

EXECUTIVE SUMMARY**ES 1. Project Brief****ES 1.1 Project Fact Sheet**

Project Name	Proposed Manila Harbour Centre Reclamation Project
Project Location	Barangay 128, Tondo, Manila
Project Type	Reclamation Project
Project Size	50 hectares (Reclamation)
Project Components	<ul style="list-style-type: none"> • Industrial Lots (to include the Port lot intended for the Berthing Area / Port Area) • Road Network including Right-of-Way through Magallanes and Legaspi Streets of Harbour Centre Port Terminal Facility • Water Distribution System • Drainage System • Sewage Collection System • Centralized Sewage Treatment Facility • Power Distribution System • Telecommunication System • Administration Office
Project Duration	Approximately 48 months
Manpower Requirements	Approximately 300-400 employees during project development (reclamation and land development)
Project Cost	Php 6,955,840,000.00
Project Proponents	City Government of Manila (Principal Proponent) and R-II Builders Inc. (Co-Proponent)
Office Address	<p>City of Manila Office of the Mayor City of Manila, Manila City Hall, Intramuros, Manila</p> <p>R-II Builders Inc. 136 Malakas Street, Diliman, Quezon City</p>
Authorized Representative for the Principal Proponent	<p>City of Manila Hon. Joseph E. Estrada City Mayor</p> <p>R-II Builders Incorporated Engr. Victor S. Songco <i>President</i> Telefax Number: (02) 925-3301 Email Address: victorsongco412@yahoo.com</p>
Authorized Representative for the Developer	<p>by: Engr. Benigno B. Sangalang VP, Operations Telefax Number: (02) 925-3301 Mobile Number : 0977.8353610 Email Address: bbs10191965@gmail.com</p>
Authorized	Mr. Joel A. Espineli

Representative for EIS application	Philkairos, Inc. JE Business Center, Pinesville Road corner Ortigas Avenue Extension Taytay, Rizal 1920 Telephone Number: (02) 706-4008 / (02) 727-9005 Email Address: admin@philkairos.com
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While the proposed project is directly connected to the Harbour Centre Port Terminal through a shared ROW, the project will be developed independent of the Port Terminal, through a Joint Venture Agreement between the City of Manila and R-II Builders. It will be provided by components and facilities that are independent of the Port Terminal. Eventually, the operation of the proposed project will also be managed by a separate entity.

ES 1.2. Project Location and Accessibility

The proposed Manila Harbour Centre Reclamation Project is located immediately westward of and adjacent to the 79 hectare Harbour Centre Port. The project is conceptualized to comprise the reclaiming of a 50 hectare area in Manila bay.



Figure ES-1 Location of the Proposed Project (on Google Earth Map)

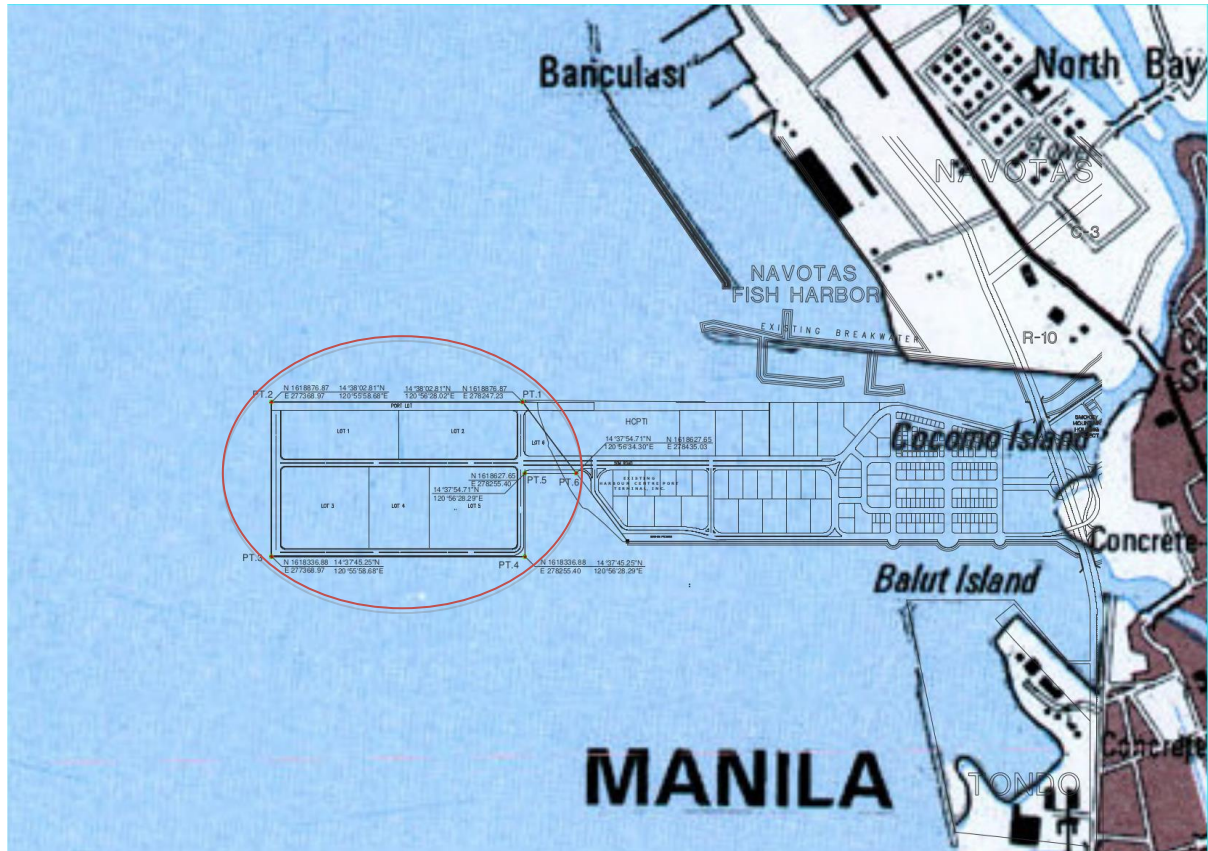


Figure ES.2 Location of the Proposed Project (on NAMRIA Map)

The primary road access to the project area begins at its connection to the main road artery of the existing Harbour Centre and extends westward, approximately 878 meters (2880 feet).

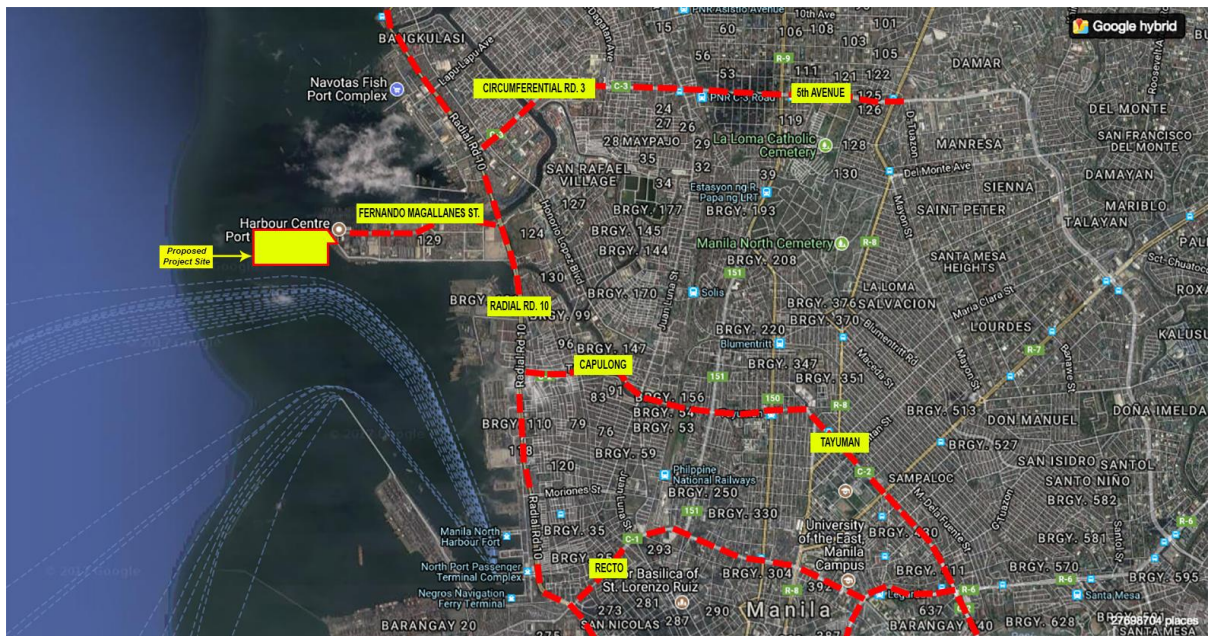


Figure ES-3 Major Roads leading to the Project

ES 1.3. Project Rationale

The rapid expansion of the Philippine economy in recent years, coupled with enhanced growth in various sectors, such as the construction industry has resulted in increased port activity and a strong demand for port-oriented facilities. Unfortunately, port infrastructure, especially in the Port of Manila has not been able to keep pace with the increased volume of logistics traffic. Hence, congestion is a considerable and critical issue currently impacting all of the port operations in Manila. In addition, a shortage of industrial land adjacent to and integrated with existing port facilities is in short supply. Other inefficiencies relating both to congested landside transportation networks as well as various factors and issues in port-oriented operations has resulted in oftentimes markedly severe problems in the movement of produce and materials into the ports and from the ports to their ultimate destinations.

The proposed project aims to establish a large contiguous area to contain large scale industrial development without having to face the problems on land consolidation, high land value, and right of way acquisition.

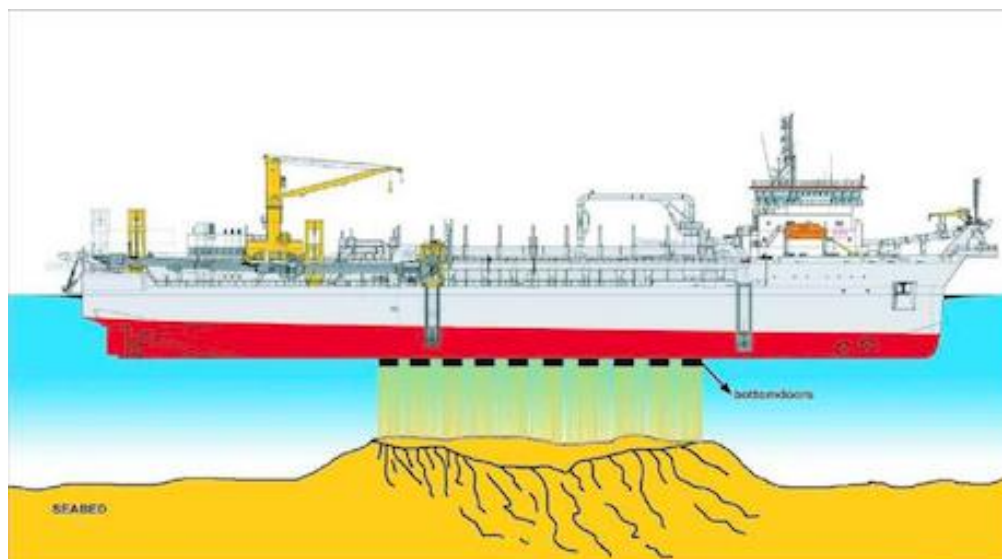
ES 1.4. Project Components

- Industrial Lots (to include the Port lot intended for the Berthing Area / Port Area)
- Road Network including Right-of-Way through Magallanes and Legaspi Streets of Harbour Centre Port Terminal Facility
- Water Distribution System
- Drainage System
- Sewage Collection System
- Centralized Sewage Treatment Facility
- Power Distribution System
- Telecommunication System
- Administration Office

ES 1.5. Process and Technology

Reclamation Methodology

1. Sailing to the discharge / dumping point – as soon as the hopper dredge is fully loaded, the suction tubes will be hoisted back on board and course will be set towards the area for unloading the hopper dredge where it will sail as a regular cargo vessel.
2. Discharging and Dumping – There are several ways to discharge the hopper head :
 - a. Bottom dumping – The fastest way to unload is by discharging the load through the opened bottom doors of the hopper. The vessel is exactly at the area where the load will be discharged, the bottom doors open and the material is directly dumped on site. A new cycle commences as soon as the load is fully dumped bby sailing back to the fill source.

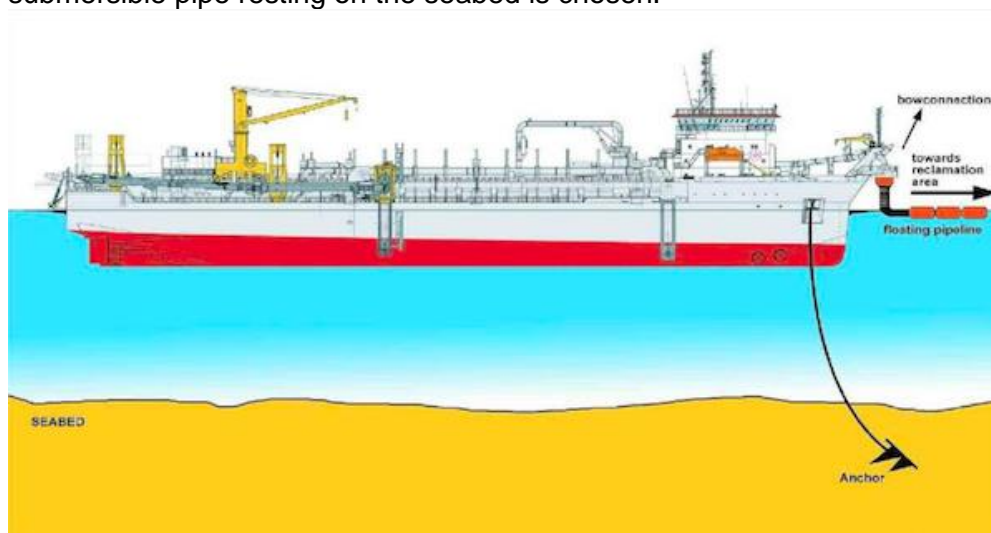


Direct Dumping

- b. Pumping – Some hopper dredgers are equipped with pumping facilities. This enables them to pump the load on a floating pipeline directly into the reclamation area. The hopper dredge will be connected via the bow connection on board to this floating pipeline.

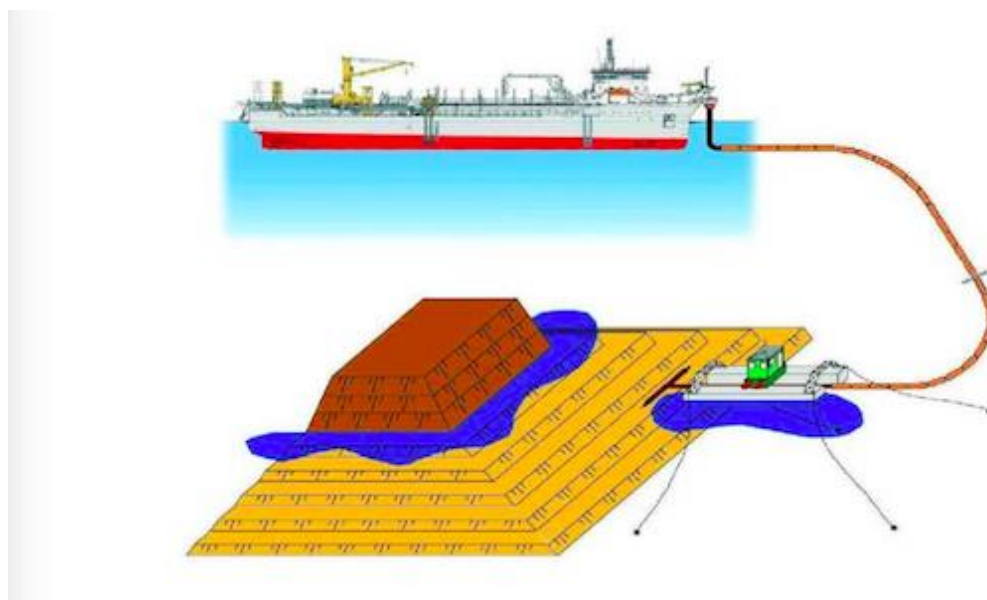
In this method, jets in the hopper will fluidize the sand in the hopper and pumps will convey the mixture through the pipelines to the reclamation area.

For sections where pipeline route has to cover large/long distances over water where it has to cross a surf zone or shipping channel, a submersible pipe resting on the seabed is chosen.



Hopper Dredge coupled to a floating Pipeline

- c. Reclamation with a spray-pontoon – If bottom dumping is not possible, the unloading done using a spray-pontoon. The spray-pontoon is connected to the hopper dredge using a similar pipeline system, which will be moved over prescribed tracks to deposit the load evenly over the required surface area.



Reclaiming using a Spray-pontoon

ES 2. Process Documentation of the Conduct of EIA Study

ES 2.1 EIA Methodology

The Environmental Performance Report and Management Plan (EPRMP) is the result of the Environmental Impact Assessment (EIA) conducted for the Manila Harbour Centre Reclamation Project located offshore waters of Barangay 128 Tondo Manila.

Data gathering involved infield surveys for the assessment of the existing physical and biological conditions of the project site. Based on the standard EIA procedures, collection of secondary data was sourced from the concerned government agencies and offices, desktop research and literature review of relevant studies. The succeeding tables show the methodologies employed during the study.

Table ES-1: Primary Data Gathering Matrix		
Methodology	Source Person/s	Gathered Data/Activity Conducted
Meetings	EIA Study Team and Proponent	<ul style="list-style-type: none"> Project information, project site boundary, and conceptual site layout and plans
Consultations Perception Surveys Interviews	EIA Study Team	<ul style="list-style-type: none"> Perception of the Project Level of awareness on the proposed project Barangay Profiles Anecdotal accounts of past earthquakes, typhoons, flooding and storm surges in the area
Infield Surveys and Fieldworks using the following methodologies: <ul style="list-style-type: none"> Site inspection Transect walk method for 	EIA Study Team	<ul style="list-style-type: none"> Engineering Geological and Geohazard Assessment of the Project Site Terrestrial Ecology Assessment of the Project Site Freshwater Ecology Assessment of

Table ES-1: Primary Data Gathering Matrix		
Methodology	Source Person/s	Gathered Data/Activity Conducted
terrestrial flora and faunal survey <ul style="list-style-type: none"> • Rapid Bioassessment for freshwater macroinvertebrate • Modified kick net for freshwater macroinvertebrates • Coastal Mapping • Transect-quadrat method for marine ecology survey • Grab sampling for water sample collection • Gas Bubbler and Pararosaniline Method for SO_x and NO_x • High Volume and Gravimetric Method for TSP and PM₁₀ • Noise meter for ambient noise level 		the Project Site <ul style="list-style-type: none"> • Marine Ecology Assessment of the Project Site • Water Quality Assessment • Ambient Air Quality and Noise Level Assessment

Table ES-2: Secondary Data Gathering Matrix		
Methodology	Agencies Visited / Documents checked	Gathered Data
Desktop Research and Literature Review	<ul style="list-style-type: none"> • Philippine Statistics Authority (PSA) • City Planning and Development Office – Manila • Barangay 128 	<ul style="list-style-type: none"> • Physical, biological, socio-economic and demographic profiles of the City of Manila and Barangay 128
Desktop Research	<ul style="list-style-type: none"> • Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) • Philippine Institute of Volcanology and Seismology (PHIVOLCS) • Mines and Geosciences Bureau (MGB) 	<ul style="list-style-type: none"> • Climatological normal and extremes • Risks and hazards • Geological data and maps
Literature Review	<ul style="list-style-type: none"> • Geotechnical Engineering Assessment Report by 	<ul style="list-style-type: none"> • Hydrology/Hydrogeology • Soil Quality and

Table ES-2: Secondary Data Gathering Matrix		
Methodology	Agencies Visited / Documents checked	Gathered Data
	GeoLab Technical Services (Jan 2017) <ul style="list-style-type: none"> Hydrologic, Hydraulic and Sediment Transport Study by EGS Asia Inc (May 2017). Feasibility Study for the Project by DAZA and Associates (2017) 	Subsurface Lithology <ul style="list-style-type: none"> Project Information

Stakeholders' Engagement / Public Participation

A public scoping for the proposed project was conducted last January 26, 2017. Present during the activity were the LGU officials of Manila, barangay council members and concerned stakeholders from Barangays 128 and neighboring barangays and representatives from other concerned government agencies. Representatives of proponent, its Consultant DAZA and Associates were also present. Below is the summary of the issues raised during the activity. The full documentation of the public scoping is attached as annex.

- Issue on degradation of the quality of the environment once operation starts
- Traffic Congestion
- Environmental Issues / Effects
- Priority employment and skills development
- Benefits from the project

Last June 6, 2017, further IEC and an SDP workshop was conducted amongst the concerned government agencies and the key stakeholders from the host barangay.

Consultation with Government Agencies

After the conduct of the first Technical Review on February 1, 2018, the Review Committee strongly recommended the conduct of individual agency consultations related to or having jurisdiction in the project area or its future operations. Assisted by PHILKAIROS Inc., the proponent conducted consultations with the agencies listed below between the period March 20 – April 26, 2018:

- Philippine Reclamation Authority
- National Historical Commission and National Commission for Culture and the Arts
- National Museum
- Philippine Institute of Volcanology and Seismology (PHIVOLCS)
- Bureau of Fisheries and Aquatic Resources (BFAR)
- Philippine Coast Guard Environmental Protection Command (PCG-CG9)
- Philippine Ports Authority – Port Management Office NCR North (PPA PMO North)
- Metropolitan Manila Development Authority (MMDA)

The team also communicated with the MARINA, Manila Bay Office and the Manila Bay Coordinating Council who all opted to send their comments and suggestions.

Some of the comments and concerns raised during the agency consultation are as follows:

- Change in water level that may cause flooding due to the reclamation

- Solid waste management plans/policies
- Proper engineering design to minimize change in current and wave patterns
- Access or right of way issues
- Sufficiency of the water depth at the port/berthing area
- Dumping or disposal area for unwanted materials if there would be any
- Continued siltation at the mouth of the waterways
- Mitigating measures to address geohazards (liquefaction, ground shaking, erosion, tsunami, storm, flooding)
- Compliance to the provision of the National Building Code
- Proper procedures in handling chance historical/archeological finds
- Compliance to the order and provision of the Supreme Court Mandamus on Manila Bay
- Concerns on the continued pollution in Manila Bay affecting marine ecology
- Implementation of policies and guidelines in responding and addressing naval accidents such as oil spills and proper coordination protocols with the PCG
- Provision of buffer zone at the work area during reclamation
- Implementation of Traffic Management Plan
- Dredging of the area near the mouth of the two waterways

ES 2.2 EIA Study Team

The proponent of the Project has contracted the services of a third party environmental consultant, Philkairos, Inc. in the preparation of the EIS. The EIA study team is composed of specialists who have extensive experiences in the conduct of baseline characterization and impact assessments for similar development projects. The team composition is presented below (**Table ES-3**).

Table ES-3: EIS Study Team

Name of Preparers	Field of Expertise
Jose Leonilo A. Espineli (IPCO-088)	Project Director
Maria Luisa M. Gutierrez (IPCO-097)	Project Manager
Felixberto H. Roquia (IPCO-028)	Socio - Anthropologist
Dennis S. Tojos	Geologist
Rodolfo Romarate Jr.	Terrestrial and Aquatic Ecology Specialist
Ana Karmela S. Miranda (IPCO-070)	Project / Research Assistant
Rexadi Roy Zamora	Project / Research Assistant
EGS Asia Philippines / Environmental Assessment Services, Ltd	Coastal Engineering, Current and Sediment Transport Study
EGS Asia Philippines / Environmental Assessment Services, Ltd	Wave Study
Dasa Alternative Urban Features by Archt. Jose Danilo Silvestre and Engr. Antonio Kaimo	Traffic Study

ES 2.3 EIA Study Schedule

The overall schedule of activities conducted is presented as follows:

Table ES-4: EIS Preparation Schedule of Activities

Inclusive Dates	Activity Undertaken
Scoping Activities	
January, 2017	Public Scoping
May, 2017	Technical Scoping with EMB CO and EIARC
June 6, 2017	Information, Education and Communication (IEC) Activity
June 6, 2017	ISDP Planning Workshop
	Government Agency Consultations
March 20, 2018	- DPWH
March 20, 2018	- PRA
March 26, 2018	- NHCP-NCCA-NM
April 3, 2018	- PHIVOLCS
April 3, 2018	- BFAR
April 10, 2018	- PCG C9
April 24, 2018	- MMDA
Environmental Impact Assessment	
July 10-15, 2017	Geological and Geohazard Assessment
July 10-15, 2017	Terrestrial Ecology Assessment / Infield Survey
July 10-15, 2017	Freshwater Ecology Assessment / Infield Survey
July 10-15, 2017	Marine Ecology Assessment / Infield Survey
July 10-15, 2017	Water Quality Sampling
July 10-15, 2017	Ambient Air Quality Sampling
July 10-15, 2017	Noise Level Sampling
EIS Preparation	
August 2017 – September 2017	Data Analysis and EIS Preparation

ES 2.4 EIA Study Area

The Direct and Indirect Impact Areas of the proposed project in terms of biophysical and socio-cultural impacts are summarized in **Table ES-5**.

Table ES-5: Impact Areas of the Project

Area Classification	Area Coverage
Direct Impact Areas	In terms of biophysical impact: <ul style="list-style-type: none"> The 50-hectare reclamation area; and Surrounding seabed areas where the portion of the filling materials will be taken. The 1-2 Km peripheral area around the boundaries proposed project which will be the receptors of air and noise impacts during development Adjoining barangays Brgys. 100, 101, 105, 106 in Manila
	In terms of socio-cultural impact: <ul style="list-style-type: none"> Barangay 128 as primary beneficiaries of the Social Development Programs (SDP) and whose lifestyle would be impacted by the project (e.g. increased traffic movement, safety and health risks, etc); Residents of Barangay 128 who will most likely be affected by

Area Classification	Area Coverage
	<p>the reclamation and construction activities;</p> <ul style="list-style-type: none"> City of Manila as direct beneficiary of the revenue from the development
Indirect Impact Areas	<p>In terms of biophysical impact:</p> <ul style="list-style-type: none"> The adjacent waters and seabed of the reclamation and dredging areas, and the source of reclamation material Surrounding/adjacent barangays, Barangays North Bay Boulevard North and South in Navotas, City
	<p>In terms of socio-cultural impact:</p> <ul style="list-style-type: none"> Adjacent communities / barangays other than the primary beneficiaries of the SDP that will benefit at a provincial and regional level from potential revenues and taxes of the project. In addition there will be an increase in potential livelihood and job market for skilled and semi-skilled labor both during development and eventual operations.

ES 3. EIA Summary

3.1 Project Alternatives

The proposed project was based on the following criteria: facility siting, technology option, resources and susceptibility to natural hazards. A summary of findings is presented below.

Table ES-6: Summary of Project Alternatives

Facility Siting	This proposed project is comprised of a fifty (50) hectare reclamation at the Manila Harbour Centre. The project from the onset is characterized as an industrial seaport, as contrasted to the original concept for the Manila Harbour Centre which as discussed earlier introduced the possibility of a mixed-use development. In contrast to the situation in 1995, the current need to augment port facilities and sites for industrial activities in proximity to and within easy access to berthing areas for cargo vessels provides the impetus and rationale for this directed approach toward the development of the proposed 50 hectare reclamation project.
Technology Option and Development Design	The proposed reclamation project would entail sourcing for fill materials from sources such as offshore quarry and land based quarry for the topping materials. The project feasibility would show that this is the most viable for the project in terms of economics and other physical factors. With these at hand, the method to be used in the reclamation work is by sheet piling and through cutter-suction to be done in phases.
Resources	The primary source of the reclamation fill materials would be the at the San Nicolas Shoal off the coast of Cavite
No Project Option	Without the project, the area will remain a part of the Manila Bay. Economic activity and port movement will continue to increase with the volume cargoes expected to rise in the next decade. While the government has been trying to decongest port activities by studying possibilities of utilizing the Batangas Port and Subic Bay Port facilities, the Manila North Harbor area will remain as the central naval economic zone. The spill over effect of business operation in the Circumferential Road network system will also expand the economic

	activities in the area. Much of the existing area on which the proposed reclamation will be developed is already utilized as navigational area for ships, barges and tugboats operating and accessing the existing 79 hectare Harbour Centre. As such, periodic dredging of the area already occurs in the maintenance of navigable channels.
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ES 3.2 Baseline Characterization, Impacts Management and Monitoring Plan

The proposed project was assessed based on its potential impacts to both the bio-physical and socio-cultural environment. A summary of the key findings is presented in **Table ES-7**.

Table ES-7: Summary of Baseline Characterization

Environmental Aspect / Module	Baseline Characterization
The Land	
Compatibility with existing land use	The project will be developed in a designated industrial area in compliance with the city land use plan.
Compatibility with classification as ECA	The project site is identified as an area susceptible to natural calamities.
Existing land tenure issue/s	The reclamation area is classified as an industrial zone.
Visual aesthetics	Currently, the coastline of the proposed reclamation project is heavily built-up with the presence of both residences and industrial establishments. With the development of the reclamation project into an Industrial Estate, it is expected that visual aesthetics of the area will be enhanced with a well-planned design particularly in terms of a balanced land use.
Land value as a result of improper solid waste management and other related impacts	<i>Land valuation is still estimated to increase even with the current state of its surrounding environment having improper disposal of waste. Land value remains high and in high demand due to clamor for areas to decongest existing port facilities.</i>
Surface landform / geomorphology / topography / terrain / slope	<p>The adjoining barangays adjacent to the project site is characterized by level ground.</p> <p>The changes in elevation due to reclamation may cause a reversal of gradient of drainage structures could worsen flooding condition.</p>
Susceptibility to natural hazards	<p>The hazards that may be experienced in the site are:</p> <ul style="list-style-type: none"> • Ground shaking, liquefaction, tsunamis, ground subsidence, earthquake induced landslides, settlement, flooding, marine sedimentation, coastal erosion and accretion and storm surge.
Soil erosion / loss of top soil / overburden	<i>There is no noted erosion in the existing environment particularly at the existing port terminal facility. There is however a noted deposition of sediments at the mouth of the two water channels.</i>
Vegetation removal and loss of habitat	No terrestrial resource will be affected
Existence and / or loss of important species	No keystone species, endangered and highly endemic to the area organisms observed during the sampling.
Abundance, frequency and distribution of important species	No keystone species, endangered and highly endemic to the area organisms observed during the sampling.
Wildlife access	No keystone species, endangered and highly endemic to the area organisms observed during the sampling.
The Water	
Drainage morphology / inducement	<i>The project will run between two river channels</i>

Environmental Aspect / Module	Baseline Characterization
of flooding	<i>which are currently heavily silted hence affects flooding in the upstream areas.</i>
Stream, lake water depth	<i>The reclamation area is located in front of the two esteros/river channels with observed deposition of sediments.</i>
Depletion of water resources / competition in water use	<i>Water supply is provided by the MAYNILAD Concessionaire. Based on the proposed use (locators) and current usage of the existing port facility, the concessionaire would still be able to provide for the water demand of the project</i>
Bathymetry	The effect of dredging is to lower the elevation of the mounds and platforms. Shallowing will also occur in areas with sediment accumulation.
Freshwater quality	There are cases of exceedance in terms of trace metals and coliform values. These could be attributed to the existence of settlers along the river waterway and the improper waste water disposal practices of the residents.
Marine water quality	There are cases of exceedance in some of the stations identified. These could be attributed to the existence of settlers along the river waterway and the improper waste water disposal practices of the residents.
Freshwater ecology	There is no major impact of the project to the freshwater ecology since the waters are already impacted with the urbanization of the area. Severe pollution and impact has been observed to the freshwater ecology. The project is not likely to affect the existing species.
The Air	
Local micro-climate	The proposed project direct contribution to climate change is relatively small, and any climate change impacts in the region are not likely to be related to the project.
Greenhouse gas emission	<i>The existing environment has direct contribution to climate change with heavy industrialization of the Port zone.</i>
Air quality	<i>Ambient air sampling show that the TSP, PM₁₀, SO₂ and NO₂ levels at the two stations are still within DENR Standards for Air Quality levels</i>
Noise level	<i>Ambient noise levels in the area went over the standard levels for ambient noise.</i>
The People	
Displacement of settlers	<i>The offshore portion where the proposed project will be developed has been designated as a reclamation area for port and industrial development based on the existing and current land use plan of the City, hence no informal settlers are noted.</i>
<i>In-migration</i>	<i>Community surrounding the project have noted presence of migrants.</i>
Cultural/Lifestyle change (especially indigenous people if any)	There are no indigenous peoples groups in the project area nor its immediate vicinity.

Environmental Aspect / Module	Baseline Characterization
	<i>The existing community has adapted to local lifestyle dictated by current environmental conditions.</i>
Physical cultural resources	<i>The project is not located within areas with cultural resources.</i>
Delivery of basic services /resource competition	<i>Concerned water, power and telecommunication providers, health institutions and the basic services from the city government are available.</i>
Public health and safety	<i>Local health conditions and safety protocols are enforced by the barangay health and city health units while peace and order is covered by the local tanods and the PNP.</i>
Generation of Local Benefits from the project	<p><i>The area indulges in employment and livelihood, business opportunities and associated economic activities with the continued development in the area.</i></p> <p><i>The LGU partakes of benefits from different forms of taxes and other revenues from the operation of commercial and port facilities in the area.</i></p>
Traffic congestion	A large volume of traffic has been observed in the vicinity of the project during the course of the study particularly during rush hours. Increase in traffic volume on thoroughfares going to and exiting from the site in the past years.

Table ES-8: Summary of Impacts, Mitigation of Enhancement and Residual Effect

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
Reclamation / Land Development : Land			
Land Use, Compatibility, tenure and Visual Aesthetics	Compatibility with existing land use	No management and monitoring plan to be proposed.	No residual effect since the proposed project is compatible with the area's current land use
	Compatibility with classification as ECA	The structural design for the project should strictly follow other specifications set by the National Structural Code for Buildings (NSCB) and other relevant requirements specified in the National Building Code of the Philippines (NBCP) considering it's susceptibility to natural calamities and geologic hazards which may/occurs with or without the proposed project.	Residual effect projected on the reclaimed land considering it will be the first line of impact.
	Existing land tenure issue/s	No management and monitoring plan to be proposed.	No residual effect.
	Visual aesthetics	Strict compliance to the approved engineering designs.	No residual effect.
Solid waste management	Increased generation of solid waste, disposal and related impacts	Proper housekeeping, waste minimization and segregation, and proper machine maintenance will be employed in accordance with the provisions of R.A. 9003. Disposal of solid wastes shall be coordinated with the City Solid Waste Management Office and / or other collecting entity and disposal shall be at authorized disposal sites.	No residual effect
Geology	Changes in landform / geomorphology / topography / terrain / slope	The effect of sedimentation should be monitored by doing profiling or coastal topographic survey regularly preferably during southwest and northwest monsoon season or after a strong typhoon.	No residual effect

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		<p>The general gradient of the reclaimed land should be towards the open sea to the west.</p> <p>Appropriate engineering design will be implemented considering and addressing projected impacts on the project and surrounding area/s.</p>	
Geology	Susceptibility to natural hazards	<p>The structural design for the project should strictly follow other specifications set by the National Structural Code for Buildings (NSCB) and other relevant requirements specified in the National Building Code of the Philippines (NBCP).</p> <p>To mitigate the effects of liquefaction it is necessary to properly compact the soil and increase its density. The ground improvement techniques include jet grouting, vibroflotation / vibro replacement and pre-loading with pre-fabricated drains.</p> <p>A properly anchored retaining structure that could hold in-place the reclaimed land should be constructed to mitigate occurrence of earthquake-induced landslides. The slope of the fill should not be overly steepened to minimize slope failures.</p> <p>Tsunami evacuation sites should be</p>	No residual effect to moderate

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		<p>identified and evacuation routes should be marked and cleared off obstructions. Community based tsunami warning and evacuation drills and procedures should be done for the reclaimed land and adjacent barangays.</p> <p>The soil that should be used for reclamation should not contain high amount of silty and clayey materials. Preferably, well-graded sand and gravel materials should be used. It should be mixed with stabilizing material such as cement. Alternatively ground improvement techniques should be implemented.</p> <p>To efficiently convey floodwaters to the sea, it is also necessary to construct a network of drainage canals / mouth of two waterways. The general gradient of the reclaimed land should be towards the open sea to the west to ensure free flow.</p> <p>The working areas will be installed with silt curtain throughout the duration of the project to mitigate marine sedimentation. Other mitigating measures such as prevention of oil / gas spill from marine equipment will be guided by the Philippine Coast Guard (PCG) rules or guidelines.</p>	
Geology	Soil erosion	Detailed nearshore circulation study should be conducted to determine the flushing	Temporary

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		capacity of the streams and tides and to determine the optimal channel width. Proper easement along rivers should be implemented as part of land use zoning. Regular clean-up in waterways should be done particularly before the onset of the rainy season.	
Terrestrial Ecology	Loss of Vegetation, important species, hindrance to wildlife access, disturbance to terrestrial environment	The project area is devoid of terrestrial flora. No remedial measures will be undertaken. Future locators are however are encouraged to engage in greening programs or landscaping	No residual effect.
		Daily sprinkling of water in the area so that dust will be suppressed. In consonance with the National Greening Program of the DENR, the company shall participate in planting trees surrounding the area.	
Reclamation / Land Development : Water			
Oceanography	Inducement of flooding	<p>To efficiently convey floodwaters to the sea, it is also necessary to construct a network of drainage canals / mouth of two waterways. The general gradient of the reclaimed land should be towards the open sea to the west to ensure free flow.</p> <p>The design of all infrastructures (roads, bridges, drainage canals, etc.) should consider the expected increase in rainfall due to climate change.</p> <p><i>Dredging of the mouths of the two water channels will be conducted to enhance</i></p>	Nil to minimal (considering the current state of the tributaries in the area)

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		<i>water flow and limit/prevent further siltation of the area</i>	
	Impact on depth of water, wave and current pattern	<p>Dredging could be done to remove the accumulated sediments and maintain the depth and gradient at the mouth of the two waterways. Proper waste management in the project area and in the community would significantly improve the stream conditions.</p> <p>Implementation of appropriate engineering design, considering results of modelling in order to minimize if not totally prevent adverse or negative effect on circulation patterns.</p>	<p>Minimal effect considering that the project will be designed and implemented with modelling results factored in the reclamation and construction methodologies.</p> <p>The loss of the 50-hectare water body will be the irreversible impact of the project.</p>
		Regular bathymetric survey should be conducted during dredging to limit the vertical extent of dredging. Areas that are prone to shallowing due to sediment deposition could be dredged if it hinders sea transportation or waterflow from the waterways. Areas prone to deepening due to erosion should be protected by erosion control measures. This could be done in conjunction with engineered erosion control measures.	Projected enhancement in terms of improving water flow, removal of sediment deposition, improvement of naval traffic, prevention of flooding
Ground Water	Depletion of water resources / competition in water use	<p>Appropriate water use management will be implemented to promote water conservation.</p> <p>Rainwater harvesting during the rainy season could be done to augment the</p>	Nil to Minimal considering availability of water resources.

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		water source. The community should also be trained on how to conduct rainwater harvesting and on proper water management.	
Fresh Water	Degradation of freshwater quality	The company, in coordination with the LGU and DENR, may conduct clean up activities along the river as part of their CSR activities. Proper waste management in the project area and in the community would significantly improve the stream conditions.	Projected enhancement in terms of improving the water quality of freshwater discharged at the Bay
Marine Water	Degradation of marine water quality (Contamination, Increased Turbidity, improper disposal of wastes, etc)	<ul style="list-style-type: none"> • Proper disposal of solid waste in compliance with RA 9003 and regulations implemented by the PCG Marine Environmental Protection Unit (MEPU) and the Manila Bay Coordinating / Monitoring Unit • Proper maintenance and operation of vessels to include on board sanitary facilities, solid waste management (with land based counterpart for disposal), appropriate bilge water management and measures to comply with MARPOL and PCG MEPU protocols • Implementation of appropriate dredging and reclamation methodologies, use of silt curtains and other containment structures, conduct of spot sampling of fill materials for both offshore and inland fill sources to prevent contamination. 	No residual effect since there will be no intentional disposal / discharges at sea, bulk of reclamation fill will be sourced from Manila Bay
Marine Ecology	<ul style="list-style-type: none"> • Threat to the existence and/or loss of species of important local species and 	In the course of dredging and filling of the reclamation area, the company shall ensure that siltation will be contained within the	Nil to insignificant

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
	habitat • Threat to the abundance, frequency and distribution of species	reclamation area. Silt curtains and armor rocks shall be placed as an erosion measure. The developer and its contractors shall conduct quarterly monitoring activities (e.g. water testing, annual marine assessment or as necessary, etc) observe sound construction/reclamation procedures, conduct regular equipment and vessel maintenance to ensure compliance with the DENR regulations and the Supreme Court Mandamus on Manila Bay. The company / proponent shall coordinate with the DENR to support and initiate programs that are in line with the Manila Bay Rehabilitation programs.	
Reclamation / Land Development : Air			
Greenhouse gas emission	Degradation of Air quality – increased CO2 emission	GHG accounting and reporting will be undertaken. GHG emission reduction program/campaign will be undertaken to minimize or remove unnecessary CO2 emissions.	Nil
Air quality	Degradation of Air quality - Dispersion of dust particles, effects of emission from equipment	Delivery trucks of topping material should be covered with dust suppressing material. As applicable, controlled watering of roads and access to the project will be	Nil

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		<p>undertaken to dissipate dust dispersion.</p> <p>Quarterly ambient air quality monitoring for air pollutants (SOx and NOx).</p> <p>All vehicles and equipment including dredging vessels must be properly and regularly maintained and standard emission reduction devices should be maintained in all units</p> <p>Vegetation in the reclaimed area (parks/open spaces) must be initiated as the reclamation progresses.</p> <p><i>Compliance to with MARPOL guidelines and the PGCs Environmental protocols during transport of fill materials from San Nicolas Shoal</i></p>	
Noise level	Increased Noise levels	<p>Reclamation activities will well-planned, undertaken in stages in sectional areas to somehow limit noise in a smaller/manageable area.</p> <p>As much as possible and practical, vehicle and equipment traffic to and from the project area will be done during regular working hours. This includes activities that will cause excessive noise as pile driving.</p> <p>Machines and equipment will be operated at low speed and or power whenever</p>	Nil – temporary and short-term

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		<p>practical and switched off when not in use.</p> <p>Equipment and machines that are found to generate excessive noise compared to industry standards will be removed from site and replaced.</p> <p>All equipment and vehicles will be properly serviced, properly and regularly maintained and fitted with appropriate mufflers.</p> <p>Optimum traffic routes will be adopted to shorten time of exposure to noise.</p> <p>Noise level monitoring will be done as frequently practicable to be able to determine increased and excessive noise levels. In these instances, cause will be determined and remedial measures immediately applied. Applicability and/or changes in monitoring stations will be also be regularly evaluated.</p>	
Reclamation / Land Development : People			
Socio-economic	Displacement of settlers	The local government will be directly responsible for the removal of illegal settlers should there be any. The census of the area relative to the existence of such is currently being determined / validated.	Not relevant – there will be no households that will be displaced
	In-migration	It is recommended that a validation of the census on households in the vicinity of the of the project site (communities within the periphery). This will be done and	Nil to Insignificant

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		<p>spearheaded by the LGU.</p> <p>Coordination with the Barangay LGU Tanods to ensure authorized establishments and control of unauthorized entry of outsiders.</p>	
Socio-economic	Cultural/Lifestyle change (especially indigenous people if any)	<p>Generation of employment as service providers such as putting-up food stalls, variety stores and other services.</p> <p>Skills training to upgrade local skills of residents that can be hired.</p>	Nil
	Physical cultural resources	The company will put up a Community Relations Unit that will facilitate the community extension program of the company to the community. This office will be responsible in seeing that no major detrimental alterations in any cultural values and practices will occur in the area.	Nil
	Resource competition - Delivery of basic services	Delivery of these services will be regularly coordinated with these agencies to ensure orderly implementation of project development details. Delivery of basic services will also be monitored and in coordination with concerned agencies. As necessary, partnership with health institutions, the barangay and related agencies will be forged.	Nil
	Threat to public health and safety	<p>The proponent will establish an in-house security group to secure the area.</p> <p>Proper security protocols will be</p>	Nil to minimal

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		<p>established to ensure safety and security of the project area/estate and its support facilities.</p> <p>Coordination/Partnership with the LGU's, Barangay Security units, the local PNP and the PCG Office will be established to strengthen security nets within the area and corresponding security and safety protocols will be established.</p> <p>Coordination/Partnership with the city and barangay Health units, other health institutions, the CDRR units will also be established to address Emergency response procedures.</p> <p>Standard Safety protocols will be implemented on site as required by the DOLE. A Safety Officer will be engaged to oversee compliance and implementation of such policies. Similarly, medical personnel, an on-site clinic, or similar measure will be adopted to make sure that immediate medical emergencies are addressed.</p>	
Socio-economic	Generation of Local Benefits from the project	<p>Prioritization will be given to qualified local manpower from the host barangays, neighboring barangays, the municipality and neighboring towns.</p> <p>Through the proponents SDP and Corporate Social Responsibility Programs,</p>	Positive effects in terms of employment, livelihood

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		<p>alternative programs will be implemented in line with the Barangay's Social Development Program in accordance with the Barangays' IRA.</p> <p><i>Social Development Programs on enhancement of livelihood for fisherfolks in the community (if there are any) will also be considered.</i></p> <p>The LGU of Manila will directly benefit from the project, being a Partner in the project's development. It will earn from the shares from the sale and operation of the estate. Similarly, there will be additional earning from tax revenues from locators and other developers that will eventually be established in the estate development.</p>	
Socio-economic	Traffic congestion	<p>A Traffic Management Scheme will be established and implemented on site all times. These will be implemented in coordination with the Manila Traffic Bureau, the MMDA the local PNP and the Barangay Traffic/Safety Units.</p> <p>As deemed necessary, coordination with the city engineering office and/or the local DPWH office will be made in cases of road infrastructure development on access roads to the project site.</p> <ul style="list-style-type: none"> • Provide adequately designed ingress and egress for vehicles at 	No residual effects – appropriate traffic management plan will be implemented

Environmental Aspect / EIA Module	Potential Impact	Proposed Management and Monitoring Plan	Residual Effects
		<p>project site.</p> <ul style="list-style-type: none"> • Provision of parking area. • Assign guards to direct traffic. • Proper scheduling of material transport (deliveries) and movement of equipment and vehicles, in and out of the project area, to prevent traffic congestion particularly during rush or heavy traffic hours. • Coordinate with the Barangay Traffic and Security Unit for traffic management outside or within the immediate vicinity of the project area requirement/assistance as necessary. 	