1.0 Project Description

Brief Background of the Proposed Project

This shall be a 286.86 hectares Reclamation Project to be located in the City of Paranaque.

Institutional Arrangement and Mandates

A. The Philippine Reclamation Authority (PRA)

Based on Presidential Decree (PD) No. 3-A, all reclamation of foreshore, submerged and offshore areas shall be limited to the National Government or any person authorized by it under a proposed contract.

By virtue of Presidential Decree No. 1084 dated February 4, 1977, the Public Estates Authority (PEA), now called the Philippine Reclamation Authority was created

> ….‖ to provide for a coordinated, economical and efficient reclamation of lands, and the administration and operation of lands belonging to, managed and/or operated by the Government, with the object of maximizing their utilization and hastening their development consistent with the public interest…‖
>
> and to operationalize the following purposes, among others:
>
> a. To reclaim land, including foreshore and submerge areas, by dredging, filling or other means, to acquire reclaimed land;
> b. To develop, improve, acquire, administer, deal in, sub-divide, dispose, lease and sell any and all kinds of lands, buildings, estates, and other forms of real property, owned, managed, controlled and/or operated by the Government; and
> c. To provide for, operate or administer such services as may be necessary for the efficient, economical and beneficial utilization of the above properties.

Among the powers and functions of the PRA is ….To reclaim lands….

B. The City of Paranaque as Project Proponent

The City of Paranaque, represented by its **Honorable Mayor Edwin L. Olivarez,** entered into a Memorandum of Understanding (MOU) with the Philippine Reclamation Authority (PRA) cited above and shown in **Annex 1.**

Furthermore, the capacity of the Provincial Government of Cavite to reclaim is pursuant to Republic Act (RA) No. 7160 or the Local Government Code of 199. The Department of Interior and Local Government, under Memorandum Circular No. 120, s.2016, confirmed the authority of local government units to enter into Public-Private Partnerships and Joint Ventures for reclamation projects pursued consistent with the mandate and charter of the PRA.

C. The Role and Mandate of NEDA

Approval of Reclamation Projects. While Executive Order (EO) No. 146, the governing law pertaining to the approval of all reclamation activities, delegates the power of the President to approve all reclamation projects to the NEDA Board, PRA is still tasked to process, evaluate and recommend the approval of all reclamation projects to the NEDA Board. In this regard, inputs from PRA should be sought to review the merits of the project.

The NEDA Formulation of the Manila Bay Sustainable Development Master Plan (MBSDMP). NEDA has initiated the engagement of consultants for the formulation of the MBSDMP with grant assistance from the National Government of The Netherlands. The MBSDMP aims to provide a comprehensive and supporting institutional framework for the sustainable development of the entire

Manila Bay area. The MBSDMP will guide future decisions on programs/projects (e.g. coastal protection works, solid waste and water resources management, transport, reclamation activities) to be undertaken within the bay area. The formulation of the MBSDMP is expected to be completed by June 2020. As such, (per recent public consultation organized by the NEDA), it is apparent that this particular project will not be included in the policies/regulations arising from the MBSDMP.

- **Location of the Project**

The project exact geographical boundaries for the 286.86 hectares is presented in Table 1.

Table 1 Geographical Coordinates

CPC ISLAND 1 (AREA=286.86 Has.)				
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**
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 1 – Site Plan of the Proposed Paranaque Reclamation Project

A. Project Area, Location and Accessibility

Project Area

The proposed Reclamation project is to be located in the City of Paranaque covering a proposed total reclaimed area of 286.86 hectares.

Location

City of Parañaque, is one of the cities and municipalities that make up Metro Manila in the Philippines. It is bordered to the north by Pasay, to the northeast by Taguig, to the southeast by Muntinlupa, to the southwest by Las Piñas, and to the west by Manila Bay. Parañaque is composed of two congressional districts and two legislative districts which are further subdivided into 16 Barangays. legislative District 1 consists of eight *barangays* in the western half of the city, whilst legislative District 2 consists of eight barangays in the eastern part of the city. as presented in Table 2.

Table 2 – List of District Barangays in Paranaque

Barangays	District
Baclaran	1st
BF Homes	2nd
Don Bosco	2nd
Don Galo	1st
La Huerta	1st
Marcelo Green	2nd
Merville	2nd
Moonwalk	2nd
San Antonio	2nd
San Dionisio	1st
San Isidro	1st
San Martin de Porres	2nd
Sto. Nino	1st
Sun Valley	2nd
Tambo	1st
Vitalez	1st

Accessibility

Railway

Parañaque is served by the LRT-1 (via Baclaran Station which is located in Pasay City) and the PNR (via Bicutan station). The LRT-1 is to be extended to Bacoor. The construction will start in October 2018 once the Right-of-way issues are substantially addressed. The groundbreaking of LRT Line 1 South Extension Project was held on Thursday, May 4, 2017. The LRT Line 1 South Extension Project will be done in phases. Once the phase 1 is completed, Parañaque will be served by the LRT-1 (via Redemptorist Station, Manila International Airport Station, Asia World Station, Ninoy Aquino Station and Dr. A. Santos Station). The extension from Baclaran to Dr. A. Santos Avenue is expected to be operational by third quarter of 2021.

Airport

Parañaque is the location of Terminal 1 of Ninoy Aquino International Airport, as the airport complex sits on the Pasay-Parañaque border. It is located along Ninoy Aquino Avenue and many major international airlines operate flights from the terminal.

Road network

Parañaque is served by a network of expressways and arterial roads.

Expressways, like Manila-Cavite Expressway, and Metro Manila Skyway connects the city with the rest of Metro Manila and Calabarzon. The at-grade portion of Metro Manila Skyway in Parañaque has two service roads, namely the West Service Road and East Service Road, which both serves the communities and businesses lying near the expressway. The NAIA Expressway is the airport expressway that connects NAIA Terminal 1, Manila-Cavite Expressway, Metro Manila Skyway and also the Entertainment City under development on the reclaimed area.

Dr. Santos Avenue (formerly Sucat Road), Roxas Boulevard, Doña Soledad Avenue and Elpidio Quirino Avenue functions as the city's principal arterial roads. Carlos P. Garcia Avenue (C-5 South Extension), which has been involved in land ownership controversies involving then Senator Manny Villar, and C-6 Road, which is proposed to be an expressway, serves as secondary arterial roads.

BF Homes Parañaque is served also by a network of arterial roads, serving residential and commercial areas within it

The Access Ways

Preliminary design works are underway for the link from shore to the reclaimed land. In any case, the initial plan is for access ways to be linked to the Manila-Cavite Road.

2.0 Reclamation Method

The various reclamation methods refer to the types of equipment to be used. The determining factors in the choice of the methodology are:

- 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. Another method which is -rainbowing‖ illustrated at the right plate could result in significant silt dispersal.
- 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

Dredging Equipment

This shall be dependent on the selection of dredging contractor. Options for equipment are:

A. Trailing Suction Hopper Dredger (TSHD)

There are two types of Trailing Suction Hopper Dredger; a) Trailing type that utilizes dredging pump inside the ship, slowly sails and dredges the soil and b) Moored type that fixes the Anker, adjusts the Anker rope and dredges. Sans special conditions or situations, trailing type is more widely used. Trailing type is the type that sucks the dredged soil through the Drag Head on the fleet of suction pipe.

After loading the dredged soil to the Hopper and arriving at the reclamation site, the gate bar opens and the soil is loaded or conveyed by a pipe. This dredger type is less affected by weather and unfavourable sea condition and widely used in deep sea soil sourcing. It can hold the Hopper itself, can be separately transported, and is very advantageous for long distance destination.

However, it has a disadvantage in which it will transport more water when it dredges some soil such as clay, and other similar types of soil. Trailing suction hopper dredger has a big dredging capacity (more than 100,000~150,000 cu.m./day) and long conveying distance (more than 20 km), yet, it is not well applied for the area with low water level like the condition of the project area.

B. Cutter Suction Dredger

One type of dredging equipment contains a ladder with a cutter, called as Cutter Suction Dredger. The dredging system is executed by lowering the ladder into the dredging area, and as the ladder hit the target dredging area, the cutter attached to the bottom of the ladder is activated and operated.

The soil or sand dredged by the equipment and the water are then extracted simultaneously by the pump and transported and delivered to the identified area using an extension pipe as conveyor. Generally, cutter suction dredger with engine capacity 12,000 HP is widely used, though project requiring higher engine capacity can secure of up to 20,000 HP.

Capacity of cutter suction dredger differs based on the soil condition. A 12,000 HP Dredger can dredge 1,200~1,300 cubic meter per hour with maximum conveying distance of 5.0 kilometers (soft soil characteristic). It has a capacity 5 times bigger than Grab Dredger (bucket capacity 16 cu.m).

Due to the high pressure at the discharge side, it is impossible for cutter suction dredger to directly load the soil into the barge such that it directly conveys the soil to the reclaimed land by a conveyor pipe. Generally, 20,000HP pump dredger and pipes are used to convey dredged soil to the reclamation site for up to a distance of about 5-10 kilometers. In some cases, one 20,000 HP pump dredger in series with one 12,000 HP pump dredger is used for reclaiming sites or land with a distance of more than 10 km.

C. Barge Loading Dredger

Barge loading dredger is one of the alternative methods when there are some difficulties in conveying the dredged soil using a pipe, when the conveying distance is more than 15 km and when the higher dredging capacity is necessary. In dredging sandy material, the use of this dredger type is more economical, causes less pollution. Dredging capacity can be increased by increasing the capacity of the pump. However, efficiency of barge loading significantly decreases when the dredged soil mainly composed of mud. Severe pollution will occur due to overflow, and some adverse impacts occur due to the dispersion of sediments.

The dredging method using a pump without cutter usually discharges high pressure water to disturb soil and sand and then sucks them. Knife be may applied in case of solid or hard ground and when excavation difficulties are encountered. Collecting capacity of barge loading cutter dredger varies according to the installed pump capacity. Dredging barges are moored on the both sides of mining boat and then dredged soil is discharged through the discharge pipe of the pump into the barges.

Depending on the soil conditions, an appropriate knife shall be attached in order to improve the excavation capacity. On the other hand, cutter-less suction dredger is usually used for sourcing underwater sand or dredging along soft mud zone. It sucks the soil and conveys the soil for short and medium distance. Using a high pressure pump instead of cutter knife, it disturbs the sand and earth spewed from inlet port in the end of the ladder and sucks it up. This type is suitable for sandy soil.

D. Grab Dredger

Grab dredger operates by loading the crane equipped with grab into moored dredging barges. Grab bucket capacity is expressed as a specification of grab dredger. Grab dredger is suitable for small places, small scale dredging, deep places, and primary excavation. Conveying process during dredging is usually done by a dredging barge and the dredging barge is towed to the area by a tugboat. Comparing with the other dredger, disturbance on earth and sand is less, moisture content is low, and water drawn by the vessel is less so that this dredger may be used for dredging in shallow area.

Grab dredger (with a dredging capacity of 200 cu.m. / hr and bucket capacity of 12.5 cu.m.) has a lower dredging capacity when compared to that of a pump dredger with capacity of 6 cu.m. and 25 cu.m./hr. Moreover, in very loose soil, percentage lost of dredged soil in grab bucket is so high that it becomes less efficient (dredging capacity is lower than 1/3 when compared to that of pump dredgers). It is also very uneconomical to operate as compared to pump dredgers.

Dredging-Conveying Reclamation Method

A. Direct Reclamation using Pump Dredgers

For common dredging work with 20,000HP and conveying distance of 10 km, this method is the most economical. Moreover, use of conveying pipe causes less dispersion of sediment such that this method is environmentally more manageable when compared to other dredging methods.

B. Reclamation using Pump Dredger + Relay Pump

Generally, 20,000HP pump is used to convey the soil up to 10 km and when connected by 12,000HP pump, the distance between dredging area and reclamation land can be farther at about 15 km. The use of the equipment combination (direct connection of the pumps) is environmentally friendly though difficulties in maintenance would be unavoidable.

C. Reclamation using Barge Loading Dredger and Dredging Barge

This reclamation method is suitable for long conveying distance, difficulty and almost impossible to use conveying pipe, and when large dredging output is required. It is also very useful to convey sandy soil for a distance of more than 15 km. Its dredging capacity can be adjusted according to the pump capacity and type of dredging barge, which is dependent on the conditions of the course or route (depth of water, master, site of abandonment). On the other hand, disposal method is determined by direct disposal (drop bottom, mid-ship detached), belt conveyor, combination of unloading pumps, and other factors. When the water depth of the dredging barge route is secured and the access course is not constrained, direct disposal by dredging barge is preferable. Moreover, belt conveyors and unloading pumps can be used if there are difficulties to do direct disposal.

Reclamation by Trailing Hopper Dredger

Trailing Hopper Dredger is well applied when the distance between dredging area and reclamation area is more than 20 km and when dredging scale is big. Its big size makes it less affected by weather and sea conditions. However, it cannot be used in shallow area.

Options for Soil Stabilization Method

The acceptable method and their comparative evaluation are as follows:

A. 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 entrapped water within the voids of the saturated underground soft soil, thereby inducing settlement at an accelerated rate.

Preliminary estimations on approximately 5-meter high embankment indicated approximately 5 years to attain full consolidation. This is too long a period to wait for the utilization and disposal of buildable areas not taking into account the length of construction time required for the development of the site in terms of provision of roads, utilities, etc.

B. 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 much faster rate than if surcharge method alone is used without providing vertical drainage pathways. The subject area can therefore be made usable at a much earlier date.

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 gooconstruction 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.

C. 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.

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.

D. Well Point Plus Sand Drain Piles

This is the use of well point equipment to dewater the soil down to the desired depth. 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.

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.

E. 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.

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.

F. Vertical Drains Plus Surcharge

This method functions in exactly the same way 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.

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.

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.

It is therefore recommended to **use wick drains and surcharge** to improve the natural soft soil and use dynamic compaction to improve the reclaimed sand layer.

Fill materials (Sand)

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.

Power and Water Supply

- **Power**- During the dredging/reclamation works, electrical power that will be required by sea craft and auxiliary equipment (e.g. pumps) will be sourced on-board these sea vessels.

  During soil consolidation, which may take approximately 1 to 2 years, the minimal power requirements of the maintenance crew and for lighting on the reclaimed land will be sourced through MERALCO.

- **Water-** Water supply by the vessel/barge crews will also be on board. No underground water extraction. Internal sourcing by individual or thru private water concessionaire.