PROJECT DESCRIPTION REPORT (PDR) FOR SCOPING

1.0 BASIC PROJECT INFORMATION

Table PD-1. Project Fact Sheet/PD Summary

ITEM	Project Information
Name of Project	**PROPOSED 1500 HECTARE CORDOVA RECLAMATION PROJECT**
Location	Along the Coast of Cordova Bay in the territorial jurisdiction of Municipality of Cordova, Cebu
Nature of Project	ECP in an ECA (Presidential Proclamation 2146 dated 14 December 1981)
Project Classification & Type	Major Reclamation Project ≥ 50 hectares
Project Classification Code	D.1.
Size/Scale	**1500 Hectares (More or less)**
Status of ECC	Being Applied For

Table PD-2. Project Proponent/EIA Preparer

ITEM	Project Information
Project Proponent	**Municipality of Cordova**
Proponent Address	Municipal Hall of Cordova, Cebu
Telephone Number	**Office of the City Mayor : 032-236-8702 / 032-238-8602**
Responsible Officer	**THE HONORABLE MAYOR MARY THERESE SITOY-CHO OR HER DESIGNATE**
EIA Preparer	**TECHNOTRIX CONSULTANCY SERVICES, INC. (TCSI)**
Contact Person	**Edgardo G. Alabastro, Ph.D.**
Address	Unit 305 FMSG Building, Balete Dr. QC 1101
Contact Numbers	(632) 416.4625; 0917.8255203
Email address	technotrixinc@gmail.com

2.0 SCOPE OF THE PROJECT

The **Environmental Compliance Certificate (ECC)** application involves the Proposed 1500-hectare (more or less) reclamation project along the coast of Cordova Bay in the territorial jurisdiction of Municipality of Cordova, Cebu. The ECC application covers only the horizontal development or the reclaiming of land.

The vertical developments, which will be implemented after the full stabilization of the reclaimed land will basically cater to mixed use development. These developments – *referred to as the Operations Phase* - will be governed by the applicable aspects of the Philippine EIS System (PEISS).

2.1. Project Area, Location and Accessibility

- Location and Political Boundaries

The proposed reclamation project will occupy an area of **1500 hectares (more or less)** along the coast of Cordova Bay in the territorial jurisdiction of the Municipality of Cordova, Province of Cebu. The site is approximately situated at a distance of 1 kilometer from the nearest corner of the reclamation layout to the nearest southwestern shoreline of Mactan Island.

Provided in **Figure PD-1** is the Google earth satellite map of the proposed project site. The identified impact barangays for the proposed project are **Barangays Alegria, Bangbang, Buagsong, Catarman, Cogon, Dapitan, Day-as, Ibabao, Gabi, Gilutongan, Pilipog, Poblacion and San Miguel.**

The coordinates of the site are shown in **Table PD-3.**

- *Geographic Coordinates of the proposed project*

Table PD-3. Geographical Coordinates

Land Form (07102018) UTM Coordinates

Point	*Northing (m)*	*Easting (m)*
ISLAND A		
1	1135505.8987	600467.5732
2	1135647.8326	600326.8534
3	1135770.9875	600169.4363
4	1135876.6933	599999.6922
5	1135978.7277	599827.6797
6	1136078.2985	599654.2295
7	1136175.3854	599479.3769
8	1136269.9687	599303.1573
9	1136362.0291	599125.6067
10	1136451.5478	598946.7612
11	1136538.5067	598766.6572
12	1136609.4916	598580.9018
13	1136599.2193	598482.3827
14	1136551.0088	598395.1831
15	1136381.4369	598293.3886
16	1136195.0417	598220.9636
17	1136004.7217	598159.5892
18	1135811.1313	598109.4763
19	1135614.9363	598070.7974
20	1135416.8114	598043.6854
21	1135179.7059	598026.6296
22	1135187.0078	598188.6280
23	1135173.1861	598388.0169
24	1135134.3850	598584.0818
25	1135072.1722	598774.0613
26	1135024.0935	598967.9474
27	1135009.5749	599167.1774
28	1135029.0366	599365.9855
29	1135081.9154	599558.6178
30	1135166.6809	599739.4996
31	1135278.3344	599905.2998
32	1135378.5930	600078.1741
33	1135454.2673	600263.1354
ISLAND B		
1	1134655.6044	600883.1627
2	1134783.2385	600850.9499
3	1134972.4199	600786.3141

Land Form (07102018) UTM Coordinates

Point	Northing (m)	Easting (m)
4	1135154.2946	600703.3141
5	1135349.5197	600587.9619
6	1135318.0690	600417.7771
7	1135263.1099	600225.5679
8	1135183.4765	600042.4825
9	1135082.3841	599869.9732
10	1134967.5811	599706.2964
11	1134872.3325	599531.0002
12	1134822.3614	599337.8579
13	1134820.6417	599138.3634
14	1134862.8123	598943.0720
15	1134918.2522	598750.9265
16	1134970.1152	598557.9574
17	1134989.0131	598359.1041
18	1134973.3017	598159.9737
19	1134942.6535	598026.1126
20	1134680.7876	598044.7596
21	1134482.7426	598072.4497
22	1134286.6614	598111.7012
23	1134093.2181	598162.3789
24	1133903.0780	598224.3086
25	1133716.8951	598297.2774
26	1133535.3095	598381.0342
27	1133358.9457	598475.2911
28	1133185.1557	598574.0023
29	1132980.3346	598652.1886
30	1132991.5645	598832.2499
31	1133027.5442	599028.8550
32	1133087.7163	599219.4526
33	1133173.0517	599400.0251
34	1133305.5284	599548.6327
35	1133479.1913	599645.9749
36	1133675.0922	599681.4308
37	1133871.7442	599714.3476
38	1134053.0356	599797.4386
39	1134206.5446	599924.7402
40	1134320.3455	600084.8746
41	1134401.7376	600267.4082
42	1134461.4899	600458.2153
43	1134531.6738	600645.4002
ISLAND C		

Land Form (07102018) UTM Coordinates

Point	Northing (m)	Easting (m)
1	1133401.4806	601729.2469
2	1133624.5392	601785.1170
3	1133823.2972	601781.9273
4	1134006.5088	601704.8012
5	1134147.7074	601564.8802
6	1134249.0970	601392.5202
7	1134349.5336	601219.5680
8	1134462.3880	601026.0658
9	1134402.0184	600860.7566
10	1134338.8023	600671.0182
11	1134281.3746	600479.4484
12	1134143.8147	600106.7723
13	1134143.8147	600106.7723
14	1134002.3388	599966.7930
15	1133822.0361	599882.5283
16	1133623.8986	599863.7890
17	1133425.0195	599877.1573
18	1133235.0166	599819.0072
19	1133082.0232	599692.2176
20	1132989.6035	599516.3166
21	1132941.1400	599322.2890
22	1132887.8396	599129.5295
23	1132828.9327	598938.4087
24	1132745.7165	598697.2037
25	1132601.0951	598703.4213
26	1132402.0740	598685.7303
27	1132208.2716	598637.3066
28	1132013.9583	598590.5636
29	1131815.1981	598569.6593
30	1131615.4118	598574.9534
31	1131418.0377	598606.3549
32	1131226.4726	598663.3232
33	1131099.2172	598717.1344
34	1131160.8269	598971.5133
35	1131219.8776	599162.5718
36	1131289.1212	599350.1769
37	1131368.3572	599533.7852
38	1131457.3560	599712.8649
39	1131559.5318	599884.6150
40	1131688.9386	600036.7590
41	1131843.3000	600163.5127

Land Form (07102018) UTM Coordinates

Point	Northing (m)	Easting (m)
42	1132017.7119	600260.8494
43	1132204.6578	600331.6759
44	1132385.0584	600417.7924
45	1132555.0207	600523.0218
46	1132712.5275	600646.1153
47	1132855.7095	600785.6121
48	1132982.8673	600939.8564
49	1133092.4918	601107.0177
50	1133171.5649	601258.2494
51	1133239.1845	601396.7726
52	1133326.9187	601576.5021
ISLAND D		
1	1131124.4063	602140.6141
2	1131254.3110	602150.6324
3	1131427.2607	602054.4691
4	1131596.0218	601947.2618
5	1131773.6239	601855.4401
6	1131958.6679	601779.7272
7	1132149.6963	601720.7194
8	1132345.2041	601678.8817
9	1132543.6516	601654.5435
10	1132743.4754	601647.8965
11	1132943.0080	601652.6424
12	1133048.6273	601503.8376
13	1132988.6903	601313.3249
14	1132900.7765	601133.9047
15	1132787.4422	600969.3353
16	1132651.1832	600823.1805
17	1132494.9501	600698.6054
18	1132322.1262	600598.3077
19	1132136.4540	600524.4593
20	1131941.9543	600478.6595
21	1131746.6272	600438.0477
22	1131572.2107	600341.8933
23	1131436.4115	600196.2039
24	1131352.7354	600015.4689
25	1131302.9186	599821.8437
26	1131235.5771	599633.5982
27	1131151.0642	599452.4110
28	1131050.1086	599279.8445
29	1130857.3043	599026.1450

Land Form (07102018) UTM Coordinates

Point	Northing (m)	Easting (m)
30	1130834.8278	599046.0148
31	1130992.3647	599247.4750
32	1130838.8245	599412.1192
33	1130693.0307	599325.2975
34	1130535.0208	599231.1743
35	1130671.8982	599064.2190
36	1130789.5079	598952.9878
37	1130768.4123	598931.5446
38	1130619.6672	599076.6517
39	1130496.5154	599234.0564
40	1130395.0237	599406.2251
41	1130316.9382	599590.1959
42	1130263.6022	599782.8040
43	1130242.7451	599981.2269
44	1130271.4310	600178.6343
45	1130348.0127	600362.8293
46	1130453.8190	600532.4766
47	1130550.9877	600707.2622
48	1130639.3605	600886.6557
49	1130718.7196	601070.2147
50	1130788.8694	601257.4867
51	1130849.6369	601448.0099
52	1130900.8722	601641.3146
53	1130942.4491	601836.9243
54	1130960.9856	601944.2102
55	1130982.8576	602013.8890
56	1131041.6080	602092.6253

The coordinates are vital for (a) identifying the Scope of the ECC that is being applied for, (b) providing the footprints from which environmental assessments and evaluations may be made, e.g. water circulation, bathymetry; geotechnical investigation and marine surveys and for (c) ascertaining that the site is indeed within the political boundaries of the Municipality.

Figure PD-3 and PD-4 shows the Proposed Project in Google Earth and NAMRIA Map.

Figure PD-1. Google Earth Map indicating the Proposed Project

Figure PD-2. Proposed Project on a NAMRIA Map

Accessibility

There will be individual bridges to each of the four (islands) taking off on shore from either the existing roads or from the proposed Cebu Cordova Link Expressway (CCLEX) Project, shown in **Figure PD-3.**

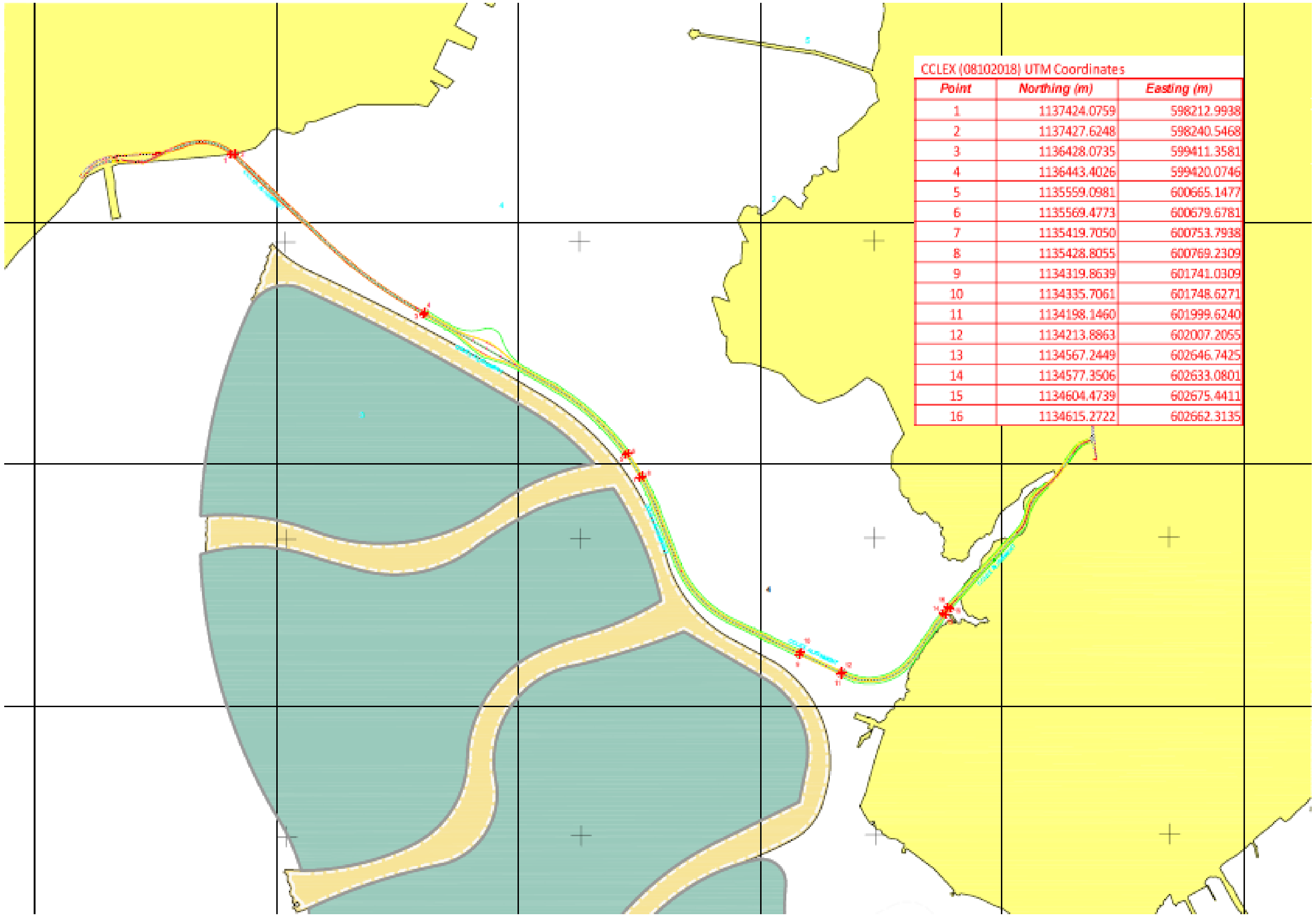
Figure PD-3. Access Ways to the Reclamation Islands

Vicinity Map and Adjacent Landmarks

Important landmarks are Lantaw Floating Native Restaurant, 10,000 Roses, Coral Reef Village and Cordova Municipal Hall. This is provided in **Figure PD-4;** the adjacent proposed Cebu-Cordova Link Expressway (**CCLEX)** Project is shown in **Figure PD-5.**

Figure PD-3a Access Ways to the Reclamation Islands (Interisland Transit Loop and Connections)

Figure PD-4 Vicinity Map Showing Adjacent Landmarks



CCLEX (08102018) UTM Coordinates

Point	Northing (m)	Easting (m)
1	1137424.0759	598212.9938
2	1137427.6248	598240.5468
3	1136428.0735	599411.3581
4	1136443.4026	599420.0746
5	1135559.0981	600665.1477
6	1135569.4773	600679.6781
7	1135419.7050	600753.7938
8	1135428.8055	600769.2309
9	1134319.8639	601741.0309
10	1134335.7061	601748.6271
11	1134198.1460	601999.6240
12	1134213.8863	602007.2055
13	1134567.2449	602646.7425
14	1134577.3506	602633.0801
15	1134604.4739	602675.4411
16	1134615.2722	602662.3135

Figure PD-5. Map Showing the Proposed CCLEX Alignment Relative to the Project Site

2.3 Project Rationale

Based on Cordova's Comprehensive Land Use Plan, the town's limited land area of only 956 hectares is one development constraint. The lack of available space for the various projects of both public and private sectors hampers the town's growth and development. This dilemma also contributes to substandard road network, lack of sidewalks or pedestrian walkways, and traffic congestion.

The aptly stated vision of the municipality is: *"Cordova - a competitive and sustainable **ECO-TOURISM GATEWAY IN THE VISAYAS**, industrially and commercially attuned through a pro-active and responsive governance constituted by an empowered, culturally-rich, and God-centered citizenry."* Its mission, on the other hand, is: "Paving the way to a world-class eco-tourism hub through economically-viable and socially-acceptable investments and pursuits."

Cordova's development has to be managed in order to maximize the best possible use of its land resource. Hence, part of Cordova's CLUP is the Proposed Cordova Reclamation Project. It is a proposed reclamation development project, which is about 1,500 hectares in the offshore, fronting barangays Day-as and Buagsong. Planned development includes office districts, residential developments, leisure and entertainment, resort hotel, civic / institutional projects such as schools/universities, hospitals, sports complex and projects geared to promote culture and arts. There will also be malls and shopping centers and port facility for both local and international cruise ships. When realized, this will give Cordova not just a lift in terms of land area but of major economic growth as well.

2.4 Project Components

The initial project developmental concept is shown in **Figure PD-6**.

The major components of the project are:

- Four (4) Islands
- Three (3) Channels between Islands
- Mangrove Reserve Areas
- Access Ways
- Bridge Connections between Islands

The above components are shown in the figure. The other components are:

- Internal road network
- Storm Drainage Plan
- Storm surge protection
- Internal Island Transit Loop. This is shown separately in **Figure PD-3** above.

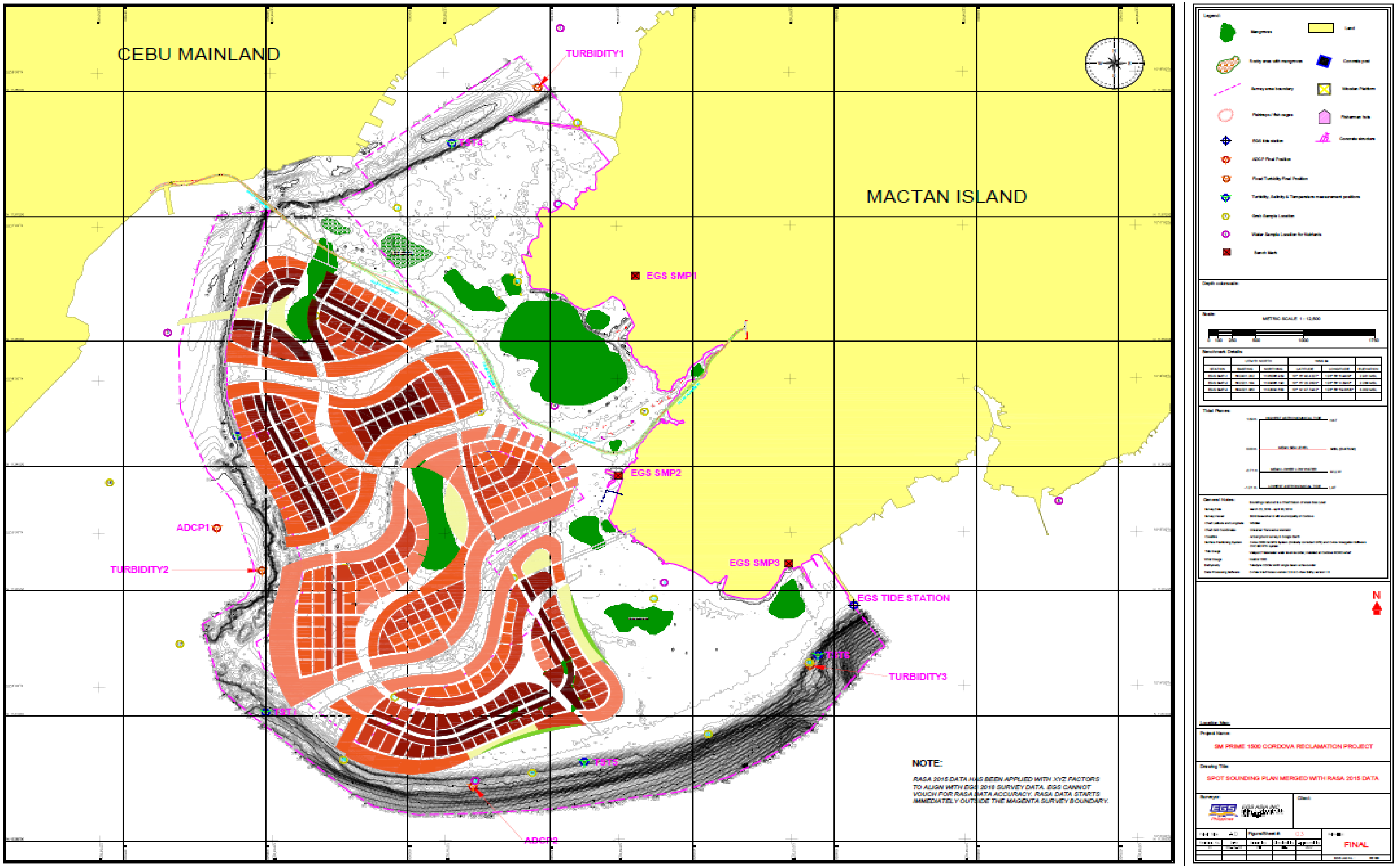


Figure PD-6. Preliminary Land Use Development Plan

2.5 Project Alternatives

The alternatives evaluated refer to:

1. The Landform

The landform was arrived at after in depth master planning studies and considered the following key parameters:

- The multiple number (4) of islands allows phased reclamation works
- Water circulation and flushing which are provided by the three (3) channels
- Proximity to existing and proposed road networks for accessibility to the islands
- Minimal impact through effective management of existing marine resources
- Existing fishing grounds, mangrove areas and identified marine protected areas should be left untouched.

2. The Site Selection

Cordova was chosen as the site of the proposed project for the following reasons:

- Proximity to Cebu City
- Shallow offshore and foreshore areas of Cordova making it ideal to reclaim
- Invitation of Cordova LGU to SMPHI to serve as its joint venture partner in creating an alternative Metropolitan Cebu
- District which will spur the growth and development of the Municipality of Cordova

3. Reclamation Technology and Methodology

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. The design of the containment structure(s) will be largely dictated by geotechnical considerations.
- The source and properties of the filling materials.
- The volume and properties of the sea bed silts 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).

For illustrative purposes, the “process” involved is shown in **Figure PD-7.**

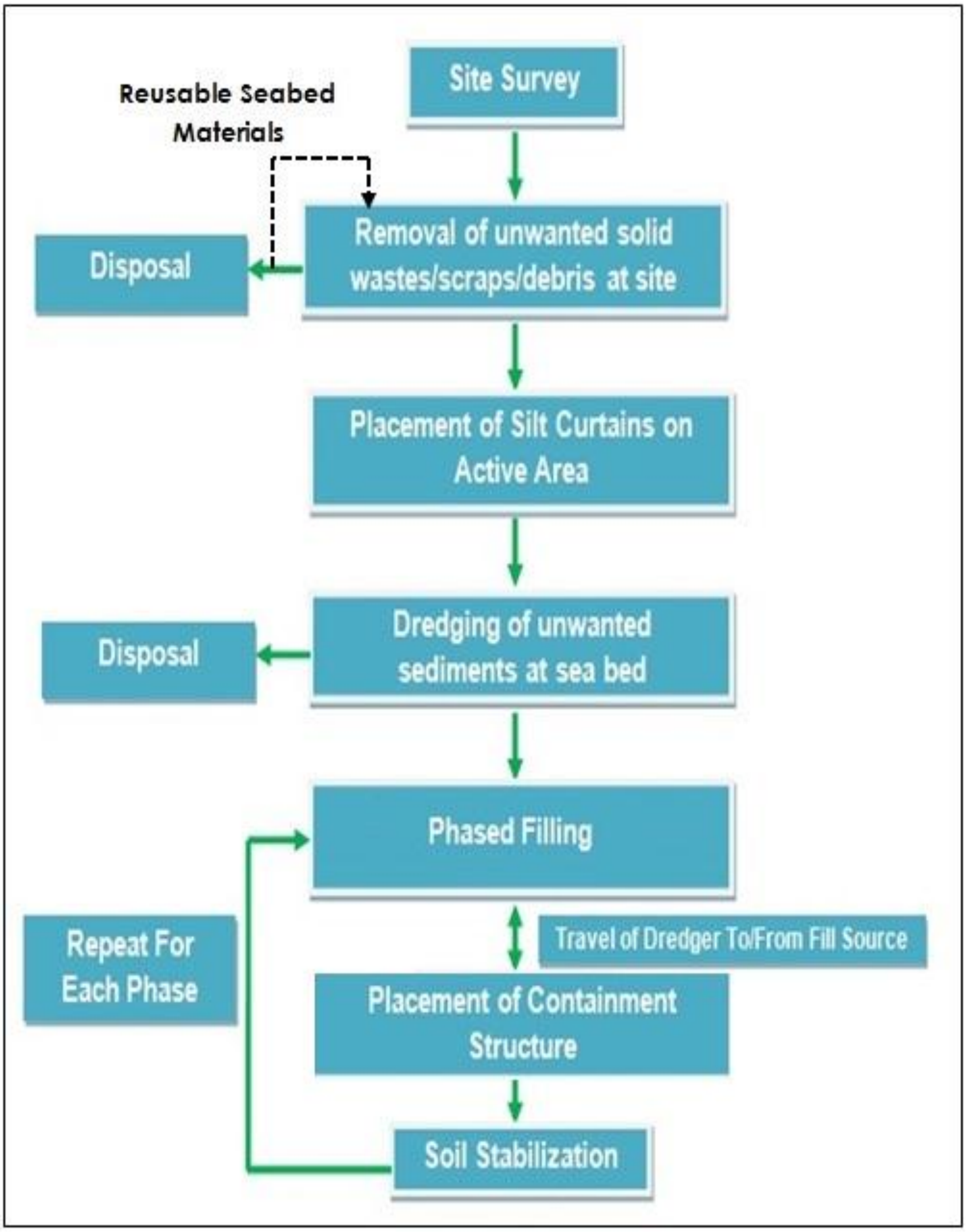


Figure PD-7. The Reclamation “Process” Diagram

The Containment Structure

This is a vital component of reclamation due to its primary function of providing soundness and stability of the finished land and of the structures to be therein constructed.

Shown in **Figure PD-8** are images of the typical types of containment structures. Revetment consists of placement of concrete/asphalt and interlocking blocks in the fills which are normally sloped.

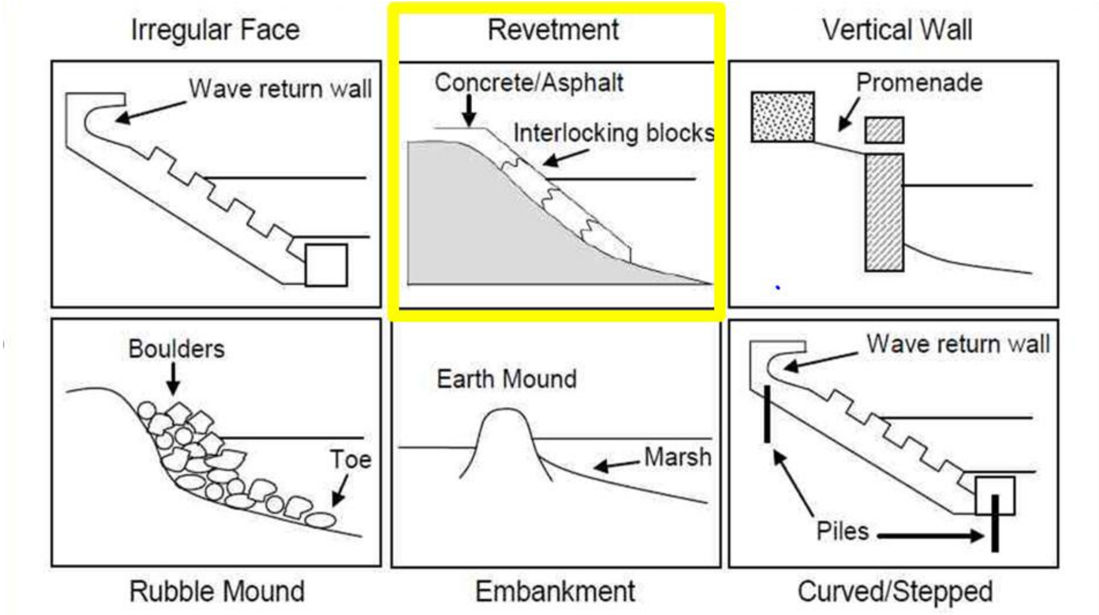


Figure PD-8. Images of Typical Containment Structures

4. Alternative Sources

- **Raw Materials**

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

- Fill materials from the Maasin and Malapascua – Southern Leyte .
- Borrow areas, dredged material taken from the channel and peripheries of the project site shall be used as fill material

Preliminary estimates indicate that <u>75 million cu meters</u> of fills will be required.

- **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 from the local electric cooperative.

- **Water**

Water supply by the vessel/barge crews will also be on board. Mobile water tanks most likely to be used by contractors. No underground water extraction. Internal sourcing by individual contractors or water can be tapped from the local concessionaire. The reclamation works are "dry" in nature.

2.6 Process Technology (Methods of Reclamation and Dredging)

The major activities or aspects of the reclamation works illustrated in Figure PD-8 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 seabed. Depending on the reclamation technology, these will most likely be disposed outside of the reclamation site and in likely in an approved dump site onshore.

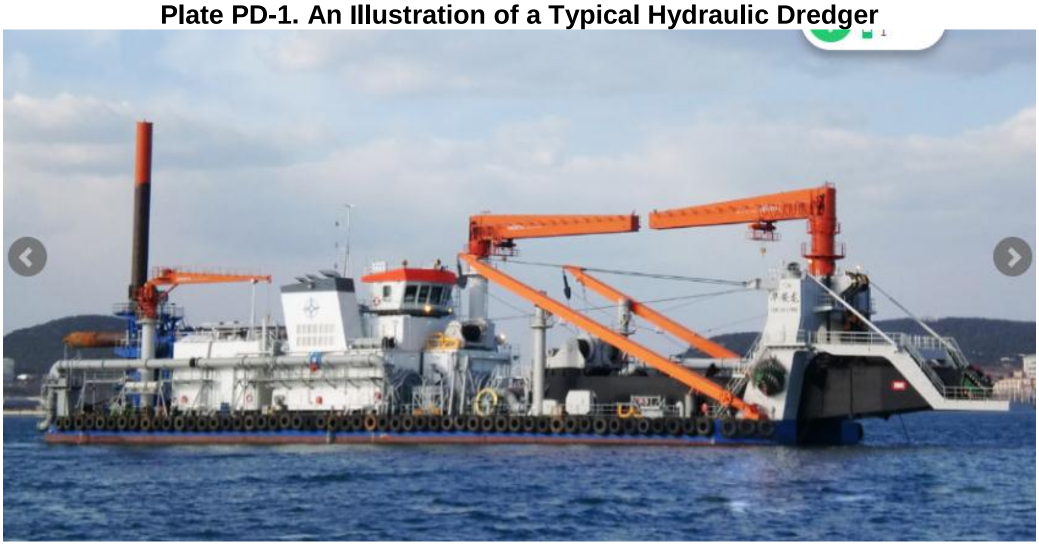
2. **Dredging at the Reclamation Site to remove unwanted sea bed materials and prepare the seabed for filling.**

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 as filling materials but may be usable if in combination with the imported fill materials. Sands may be fitted for reuse as reclamation fill. The reuse 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. The designation of this disposal site is subject to approval/permits from government entities i.e. the Philippine Coast Guard, the Municipality of Cordova and the DENR.

The dredging operation could be undertaken either hydraulically or mechanically and the former method may likely be adopted. Hydraulic dredging is the use of a floating dredge or pump by which water and soil, sediment, or seabed materials are pumped onboard, after which, 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 PD-1** or illustration purposes.

Plate PD-1. An Illustration of a Typical Hydraulic Dredger



3. Filling Operation

This may be considered as the start of the reclamation or the land formation process and will be undertaken in phases, i.e. only a portion of the entire 1,500-hectare area will be worked on at a given time.

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

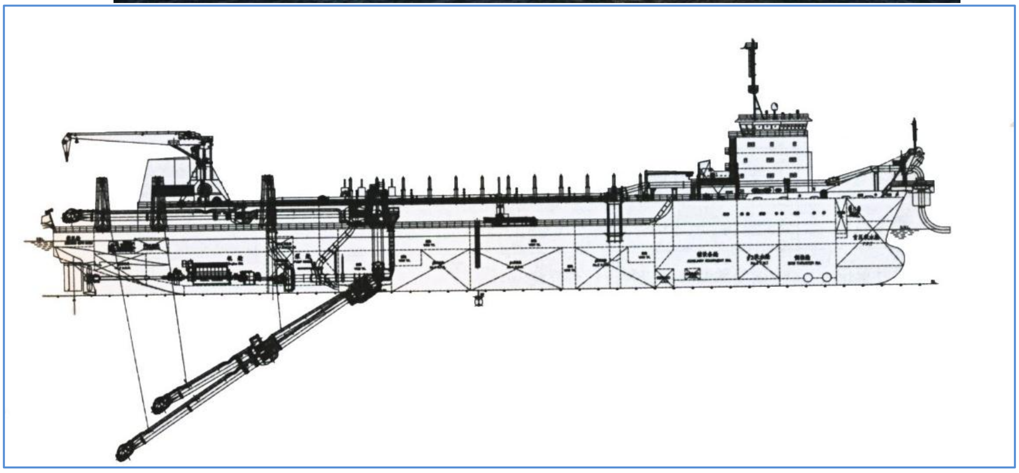
Plate PD-2. Illustration of Silt Curtain

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

Transport of Fill Materials from Source (Maasin and Malapascua – S. Leyte)

This will be undertaken using a Trailing Suction Hopper Dredger (TSHD-Illustrated in **Plate PD-3**) which will travel between the site and the source of the fill materials dredging and collecting the fill and discharging it at the project site. The 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.

Plate PD-3. A Typical TSHD



The deposition of the fill materials 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.

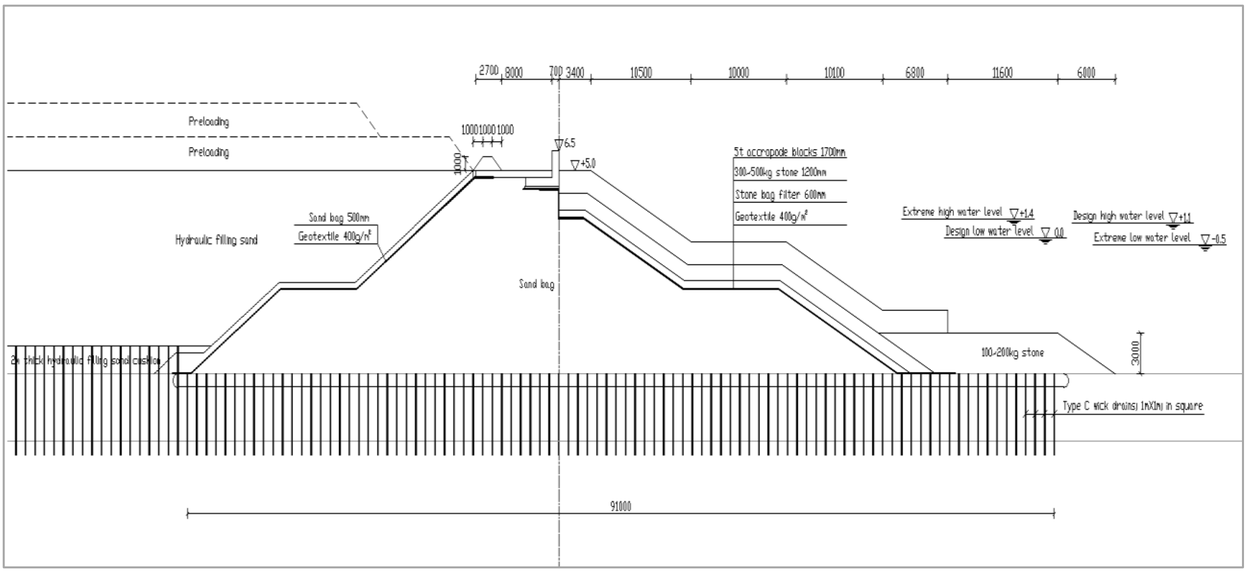
Dredging equipment can have these functions integrated or separated. The choice of the dredger for executing a dredging operation depends not only on the above mentioned functions but also from other conditions such as the accessibility to the site, weather and wave conditions, anchoring conditions,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

4. **Creation of Land**

Construction of Containment Structures

Installation of Support Structures

Considering the actual condition of this project and experience of similar projects, it is considered to use sand bag slope embankment as the containment structures and use wick drains and sand bag cushion to improve the condition/density of the soft soil under the embankment. Artificial concrete blocks will be used as the revetment and a retaining wall will be constructed on the embankment to combat the high wave. The typical cross section is shown as follows:



5. Soil Stabilization

The newly reclaimed area needs to be compacted and consolidated to a specified 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

The 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.

   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.

2.6 The Direct and Indirect Impact Areas

The guidelines provided by the Revised Procedural Manual relevant to this project are used for the delineation of the EIA Study Areas is based on the determination of the Direct Impact Area (DIA) and the Indirect Impact Area (IIA). These study areas are identified in the discussions of the specific modules, i.e. Land, Water, Air and People.

<u>THE PRE-EIS IMPACT AREAS FOR THE CONSTRUCTION PHASE UP THROUGH THE FORMATION OF LAND</u>

The guidelines provided by the Revised Procedural Manual for the DENR Administrative Order 2003-30 relevant to this project are used for the delineation of the DIA and IIA, to wit:

a. **Direct impact area (DIA)** is … the area where ALL project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken. For most projects, the DIA is equivalent to the total area applied for an ECC.

For the proposed project, the DIA are:

- The reclamation area itself wherein the construction activities will be undertaken. This area is currently the body of water covered by the planned landform.
- There are existing fish lift structures and fishing activities in certain portions of the site.
- Barangays Alegria, Bangbang, Buagsong, Catarman, Cogon, Dapitan, Day-as, Ibabao, Gabi, Gilutongan, Pilipog, Poblacion and San Miguel by virtue of their being fronting the site.
- The navigational path of the dredging vessel, which could unintentionally drift close or affect the existing fish lifts and fishing resources
- The creeks near proposed project and the discharge of outfall of the drainage.
- Nearest existing road where access ways will be built
- Areas where sea transport of filling materials takes place.
- Competition or otherwise enhancement of livelihood or businesses adjacent to site

Indirect Impact Area (IIA) …an IIA can be the stretch of the river/s OUTSIDE the project area but draining the project site which can potentially transport Total Suspended Solids and other discharges from the project towards downstream communities.

For the proposed project, the IIA are:

- Changes in circulation patterns particles that could affect its immediate vicinities
- Transport of particles that could affect the proposed project site and its immediate vicinities
- Individual perceptions about reclamation projects
- Competition with Small Establishments

Table PD-6. Impact Areas – Reclamation/Construction Phase

RATIONALE	MAJOR IMPACTS	SITES/IMPACT AREAS
DIRECT IMPACT AREA		
Land	Increase Solid Waste Generation due to Construction Works	• At and vicinity of site
	Protected Areas	• Central Cebu Protected Landscape • Tanion Strait (Protected Seacape) • Olango Island (Game Refuge and Bird Sanctuaries)
Water	Marine Ecology/Fishing activities	• At site and vicinities
	Change in water circulation	• Project site and vicinities
	Potential for silt dispersal	• Within and immediate vicinity of the project site
	Contamination from filling materials (Channels within site; Maasin, Malapscua S. Leyte)	• Reclamation site
	Water contamination, e.g. oil leaks, domestic wastes from sea vessels	• Along the navigational lanes of the sea vessels.
	Change in seabed topography	• Seabed of reclamation island
	Accretion/erosion	• Seabed of reclamation island and vicinity
	`Positive impacts on employment and livelihood	• Municipality of Cordova
	Positive impacts on economic uplift	• Municipality of Cordova
	Competition or otherwise enhancement of livelihood or businesses adjacent to site	• Existing businesses adjacent to site
INDIRECT IMPACT AREAS		
Domain impacted by changes in circulation	Changes in circulation patterns Transport of particles	Body of water potentially affected by changes of circulation
Adjacent establishments, institutions, buildings	Individual perceptions about reclamation projects	• Establishments adjacent to site
Business Competition	Competition with Small Establishments	• Adjacent establishments

Direct and Indirect Impact Map provided in **Figure PD-9.**

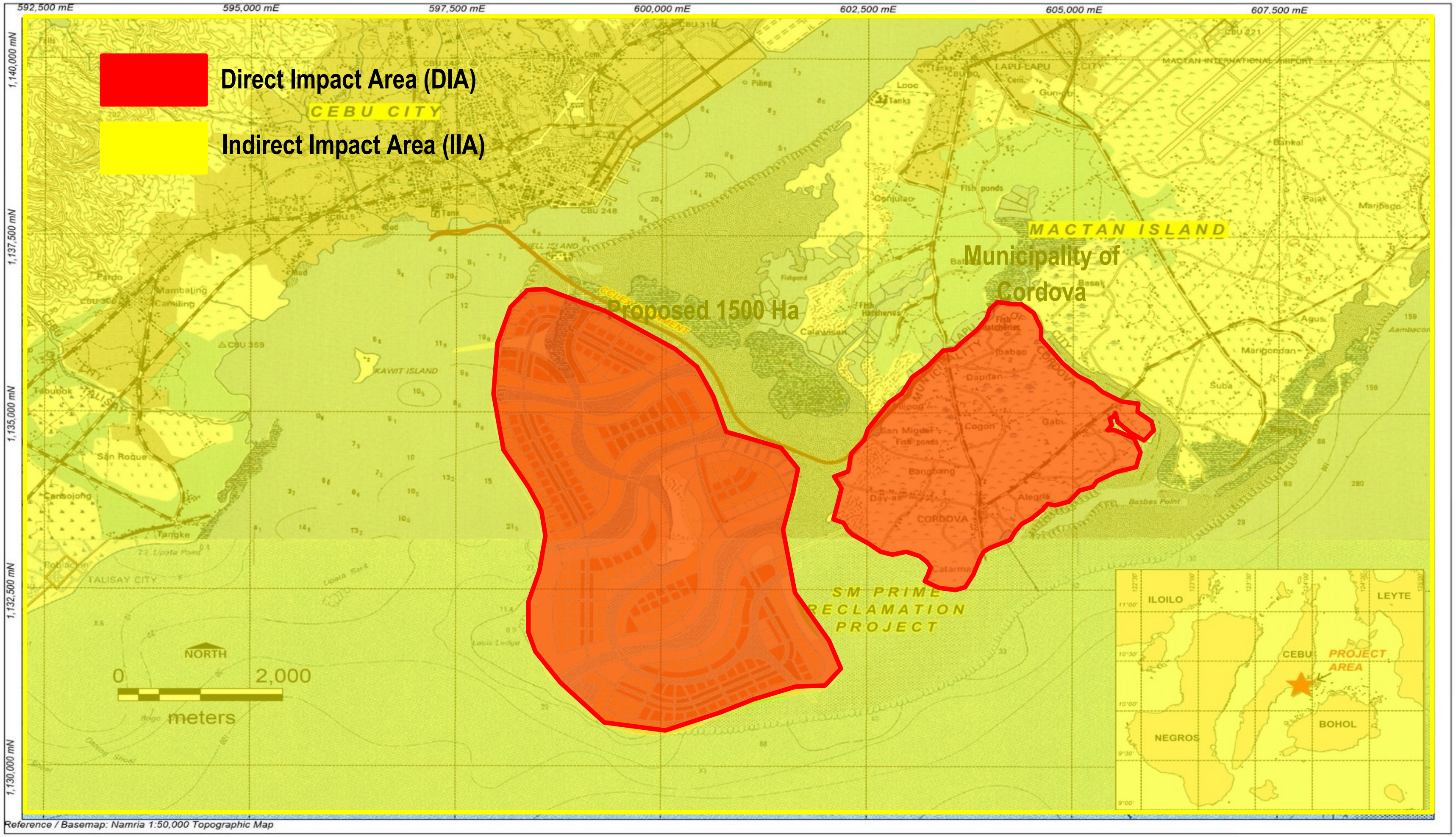


Figure PD-9. Pre-Direct and Indirect Impact Areas (NAMRIA)

2.8 Development Phases. Development Phases in terms of specific activities (with 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.)*

  There are no activities during this phase that will result in significant environmental impacts. Geotechnical survey will involve soil boring and tests which will be made at specific areas which will not disturb the marine ecology.

- ***Construction*** *(e.g. land/site clearing, temporary housing, transport of materials, health and other services for the workforce)*

  The various dredging and reclamation activities described in the previous sections are summarized in **Table PD-8** with focus on potential environmental impacts.

Table PD-8. Summary of Various Dredging and Reclamation Activities

Major Activities	Environmental Impacts
Dredging at Site for Removal of Unwanted Seabed Materials	Potential for silt dispersal
Sailing of Dredger to and from Source of Fill Materials	Potential Oil Leaks
Filling of Reclamation Area	Potential for silt dispersal
Soil stabilization	Essentially Nil
Domestic activities of construction workers	Domestic waste and garbage generation

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- ***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 and fuel requirements, infrastructure requirements (transport—road/rail/ship, power, water supply and storage, storm water drainage, sewerage, telecommunications, accommodation and other infrastructure), waste management (characteristics and quantities of waste materials: wastewater, air emissions, solid wastes - toxic and hazardous, non-toxic and non-hazardous)*

  The operations phase involves the construction of buildings and structures by various locators and the operation of their activities, e.g. food stores, convention centers, movie houses, etc. This phase is not included in the scope of this EIS and in the application for an ECC.

- ***Abandonment.*** *Final Rehabilitation/ Decommissioning Plan, to include Land/soil restoration, decontamination or remediation activities and procedures & projected schedule. Should discussions about strategies and methods for final rehabilitation of the environment disturbed by the project. The land use suitability of the various land disturbance types should also be described.*

  The proposed decommissioning plan envisaged in terms of the following:

  - **Procedures for the decommissioning of the project components;**

    The project components are largely the reclaimed land including the infrastructures therein constructed e.g. roads open spaces, drainage culverts, electrical and water lines, etc.

  - **Transport/disposal of equipment and other materials used**

    The equipment and other materials used in the reclamation and dredging works would have been returned or claimed back by the contractors by the time of the decommissioning of the project.

- **Remediation of contaminated soil and water resources due to spills and leakage of chemicals and other materials used in the operation;**

  There are no spills and leakages during the process of soil stabilization and hence this aspect is not relevant.

- **Alternatives for the future use of abandoned area;**

- **Consistency with long term zoning and land use development plan of the city;**

  - **Rehabilitation/ restoration plans, if any**

  The project is consistent with the long term zoning and land use development, noting that the proposed project is the LGU itself.

2.9 Project Size

The proposed reclamation project will be composed of four (4) islands and will occupy an area of **1500 hectares** of reclaimed land.

2.10 Initial Estimate of Project Cost and Timeline

The project cost is initially estimated at Php 137.8 Billion

2.11 Initial Environmental Impacts and Management Plan (IMP)

The IMP is provided in **Table PD-9.**

Table PD-9. Initial Environmental Impacts and Management Plan (IMP)

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement
I. PRE-CONSTRUCTION PHASE-Potential disturbance of corals and marine ecology during the geotechnical survey of the sea bed; mitigation is by avoidance through appropriate selection of test sites		
II. CONSTRUCTION PHASE		
A. The Land	Perception of Flooding onshore as a result of reclamation	Reclamation itself provides protection against storm surges and thus against floods.
		Municipal Drainage system not disturbed
	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. Reclaimed land will rest on solid foundations. Engineering interventions will be undertaken.
	Ground shaking and liquefaction	Structural and engineering design intervention
		Philippine Standards
	If disposal of unwanted dredged materials is onshore	Conduct lab tests re: quality of materials to be disposed. Contain materials in sand bags Apply for appropriate permits and follow regulations

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation* or Enhancement
B. The Water-Manila Bay- No rivers, creeks, lakes at site Manila Bay	Permanent loss of Cordova Bay water body equivalent to 1500 hectares	Irreversible. Comply with PRA Notice to Proceed. Creation of water body in portion of Cordova Bay which will be dredged for use as land fill
	Disturbance of marine species/Damage to or impairment of economically significant marine life.	For study
	Silt dispersal/turbidity increase due to sea bed disturbance	Silt curtains and screens, etc. Phasing of construction schedule
	Water circulation	Design of islands
		Observe project boundaries
	Contamination from filling materials (Channels within site; Maasin, Malapscua S. Leyte)	Ensure contaminants absent
	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	• Onboard vessel oil containment and recovery equipment • Own temporary toilet facilities, Disposal on land by 3rd parties
	Disposal of unwanted dredged materials at sea	Approved disposal methodology and site
	Reclamation does not use significant water	• Arrangement with local concessionaires • No underground abstraction
C. The Air	Noise Degradation of ambient air quality	Buffer zone from population areas
D. The People	No settlers/No population centers affected	Social Development Program
	Livelihood and employment opportunity	Enhancement

3.0 ANNEXES

3.1 Photographs of the Project Site