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A. PROJECT FACT SHEET

Project Name	**REHABILITATION / IMPROVEMENT OF RIVERBED AND NAVIGATIONAL SEA CHANNEL OF BOAC RIVER**
Project Location	Barangay Tabigue, Municipality of Boac in the Province of Marinduque
Project Threshold and Categorization for Category A: ECP Projects	Section 2.1.3 – Extraction of Non-metallic Minerals such as Aggregates (sand, stone, gravel including dredging with / intended for recovery / use of materials) with annual extraction rate of ≥75,000 metric tons and/or project area ≥20 hectares (regardless of capacity) Environmental Mitigation; Disaster Risk Reduction; Climate Change Adaptation.
Nature of Project	Flood Control, Rehabilitation and Improvement of Boac River by dredging with delta clearing using Cutter-Suction Dredger (CSD) and Conventional Type (Long Arm Excavator-Loader & Dump Truck)
Area Covered	Approximately **6.8 hectares** with net length of **500 linear meters** of River Dredging Zone with **17 hectares** as Navigational Zone
Volume of Deposit	Extraction of 159,228.95 cubic meters at the River Dredging Zone
	Extraction of (TBD) cubic meters at the Navigational Zone for river delta clearing
Estimated Operation Duration	5 months – River Dredging Zone (TBD) days – Navigational Zone
Extraction Rate	1,000 m^3 per hour capacity Cutter-Suction Dredger
Project Proponent	PROVINCIAL GOVERNMENT OF MARINDUQUE and DPWH MIMAROPA
Dredging Contractor	**KYRO BUILDERS, INC.** Philip M. Natividad – Authorized Managing Officer
Proponent Address	No. 14 Onjianco Street, Sta. Veronica, Guimba Nueva Ecija
Contact Person	**Engr. Rolly Oligario** Mobile: 09109389455
EIA Preparer / Consultant	**BLACKGEAR ENVIRONMENTAL ENGINEERING SERVICES** **Engr. Julius Marino O. Cariño** Mechanical Engineer / EIA Preparer – IPCO No. 089 2964-B Garong St., Brgy. 8, San Jose, Occ. Mindoro Mobile Number: +639277391727 Email Address: jmcarino77@gmail.com

B. EIA Team

The company through Mr. Kyro C. Natividad, engages the services of an environmental consultants to ensure that proper environmental management, protection and awareness are truly gathered and be implemented.

Different science and engineering disciplines collaborated to the project that includes Mining Engineer, Hydrologist, Marine Biologist, Civil / Sanitary Engineer, Electrical Engineer, Mechanical Engineer, Geologist, Geological Engineer and Civil-Geotechnical Engineer.

Table 1_EIA Team for Boac River Dredging Project.

NAME AND DESIGNATION	PARTICIPATION IN EIA STUDY
Proponent Team	
Mr. Philip M. Natividad President **Mr. Kyro C. Natividad** Authorized Managing Officer	Authorized signatory, Project Planning and Implementation
Mr. Rolly Oligario Sr. Office Engineer	Provided all documents, data and information relevant to the project
Mr. Dario De Jesus Project Manager	Project coordination and Site Technical Assistance
Key EIA Consultants	
Engr. Julius Marino O. Cariño Mechanical Engineer EIA Preparer – IPCO 089	EIA Team Leader Report Integration, Environment, Socio-Economics & Coordinator
Philearth Consultancy, Inc. **Lily Galang** Geologist	Geologic and Geohazard Assessment with Hydrogeology
AM Geoconsult & Associates, Inc. **Raymond Fran Siao** Civil / Geotechnical Engineer	Sub-surface Geotechnical Investigation
Benjamin Francisco – Leader Marine Biologist – IPCO 038 **Ronald T. Pocon** BS Fisheries / Scuba Diver	Freshwater & Marine Ecology Baseline Assessment
Trinav Surveys **Florante Soliman** Geologist / Surveyor	Seismic Profiling & Bathymetric Measurements of Marine / Navigational Area
Aeronics, Inc. **Susan M. Almanzor** Operations Manager	Freshwater and Seawater Analysis
FDC Materials Testing Center, Inc. **Edgar John C. Aradillos** Laboratory Head	Soil / Sediments Analysis

1 PROJECT DESCRIPTION

The proposed Rehabilitation/ Improvement of Riverbed and Navigational Sea Channel of Boac River System will not only revert the original course of **BOAC RIVER** as determined from the available NAMRIA Maps and DPWH Plans through deepening and widening but it will also to open the river mouth / estuary to be able to unload the water carrying the river-run materials coming from the mountains including the river run materials to Tablas Strait / Tayabas Bay.

Dredging will mitigate the risk of flooding in the surrounding areas or communities and eventually focus on the restoration and rehabilitation of the said river. Flooding has been a problem in the Municipality of Boac since 1987. It can be associated with the accumulation of river-run materials such as sand, gravel, pebble and other sediments including garbage and debris from the city which resulted to the current river profile. Dredging should be carried out to achieve the necessary profile of the river to increase its conveyance capacity and hence prevent the overflow of water to the Boac Proper Area.

There have been a number of notable weather disturbances that have caused flooding in the area of Boac River Basin. These events include Typhoon Herming in 1987, Typhoon Monang in 1993, Typhoons Caloy and Reming in 2006, Typhoon Frank in 2008, Typhoon Ofel in 2012, Super Typhoon Yolanda in 2013, Typhoon Glenda in 2014, and Typhoon Nona in 2015. During the incidence of tropical storm Hagupit (international name, Ruby) in December 2014, families residing near Boac River were evacuated due to threats of flash floods and spillovers of possible remnants of mine tailings coming from the Marcopper Mining Disaster.

One of the primary concerns of the Municipal Government of Boac and the Marinduque Council for Environmental Concern (MACEC) has been the conservation and protection of the municipality's environment and natural resources as well as the management of solid waste. One major issue is the continuing pollution of the Boac River caused by the 1996 Marcopper Mining Disaster, a man-made industrial disaster. This proposed project aims to carry-out the flood control program and the rehabilitation of the affected river system aiming at enhancing the socio-economic development and safety of all Marinduqueño.

The proposed operation involves the eventual dredging of about **159,228.95 cubic meters** coming from the **River Dredging Zone** and (to be determine) **cubic meters** coming from the **Navigational Zone** of **dredged / river-run materials** (sand, gravel, pebble and other sediments) during the maximum operation based on the calculated quantity of deposits. The Cutter-Suction Dredger has a capacity of 1,000 cubic meters per hour to deal with the time and volume of river-run materials to be dredge / de-silt from the above-mentioned river due to the unpredicted weather condition nowadays. The

river-run materials dredged from the river delta, lower reaches, middle reaches and upstream shall be discharged aboard a split hopper barge through a specialized floating discharge hose or to a sand carrier vessel and via conventional loading through long-arm excavator or clamshell-type crane coming from the designated stockpile area (optional) near the shoreline of Boac River. The dredging spoils will be temporary embanked or to be use as materials for concrete dike or dike road to prevent future flooding. The dredging channel which requires slope protection shall be protected by sand bagging / geotextile retaining wall on both sides of the riverbanks in order to prevent erosion with the supervision and approval of DPWH.

1.1 PROJECT LOCATION AND AREA

Boac River to be dredge and restore is located at Barangay Tabigue within the Municipality of Boac in the Province of Marinduque. Boac River is the longest and largest river which gets its source in the mountainous forest in the extreme southwest and spills off to the northern shore of Boac, divides the municipality into two geographical areas: north and south. The municipality is generally hilly, rugged and mountainous in the south and eastern part with thin strips of flat and farm lands and long shoreline in the west.

The Boac River Basin is a 21,330-hectare watershed in the province of Marinduque that covers majority of the Municipality of Boac, and minor portions of the Municipalities of Mogpog, Santa Cruz, Torrijos, Buenavista, and Gasan. The Department of Environment and Natural Resources (DENR) - River Basin Control Office (RBCO) identified the basin to have a drainage area of 209 km2 and an estimated 334 million cubic meters (MCM) in annual run-off (RBCO, 2015). The basin's main stem, the Boac River, is part of the forty-five (45) river systems in the Southern Tagalog Region under the Phil-LiDAR 1 partner higher education institution, UPLB.

The Boac River Basin encompasses the following barangays: Agot, Agumaymayan, Apitong, Balagasan, Balimbing, Bamban, Bantad, Bantay, Bayuti, Binunga, Boi, Boton, Canat, Catubugan, Daig, Daypay, Hinapulan, Isok I, Isok II Poblacion, Mahinhin, Mainit, Malbog, Malusak, Mansiwat, Mataas na Bayan, Maybo, Mercado, Murallon, Ogbac, Pawa, Poctoy, Poras, Puting Buhangin, Puyog, Sabong, San Miguel, Santol, Sawi, Tabi, Tabigue, Tagwak, Tambunan, Tampus, Tumagabok, and Tumapon in the Municipality of Boac; Bagtingon and Malbog in the Municipality of Buenavista; Tabionan and Tiguion in the Municipality of Gasan; Bocboc, Danao, Malayak, Anapog-SIbucao, Mampaitan, and Puting Buhangin in the Municipality of Mogpog; Kilo-kilo, Labo, Makulapnit, and San Antonio in the Municipality of Santa Cruz; and, Malibago, Sibuyao, and Talawan in the Municipality of Torrijos. To delineate the watershed of Boac River, the digital elevation model of Marinduque obtained from the NAMRIA which has a

resolution of 5m was used in the study. The delineated watershed of Boac River has an area of 212 sq. km.

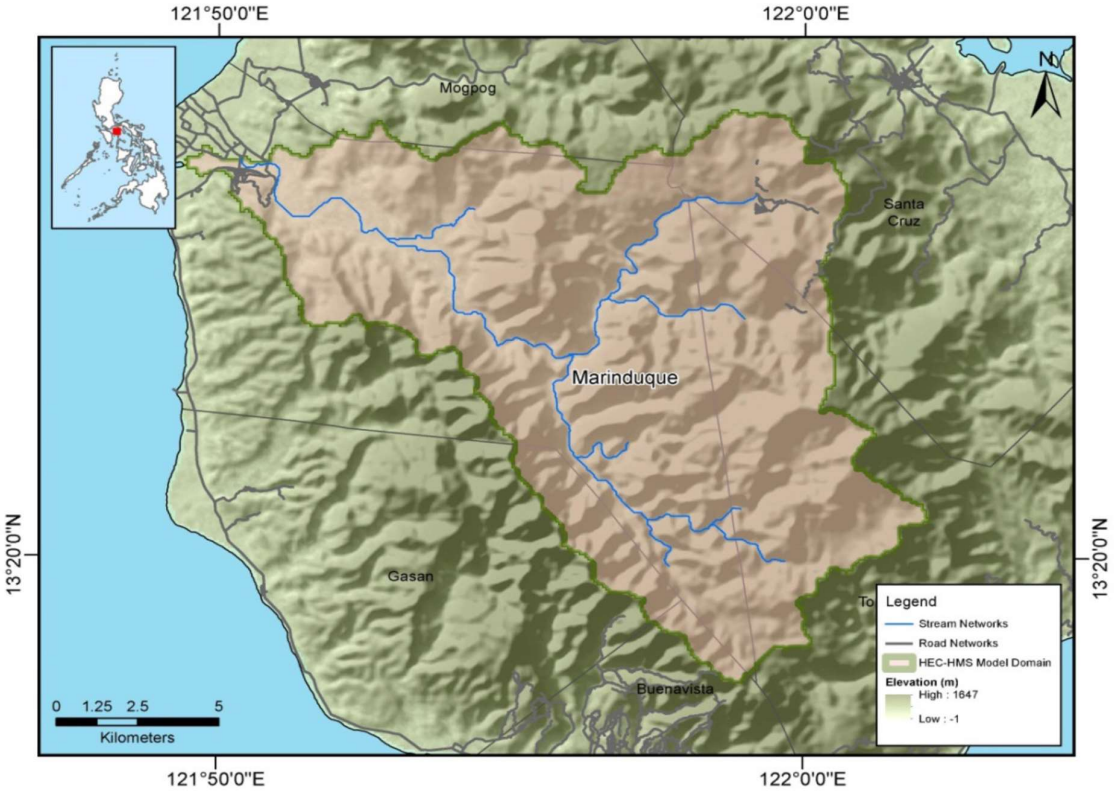

Figure 1_Location Map of Boac River Basin. **Source:** *LiDAR Surveys and Flood Mapping of Boac River (Phil-LIDAR 1)*.

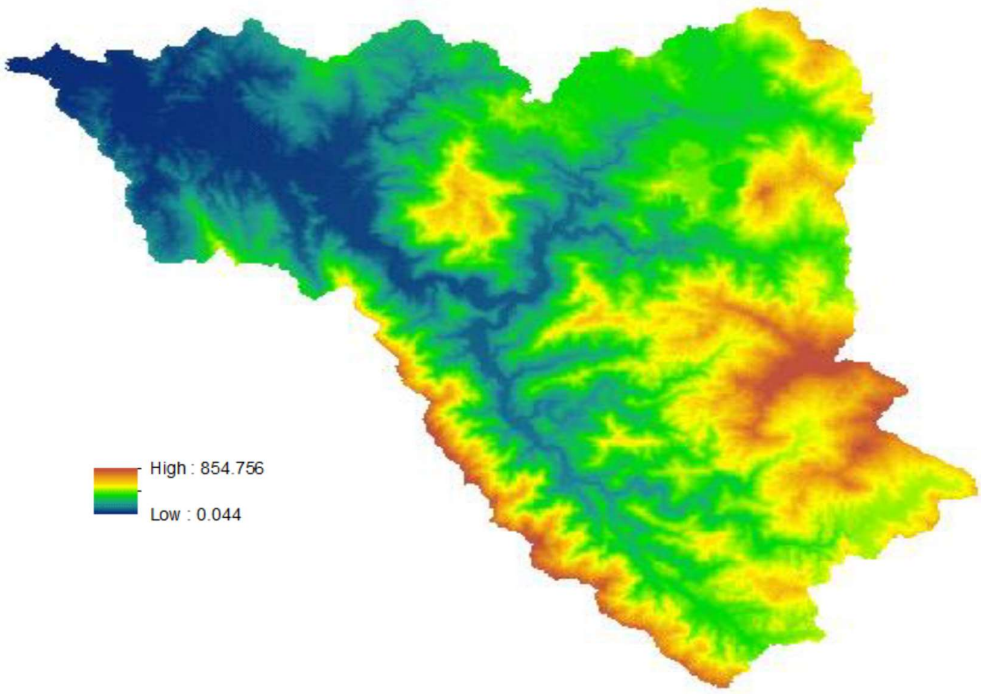

Figure 2_Delineated Watershed of Boac River showing elevation (meters) **Source:** Hydrologic Modelling and Technical Analysis Report 2022.

The Municipality of Boac is a 1st class municipality and capital of the Province of Marinduque. According to the 2020 census, it has a population of 57,283 people making the most populous town in Marinduque. Situated in the western coast of Marinduque Island, the municipality is bordered in the north by the municipality of Mogpog, in the east by the municipality of Torrijos, in the south by the municipality of Gasan and Buenavista while in the west by Tablas Strait that forms as natural boundary. Boac has a rugged terrain with long meandering rivers drained towards west.

Boac, a heritage town in its own right, is known as one of the main venues of the annual Moriones Festival and is the location of a number of historical sites in Marinduque including the Boac Cathedral fortress church, Casa Real and the Liwasan ng Kalayaan, Laylay Port and the Battle of Paye site. The municipality is also home to the Marinduque Branch of the National Museum of the Philippines.

It is approximately 220 kilometers by the shortest routes from Manila and forty-five (45) minutes flight from Manila Domestic Airport to Masiga Airport in Gasan, which is seven (7) kms away from Boac. It could also be reached about three (3) hours by the Roro (Boat) from Talao-Talao Pier in Dalahican, Lucena to Cawit Pier and about 2 hours and thirty minutes to Balanacan Pier. From Balanacan it takes about 15 minutes ride to reached Boac town proper.

The municipality of Boac is composed of sixty-one (61) barangays with a total land area of approximately 21,272 hectares or 21.272 square kilometers. Barangays San Miguel, Murallon, and Mercado are the town's business district where the public market, medium-rise buildings, sports arena and Boac Town Arena, now Moriones Arena are located. Meanwhile, Barangay Isok is home to the town's education district. Marinduque National High School, St. Mary's College of Marinduque, Don Luis Hidalgo Memorial School, Barangay Day Care Centers, Boac North District Office and the Division of Marinduque DepED Office is in Barangay Isok. The Municipal Building Hall is at Barangay Tampus, adjacent is the Marinduque Museum at Barangay Malusak. The Marinduque Provincial Capitol is in Barangay Santol near the Dr. Damian Reyes Memorial Hospital (formerly Marinduque Provincial Hospital) and Camp Maximo Abad. Other barangays are Agot, Agumaymayan, Amoingon, Apitong, Balagasan, Balaring, Balimbing, Balogo, Bamban, Bangbangalon, Bantad, Bantay, Bayuti, Binunga, Boi, Boton, Buliasnin, Bunganay, Caganhao, Canat, Catubugan, Cawit, Daig, Daypay, Duyay, Hinapulan, Ihatub, Laylay, Lupac, Mahinhin, Mainit, Malbog, Maligaya, Mansiwat, Mataas na Bayan (Poblacion), Maybo, Ogbac, Pawa, Pili, Poctoy, Poras, Puting Buhangin, Puyog, Sabong, Sawi, Tabi, **Tabigue**, Tagwak, Tambunan, Tanza, Tugos, Tumagabok and Tumapon.

Based on the "Hydrologic Modelling and Technical Analysis Report 2022 for the proposed "REHABILITATION / IMPROVEMENT OF RIVERBED AND NAVIGATIONAL SEA OF BOAC RIVER" conducted by Philearth Consultancy, Inc. for DPWH MIMAROPA given to a dredging contractor – KYRO BUILDERS, INC. with the following coordinates on the table listed below with varying elevation starting from 0 meter up to 4 meters Boac River Dredging Zone.

Table 2_Geographic coordinates of the dredging area (using WGS 84 datum).

Corner	Latitude	Longitude
1	13°27'0.56"	121°48'37.93"
2	13°27'1.04"	121°48'38.73"
3	13°27'1.79"	121°48'45.50"
4	13°27'3.45"	121°48'50.83"
5	13°27'3.46"	121°48'51.63"
6	13°27'4.83"	121°48'54.86"
7	13°27'1.15"	121°48'56.56"
8	13°26'58.77"	121°48'49.07"
9	13°26'57.80"	121°48'46.78"
10	13°26'57.89"	121°48'46.40"
11	13°26'57.17"	121°48'41.34"
12	13°26'56.61"	121°48'40.74"
13	13°26'56.34"	121°48'40.05"
14	13°26'56.31"	121°48'38.71"

Approximately 6.8 hectares with net length of 500 linear meters of RDZ

Table 3_Geographic coordinates of the marine area

Corner	Latitude	Longitude
1	13°27'1.55"	121°48'37.75"
2	13°27'6.30"	121°48'20.73"
3	13°26'50.91"	121°48'22.87"
4	13°26'54.77"	121°48'38.98"

Marine Area / Navigational Zone – 17 hectares (approximately)

1.1.1 Impact Areas

The area subject for Environmental Impact Assessment (EIA) Study as stipulated in DAO No. 2003-30, was based on the perceived direct and indirect impact areas of the proposed dredging project is from the marine area (to open the river delta), mouth and lower reaches of Boac River having a length of 500 linear meter situated at Barangay Tabigue in the Municipality of Boac, Province of Marinduque as identified by the consultants during the site inspection and verification.

Table 4_Impact Areas of the Project:

AREA CLASSIFICATION	AREA COVERAGE
Direct Impact Areas	**In terms of Biophysical Impact:** • Shoreline and the 17-hectare marine area as navigational zone to open-up the river mouth / delta; • The 6.8-hectare dredging area (at the delta or mouth and lower reaches of Boac River) • Freshwater and Marine Ecosystem • Estuarine area • Riverbanks and Concrete Dikes • Designated spoil area • Fauna at the riverbanks • Cultivated / Agricultural land along the 200-meter radius from the bank of Boac River; • Approximately 1 kilometer diameter of the navigational area due to the movement of dredgers, vessels and local fishing boats
	In terms of Socio-Cultural Impact: Residents of Barangay Tabigue being the host community will benefit from the project's Social Development Programs (SDP) and Corporate Social Responsibility (CSR) specially fisherfolks and farmers
Indirect Impact Areas	**In terms of Biophysical Impact:** • Barangay access roads • Users of water (local irrigators, if any) • Other users of river water
	In terms of Socio-Cultural Impact: Community of the surrounding Barangays Lupac, Laylay, Bangbanglon and Santol within the RDZ

1.1.2 Protected Areas and RAMSAR Sites

Table 5_List of Protected Areas and RAMSAR Sites in the Province of Marinduque:

Name	Legal Basis	Legal Status	Proximate Distance from the Project Area
Torrijos Watershed Forest Reserve	Proclamation No. 357, s. 1994	Initial Component	34.76 aerial kilometers southeast of the project area
Marinduque Wildlife Sanctuary	Proclamation No. 696, s. 2004	Legislated	20 aerial kilometers southeast of

			the project area
Mangrove Swamp Forest Reserves: • Island of Sta. Cruz and Salomague • Foreshoreline of Dapdap and Alabo to the mouth of Tagum River, Malinoa Creek to Salomague Point • Foreshoreline of Barrio Cabuyagan to eastern side of Dating Bayan River in Calancan Bay	Proclamation No. 2152, s. 1981	Initial Component	30.5 aerial kilometers east of the project area

Torrijos Watershed Forest Reserve comprising an area of 417 hectares. In this area of residual rushland / grassland were monitor lizards, wild pigs, deer civet cats, hornbills, jungle fowl, brahminy kites and aquatic fishes as identified in a 2000 study sponsored by USAID with a small group of scientists, NGO's, the government (PAWB, BFAR, LGUs) and academic institutions.

Marinduque Wildlife Sanctuary is described as a gently undulating mountain landscape falling into the coastal plains in the west and east. There is a large number of animals such as the Giant Borken Rats (*Phloeomys cumingi*) in this conservation area. The Philippine Pustelschwein (*Sus philippensis*) is now regarded as extinct on the island. From the genus of the bats there are records of the subspecies Hipposideros pygmaeus, Eonycteris robusta and Rhinolophus rufus. In amphibians the frog species Rana magna macrocephala and Kaloula conjuncta exist in the area. From the avifauna are observations in this Wildlife Sanctuary of the Philippine duck (*Anas Luzonica*), the Luzon-Spatelschwanzpapageis or Green Racket-Tail Parrot (*Prioniturus luconensis*) and Red-Vented Cockatoo, also known as the Philippine cockatoo (*Cacatua haematuropygia*).

In 1981, certain parcels of the public domain and/or parts of the country were declared as **Mangrove Swamp Forest Reserves**. They included parts of Sta. Cruz, Marinduque, specifically: The Islands of Sta. Cruz and the Island of Salomague, the foreshoreline of Bo. Dapdap and Alabo up to the mouth of Tagum River, Malinao Creek up to Salomague Point, and the foreshoreline of Bo. Cabuyagan to the eastern side of Dating Bayan River in Calancan Bay.

Plate 1_Panoramic view of the river delta or the mouth of BOAC RIVER using DJI Mavic 2 Zoom Drone. Note that the mouth or the river delta was stalled by silt materials or sediments that prevents the flow of the water including the river run materials to the receiving Tayabas Bay / Tablas Strait.

Plate 2_Panoramic view of the BOAC RIVER using DJI Mavic 2 Zoom Drone showing the accumulation of sediments preventing the water and other river-run materials to smoothly flow to Tablas Strait /Tayabas Bay. Riverbanks are protected with concrete dike to prevent overflow / flooding.

Plate 3_Panoramic view showing that the left bank near the mouth of BOAC RIVER were eroded while the vicinity (titled lots) is heavily vegetated.

Plate 4_Panoramic view showing that the right bank near the mouth of BOAC RIVER were eroded while the vicinity (titled lots) is heavily vegetated.

Plate 5_This photo showing the newly opened By-pass Road Bridge going to the municipalities of Gasan, Buenavista, Torrijos and other town in Marinduque without passing the busy and narrow streets within the Municipality of Boac.

Figure 3_Satellite Image showing the geographical coordinates of the **RDZ – yellow** and **Navigational – white polygon**, respectively.

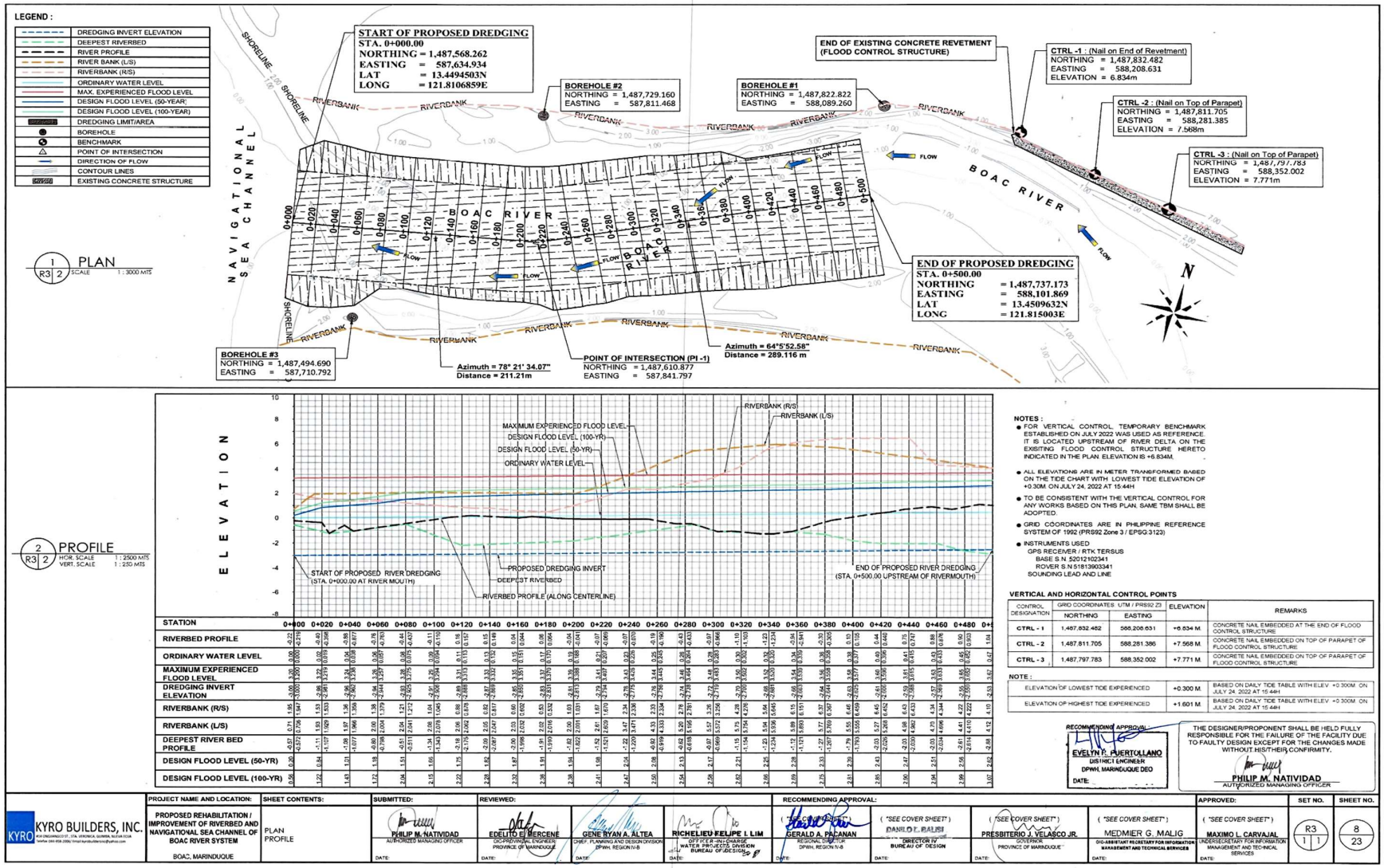

Figure 4_DPWH Dredging Master Plan showing the River Dredging Zone of Boac River.

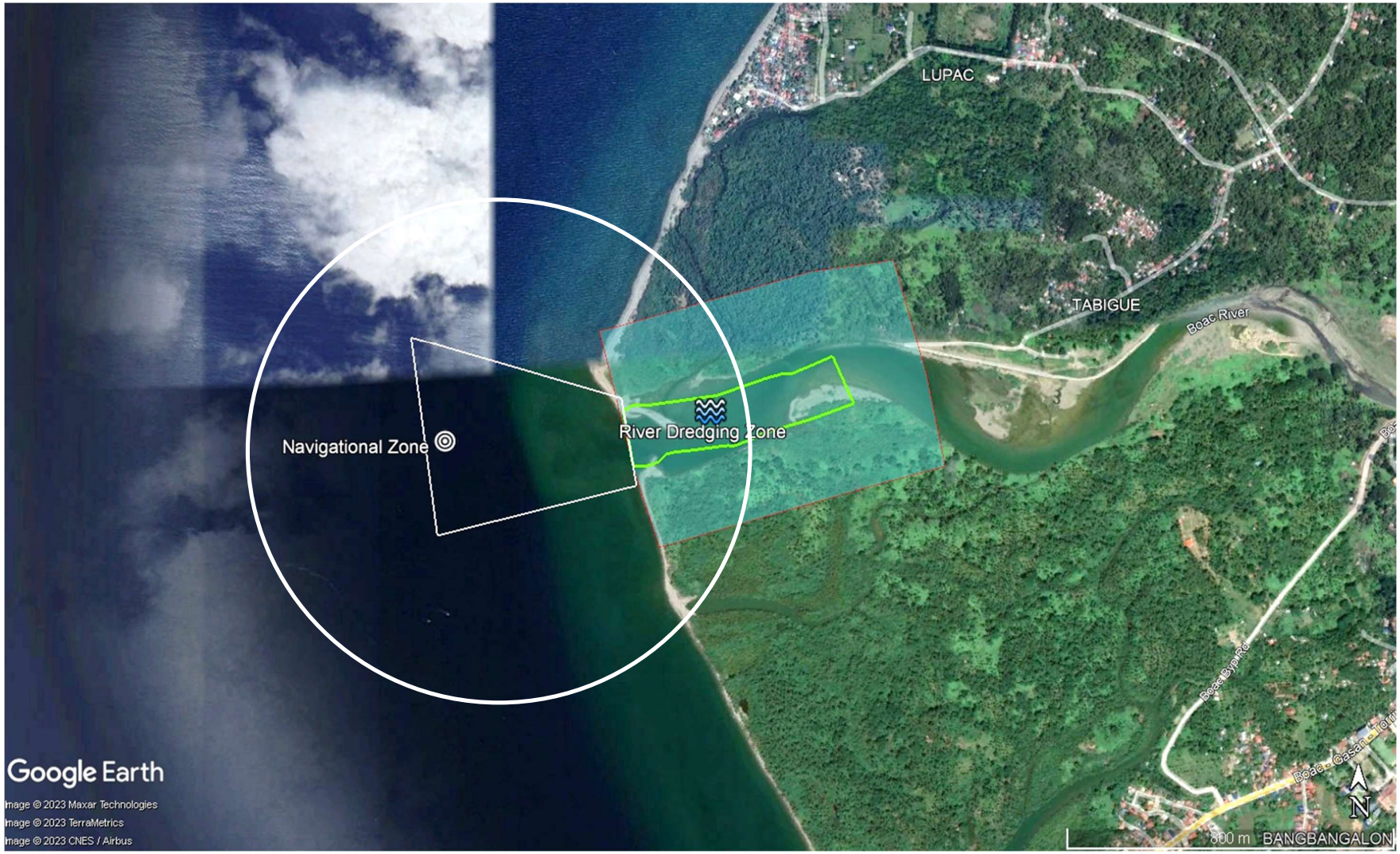

Figure 5_The Primary and Indirect Impact Area is the 200 meters represented by the **red-teal polygon** on both side of the river dredging zone while 1 kilometer diameter for the navigational zone regarding the movement of the vessels.

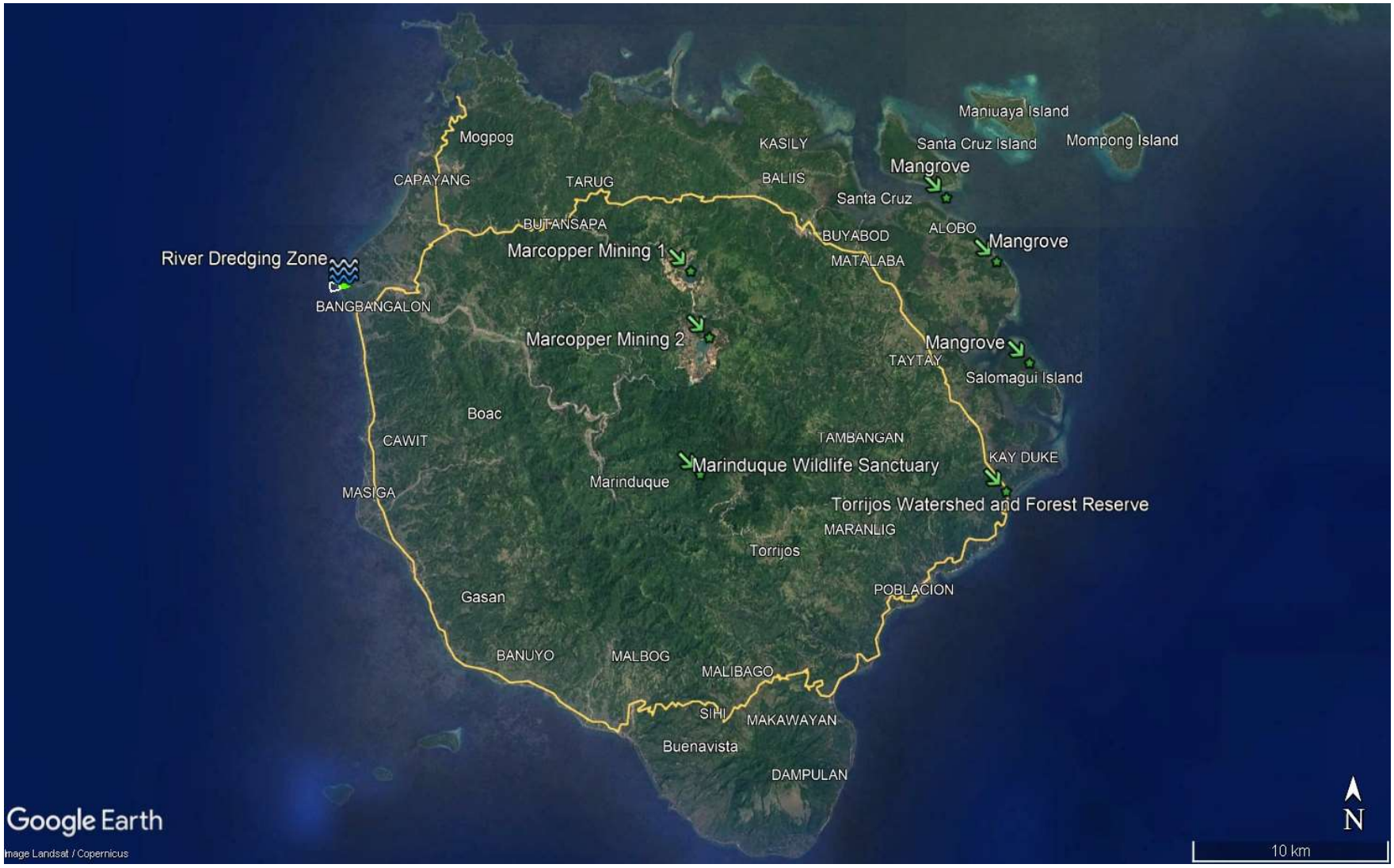

Figure 6_Location of Protected Areas and RAMSAR Sites in the Province of Marinduque.

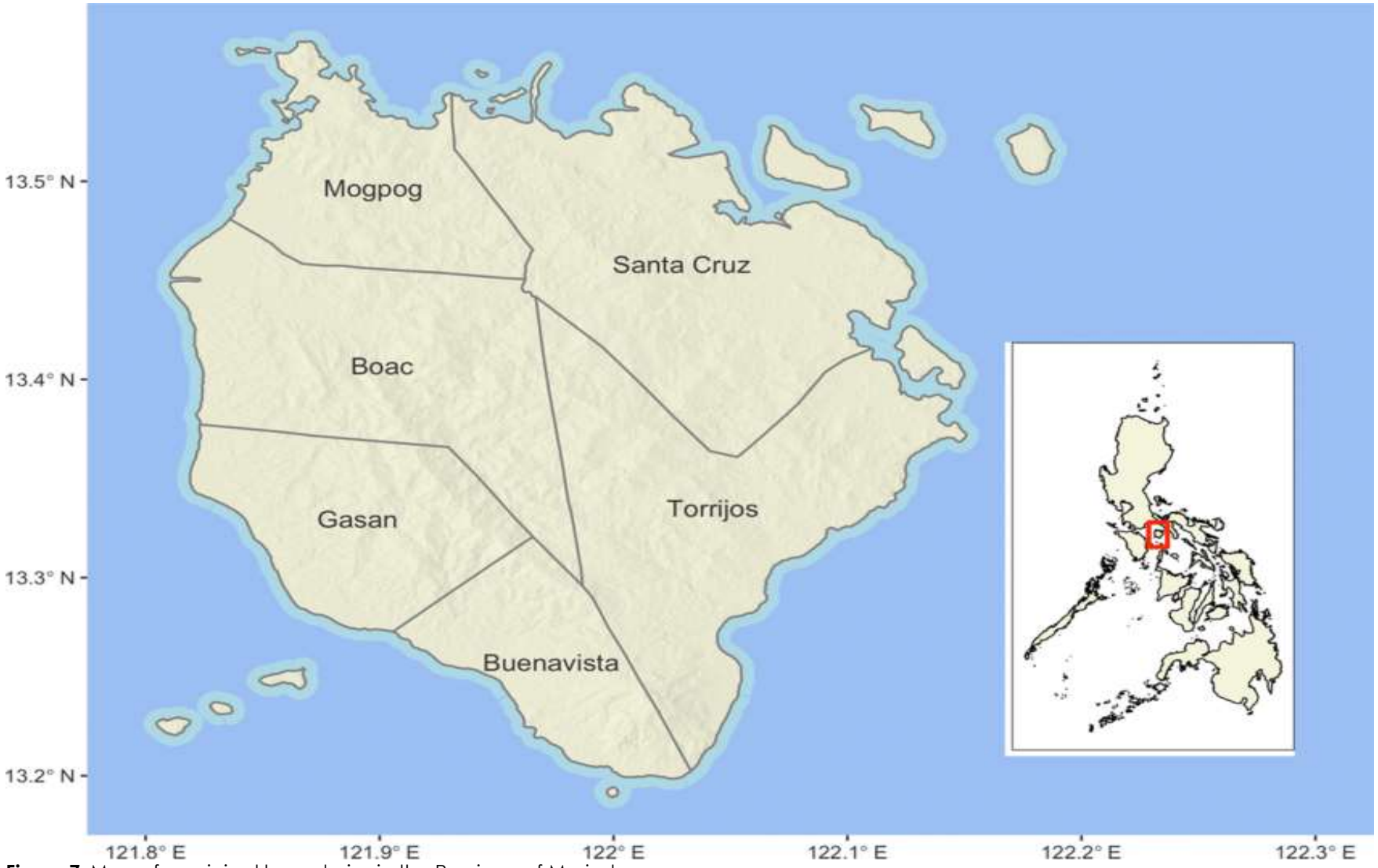

Figure 7_Map of municipal boundaries in the Province of Marinduque.

1.2 PROJECT RATIONALE

The Local Government Code empowers the province "*to do preventive actions or implement risk reduction by way of providing services to the people in the form of drainage, sewerage, flood control, reclamation projects, and other emergency measures as may be necessary during and in the after-math of man-made and natural disasters.*"

Based on the DENR Administrative Order Nos. 2020-07 and 2020-15 "Rationalizing Dredging Activities in Heavily-Silted River Channels" pursuant to the DENR-DPWH-DILG-DOTC Joint Memorandum Circular No. 01 series of 2019" under Section 3. Rationale and Objectives states that "*In order to restore the natural state and water flow of the heavily-silted river systems and improve its hydraulic capacity thereby eliminate flooding, large-scale dredging and desilting operations, based on a comprehensive dredging plan, must be implemented.*" DAO 2020-07, DAO 2020-15 and JMC No. 2019-10 attached as **Annex B**.

The Inter-Agency Committee (IAC) headed by Provincial Government of Marinduque together with DPWH-MIMAROPA, DENR-MIMAROPA, MGB-MIMAROPA and EMB-MIMAROPA requested for the participation of the private entities to dredge the river systems affecting the concerned communities of the entire Province of Marinduque at "*no cost to the government of the Republic of the Philippines*" and conducted a thorough and meticulous process of selecting private companies with qualifications and capabilities to dredge or desilt the Boac River.

The IAC through a selection process awards Boac River to Kyro Builders, Inc. as the Dredging Contractor to dredge / de-clog / desilt the river channel from the river delta / mouth and lower reaches up to 500 linears meters of Boac River including the marine area as navigational zone to open the river mouth. The dredging operation will be supervised by the DPWH District Engineer's Office to conform with the approved dredging plans. IAC Resolution No. _ attached as **Annex A**.

1.3 PROJECT ALTERNATIVES

1.3.1 Siting

The Inter-Agency Committee (IAC) granted the proposed dredging area to Kyro Builders based on the approved Dredging Master Plan attached as **Annex C** after complying all the necessary requirements of all the government agencies concerned.

The result of the exploration activity and other secondary information gathered at various government agencies guided the proponent to pursue the dredging and desilting project. The quality of river-run

materials is ideal for reclamation purposes and the location was also considered during the transport of river-run materials to its prospective reclamation sites within CALABARZON and MIMAROPA Area including METRO MANILA.

There are different kind of dredgers and other methods to dredged and desilt / de-clog the subject river. Among them are Cutter-Suction Dredger, Trailing Suction Hopper Dredger, Grab Dredger, Backhoe Dredger and the conventional method using Backhoe-Loader-Dump Truck Tandem among others. Cutter Suction Dredger (CSD) is ideal or suitable for small river because of its size and capability to dredge and grind stones during suction. 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 at a precise depth. The sand dredged by the equipment and the water are then extracted simultaneously by the pump and transported and delivered to barges or sand carrier using an extension pipe as conveyor. It operates on an almost continuous dredging cycle resulting to economic and maximum economy and efficiency. Dredging takes place while the vessel is moored by means of spuds and/or anchors and combines cutting action for rocklike formation with suction. The use of silt curtains at the dredging site shall also be implemented to reduce further turbidity.

1.3.2 Process Technology and Design

This is closely identified with the equipment to be used. This shall be dependent on the dredging contractor.

There are different kind of dredgers and other methods to dredged and desilt / de-clog the subject river. Among them are Cutter-Suction Dredger (CSD), Trailing Suction Hopper Dredger (TSHD), Grab / Clamshell Dredger and Backhoe Dredger (BHD) among others.

a. Cutter-Suction Dredger (CSD)

Cutter Suction Dredger (CSD) is ideal or suitable for small river because of its size and capability to dredge and grind stones during suction. The dredging system is executed by lowering the ladder into the dredging area where the cutter attached to the bottom of the ladder is activated and operated at a precise depth and width. The sediment dredged by the equipment and the water are then extracted simultaneously by the pump and transferred to a hopper barge or sand carrier using an extension pipe as conveyor.

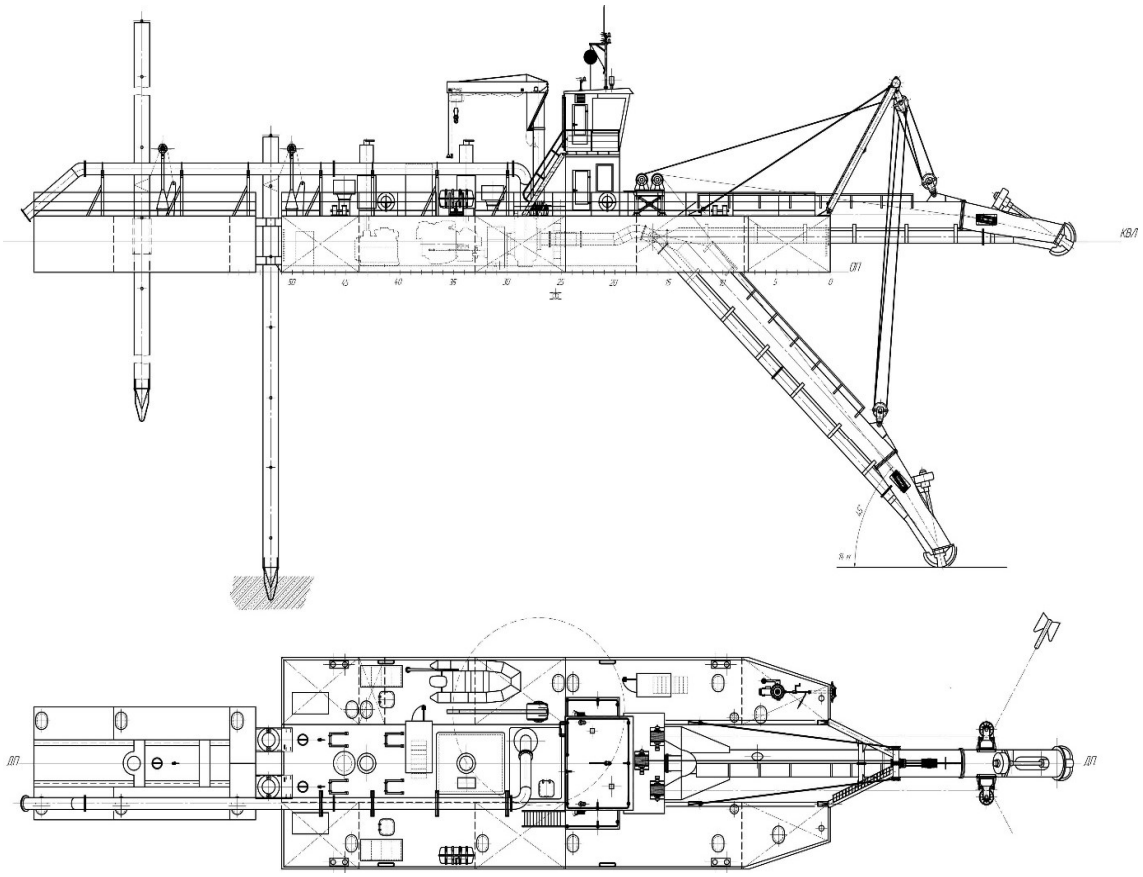

Figure 8_Side & Top View of the Cutter Suction Dredger, respectively.

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 meters per hour with maximum conveying distance of 5km (soft soil characteristic). It has a capacity 5 times bigger than Grab Dredger (bucket capacity of 16 m^3).

It operates on an almost continuous dredging cycle resulting to economic and maximum economy and efficiency. Dredging takes place while the vessel is moored by means of spuds and/or anchors and combines cutting action for rocklike formation with suction. The use of silt curtains at the dredging site shall also be implemented to reduce further turbidity.

b. Trailing Suction Hopper Dredger (TSHD)

A Trailing Suction Hopper Dredger (TSHD) is a self-driven dredger. They are designed with hopper tanks or trailers. The sediment is excavated and dumped in these tanks. Each tank / trailer has

outlet gates or valves at the bottom of the hull. When the tanks are filled, the dredger is moved to the discharge point, often for long distances, and these gates/valves are opened to empty the tanks or pump them outside.

Commonly deployed for open waters since it is less affected by weather and unfavorable sea condition, they are preferred for harbor maintenance and pipe trenching. Hopper dredges mostly dredge non-coercive materials such as soft soil and silt at very high efficiency. High-pressure water jets are often used to improve the performance further. 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 and has difficulty dredging side banks. Trailing Suction Hopper Dredger has a large dredging capacity and long conveying distance of more than 20 km but due to its deep draft this type of dredger precludes use in a shallow water like the condition of the project area.

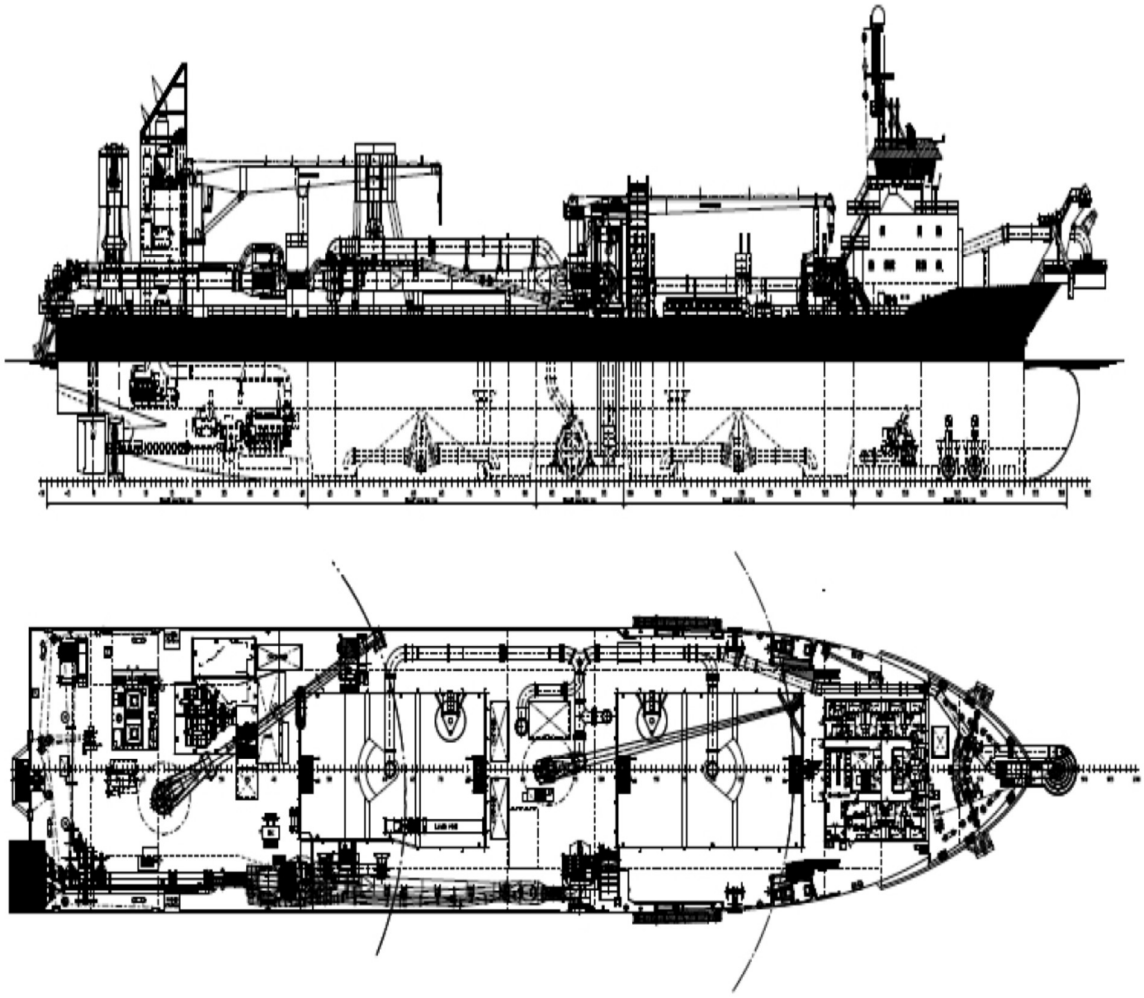

Figure 9_Side View and Top View of the Trailing Suction Hopper Dredger, respectively.

c. Grab / Clamshell Dredger

Stationary dredgers are held in place by anchors or spud-poles. The wire-operated clamshell grabs are used to dredge and load the material on a barge of hopper tank. The grabs may be of various configurations based on the sediment type. Some grabs are also watertight in nature; the capacity may range up to 2500 m³. This is largely dependent on crane power. These are efficient accessing corners and closer to quay walls. Since the grabs are not powered for high grip strength, they are deployed for general-purpose gravel, rock, and coarse sand dredging. No cutting action is delivered. Hence, they may need to be equipped with at least two types of grab buckets.

Clamshell dredger suitable for dredging operations in free fall, dragline and suitable for lifting operations for up to 25 tons. Due to the barge equipped with wire spuds, hopper barges can come alongside without interfering with the mooring arrangement.

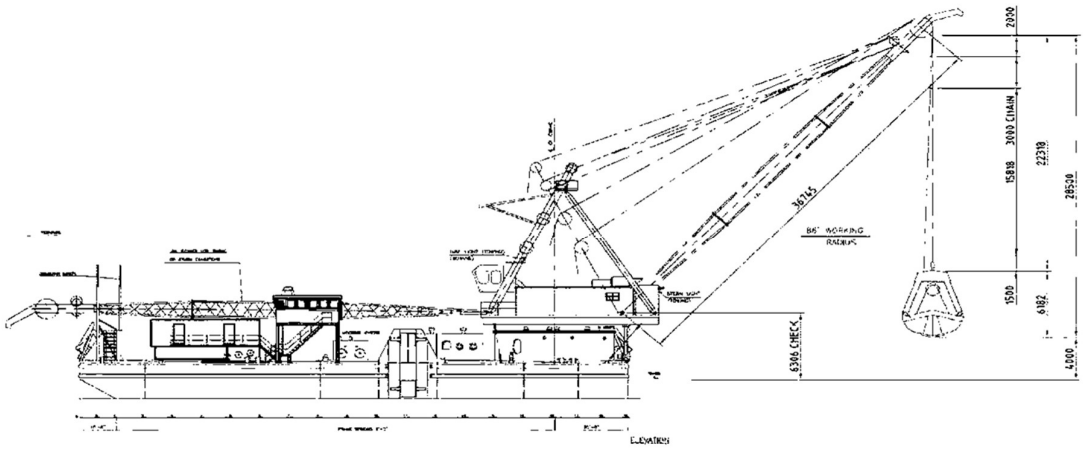

Figure 10_Van Loon Maritime Services B.V. Grab Dredger with 5-8m³ clamshell attached to line with dredging depth of 20 meters max (on spuds).

d. Backhoe Dredger (BHD)

Backhoe dredgers are stationary dredgers with a hydraulic excavator installed on a pontoon. The backhoe dredgers can dredge a wide range of materials very precisely and they operate mainly in shallow and enclosed waters. The backhoe dredger is anchored firmly with three spuds.

Also known as Dipper Dredger and similar to the standard land excavator. These are hydraulically driven buckets with teeth at the leading edge, which are used to excavate a wide range of sediments. They can cut through soft materials but something like a rock. The bucket empties the dredged materials on a barge, which works in close quarters. These dredgers efficiently excavate sand, but the efficiency drops with dense and very dense materials.

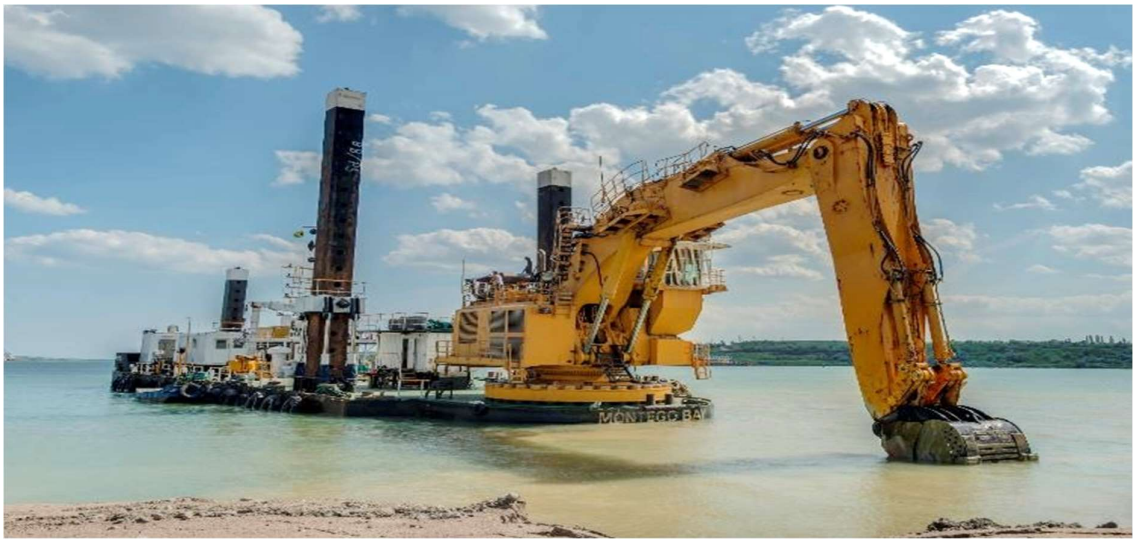

Figure 11_DSB Offshore Ltd - Backhoe Dredger with Liebherr P995 Litronic and 14.5 m³ + 11 m³ bucket excavator that can excavate on a max 19.5-meter depth.

1.3.3 Discussion of the consequences of not proceeding with the project on a "No Project Option"

Under this scenario:

- The purpose of dredging is preventing flooding hazard that could damage the farms, properties, infrastructures and more important is the threat to the lives of residents living near the river during rainy season;
- Dredging may restore the original water depths of the subject river, where decades of siltation have significantly reduced its depth;
- It aims to carry out dredging activities to create or improve waterways and to recover silt materials or sediments for beneficial use;
- The opportunity for social development of the host barangay through additional employment of qualified residents as well as livelihood projects, skills training, scholarship programs and medical assistance will be lost or will not be felt;
- In addition, the substantial increase in local taxes and revenues, multiplier effect of the project such as business opportunities, support to social services and other opportunities for the community and the Local Government Unit (LGU) will also be foregone.

However, "No Project Option" means no additional environmental impact such as siltation, disturbance of marine environment and potential oil spill from dredging vessel and equipment but the recurrence of flooding hazard will continue to affect the lives of the residents of Barangay Tabigue specially those living near the river and the coastal areas.

1.4 PROJECT COMPONENTS

The dredging operation of Boac River will start to deepened the marine area or navigational zone covering an area of approximately **17 hectares** for validation through Seismic Data and Bathymetric Measurement before opening the mouth of the river (delta) following the original contour or pattern of the river for the **6.8 hectares with net length of 500 linear meters River Dredging Zone**.

A pre-construction survey shall be jointly conducted by DPWH Technical Staff, Provincial Engineers Office representative and Dredging Contractor including their Dredging Experts to determine the actual situation of the river and the distance of riverbanks, dikes, bridges, irrigation canals as well as other infrastructures within the project area.

Kyro Builders will construct temporary dikes or gabion as retaining walls to guarantee that it will not cause damage to any infrastructure in coordination and approval of DPWH MIMAROPA and/or DPWH District

Engineering Office based on the Boac River Dredging Master Plan. During construction of the retaining walls, sand materials shall be excavated with a depth that varies from 2 meters up to 5 meters (maximum depth) on the line of dredging area. The dredging channel shall be protected by sand bagging both sides in order to prevent erosion. Sounding shall be conducted every 100 meters of the dredge channel for the calculation of volume or by drop survey of vessel. For safety of all workers and crew during typhoon season or if there are announcement of tropical depression or huge swelling to arrive at Tablas Strait / Tayabas Bay, the Engineers shall suspend the dredging activities and vessel shall automatically hide their barges, vessel and suction dredger to a safer place at Balancan Port. The DPWH Technical Staff as well as the Provincial Engineers Office representative shall monitor the conventional method and dredging operation up to 12 hours per day for 8 up to 10 months or as long as the weather permits.

The operation involves the eventual dredging of about **159,228.95 cubic meters** coming from the **River Dredging Zone** and (to be determine) **cubic meters** coming from the **Navigational Zone** of **dredged / river-run materials** (sand, gravel, pebble and other sediments) during the maximum operation based on the calculated quantity of deposits. The Cutter-Suction Dredger has a capacity of 1,000 cubic meters per hour to deal with the time and volume of river-run materials to be dredge / de-silt from the above-mentioned river due to the unpredicted weather condition nowadays. The river-run materials dredged from the river delta and lower reaches shall be discharged aboard a split hopper barge through a specialized floating discharge hose or to a sand carrier vessel and another option is via conventional loading through long-arm excavator or clamshell-type crane coming from the designated stockpile area (optional) near the shoreline of Boac River.

1.4.1 Major Components

The proposed river dredging with delta clearing project will involve the extraction of river-run materials such as sand, gravel, peebles and other sediments at Boac River.

Project components and equipment requirement for the proposed river dredging with delta clearing project will consist of the equipment listed below. The method of dredging operations to be implemented by herein proponent shall be the **Cutter-Suction Dredging Method** to be paired with **Excavator-Dozer-Loader.**

- 1 unit of Cutter-Suction Dredger (CSD) having a capacity of 1,000 cubic meters per hour;
- 1 unit of Tugboat;

- 2 units of Split Hopper Barges having a capacity of 6,000 cubic meters;
- 1 units of Long Arm Excavator with 1.5m^3 bucket capacity;
- 1 unit of 25 kVA Generator Set;
- Service pump boat for materials, supplies and personnel transfer.

Cutter-Suction Dredger – CSD:

Using the data acquired from the "bathymetric measurements, seismic profiling, marine assessment, cross-section analysis, depth sounding and geotechnical report including geologic assessment" of the subject river including the marine area as access point or navigational zone, the vessel shall be positioned in the area that a Cutter-Suction Dredger can safely and efficiently remove sand materials. The said survey, provides information as to subsurface topography of the intertidal zones, depth of water, thickness of sand profile, boulders and basement, among others.

Description and Process Operation of Cutter-Suction Dredger

The process technology includes dredging by suction, vessel loading and transporting of materials to the different locations of prospective clients. It can also be stored or stockpiled at the designated stockpile area near the proposed dredging site as presented.

The CSD to be commissioned is a specialized on-propelled vessel, equipped with 2 hydraulic spuds and anchors to move itself around the dredging area and a powerful rotating cutter head to remove all kinds of material including rock, clay, silt and sand. It is very effective when deployed in the construction and maintenance of ports, harbors and approaches, rivers and estuaries, land reclamation and coastal defenses. The proponent shall deploy the herein CSD to remove substantial volume of sand at the river mouth and reduce significantly the overly deposited river run materials. A CSD is positioned on spuds and anchor winches to ensure the vessel is firmly anchored during dredging. The cutter ladder is lowered. By pulling on the side wires, the cutter head is moved sideways, swinging around the main spud. The cutter suction dredger moves forward by means of the spud carriage.

The cut material together with a large quantity of water is drawn into the suction mouth. The sand, soil and water mixture are then transported by the dredge pump through the large discharge pipeline for further transport to the waiting or stationary hopper barge in the vicinity of the CSD. The dredging channel to be

created shall maintain the angle of repose to minimize slope failure.

Figure 12_This Cutter-Suction Dredger with ID "Damen CSD 250" will be employed initially in the project. Side View of the Damen CSD 250, showing 2 spuds to position the dredger steadily.

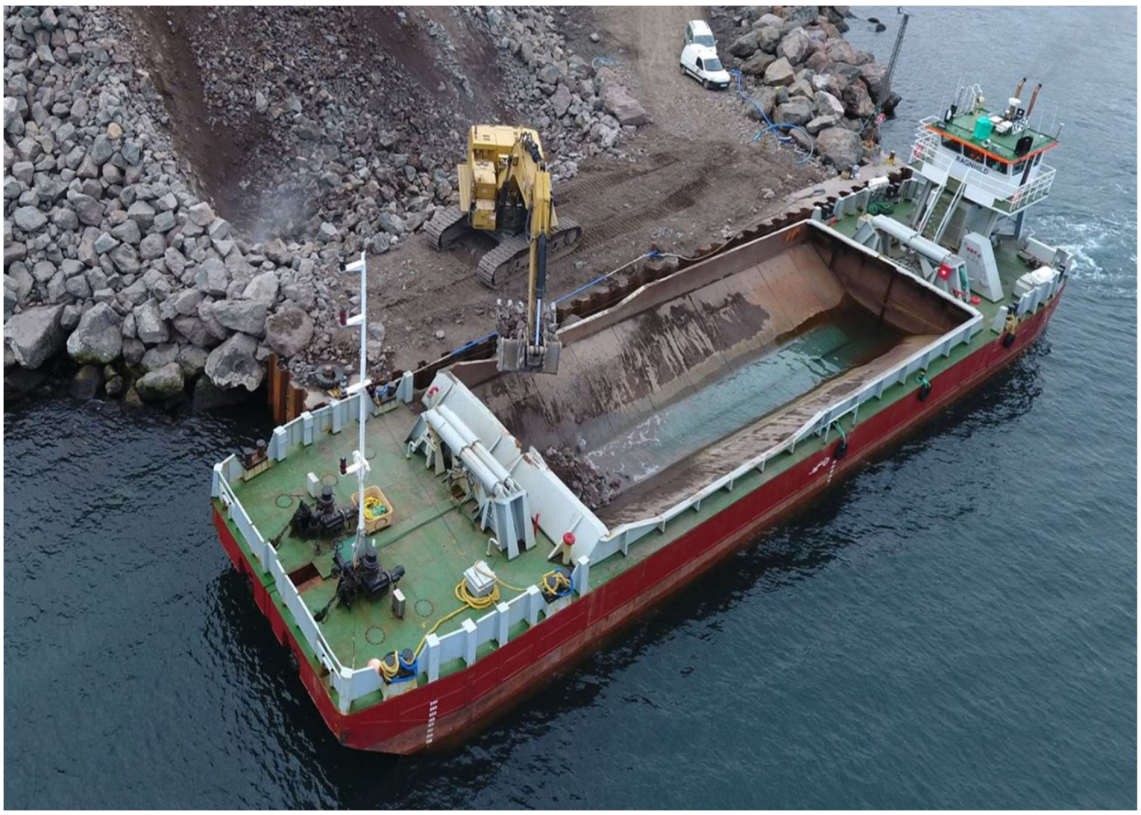

Figure 13_Typical Split Hopper Barge for reclamation projects.

Figure 14_Loading of Dredged Materials to Floating Hopper Barge.

Cutter Suction Dredger Capacity and Specification

Table 6_Damen CSD 250 Dredger Capacity & Specification

MAIN DATA	DIMENSION
Gross Tonnage	30
Length overall	19 m
Suction pipe diameter	250 mm
Discharge pipe diameter	250 mm
Swing width	20 m at maximum dredging depth
Maximum mixture capacity	1,000 cubic meter / hour
Max. dredging depth	6 m
Min. dredging depth	1 m
Anchoring system	Spud carriage
Total installed power	254kW @ 1,800 rpm
Cutter power	40 kW
Cutter diameter	950 mm
Cutter Type	Crown model (with changeable chisels)

1.4.2 Other support facilities (power/energy generating facility, water supply system)

The dredging ships and barges are fitted with rooms and amenities for use of the deck officers and crew. There are several activities for maintaining the dredging fleet in a normal and economical condition to achieve the planned dredging schedule for the project. Maintenance, inspection, provisioning, refueling and repair of the vessels will be done through a remote docking and port facilities in Tanza, Cavite or Subic Bay.

There will be a field office, material recovery facility for solid & hazardous waste, staff house, plant nursery, motor pool and other onshore facilities for the land-based equipment will be constructed on the 2-hectare leased lot located at Barangay Tabigue across the bank of Boac River (on-shore / land).

Kyro Builders will invest on a Nursery to propagate and replace immediately all plant species affected by the dredging activity like nipa tree, aroma tree and other trees / plants that are endemic to Boac River. The roots of these plants hold and secure the riverbanks from erosion and help propagate fish, crabs and other living creatures in Boac River.

Fuel Supply

The fuel consumption for project operation is expected to consume an estimated **18,000 liters of Diesel Fuel per day** for the Dredger, Barges and other heavy equipment to be sourced out from the locally available

fuel-oil supplier onshore within the project area in the Municipality of Boac and nearby municipalities. No refueling stations or tanks will be constructed at the project site.

Power Supply

Power or electricity required by dredgers and its auxiliary equipment during the dredging and filling works will be sourced on-board these sea vessels.

25kVA Diesel Generator Set will be used to power the site office and its support facility. The generator set is silent-type with insulated housing to further decrease the noise level. Option 2, the power requirement / electric supply of estimated 20kWH per day can be source from Marinduque Electric Cooperative (MARELCO) Inc.

Water Supply

Water supply, on-board the vessel will be outsourced from Local Water Vendors / Tenders for washing, laundry, bathing and cooking including potable water for drinking is estimated to consume **2 cubic meters per day.**

1.4.3 Waste Generation and Built-in Pollution Control Measures

Waste Management Systems

The working areas such as dredging area, re-handling pit and water discharge point of pumping area, docking area will be installed with silt curtain throughout the duration of the project. 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.

Locations of the Silt Curtains

The silt curtain shall be installed 500-meter radius from the vessel to control the migration of suspended silts and sediments into the waterways. It will be installed around the dredgers, as possible, and/or downstream of the shifting currents in which at least two (2) silt curtains are needed to mitigate or lessen transport of sediments.

Plate 6_Typical Silt Curtain Installation. **Source:** *Aquatic Engineering https://aquaticengineering.co.uk/difference-silt-curtain-and-turbidity-barriers/*

Plate 7_River Dredging using barge with long-arm excavator to remove the sediment with silt curtain to prevent turbidity from spreading at Allied Paper-Portage Creek-Kalamazoo River. **Source:** *Michigan Radio.org – US EPA*

Silt Curtains shall be installed around civil works in or adjacent to waterways to control the migration of suspended silt and sediment into the waterway. Turbidity curtains should be placed parallel to the direction of flow of a moving body of water to mitigate the load and strain on the system. The two layered (inner and outer layer separated at 30 meters) containment boom and silt curtain will utilize fine mesh sized material to filter fine and very fine sands to prevent transport across the block boundary. The containment boom and silt curtain will control suspended solids and turbidity in the water column generated by dredging and unloading of the dredged materials. Type II silt and turbidity curtain and containment boom will be installed at the unloading site where the water swell is up to 36 inches. The Type III silt and turbidity curtains will be used at the dredging site to keep turbidity and silt contained. The curtain extends to the bottom of the seawater so as to trap the heavier particles, which may tend to settle down the water column.

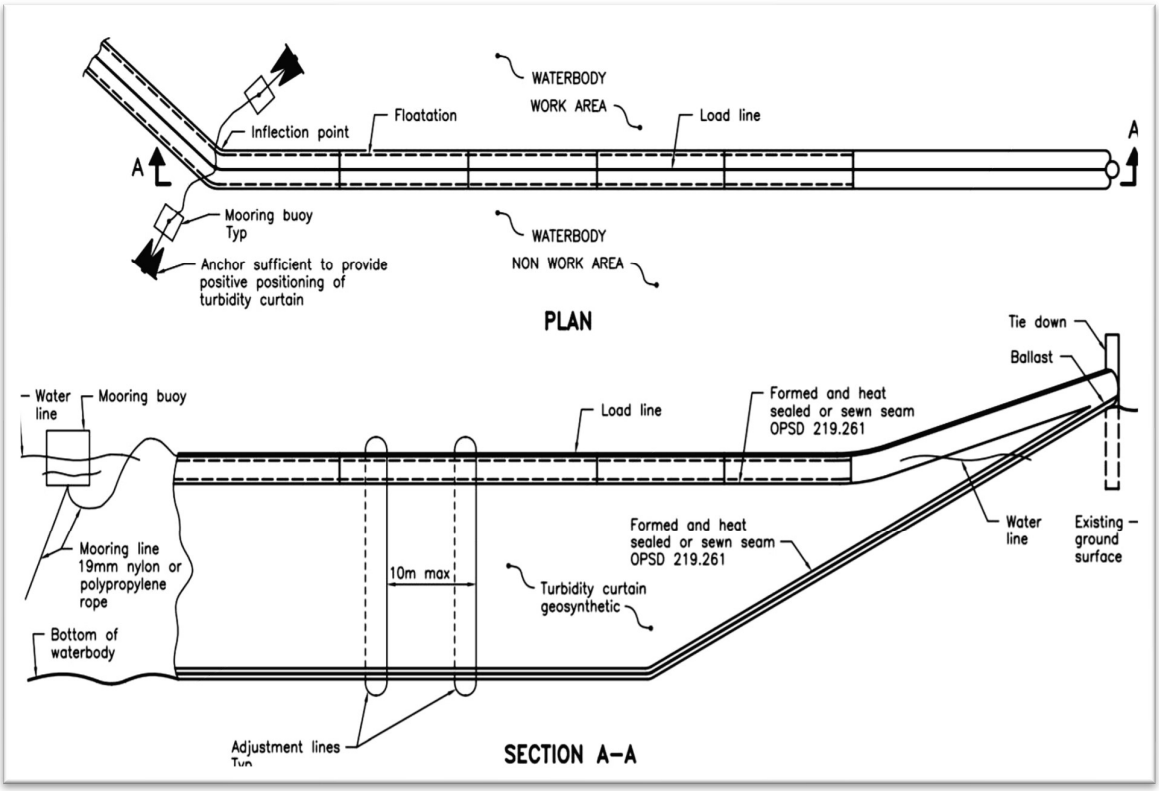

Figure 15_Cross Sectional View of a Typical Silt Curtain.

Accidental Oil Spills

The fact that the Cutter Suction Dredger and barges carries Diesel Fuel and its engine is running on oil / lubricants suggests that there are risk/s and concerns on potential oil spills.

Preventive measures consist of:

a. Assurance of sea worthiness of the vessels through:
   - Compliance with international and local (PCG) standards
   - Training of vessel crew and personnel;
   - Possession of adequate navigational aids.

b. Inspection by the PCG of the integrity of the oil storage tank in the vessel
   - Record of last inspection of the tank
   - Checking of safety instruments of the oil system e.g. valves, fittings

c. Provision for on board oil spill containment and recovery equipment
   - Oil Spill Boom
   - Approved oil spill dispersant
   - Oil recovery equipment e.g. oil pump

d. Spilled oil shall be recovered by pumping from the seawater to be stored in sealed tanks / drums for disposal onshore to a third-party accredited Treatment, Storage, and Disposal (TSD) facilities.

e. Continuous training and accreditation of the vessel crew.

Disposal of unsuitable dredged materials

The disposal of unsuitable dredged materials will be stockpile at the designated spoil site (see **Figure 16**) and/or dump at the side of the riverbank for further protection of gabions but subject for approval from government entities such as the DPWH, Municipality of Boac and the Province of Marinduque. Unsuitable dredged fill materials can also by transported offshore at the designated offshore disposal site designated by the Philippine Coast Guard (PCG) using the same dredging equipment.

Solid Waste Management

Solid Waste generated at the site office and support facility is **expected at least a total of 0.05 tons per month during its full operation phase** that includes food scraps / kitchen refuse, contaminated or waxed cardboard, plastics and/or styro (wraps or bags, utensils, straws, single-use plates, cups, stirrer) glass bottles, tin and aluminum cans, lumber, plastics, and metal scraps can be discarded as regular solid waste for disposal and to be collected by LGU Solid Waste Management Department or Private Company Garbage Collector.

A solid waste segregation scheme shall be implemented to categorize and segregate organic and inorganic substances by instituting or putting specific containers for a particular type of waste to be stored temporarily at the Material Recovery Facility (MRF) of the onshore facility. Waste minimization is the preferred approach in dealing with this material. A solid waste management system that encourages recycling

will be enforced by the Pollution Control Officer (PCO) like a color-coded garbage bins for identification of biodegradable, non-biodegradable and hazardous as well as for recycling. Reduce and discourage employees from using plastic such as utensils, straws, single-use plates, cling wrap, cups, stirrer, sando bags and expandable polystyrene a.k.a Styrofoam or Styropor packaging.

Hazardous Waste Management

Hazardous Waste are materials that are no longer useful, needed or wanted are to be considered hazardous waste.

Hazardous waste such as batteries (i.e. lead-acid batteries, rechargeable batteries (NiCad, Lithium), pesticides, mercury containing equipment, ballast and florescent lamps (Hg content). Used oil generated at the facility includes lubricating oil, hydraulic fluid, compressor oil, coolants, metal working fluid resulting from maintenance activities associated with pneumatic tools, heavy equipment, generator sets, compressors as well as vehicles. Waste from Electrical and Electronic Equipment (WEEE) such as PC, laptops, televisions, keyboards, printers, ink cartridges, telephones, typewriters, calculators, copiers, fax machines, audio equipment, air condition unit, lead-acid batteries, rechargeable batteries that can catch fire, react, or explode under certain circumstances, or that are corrosive or toxic as hazardous waste that requires special care when you dispose of them.

Consider reducing your purchase of products that contain hazardous ingredients. Use LED lights instead of Compact Fluorescent Lamp (CFL) and it will last longer. Use also LED Solar Street Lights as an alternative perimeter lighting using renewable energy. Store these identified HHW at the designated Material Recovery Facility (MRF) before its final disposal to DENR – EMB Accredited Hazardous Waste Hauler / Treater or to local businesses (recyclers, vulcanizing shops, etc.) to ensure safe management and disposal.

Contingency Plan is intended as a guide of emergency procedures in the event of fire, explosion, spill and exposure of hazardous waste. This document also intends as reference source to familiarize local emergency response agencies such as BFP, PNP, Rescue Team and Hospitals on the operations relating to hazardous materials/waste and emergency response at the facility.

Kyro Builders must secure DENR Hazardous Waste Generator (HWG) ID and only dispose the **estimated 0.15 tons per month of Hazardous Waste** to an Accredited Hauler / Transporter / Treater.

Figure 16_Satellite image showing the River Dredging Zone, Dredging Navigational Zone and **Designated Spoil Site / Area**.

1.4.4 Navigational Traffic Scheme

The herein proponent shall follow the Rule 10 of the Convention on the International Regulations for Preventing Collisions at Sea (COLREGS). The COLREGS are the rules of the road that vessels must obey at sea to avoid collisions. The proponent shall strictly follow the international navigational traffic rules, as follows:

1. A vessel using a traffic separation scheme shall: **a.)** proceed in the appropriate traffic lane in the general direction of traffic flow for that lane; **b.)** so far as practicable keep clear of a traffic separation line or separation zone; **c.)** normally join or leave a traffic lane at the termination of the lane, but when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable;

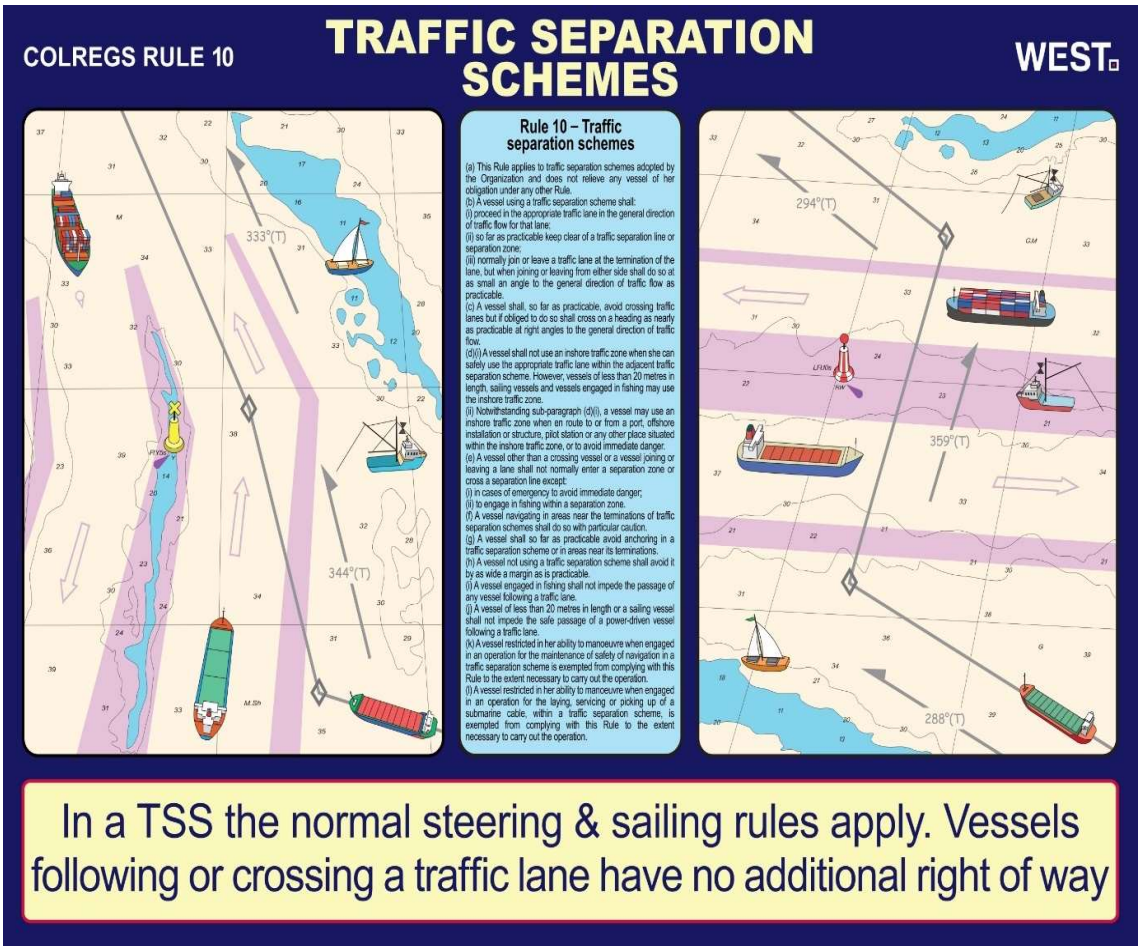

Figure 17_Schematic Form of Navigational Traffic Scheme using Rule 10.

2. A vessel shall, so far as practicable, avoid crossing traffic lanes but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow;

3. A vessel other than a crossing vessel or a vessel joining or leaving a lane shall not normally enter a separation zone or cross a separation line except: in cases of emergency to avoid immediate danger and to engage in fishing within a separation zone;
4. A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution;
5. A vessel shall so far as practicable avoid anchoring in a traffic separation scheme or in areas near its terminations; and
6. A vessel not using a traffic separation scheme shall avoid it by as wide a margin as is practicable.
7. The Philippine Coast Guard (PCG), Philippine Port Authority (PPA) and Maritime Industry Authority (MARINA) will issue an approved Navigational Traffic Scheme for the project before its operation.

Plate 8_Dozen of Bulk Carriers in Claver, Surigao Del Norte were simultaneously loaded with Nickel Ore following Rule No. 10, the COLREGS, Navigational Traffic Scheme.

1.4.5 Operations and Maintenance

The periodic regular maintenance of vessels will be once a year which will be done in a dry dock. When this happens, another vessel will replace the operations of the one for maintenance to continue the dredging operations.

During the dredging activity, all equipment, vessel and machine shall be maintained on a regular basis depending on the specification of each equipment following the manual of operation. The equipment shall be

operated by a well-trained personnel and crew as the inspection requires the sufficient knowledge of mechanical equipment and its function. Establish a system of regular preventative inspection.

As inspection items and intervals are generally recommended by the manufacturer of engine or equipment, inspection works should follow these instructions:

- Sound and visual check for noise and vibration of dredger ship;
- Visual check of damage and wear of cutterhead, blade and tip;
- Visual check of suction head;
- Sound and visual check of dredge pump;
- Sound and visual check for damage and deformation of spuds;
- Quantity, pressure and temperature of lubricating oil
- Quantity, pressure and temperature of cooling water
- Quantity of fuel oil
- Exhaust gas temperature
- Leakage of oil or water
- Filter

1.5 PROJECT SIZE

Boac River Dredging Project will cover a total area of **6.8 hectares with a length of 500 linear meters of RDZ** to include the **Navigational Zone** at marine area (tenurial instrument to create an opening for river mouth) of approximately **17 hectares** situated that will start from the mouth of the river (delta) up to the lower reaches having a bottom width **100 meters Slope 1V:6H** with average depth of **2 – 3 meters (Design Depth is 4 meters)** situated at Barangay Tabigue within the Municipality of Boac in the Province of Marinduque based on the approved **DPWH Dredging Master Plan**.

The data generated during the course of the various stages of the exploration, specifically the high-resolution seismic reflection profiling, bathymetric measurements, subsurface geotechnical investigation and geological sampling through drilling were all considered in the estimation of the resource.

Based on the **Final Geotechnical Evaluation Report** conducted by AM Geoconsult & Associate, Inc. last August 2022 and **Hydrologic Modeling & Technical Analysis Report** conducted by Philearth Consultancy, Inc. last October 2022 attached as **Annex D & E,** respectively for Boac River suggests that the subject river is continuing in the deposition of sediments from its mountain sources, subbasin and watershed having a **total volume estimate of 159,228.95 cubic meters** of combined sand, gravel, pebble and other sediments as reflected on the **approved DPWH Dredging Master Plan**.

Dredging Operations are needed and mostly situated in areas with very high siltation or sediment accumulation, affecting its surroundings

negatively. Such is the case in the river delta Boac River which us an outlet of a large watershed. This proposed dredging project, by virtue of removing impeding sediments along the mouth, increases the river's capacity to convey flood waters downstream. The flood inundation of the river is also expected to be reduced not only in the surroundings of the dredging site, but also upstream.

Based on the study conducted, whose main objective is to assess the possible hydraulic impacts of the proposed dredging project along the Boac River, the following are the summarized main findings obtained:

1. The simulated peak discharges at the outlet of the Boac River watershed corresponding to the 50-yr and 100-yr floods are 1,980 m^3/s and 2,350 m^3/s, respectively. With the effect of climate change using a 12% increase of rainfall intensity, the computed 50-yr and 100-yr discharges are 2,346 m3/s and 2,760 m^3/s, respectively.
2. Based on the results of the hydraulic analysis, the proposed dredging project reduces the simulated flood water levels up to about 2 meters along the 500-m length of the proposed dredged river for the 50-yr and 100-yr floods. The impact of the flood water level reduction is apparent up to Sta 1+500. For the 100-yr flood with climate change scenario, an increase in water level is observed and the impact of flood water level reduction due to the proposed dredged river is observed up to Sta 1+600.
3. Sediment transport analysis shows that, at design flood scenarios, scouring will occur at the immediate upstream of the dredged river and the scoured sediments will migrate and be deposited downstream. Similar trend is also observed for the with climate change scenario. Estimated depth of maximum scouring for the scenario "with" dredging project is 1.01 m at the Sta 0+540 for the 100-yr flood.
4. Estimated range of scouring for the existing dikes along the river is in the order of 1m for the 100-yr design flood with climate change scenario.
5. The proposed dredging project will not have direct effect on the water level and scouring at the new bridge located at Sta 2+260 – Sta 2+360.
6. The computed maximum velocity within the project limits is 5.43 m/s. For conservative analysis, the recommended design velocity is 6 m/s.
7. Slope stability analysis shows that the existing and the dredged geometries of the river sections pass the criteria set for all load conditions and suggest that the river sections will be stable under any of these conditions. Additionally, the critical load condition is observed for load condition 4: ordinary water level with a strong earthquake as resulting factors of safety greater but close to 1.00.
8. Settlement analysis shows that approximately 24 mm of immediate settlement can be observed during the training works in site assuming the load conditions cited in this study.

The volume to be excavated in the navigational zone to be able penetrate the river mouth of Boac River will be determined based on the Report on the Seismic Reflection Profiling and Bathymetric Measurements will be added to the total estimated volume of the proposed Rehabilitation / Improvement of Riverbed and Navigational Sea Channel of Boac River to conducted later on by a third-party Consultants and/or Experts.

1.6 DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING TIMEFRAMES

1.6.1 Pre-Construction / Construction Phase

Prior to the implementation of the project, conduct of significant studies are being done. These include preliminary design, detailed engineering study, impact study to include geohazard identification and environmental impacts assessments. All the necessary information, plans, and designs will be gathered and prepared relative to the requirements and in compliance with the existing laws and regulations applicable to the project. Jurisdiction over the project site, clearances, permits and all other administrative requirements of concerned agencies will also be completed.

The proponent is in the process of securing the necessary permits, certifications and licenses from the government agencies concerned such as the DPWH, PPA-Marina, PCG, BFAR / MAO, MGB, LGU, Provincial Government of Marinduque, among others. The herein proponent is requesting the EMB MIMAROPA for the Environmental Compliance Certificate (ECC).

There will be a field office, material recovery facility for solid & hazardous waste, staff house, plant nursery, motor pool and other onshore facilities for the land-based equipment will be constructed on the 2-hectare leased lot located at Barangay Tabigue across the bank of Boac River (on-shore / land).

During the pre-construction phase the following activities are to be undertaken:

- Conducted a high-resolution seismic reflection profiling, bathymetric measurements, marine assessment and geological sampling through drilling was all considered in the estimation of the resource;
- Topographic and Boundary Survey based on the area designated by the DPWH;
- Site Investigation for possible causeway or port construction;
- Gathering of pertinent data from LGU;
- Procurement of vehicles and equipment;

- Call for tender of bids for the purpose of selecting qualified bidders as service providers for the dredging project;

A quality assurance / quality control program during construction and commissioning ensures that equipment is purchased or leased and built according to the design requirements, while meeting all applicable legal and technical standards and codes. The dredging project is recommended to have a quality assurance / quality control program in place to prevent equipment failures that could result from:

- Use of faulty parts / materials due to improper delivery controls;
- Improper fabrication, installation, or repair methods.

The operator's manual should provide guidance and mechanisms to assure that appropriately qualified and trained personnel are used for specified vessel and piping fabrication and for installing safety critical equipment and instrumentation.

Hazard management during construction and commissioning of dredging project should have a procedure in place during the construction and the commissioning of the seabed quarry. Typically, risk assessments as described in the above section on Safety Report / Declaration also apply during the Operations Phase. Pre-Start-up Safety Reviews are often being used during commissioning.

1.6.2 Operation Phase – DREDGING

Project operation will commence about 3 months after acquisition of the ECC from EMB, Dredging Clearance from DPWH, NTP from the Province of Marinduque, Certificate of Accreditation & Ore Transport Permit from MGB and commencement of site preparation works.

The dredging operation will involve simple, straightforward dredging and haul-out of dredged materials. This process will be repetitive until the desired river bed elevation based on the approved DPWH Dredging Master Plan is attained. It is important to mention that dredging in itself is a mitigating process to address the perennial and increasing flooding problem in Boac River.

The dredging process will be implemented using heavy equipment such as a Cutter-Suction Dredger to initially break up a small channel at the river mouth to the silting / catchment basin and to remove the deposits at the dredging channel in and the river mouth. Going upstream to non-navigable portions, the long-arm excavator with 1.5 m^3 capacity bucket, wheel loader and dump truck shall be used in dredging. The cargo barge hauls the dredged material to the designated and permitted disposal site/s.

Figure 18_Operation using Cutter-Suction Dredger and immediately transfer to the floating hopper barges and/or sand carrier vessel.

The dredging operation is intended to remove substantial volume of river materials to ease and reduce the swelling of the river that threatens or could again damage the properties and farms within the vicinity. **Kyro Builders** will initially dredge and remove the silt at the navigational zone to open up the river mouth and to be increased gradually upon full understanding of the dynamics of the river run materials. The activity will be properly coordinated with the concerned government agencies to ensure that the objective of solving the drainage and flooding problems in the municipality will be attained.

The dredging methods to be employed are the Cutter-Suction Dredger from the navigational zone, river mouth and lower reaches and if necessary, Long Arm Excavator-Loader-Dump Truck will be utilized at some portion of the lower reaches of Boac River where the function of CSD will not be applicable to be filled or loaded to barges and/or sand carrier vessel that are on standby that take turns to be filled with the dredged materials for disposition to prospective clients in different locations.

The dredging operation shall be undertaken using:

- Cutter-Suction Dredger (CSD) having a capacity of 1,000 cubic meters per hour
- Split and/or Floating Hopper Barges
- Long Arm Excavator with 1.5m^3 bucket capacity
- Tug Boat
- 25kVA Generator Set

Upon issuance of the ECC and other permits and clearances, the dredging site shall now be developed based on the dredging plan approved by the DPWH, as follows:

1. Construction of Site Office on a container van;
2. Perimeter boundary survey covering the 6.8-hectare with length of 500 linear meter river dredging zone;
3. Development of "dredging lakes" as source of sand to be extracted using long-arm excavator. The said lake measures around 30-45 meters in diameter. Additional dredging lakes shall be added progressively.
4. Development of the stockpile area (if necessary);
5. Installation of safety signs and lighting fixtures;
6. Installation of buoys and lighted markers on the 17-hectare navigational zone;
7. Development of temporary earthen ramp to cross the nearby riverbanks;
8. An option to construct causeway or port to load the sand materials;

9. An option to install a 1000-ton per hour trestle conveyor loading facility designed to allow sand material-shipment in most weather conditions; and
10. To mobilize the required equipment together with the necessary personnel and materials to jumpstart the project.

The herein proponent shall require all personnel involved in the development and operation to implement and install safety measures such as radio communication equipment, visible safety signs, well-lighted working areas, emergency clinic and the wearing of Personal Protective Equipment (PPE's) among others.

The CSD will be anchored at pre-designated points based on the dredging master plan and will be moved to the next location once the desired volume of dredged materials has been extracted.

The 159,288.95 cubic meters of dredged materials more or less to be extracted from Boac River will be directly transported and use to government infrastructure projects of **Kyro Builders** and other government priority projects such as reclamations, bridges, ports and more roads. Reclamation in Pasay, Navotas and Cavite are other possible destination of the dredged materials coming from Boac River in exchange for the services in rehabilation and deepening of the subject river at no cost to the government.

Kyro Builders intended to dredge navigational zone and the river dredging zone for over a period of 5-months based on the approved DPWH Dredging Master Plan but depending on the situation and replenishment rate of Boac River.

1.6.3 Abandonment Phase

The decommissioning and abandonment plan has its focus on protecting public health and safety, improving or eliminating environmental damage and liabilities, and allowing the land use to be similar to its original use or an acceptable alternative. The decommissioning plan shall be executable at any time throughout the lifetime of the dredging activity. This plan shall also take into account environmental rehabilitation. Environmental rehabilitation shall include the removal of all surface facilities and dredging equipment at Boac River River and Tablas Strait / Tayabas Bay.

The formulation of the detailed decommissioning plan will be done by the proponent within the specified timeframe as part of the post-ECC requirement. It will be submitted for approval to the EMB MIMAROPA, IAC and all other concerned government agencies on the activities such as Environmental Site Assessment to determine contaminants left

by the operation, method and equipment to be used for dismantling of structures, clean-up or remediation plan and demobilization scheme before proceeding.

The proponent shall conduct sub-bottom profiling and bathymetry, post coastal marine assessment, freshwater sampling and marine sampling prior to permanent cessation of the dredging area. Equipment, structures and other facilities will be assessed regularly for the project to continue its operation beyond its lifespan. For purposes of compliance to ECC conditions, a detailed Abandonment Plan shall also be undertaken by the herein proponent for submission and approval of EMB at least six (6) months before the scheduled abandonment.

1.7 MANPOWER REQUIREMENTS

Scheme for sourcing locally from the host and the neighboring LGU. As much as possible, the sourcing of manpower shall give due priority to the locals for as long as there are qualified candidates. It is noted, however, that this is highly dependent on the skills requirement for operation. It is understood that 30% of the workers are considered Core Group where skills and expertise are necessary. For the other manpower requirement where less specialized skills are required, the Contractor shall coordinate with the Municipality of Boac including Barangay Tabigue as well as the neighboring barangays in the Municipality of Boac in respect to hiring of eligible locals.

Kyro Builders will take responsibility not only to ensure efficient work but also safety. It will inform the Municipality regarding the manpower requirements indicating therein the job description, required previous experience, health and medical information, as well as physical condition of job applicants, e.g. if with disabilities. It will make preliminary evaluation and short list the applicants and thereafter submit the candidates shortlisted to the Management / Human Resource for its final hiring decision. In all cases, qualified applicants who are from the host LGU will be given preference.

Policies on the hiring of men and women and on PWD and age will be dictated by the safety requirements of working in sea vessels and operating heavy equipment as well as the technical training required for the personnel. The payment of statutory benefits of workers will be in accordance with the company's policy but shall observe Philippine Labor Laws, particularly of the DOLE.

Table 7_Manpower Requirement

POSITION / PERSONNEL	REQUIREMENT PER SKILL
Operation / Project Manager	1
Captain / Dredger Operator	3
Dredging Ship Crew	18
Geologist / Engineer	1

Community Relations Officer	1
Safety & Pollution Control Officer	1
Mechanic & Welder	2
Clerk / Checker	1
Logistics / Driver Liaison	1
Heavy Equipment Driver / Operator	2
Driver's Aide / Pahenante	2
Security Guards (on Contract)	2
Total	**35**

1.8 INDICATIVE PROJECT INVESTMENT COST

The indicative project cost for the REHABILITATION / IMPROVEMENT OF RIVERBED AND NAVIGATIONAL SEA CHANNEL OF BOAC RIVER PROJECT is estimated at **ONE HUNDRED SEVENTY-TWO MILLION SEVEN HUNDRED SEVENTY THOUSAND (PhP172,770,000) PESOS**. A summary of the capital cost is shown on the table below.

Table 8_Breakdown of initial expenditures / capital cost

DESCRIPTION	ESTIMATED COST (PHP)
Cutter-Suction Dredger (CSD) and Auxiliary Equipment	73,100,000
Silt Curtain	1,500,000
Barge	7,200,000
Tug boat	8,300,000
Land-based Heavy Equipment	6,300,000
Service vehicles	2,900,000
Land Acquisition – Field Office	3,500,000
Tower Light	470,000
Contingency (10% of equipment and facilities)	10,327,000
Operating Cost	12,000,000
Total	**115,270,000**
Permitting	12,500,000
Social Development Plan	TBD
Safety and Health Program	TBD
Local Taxes (OTP, Quarry Tax, Excise Tax Business Permit, etc.)	45,000,000