.5 km radius: (may select more than one of the criteria below) **N/A Project Site outside of 0.5 km from land**

Residential ____________
Commercial/Institutional ____________
Industrial ____________
Agricultural/Recreational ____________
Protected Area ____________

III.4.2 Potential/proposed land uses within 0.5 km (may select more than one of the criteria below) **N/A.** Project Site outside of 0.5 km from land

Residential ____________
Commercial/Institutional ____________
Industrial ____________
Agricultural/Recreational ____________
Protected Area ____________

III.4.3 Number of affected Environmentally Critical Areas within 1 km:

Specify number: **One**
(The LPPCHEA) ____________

III.4.4 Distance to nearest ECA **See Google Earth Map Below**

0 to less than 0.5km ____________

0.5 to 1 km (For verification) ____________
Greater than 1 km / ____________

(The LPPCHEA)

IV. ENVIRONMENTAL PERFORMANCE – Original Project Still in planning stage

III.5 Compliance (pls. take note that this will be double-checked with PCD files) **N.A.**

Law	Violation (check if any)	Type (pls. specify number of times committed)				Type of Admin Violation	Additional Remarks/Status of Compliance
		STANDARD					
		Emission/Effluent/ Discharge	Ambient	Human Impact	Admin/ ECC		
RA 8749							
RA 9275							
RA 6969							
PD 1586							
RA 9003							

III.6 Number of Valid Complaints **N.A.**

III.6.1 Citizen and NGOs

Specify number: ____________

III.6.2 Others (other Govt. Agencies, Private Institutions)
Specify number: ____________

(To be filled up by EMB Personnel)

RECOMMENDATION/S:

____
____
____

Assessed By: ____________________

Noted By: ____________________

ACCOUNTABILITY STATEMENT OF PROJECT PROPONENT

This is to certify that all information in the submitted **Project Environmental Monitoring and Audit Prioritization Scheme (PEMAPS) Questionnaire for the Proposed 286.86 Hectare Paranaque Reclamation Project** of the City Government of Paranaque located Along the Coast of Manila Bay in the Territorial Jurisdiction of the City of Paranaque are true, accurate and complete to the best of my knowledge based on current preliminary studies. Should I learn of any information, which makes this inaccurate, I shall bring said information to the appropriate Environmental Management Bureau Regional Office.

In witness whereof, I hereby set out my hands this AUG 20 2019 day of 2019 at PARANAQUE CITY.

FERNANDO C. SORIANO
City Government of Paranaque

SUBSCRIBED AND SWORN TO before me this AUG 20 2019 day of 2019, affiant exhibiting his/her Community Tax Certificate No. ______ issued at ______ on ______

Doc. No. 291
Page No. 48
Book No. III
Series of 2019

Elena P. Tec-Rodriguez
ATTY. ELENA P. TEC-RODRIGUEZ
NOTARY PUBLIC
UNTIL DECEMBER 31, 2020
PTR NO. 1705947
ISSUED ON 01-03-19 AT PQUE. CITY
IBP OR NO. 047518
ISSUED ON 01-03-19 AT PASIG CITY
ROLL OF ATTORNEY NO. 31898

**MEMORANDUM OF AGREEMENT
ON THE CREATION OF THE
MULTI-PARTITE MONITORING TEAM,
ENVIRONMENTAL MONITORING FUND
AND THE ENVIRONMENTAL GUARANTEE FUND FOR THE
PROPOSED CAVITE PROVINCE LAND RECLAMATION AND DEVELOPMENT PROJECT:
ISLAND C (286.86 HECTARES)**

KNOW ALL MEN BY THESE PRESENTS:

This Memorandum of Agreement is made and entered into this_______________day of____, at __________________by and among:

The **DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES**, through the **ENVIRONMENTAL MANAGEMENT BUREAU** (EMB) with principal office at EMB, Bldg., DENR Compound, Visayas Avenue, Diliman, Quezon City, represented by its Director,_____, **hereinafter** referred to as **EMB**;

-And-

The **City of Paranaque,** , represented by its Atty, **Ding Soriano,** hereinafter referred to as **City Government of Paranaque.**

WITNESSETH, That:

WHEREAS:

(i) Pursuant to Presidential Decree No. 1586, **City Government of Paranaque** has been issued an Environmental Compliance Certificate (ECC) with ECC Reference Code No. xxxx dated xxxx, xxxxx, 2018 for its Proposed **286.86 Hectare Paranaque Reclamation Project** located along Manila Bay and the Coastline of Paranaque City, Within the Jurisdiction of Paranaque City, hereinafter referred to as the PROJECT;

(ii) The ECC for the Project requires, as a condition, the formation of a Multi-partite Monitoring Team, hereinafter referred to as MMT, which shall be composed of representatives of the DENR, Cavite Provincial Government, the Philippine Reclamation Authority, Non-Government Organization (NGO)/People's Organization (PO) and the affected communities/vulnerable groups. The MOA shall be submitted to this Office for approval within sixty (60) days from receipt of this ECC".

(iii) The ECC for the Project requires, as a condition, the establishment of an **Environmental Guarantee Fund**, hereinafter referred to as **EGF**, as a fund source for the indemnification of damages caused by the PROJECT and immediate rehabilitation and/or restoration of affected ecosystems, and **Environmental Monitoring Fund**, hereinafter referred to as **EMF**, to cover the expenses of environmental monitoring and surveillance activities;

(iv) The Parties desire to clarify and thus define hereunder their respective commitments and responsibilities in connection with the formation of the MMT and the establishment of the EGF and EMF;

NOW, **THEREFORE**, for and in consideration of the foregoing premises and the mutual covenants set forth herein, the Parties hereto agree as follows:

TITLE I. THE MMT ORGANIZATION

SECTION A. COMPOSITION

The following shall be represented in the MMT:

1. DENR EMB-NATIONAL CAPITAL REGION
2. CITY GOVERNMENT OF PARANAQUE
3. Accredited NGO/PO
4. PHILIPPINE RECLAMATION AUTHORITY
5. Philippine Coast Guard (PCG)
6. MANILA BAY COUNCIL

SECTION B. MMT STRUCTURE AND LEADERSHIP

The following shall serve as the MMT
Organizational Structure: MMT Executive
Committee:

1) DENR-EMB NCR- Regional Director - Chairman
2) Proponent – Parañaque City Government – Vice Chairman
3) LLPACHEA
4) PHILIPPINE RECLAMATION AUTHORITY
5) MANILA BAY

COUNCIL Sectoral

Monitoring Teams (SMT):

1) DENR NCR
2) DENR - EMB NCR
3) Parañaque City
4) NGO/PO
5) PCG

MMT
Secretariat

1) DENR-EMB NCR
2) Proponent – Paranaque City Government

SECTION C: MEMBERSHIP

The MMT shall be multi-sectoral and shall have representations from the stakeholders as identified in Section A above. The identified offices / sector shall officially designate/authorize through a written office order, endorsement letter or similar instruments, a representative to be a member of the MMT who must:

1. Be able to regularly attend meetings, orientations, training, actual monitoring and reporting activities.
2. Be able to read, write and learn the various aspects of monitoring.
3. Be credible to the larger community and without any criminal or administrative cases

The EMB shall confirm and update the official listing of MMT Members.

TITLE II. MMT FUNCTIONS, INSTITUTIONAL ARRANGEMENTS AND RESPONSIBILITIES

SECTION A. MAJOR FUNCTIONS OF THE MMT

Functions of MMT are as follows:

1. Monitor project compliance with the conditions stipulated in the ECC (**Annex A**) and the EMP (**Annex B**);
2. Validate proponent's conduct of self-monitoring
3. Receive complaints, gather relevant information to facilitate determination of validity of complaints or concerns about the project and timely transmit to the proponent and EMB recommended measures to address the complaint
4. Prepare, integrate & disseminate simplified monitoring reports to community stakeholders
5. Make regular and timely submission of MMT Report based on the EMB-

prescribed format SECTION B. INSTITUTIONAL ARRANGEMENTS AND

RESPONSIBILITIES

The EMB NCR shall be responsible for taking the lead in policy guidance, resolution of issues where consensus or decisions cannot be made at the regional level, the provision of needed support for the operationalization of the MMT and MMT Performance validation.

Other member offices/sector identified in Section A of Title I as needing representation in the MMT shall have the following roles, duties and responsibilities:

DENR-EMB NCR, with the assistance of **the DENR-PAWB** is in charge of the areas/site hosting the Project and shall lead the SMT in undertaking actual monitoring activities and act with dispatch on issues/problems that arise relative to the PROJECT being monitored.

CAVITE PROVINCIAL GOVERNMENT shall provide necessary budget/funds for the MMT activities, make available to the MMT all project information necessary to determine compliance with the environmental requirements and commitments to the extent that such information is not subject to any restrictions and confidentiality, coordinate with and allow the MMT members to inspect and observe construction and operation activities of the PROJECT including the testing, calibration and operation of pollution control and in-house monitoring equipment.

NGO/PO shall designate a representative who shall participate in actual monitoring work, prepare or concur with and sign the monitoring reports, provide the necessary information such as update regarding the perceptible impact of the project on the sector/concern being represented.

PCG shall monitor the progress of project implementation through the MMT and provide advice on the marine regulation requirements; coordinate its agency's role in assisting **Cavite Provincial Government** and its contractors in the project implementation specially in regulating navigation related activities at or around the Project to avoid environmental damage, including but not limited to, the declaration and enforcement of reasonable safety and exclusion zones.

PRA shall provide technical assistance and advice, based on their technical expertise and experience in the energy industry, on environmental management and standards of similar or comparable installations (local and international) as the Project.

TITLE III. MMT OPERATIONS AND PROCEDURES

SECTION A. MMT MANUAL OF OPERATIONS

All MMT activities shall be guided by a Manual of Operations (MOO) to be prepared based on the EMB-prescribed generic manual of operations which shall be customized based on the project type/situation and the corresponding monitoring requirements and submit to EMB-NCR for approval within sixty (60) days from the signing of this MOA. The MOO shall contain, at the minimum, the following:

MMT Code of Ethics

I. INTRODUCTION
II. PROJECT BACKGROUND
III. LEGAL BASIS
IV. VISION-MISSION
V. OBJECTIVES
VI. GENERAL FUNCTIONS
VII. MEMBERSHIP
    - 7.1 Selection Process and Criteria for Membership
    - 7.2 Suspension/Removal, Resignation and Replacement of Members
VIII. ORGANIZATION
    - 8.1 MMT Structure and leadership
    - 8.2 General Roles, Duties And Responsibilities Of MMT Members
    - 8.3 Specific Roles, Duties And Responsibilities Of MMT Members
IX. FUND ADMINISTRATION AND MANAGEMENT
    - 9.1 Amount of EMF
    - 9.2 Utilization of EMF / Preparation of a Work and Financial Plan
    - 9.3 Management of the Fund
    - 9.4 Disbursement and Auditing Procedures
X. ACTIVITIES AND CORRESPONDING GUIDELINES
    - 10.1 Meetings
        - 10.1.1 Regular Meetings
        - 10.1.2 Special Meetings
        - 10.1.3 Notice of Meetings
        - 10.1.4 Quorum
        - 10.1.5 Proxy Voting
    - 10.2 Compliance Monitoring, Site Validation and Reporting
        - 10.2.1 Document Review – ECC & EMP Commitments, EIA Predictions, Previous and Current Monitoring Reports
        - 10.2.2 Site Validation
        - 10.2.3 Confirmatory Sampling and Measurement Activities
        - 10.2.4 Complaint Verification and Management
        - 10.2.5 Reporting – Compliance Monitoring and Validation Report
    - 10.3 Records Keeping
    - 10.4 Public Disclosure and IEC
    - 10.5 Other MMT Operations Enhancement Activities
        - 10.5.1 Review of Proponent's Monitoring Protocols
        - 10.5.2 MMT Performance Validation
        - 10.5.3 Annual Planning Workshop
        - 10.5.4 Trainings

The MOO may be updated as the need arises to address operational problems and for continuous improvement of the MMT operations.

SECTION B. ESTABLISHMENT OF THE ENVIRONMENTAL MANAGEMENT FUND (EMF)

The EMF is a fund that the proponent shall commit to establish to support the activities of the MMT as described in the EMB- approved Annual Work and Financial Plan (AWFP).

Cavite Provincial Government shall arrange the opening of an account in a reputable bank in the country for the EMF within ten (10) banking days after the effectivity of this Agreement, the amount of **Php xxx** to finance the initial organizational activities of the MMT for the PROJECT based on the attached Work and Financial Plan (**Annex C**).The Interest shall accrue to the same fund. The proponent shall replenish the account whenever it falls below xxx (PHP xxx) within thirty (30) days, provided that the total amount expended by Cavite Provincial Government shall not exceed **Php xxx** for the entire duration of the initial organizational activities specified in Annex "C".

The succeeding MMT monitoring activities shall be covered by a separate work and financial plan with a replenishable budget approved by the MMT Exec Com.

SECTION C. EMF ADMINISTRATION AND MANAGEMENT

The EMF shall be exclusively utilized to cover all costs attendant to the operation of the MMT and disbursed in accordance with the guidelines stipulated in the approved MOO. The EMF shall be managed and administered by the proponent in accordance with the MMT MOO and annual work and financial plan.

A separate bank account for the EMF shall be established. The signatories shall be the designated MMT Chairman and Vice-chairman

The MMT Secretariat shall undertake the accounting of all expenses by the MMT which the Exec Com / Officers shall oversee.

An external auditor may be commissioned by the MMT, proponent or EMB to conduct audit on the expenditure/disbursement of EMF in accordance with applicable rules and guidelines.

SECTION D. DOCUMENTATION, REPORTING AND RECORDS KEEPING

All MMT activities shall be documented and a report following the EMB-prescribed format shall be submitted semi-annually to EMB Central Office (CO) and the EMB RO. The MMT shall document relevant data, technical references and compile monitoring reports and store them at the proponent's office, under the custody of the proponent's Pollution Control Officer.

TITLE IV. ENVIRONMENTAL GUARANTEE FUND (EGF)

SECTION A. OBJECTIVE

The EGF shall be established and used exclusively for the following purposes:

1. The immediate rehabilitation of areas affected by damages to the environment and the resulting deterioration of environmental quality as a direct consequence of project construction, operation and abandonment;
2. The just compensation of parties and communities affected by the negative impacts of the PROJECT;
3. The conduct of scientific or research studies related to the PROJECT that will aid in the prevention or rehabilitation of accidents and/or environmental damages; and

4. For contingency clean-up activities, environmental enhancement measures, damage prevention programs and social equity measures (e.g. livelihood, social development programs) including the necessary IEC and capability building activities related to the PROJECT.

SECTION B. <u>ESTABLISHMENT OF EGF</u>

There shall be two (2) components of the EGF as follows:

1.1 EGF Trust Fund

The Cavite Provincial Government shall open an account for the Trust Fund in the amount of **Php xxx** at the commencement of construction works for the reclamation. This amount shall be in the form of cash through time deposit, the earnings/interests of which shall accrue to the same Fund. The Trust Fund will be used to compensate aggrieved parties for any damages to life or property, undertake community-based environmental programs, conduct environmental research aimed at strengthening measures to prevent environmental damage and to finance restoration and rehabilitation of environmental quality of the project-affected area.

Upon commercial operation of the reclamation, the amount in the EGF trust fund shall be increased to **Php xxx**. The Trust Fund shall be replenished annually or whenever the amount goes below **Php xxx** The Trust Fund shall also be renewed upon every expiration. The proponent shall immediately inform EMB Central and RO should it fail to renew the Trust Fund (e.g. insurance policy) on its stated expiration date or should the Trust Fund be cancelled or voided by the Insurer because of non-payment of the required premiums or any other cause allowed by the Insurance Code or pertinent issuances of the Insurance Commission.

1.2 EGF Cash Fund

The Cavite Provincial Government shall open an account for the Environmental Guarantee Cash Fund at a reputable bank in the area in the amount of **Php xxx** the commencement of construction works for the reclamation. This amount shall be earmarked for immediate rehabilitation and compensation of affected communities in case of damage or accidents. This Cash Fund shall be placed in an interest-bearing account and such interest shall accrue to the same Cash Fund.

Upon commercial operation of the reclamation, the EGF cash fund shall be increased to Php xxx HUNDRED THOUSAND PESOS (Php x00,000.00).The Fund shall be replenished to this amount annually or whenever the amount goes below **Php xxx**.

Provided, further that in the event of insufficiency of both the EGF Trust Fund and the EGF Cash Fund to answer for expenses, the Proponent shall shoulder the amount of any such insufficiency.

SECTION C. <u>EGF ADMINISTRATION AND MANAGMENT</u>

An EGF Committee shall be established for EGF Management and Administration. It shall be composed of the MMT Executive Committee or Officers with the EMB Regional Director as the Chairperson.

The Chairperson of the EGF Committee shall not vote on any matters except to break a tie. Any determination or approval by the EGF Committee shall require a majority vote, provided there is a quorum. A quorum shall require the presence of more than half of the members including, at all times, the representatives from the DENR and the Proponent.

The Committee shall have the following functions:

- Manage, control and operate the EGF in accordance with approved procedures established regarding the mechanisms for fund disbursement, processing, validation, accounting and documentation;
- Resolve issues involving rehabilitation and compensation for damages that may be brought before it;
- Decide on issues or complaints/questions involving the implementation of the rehabilitation program between the proponent and the aggrieved party;
- Designate entities or individuals in the event that an independent body must resolve the issues and cases;
- Hire credible experts, when necessary, to conduct independent studies and research on the environmental and socio- cultural impacts of the PROJECT in order to assist the EGF Committee in making judicious decisions about environmental issues related to the PROJECT; and
- Undertake damage preventive and social equity measures.

Existing EMB guidelines on fund disbursement, processing, validation, accounting and documentation shall be implemented.

TITLE V. AMENDMENTS

Amendment - This Agreement may not be renewed, extended, amended or otherwise modified except by agreement in writing signed by both parties.

TITLE VI. EFFECTIVITY AND DURATION

Effectivity and Duration - This Agreement shall take effect immediately and shall be maintained by the Parties hereto (or their respective successors or assigns) until the transfer of ownership of the Project by the Cavite Provincial Government or the abandonment or termination of the PROJECT for whatever reason. Upon such transfer, abandonment or termination of the PROJECT, all funds set up by the Proponent under this Agreement shall automatically revert to the Cavite Provincial Government, except to the extent necessary to satisfy any outstanding obligations of the Cavite Provincial Government under this Agreement including the financing of the rehabilitation, restoration, decommissioning or other such activities as may be required for the abandonment phase relative to the PROJECT.

IN WITNESS WHEREOF, the parties hereto have signed and executed this Agreement as of the date and place first above written.

CITY GOVERNMENT OF PARANAQUE	**ENVIRONMENTAL MANAGEMENT BUREAU (EMB)**
By:	By:
Hon. xxxxxx MAYOR	**Atty. Juan Miguel Cuna** Director – EMB

WITH OUR CONFORMITY

MAYOR, CITY OF PARANAQUE	PHILIPPINE RECLAMATION AUTHORITY
By:	By:
xxxxxx	**PETER ANTHONY A. ABAYA**
BARANGAY	NGO/PO
By:	By:

WITNESSES

DENR- NCR	DENR NCR
By:	By:
Officer (CENRO)	
By:	

ACKNOWLEDGMENT

REPUBLIC OF THE PHILIPPINES)
CITY OF_________________) S.S.

BEFORE ME, a Notary Public for and in__________, on this______day of_____________, at this ______________________, personally appeared the following:

Name and Designation	**TIN/CTC No.**	**Date & Place Issued / Expiry Date**
Atty. Juan Miguel Cuna, Director EMB	_______________	__________________________
Hon. Xxxxxxx Cavite Provincial Government		

Known to me as the same persons who executed the foregoing Memorandum of Agreement and acknowledged the same as their free act and deed.

This Agreement consists of_______pages, including this the parties and their instrumental witnesses hereof duly signed page, and that each and every page.

WITNESS MY HAND AND SEAL on the date and at the place above written.

NOTARY PUBLIC

Doc. No. _____________
Page No. _____________
Book No. _____________
Series of _____________

Until________________
PTR No. ___________
Issued at __________
on ________________

Annex C

WORK PLAN TEMPLATE (MMT START UP)

No.	Function/Activities	Performance Indicator	1st QTR	2nd QTR	3rd QTR	4th QTR
1.0	Organizational Meeting, election/designation of officers /Exec Com and *Sectoral /* Committee members	Officers elected and Committees formed				
2.0	Training-Workshop on the Preparation of the MMT Manual of Operations (MOO)	MMT MOO				
3.0	Training-Workshops on the preparation and use of the customized MMT Compliance Monitoring and Validation Report (CMVR)	Customized CMVR Format for MMT Trained MMT Members on preparation of CMVR				
4.0	Preparation of Annual Work and Financial Plan (AWFP) – fully operational MMT	AWFP				
5.0	Initial Compliance Monitoring and Reporting Activities	CMVR for submission to EMB				

FINANCIAL PLAN TEMPLATE (MMT START UP)

No.	Cost Item Per activity in the work plan	Unit Cost	Qty	Days/ No	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
1.0	**Organizational Meetings, election/designation of officers /Exec Com and *Sectoral /* Committee members**								
1.1	Meals/venue								
1.2	Transportation Cost/ Allowance								
1.3	Materials								
2.0	**Training-Workshop on the Preparation of the MMT Manual of Operations (MOO)**								
2.1	Meals/venue								
2.2	Transportation Cost/ Allowance								
2.3	Materials								
2.4	Honoraria for Resource Persons								
3.0	**Training-Workshops on the preparation and use of the customized MMT Compliance Monitoring and Validation Report (CMVR)**								
3.1	Meals/venue								
3.2	Transportation Cost/ Allowance								
3.3	Materials								
3.4	Honoraria for								

No.	Cost Item Per activity in the work plan	Unit Cost	Qty	Days/ No	1st QTR	2nd QTR	3rd QTR	4th QTR	TOTAL
	Resource Persons								
4.0	**Preparation of the next year's Annual Work and Financial Plan (AWFP) – fully operational MMT**								
4.1	Meals/venue								
4.2	Transportation Cost/ Allowance								
4.3	Materials								
5.0	**Compliance Monitoring and Reporting Activities**								
5.1	Document Review Mtg. Meals/Venue								
5.2	Document Review Mtg. Transportation Cost/ Allowance								
5.3	Site Validation Per Diem								
5.4	Report Preparation Mtg. Meals/Venue								
5.5	Report Preparation Mtg. Transportation Cost/ Allowance								
	TOTAL								