# MINERAL RESOURCE VALIDATION REPORT FOR THE EVALUATION OF DECLARATION OF MINING PROJECT FEASIBILITY OF JDVC RESOURCES CORPORATION's OFFSHORE MAGNETITE SAND MINING PROJECT COVERED BY MINERAL PRODUCTION SHARING AGREEMENT DENOMINATED AS MPSA No. 338-2010-II-OMR

Offshore areas of the Municipalities of Sanchez Mira, Pamplona, Abulug, Ballesteros, Aparri, Buguey and Gonzaga, Cagayan Province

Lands Geological Survey Division
Economic Geology Section

July 2018

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## EXECUTIVE SUMMARY

The mineral resource validation of JDVC Resources Corporation's (*JDVCRC's*) Offshore Magnetite Mining Project in the Offshore areas of the Municipalities of Sanchez Mira, Pamplona, Abulug, Ballesteros, Aparri, Buguey and Gonzaga, Cagayan Province was conducted by the technical personnel of the Lands Geological Survey Division, Mines and Geosciences Bureau Central Office (MGB-CO) from June 13 to 17, 2018, upon the request of **Mr. Napoleon M. De Leon Jr.-**President of JDVCRC. The field validation team composed of Resty C. Gomez, Senior Science Research Specialist-Team Leader; Karla Anne M, Navarro, Geologist II, Cerilo V. Samuya and Mario V. Asis, both Geologic Aides of the Lands Geological Survey Division.

The purpose of the request is to conduct field validation of the declared mineral resource within the explored portion of the mineral property covered by Mineral Production Sharing Agreement denominated as MPSA No. 338-2010-II-OMR, which is the subject of Declaration of Mining Project Feasibility (DMPF) application of JDVCRC. As provided for in Chapter XXVII, Section 252(f) of the Consolidated Department Administrative Order No. 9210356, the verification fee was paid for by JDVCRC under Official Receipt No. 9086364 dated June 08, 2018 in the amount of Fifty Thousand Pesos Only (PhP 50,000.00).

The JDVCRC Final Exploration Report dated April, 2015 was prepared and signed by **Mr. Rafael R. Liwanag**, a Philippine Mineral Reporting Code (PMRC) accredited Competent Person (CP) for Reporting Exploration Results with PMRC Registration No. 08-03-02. The JDVCRC Final Exploration Report is compliant with Philippine Mineral Reporting Code (PMRC) of 2007 guidelines and Department of Environment and Natural Resources (DENR) Administrative Order (DAO) No. 2010-09. The estimated mineral resources declared by JDVCRC were computed based on the data obtained from the drilling exploration works conducted at cut-off date July 31, 2015 exploration period.

The undersigned MGB personnel validated the acceptability of the declared mineral resources of JDVCRC through: 1) Confirmation of deposit/mineralization type in the project site and collection of check samples for variance and statistics study; 2) In-situ assessment and quality acceptability of the mining contractor's existing set up of analytical laboratory for sampling, assaying, and handling of assay results; 3) confirmation of parameters used in the resource estimation and resource models; and 4) gathering of basic exploration data and validating the integrity of database.

The deposit type in the JDVCRC MPSA area is an Iron Ore that can be classified Titano-Magnetite sand offshore deposit. The sand is being transported materials from the weathering of volcanic rocks, intrusive rocks and sedimentary derivatives of the older rocks of Abuan and Dibuluan Formations from the hinterlands. The sand and the contained titano-magnetite being the most resistant materials transported by rivers and creeks to the seas and re-worked by long shore current.

The sediment built-up in the MPSA area is influenced by the supply of sediments coming from the Cagayan River and the Kuroshio. The Kuroshio Current is a northward flowing ocean current induced by West Pacific Current in the North Pacific Ocean and intrudes into the West Philippine Sea and South China Sea through the Luzon Strait. The Kuroshio Current flows from the east coast of Luzon through Taiwan and thence to Japan. The effects of the northeast monsoon cause the deflection of the Kuroshio Current towards the deeper portion of the Babuyan Channel. The Kuroshio Current contributes significantly to the dispersal pattern and accumulation of sediments in the Babuyan Channel including the delta built-up in northeast of Appari.

The mineral resource estimate conducted by MGB made use of the drillhole database of JDVCRC; the integrity of the database was checked by MGB technical personnel as well as the number of drillholes used for rendering and consequent computations. The mineral resource estimation included geostatistical analysis, rendering of geological domains/solids and block modelling using GEMS software v6.8.

A total of 10 drillholes and 28 sample intervals were used for the resource estimate at cut-off grade of 5%MF (Magnetite Fraction). The histogram for the MF shows that the samples are distributed along 5%MF. The procedure of the mineral resource estimation by MGB included basic statistical analysis, geological modelling and volumetrics and tonnage calculations. The construction of the polygons signifying the area of influence of each drillhole was done using SURPAC v6.8.1. Statistical analysis, geological modelling and resource computations were done using GEMS v6.8.1. A bulk density of 1.69 dmt/$m^3$ was used in the tonnage calculation, which was also the same density used by JDVCRC.

After MGB field validation and manipulation of the JDVCRC drillholes used in the resource estimation, the undersigned estimated a grand total raw offshore magnetite sand resource of **512,971,918.94** DMT with weighted average grade of **26.51%MF**. The cut-off grade of 5%MF came out to be the most economical cut-off considering the trade-offs in the reduction in mining and processing cost over the decrease in concentrates expected to be produced. Furthermore, it can be observed in the histogram that a small size of the sample has a very low grade (MF < 5%). Thus, it was deemed necessary to set a cut-off grade of 5%

The overall resource estimate of MGB is lesser by 93,486,053.58 DMT than that of JDVCRC's declared total resource estimate of 606,457,972.52 DMT due to the different softwares used in the construction of the polygons and determination of the area. The difference between the estimates can also be accounted to different cut-off grades and % recovery used. While the JDVC did not set any cut-off grades and % recovery, MGB used a 5%MF cut-off grade and 90% recovery. Overall, the Measured mineral resource estimates of MGB is lower by 93,486,053.58 MT with grade difference of 1.04 % MF.

Based on the Amended Feasibility Study (FS) of JDVCRC, the **initial projected** 10-year production schedule is set at an annual extraction rate of 6.91 million DMT. In consideration of the estimated grand total offshore raw magnetite sand resource of **512,971,918.94 DMT** classified as Measured category at cut-off grade of 5% MF with weighted average grade of 26.51%MF, the projected mine life is **more than 25 years** and stands sufficient to support JDVCRC's Offshore Magnetite Sand Project, with good potential for additional measured and/or indicated resource that will be blocked by in-fill drilling program with inferred resource of 177.80 million DMT at 49.68%MF.

In view of the foregoing discussions, it is hereby concluded that the Declaration of Mineral Resource Estimate of JDVC Resources Corporation's Offshore Magnetite Project under MPSA No. 338-2010-II-OMR, Cagayan Province is acceptable and compliant to the Philippine Mineral Reporting Code (PMRC) of 2007 and guidelines of the Department of Environment and Natural Resources (DENR) Administrative Order (DAO) No. 2010-09.

## 1.0 INTRODUCTION

The mineral resource validation of JDVC Resources Corporation's (*JDVCRC's*) Offshore Magnetite Mining Project in the Offshore areas of the Municipalities of Sanchez Mira, Pamplona, Abulug, Ballesteros, Province of Aparri, and Buguey and Gonzaga, Cagayan Province was conducted by the technical personnel of the Lands Geological Survey Division, Mines and Geosciences Bureau Central Office (MGB-CO) from June 13 to 17, 2018, upon the request of **Mr. Napoleon M. De Leon Jr.-** President of JDVCRC. The field validation team composed of Resty C. Gomez, Senior Science Research Specialist-Team Leader; Karla Anne M, Navarro, Geologist II, Cerilo V. Samuya and Mario V. Asis, both Geologic Aides of the Lands Geological Survey Division. As provided for in Chapter XXVII, Section 252(f) of the Consolidated Department Administrative Order No. 9210356, the verification fee was paid for by JDVCRC under Official Receipt No. 9086364 dated June 08, 2018 in the amount of Fifty Thousand Pesos Only (PhP 50,000.00).

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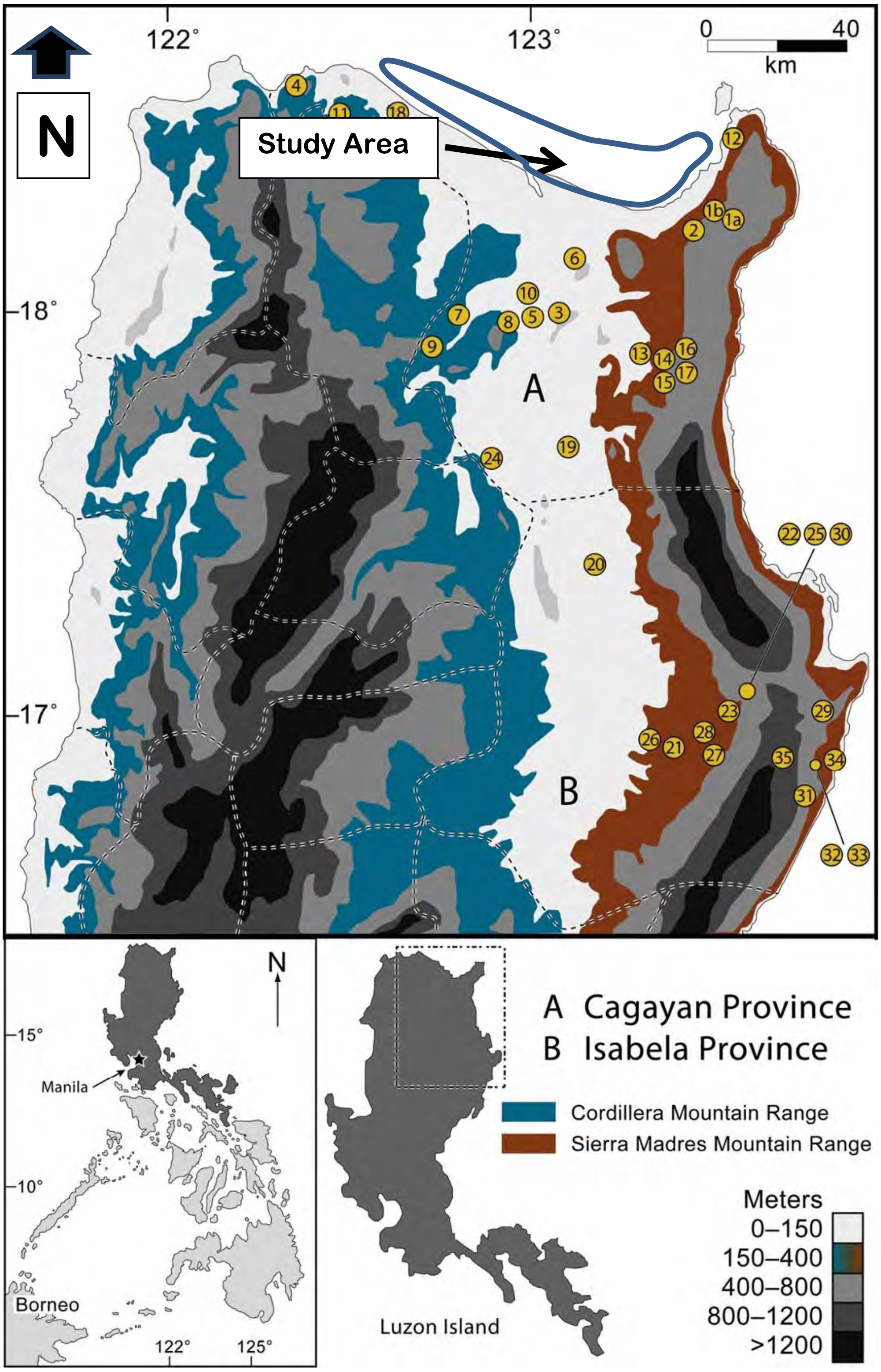
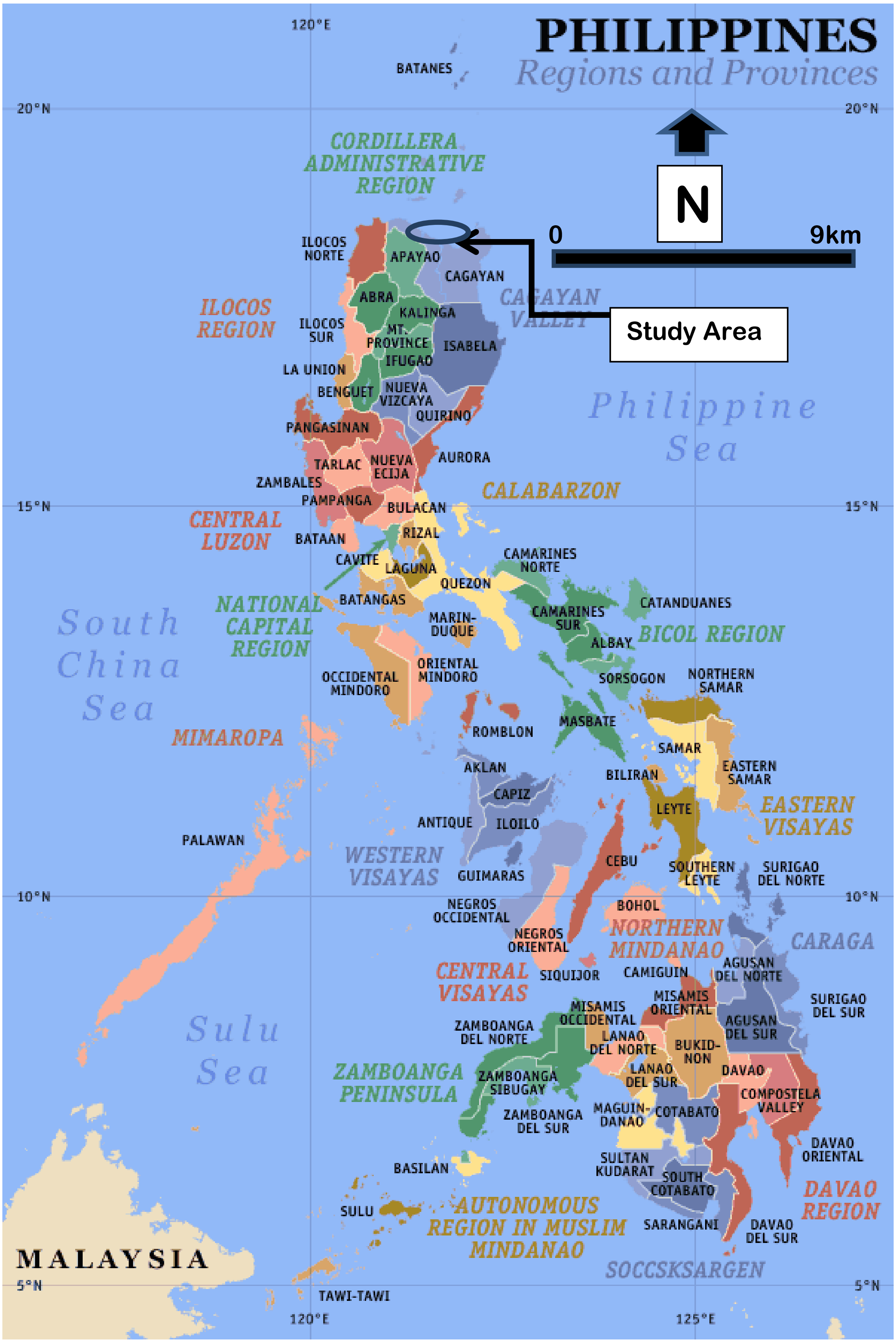



*Source: Incept Holdings Limited*

**Figure 1a.** General Location Map of the Study Area




Source:Mapsof.net

**Figure 1b.** Regional Location Map showing the Study Area

# 2.0 GEOGRAPHICAL FEATURES

## 2.1 Location and Accessibility

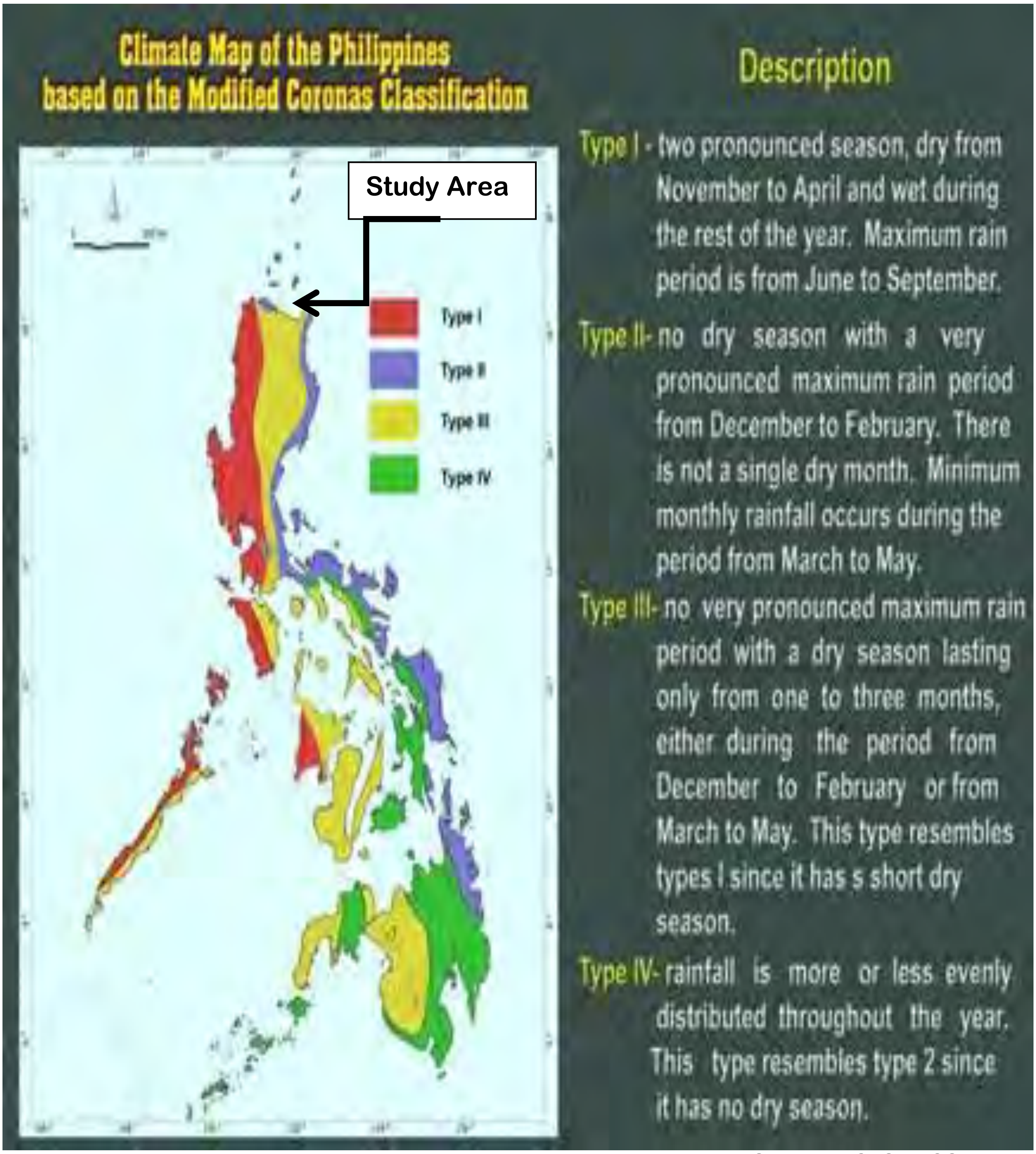
The Offshore Magnetite Mining Project of JDVC is located in the municipal waters of Sanchez Mira, Pamplona, Abulug, Ballesteros, Aparri, Buguey and Gonzaga, all in the province of Cagayan (***Figure 1a and b***). Cagayan lies in the northeastern part of mainland Luzon, approximately 17° 30' north and 121° 15' east, occupying the lower basin of the Cagayan River. Tuguegarao (now a component city), its capital is 483 kilometers north of Manila, about one hour by air travel, and ten hours by land, through the Maharlika Highway, also known as the Cagayan Valley Road--Region 02's trunkline road--which runs parallel to the Cagayan River.

The project site is easily accessible via domestic flights from Manila to Tuguegarao City, the capital of Cagayan province, taking about one hour, followed by a 3-hour drive north via Pan-Philippine Highway to Sta. Ana Port, Cagayan. From Sta. Ana Port, the tenement area is located about 14 kilometers off and parallel to the coast of the said coastal municipalities and can be reached by 2-hour ride by pump boat.

## 2.2 Climate and Vegetation

The project area belongs to Type III climate under the Modified Coronas Classification of the Philippine Climate System (***Figure 2***). This climate type has no pronounced maximum rain period, with a short dry season lasting only from one to three months, either during the period from December to February or from March to May. This climate type resembles Type I since it has short fry season. The average annual temperature is 29.0 °C while the average annual rainfall is 1196.6 mm. The least amount of rainfall occurs in March with an average of 25.2 mm. The greatest amount of precipitation occurs in October, with an average of 167 mm. The temperatures are highest on average in June, at around 30 °C. The lowest average temperatures in the year occur in January, when it is around 23 °C.

The elevated areas in the locality are forested, given the high precipitation over the region's Type II Philippine's tropical weather. The lower lands are agricultural and are mainly planted with rice, corn and tobacco.




*Source: PAGASA-DOST*

**Figure 2.** Climate Map of the Philippines

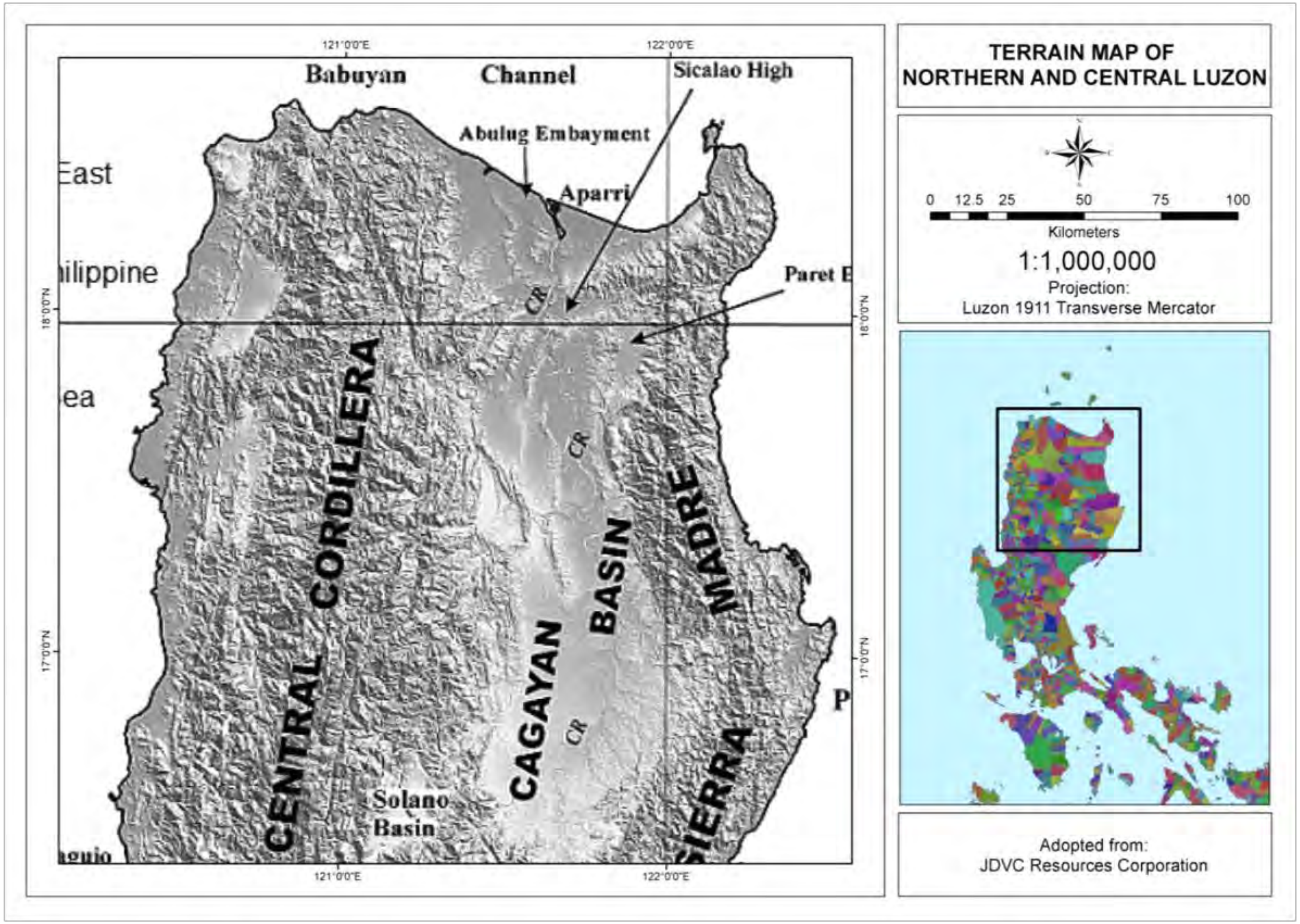
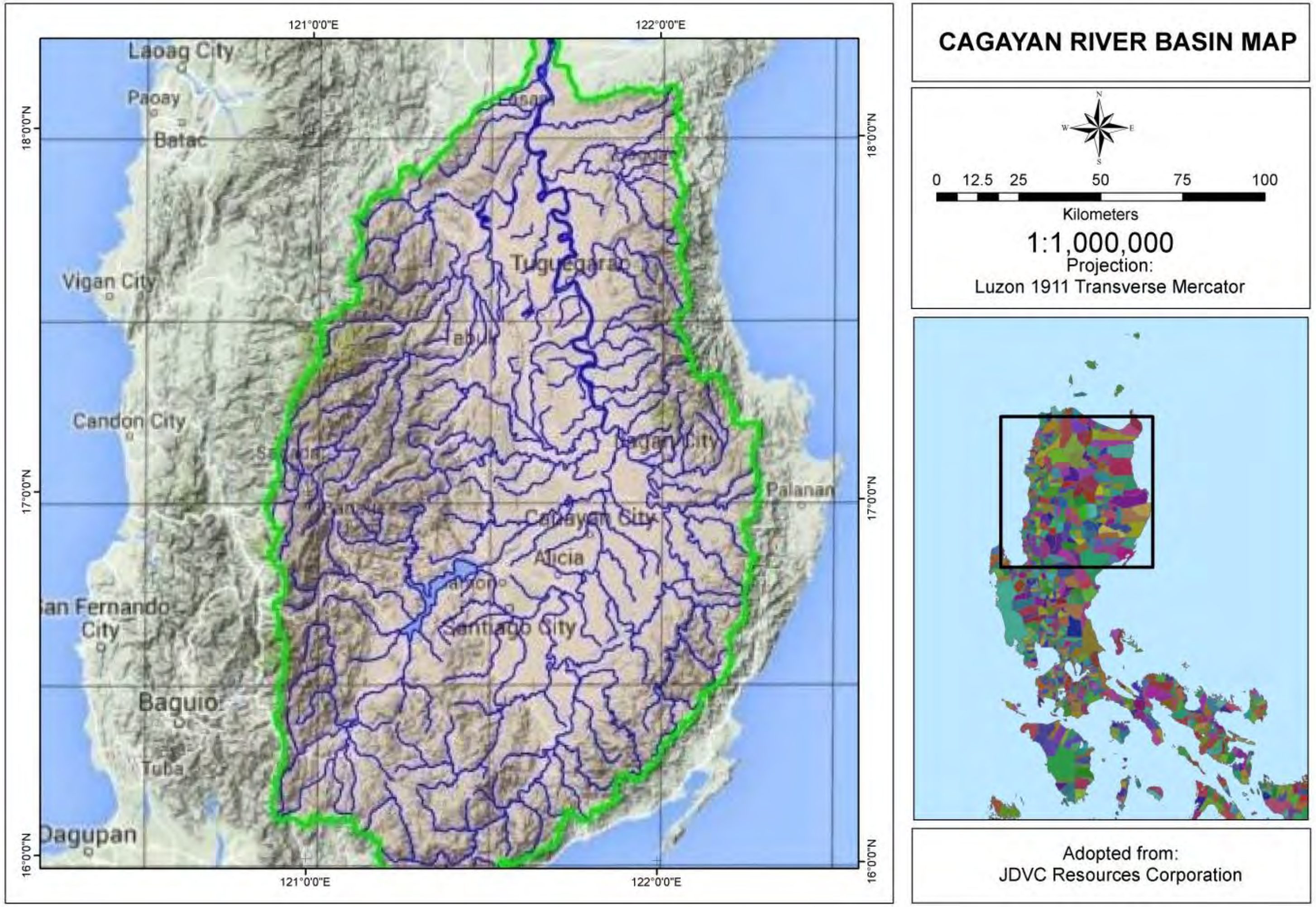



**Figure 3.** Digital Terrain Model Map of Cagayan Valley

**Figure 4.** Drainage Map of Cagayan Valley



## 2.3 Topography and Drainage

### 2.3.1 Topography

Of its total land area, 28.19% or 253,831 hectares are flat to nearly level land. This consists of alluvial plains, river deltas, low wetlands, mangroves, and beaches. Most of these are found contiguous to the bodies of water, especially along the Cagayan, Pared, Dummun, Pinacanauan, Abulug, and Chico Rivers (***Figure 3***). These areas are planted to rice and corn, subjected to frequent floods during the wet season.

The gentle and moderate slopes of the province, which constitute 6.08% and 13.48%, respectively of the total land area of the province are mostly contiguous to the level land, enclosing the plains of the meandering rivers and creeks. This arrangement forms the various dales or valleys found in between the hills of the province.

Majority of the rolling land to moderately steep areas which account for 17.07% of the province's total area are found at the foothills of the Sierra Madre and Cordillera mountains, separating the valleys and the mighty ranges.

Steep and very steep land which constitute 10.44% and 24.73%, respectively, of the total land area, or 94,030 hectares and 222,595 hectares, respectively, are found along the Cordilleras, in some parts of Sta. Praxedes, Claveria, Sanchez Mira, Pamplona, Lasam, Sto. Niño, and Rizal; and in the eastern parts of Santa Ana, Gonzaga, Lal-lo, Gattaran, Baggao and Peñablanca, as the northern mountains of the Sierra Madre range.

The Babuyan group of islands, which include the islands of Calayan, Babuyan, Dalupiri, Balintang and Camiguin, has a mixture of flat to nearly level land, and steep to very steep slopes. These islands have extensive coral reefs. There are two volcanoes in the Babuyan Islands: Mount Didicas off Camiguin Island, which has a symmetrical cinder cone, about

215 meters above sea level, and Mount Pangasun in Babuyan Island, which is about 840 meters above sea level and has two craters.

### 2.3.2 Drainage

The Cagayan River, also known as the Rio Grande de Cagayan, is the longest river in the Philippines and the largest river by discharge volume of water (followed by Rio Grande de Mindanao). It has a total length of approximately 350 kilometers and a drainage basin covering 27,753 square kilometres. It is located in the Cagayan Valley region in northeastern part of Luzon Island and traverses the provinces of Nueva Vizcaya, Quirino, Isabela and Cagayan (***Figure 4***). The estimated annual discharge is 53,943 million cubic meters with a groundwater reserve of 47,895 million cubic meters.

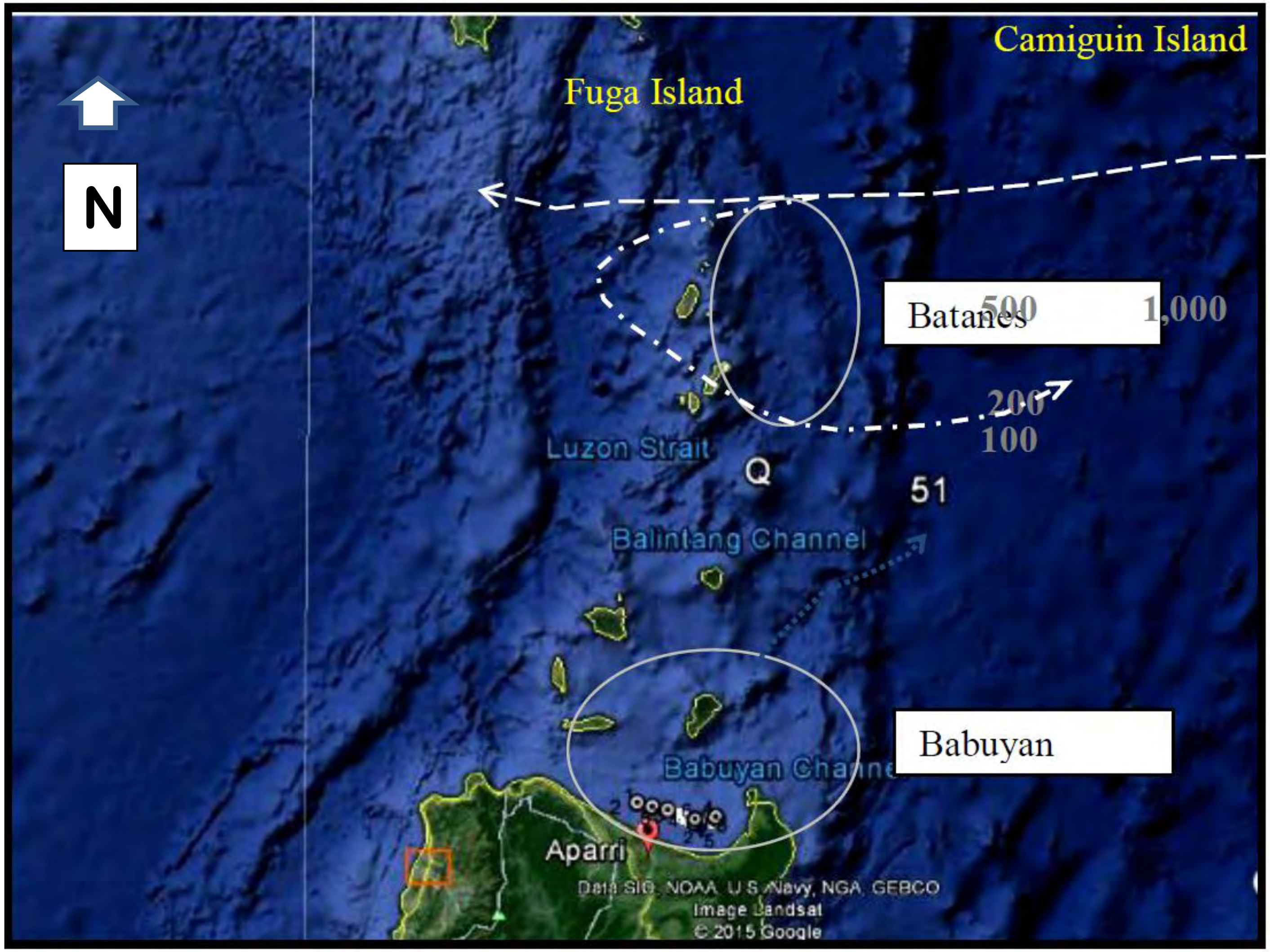
The Cagayan River's headwaters are at the Caraballo Mountains of the Central Luzon at an elevation of approximately 1,524 meters. The river flows north for some 350 kilometers to its mouth at the Babuyan Channel near the town of Aparri, Cagayan. The river drops rapidly to 91 meters above sea level some 227 kilometers from the river mouth. The larger tributaries of the Cagayan River are the Pinacanauan River in Peñablanca in the southeast; the Dummun River in Gattaran and the Pared River in Alcala, both in central Cagayan; and the Zinundungan River in Lasam and the Matalag River in Rizal, both in the west. The other rivers in the province are the Chico River in southwest Cagayan at Tuao, the Pata River and Abulug River in the northwest, Buguey River in the north, and the Cabicungan River in the northeast. These rivers drain the plains and valleys of the province, and provide water for domestic and irrigation purposes, as well

Cagayan River and its tributaries have deposited sediments of Tertiary and Quaternary origin, mostly limestone sands and clays throughout the relatively flat Cagayan Valley which is surrounded by the Cordillera Mountains in the west, Sierra Madre in the east and the Caraballo Mountains in the south. Iron sands are deposited offshore of Sanchez Mira, Pamplona, Abulug, Ballesteros, Aparri, Buguey and Gonzaga, all in the province of Cagayan.

## 2.4 Sea Bottom Topography

The Luzon Strait is approximately 250-kilometer wide span of body of water that connects the East Philippine Sea and the Pacific Ocean with the West Philippine Sea and the South China Sea (***Figure 5, JDVCRC***). The Strait is subdivided into three smaller channels (***JDVCRC***). The Babuyan Channel separates mainland Luzon with Babuyan Islands, which is separated from the Batanes Islands by the Balintang Channel. The Bashi Channel separates Batanes Islands with Taiwan. Based on the NAMRIA nautical chart and from satellite images, the bathymetry of the Babuyan Channel ranges from a few meters to more than 1,000 meter depth (***JDVCRC***).

The prominent sea bottom topographic features of the Babuyan Channel are the westward trending trough that passes through the northernmost tip of northern Luzon in Sta. Ana Cagayan and the Camiguin and Fuga Islands of Babuyan Group of Islands. The peculiar delta built up is present northeast of the mouth of Cagayan River in Aparri, Cagayan (***Figure 5***, ***JDVCRC***).

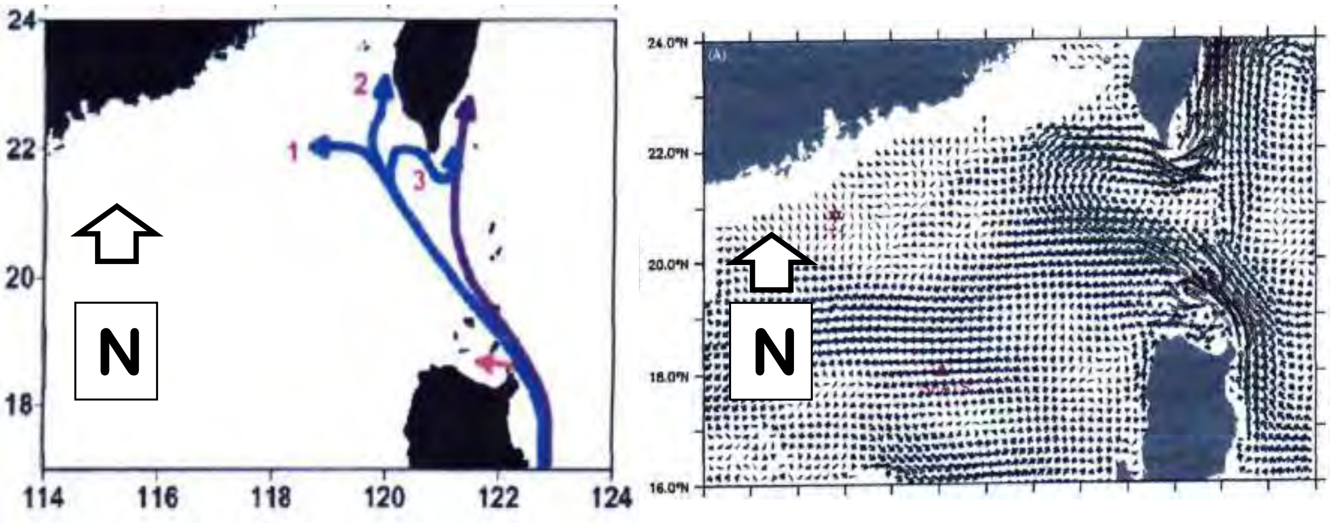



*Source: JDVCRC FER*

**Photo 5.** Location of Luzon Strait, Balintang and Babuyan Channel

The sediment built-up is influenced by the supply of sediments coming from the Cagayan River and the Kuroshio Current (***Figure 6***, ***JDVCRC***). The Kuroshio Current is a northward flowing ocean current induced by West Pacific Current in the North Pacific Ocean and intrudes into the West Philippine Sea and South China Sea through the Luzon Strait. The Kuroshio Current flows from the east coast of Luzon through Taiwan and thence to Japan as illustrated it Figure 6. The effects of the northeast monsoon cause the deflection of the Kuroshio Current towards the deeper portion of the Babuyan Channel. The Kuroshio Current contributes significantly to the dispersal pattern and accumulation of sediments in the Babuyan Channel including the delta built-up in northeast of Appari

There are indications that Cagayan River had meandered through time as suggested by the relict lakes and marsh lands in the Buguey, Cagayan (***Figure 7, JDVCRC***). The blue colored arrow in Figure 7 is presumed to be the former river path and the submerged channel. The blue dotted line is inferred to be the relict river path of Cagayan River; the white dash arrow represents the trajectory of the Kuroshio Current deflected from its northward direction. As will be shown later, the submarine channel has been identified and traced during the bathymetric survey in the project area.




*Source: JDVCRC FER*

**Figure 6.** Paths of Kuroshio Current in Luzon Strait through Babuyan, Balintang and Bashi Channels


*Source: JDVCRC FER*

**Figure 7:** Sea bottom topography and submarine features of Babuyan Channel

# 3.0 TENEMENT INFORMATION

## 3.1 Description of Mineral Rights

The JDVCRC tenement area under Mineral Production Sharing Agreement docketed as MPSA No. 330-2010-II-OMR is located in the municipal waters of Sanchez Mira, Pamplona, Abulug, Ballesteros, Aparri, Buguey and Gonzaga, all in the province of Cagayan (***Figure 8a and b, Table 1***) covering a total area of 14,240 hectares.

The property was originally covered by MPSA No. 338-2010-II-OMR, a Mineral Production Sharing Agreement between the Republic of the Philippines and Bo Go Resources Mining Corporation (BGRMC) entered into on June 9, 2010.The MPSA has a term of twenty-five (25) years, or until June 8, 2035, renewable for another 25 years. The contract grants BGRMC the exclusive rights to explore and develop the magnetite resources within the MPSA area, subject to the terms and conditions of the MPSA, and subject to compliance to the rules and regulations of other government agencies.

The corners and area of the claim boundary are bounded by the following geographical coordinates:

**Table 1. Geographical coordinates of MPSA No. 338-2010-II-OMR**

| Corner | North Latitude | East Longitude | Total Area (Has.) |
|---|---|---|---|
| 1 | 18° 42' 34.56'' | 121° 13' 26.76'' | 14,240 |
| 2 | 18° 33' 39.60'' | 121° 29' 45.96'' | |
| 3 | 18° 31' 01.20'' | 121° 40' 18.48'' | |
| 4 | 18° 26' 36.24'' | 121° 53' 32.28'' | |
| 5 | 18° 27' 42.84'' | 121° 58' 06.24'' | |
| 6 | 18° 26' 57.48'' | 121° 58' 31.44'' | |
| 7 | 18° 25' 35.04'' | 121° 53' 36.96'' | |
| 8 | 18° 30' 14.40'' | 121° 40' 04.44'' | |
| 9 | 18° 32' 53.16'' | 121° 29' 37.68'' | |
| 10 | 18° 36' 30.96'' | 121° 22' 01.20'' | |
| 11 | 18° 41' 51.36'' | 121° 13' 14.52'' | |

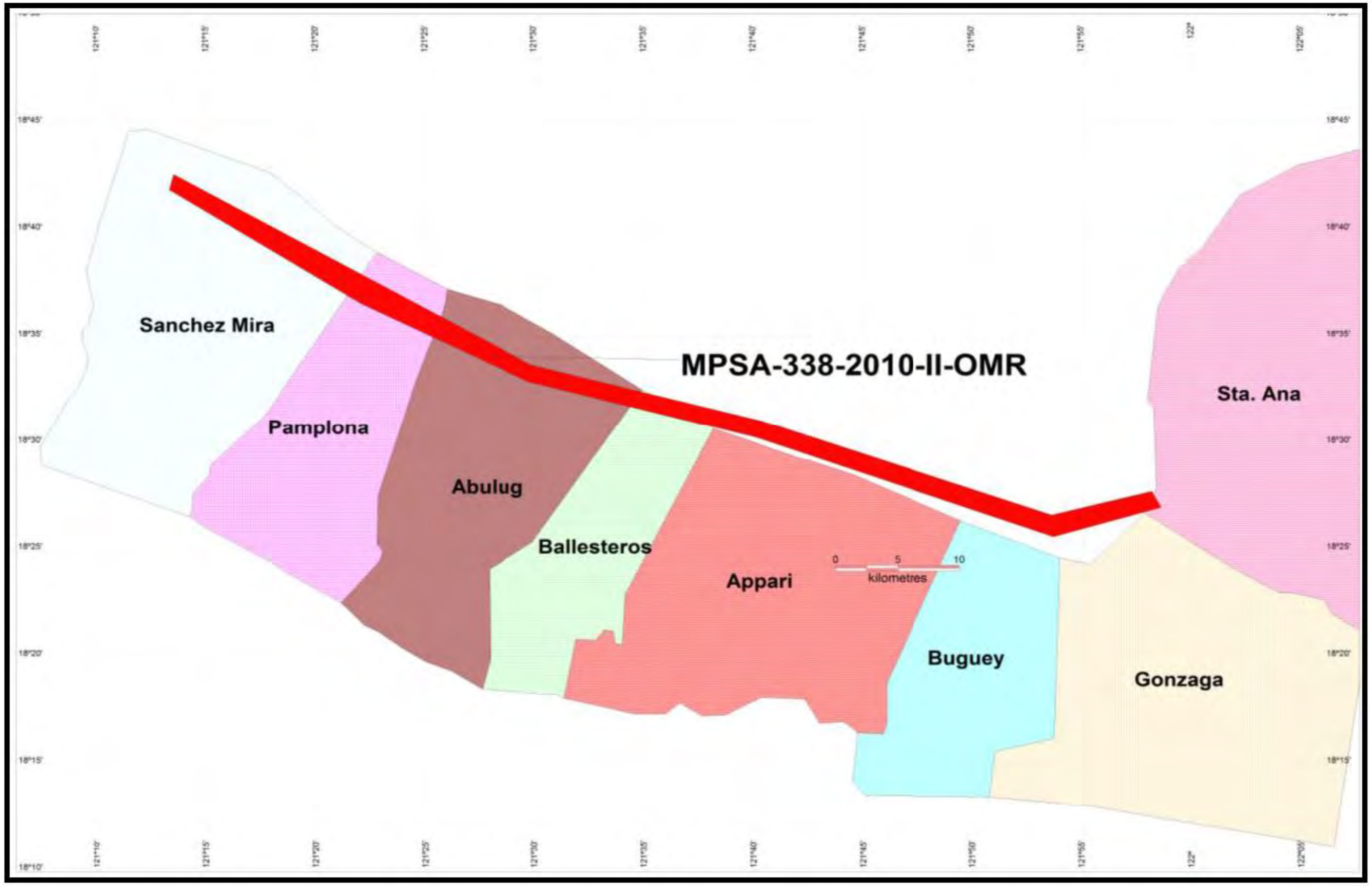
### 3.2 History of Mineral Rights

MPSA-338-2010-II-OMR was approved on June 9, 2010 as a contract between the Republic of the Philippines and BGRMC.

The MPSA Contract ownership was transferred to JDVCRC by BGRMC on November 25, 2011 by virtue of a Deed of Assignment duly approved and confirmed by both company's Board of Directors Resolutions and Corporate Secretary's Certifications. The same Deed of Assignment was duly registered with the DENR-MGB Region II, Tuguegarao City, Cagayan on 27, January 2012. It was duly approved on January 25, 2013 by the DENR Secretary Ramon J. P. Paje as recommended by MGB Director Leo L. Jasareno.

The Deed of Assignment as approved carries with it the responsibility to implement the Exploration Work Programs and the Environmental Work Program, which were eventually undertaken by JDVCRC, as well as the submission of the regular Technical/Progress Reports. The Environmental Impact Assessment (EIA) has likewise been completed and presented to the various Municipalities and stake holders in the Province of Cagayan.

The first renewal of the Exploration Period of MPSA No. 338-2010-II-OMR was granted on June 17, 2013.




Source: JDVC FER 2015

**Figure 8a**. Tenement Map Showing Political Boundaries

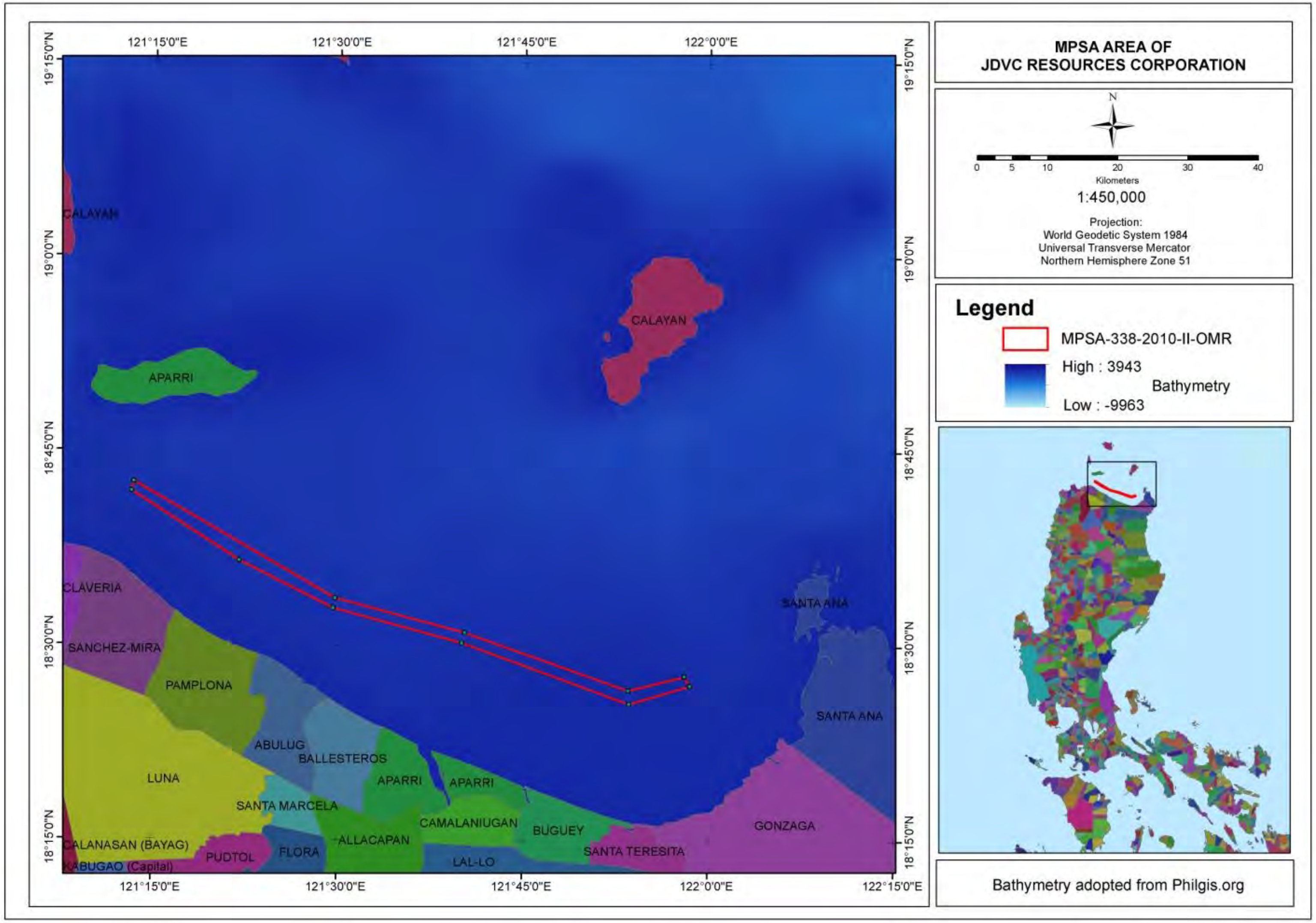



**Figure 8b**. Tenement Map Showing Claim Boundaries

## 4.0 EXPLORATION HISTORY AND RECENT WORK PROGRAM CONDUCTED

Site investigations previously undertaken by various workers in the area were noted between 1969 and 1979. Table 2 presents a summary of relevant findings by previous companies or organizations:

**Table 2.** Field Investigation Activities Conducted Between 1969 and 1979

| Year | Organization | Activities | Findings |
|---|---|---|---|
| 1969 | Anglo-Philippine oil and Mining Corporation | Offshore Survey | Presence of magnetite sand deposit |
| 1971 | Mines and Geosciences Bureau | Mineral verification from Sanchez Mira to Ballesteros | Occurrence, character, and thickness of the deposit |
| 1974 | Mines and Geosciences Bureau | Mineral verification in Gonzaga | Occurrence, character, and thickness of the deposit |
| 1974 | Mines and Geosciences Bureau | Mineral verification of the magnetite sand deposits in Sanchez Mira | Sediment profile and thickness |
| 1978-1979 | Mines and Geosciences Bureau | Beach and near-shore sediment sampling | Delineation of potential magnetite sand accumulations |

In mid-2014 to April 2015, the company has completed an exploration programme over an area of 4,999.2358 hectares out of the 14,240-hectare MPSA total area, consisting of geophysical surveys involving seismic reflection profiling and bathymetric surveys and diamond drilling and core sampling that employed a boat-mounted Longyear 38 Wireline drill with modified "Jar drill" core recovery system to ensure an acceptable high core recovery; using bathymetric points and drill collars surveyed by GPS using WGS 84 projection that enabled the delineation of an ore envelope using the conventional Polygon Method of resource estimation. Based on the data gathered from the seismic reflection survey, the drillhole spacing programmed for Parcel A is 2,000 meters with an average drilling depth of 20 meters; while for Parcel B-1, it is 4,000 meters, with an average drilling depth of 5 meters.

Within this ore envelope, 11 vertical confirmation drillholes with an average of 90% recovery, amounting to more than 140 meters, with the collection of 142 samples, which were all analyzed by XRF for %Fe, %$Al_2O_3$, %CaO, %$Cr_2O_3$, %$K_2O$, %MgO, %$P_2O_5$, %$SiO_2$,%$V_2O_5$, %As, %BaO, %Cl, %Co, %Cu, %MnO, %$Na_2O$, %Ni, %Pb, %$SO_3$, %Sn, %Sr, %$TiO_2$, %Zn,%Zr and Per cent loss-on-ignition (LOI) and Sieve Test at Intertek Testing Services Philippines,Inc., and analyzed for Magnetic Fraction (MF) using a Dings Davies Tube (DDT) which segregates the magnetite through magnetism at the Petrochemical Laboratory of the Mines and Geosciences Bureau. The geographic coordinates of the said 4,999.23- hectare portion of the MPSA contract area are shown in Table 3.

**Table 3.** Summary of Drillhole Data

| Drill Hole ID | From (m) | To (m) | %MF | %Fe | Latitude | Longitude | Water Depth |
|---|---|---|---|---|---|---|---|
| **GN18** | 0 | 5 | 26.58 | 62.05 | 18° 26' 19.9572" | 121° 53' 0.4992" | 58 M |
| | 5 | 10 | 43.87 | 61.53 | | | |
| | 10 | 15 | 24.89 | 60.45 | | | |
| | 15 | 20 | 12.58 | 62.58 | | | |
| **GN30** | 0 | 5 | 3.23 | 59.69 | 18° 25' 41.106" | 121° 53' 44.8656" | 52 M |
| | 5 | 10 | 21.01 | 61.8 | | | |
| | 10 | 15 | 20.71 | 61.38 | | | |
| **GN33** | 0 | 5 | 22.56 | 62.53 | 18° 26' 17.0016" | 121° 54' 11.0016" | 37 M |
| | 5 | 10 | 41.89 | 61.52 | | | |
| | 10 | 15 | 23.63 | 61.23 | | | |
| | 15 | 20 | 11.65 | 62.03 | | | |
| **GN48** | 0 | 5 | 24.87 | 60.58 | 18° 26' 34.0008" | 121° 55' 14.9988" | 35 M |
| | 5 | 10 | 46.55 | 62.12 | | | |
| | 10 | 15 | 25.41 | 62.35 | | | |
| | 15 | 20 | 12.66 | 60.09 | | | |
| **GN58** | 0 | 5 | 24.94 | 60.5 | 18° 26' 48.0012" | 121° 56' 12.0012" | 56 M |
| | 5 | 10 | 47.29 | 61.49 | | | |
| | 10 | 15 | 27.89 | 60.37 | | | |
| | 15 | 20 | 10.24 | 61.78 | | | |
| **GN68** | 0 | 5 | 26.98 | 60.38 | 18° 27' 5.0004" | 121° 57' 7.9992" | 64 M |
| | 5 | 10 | 43.15 | 62.58 | | | |
| | 10 | 15 | 23.89 | 61.06 | | | |
| | 15 | 20 | 13.56 | 61.74 | | | |

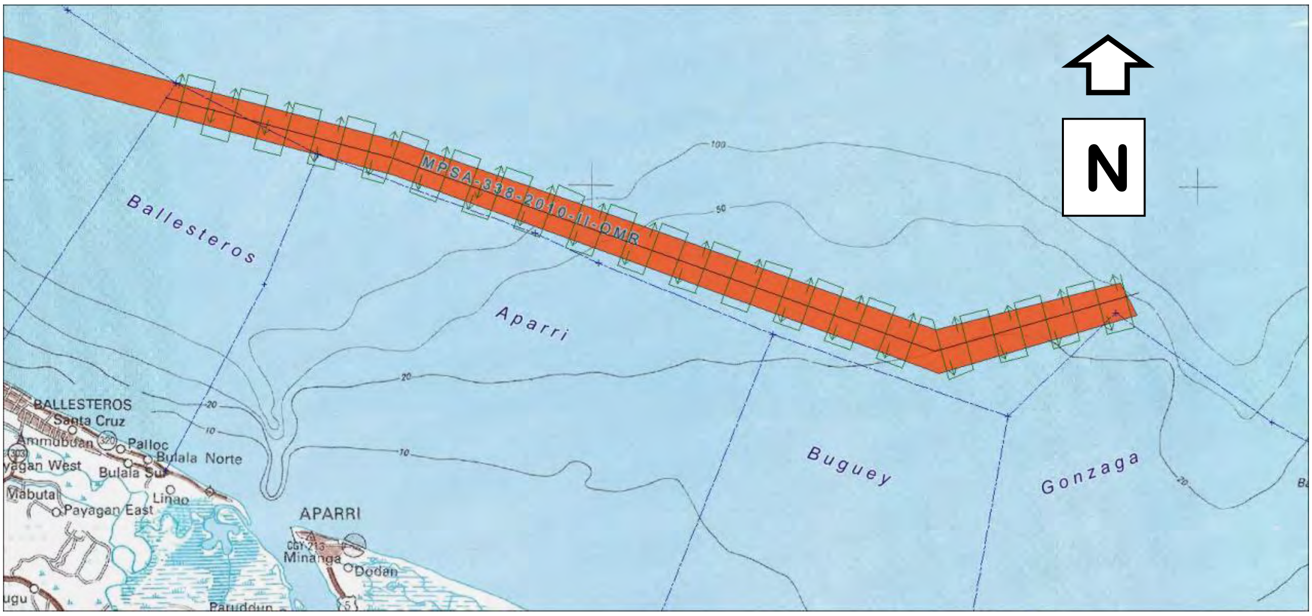
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 20 | 22 | 18.86 | 60.53 | | | |
| **GN01** | 0 | 5 | 59.3 | | 18° 26' 48.4224" | 121° 50' 38.49" | |
| **GN02** | 0 | 5 | 45.2 | | 18° 27' 34.6716" | 121° 48' 32.148" | |
| **GN03** | 0 | 5 | 46.7 | | 18° 28' 20.9208" | 121° 46' 22.4796" | |
| **GN04** | 0 | 5 | 45.4 | | 18° 29' 6.1188" | 121° 44' 56.0364" | |

*Source: JDVCRC FER*

**Photo 1.** A Longyear 38 Rotary Drill mounted in 3 interconnected boats

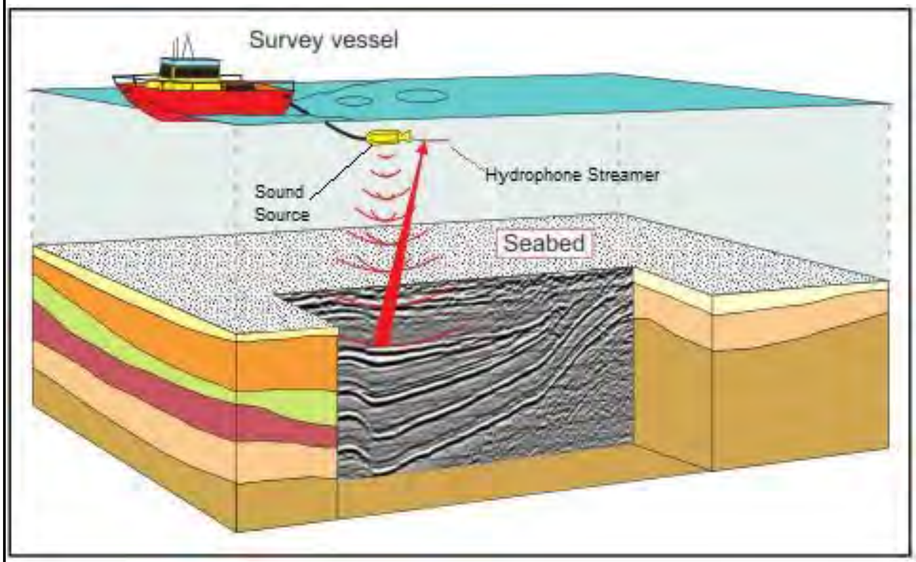
A marine geophysical survey was carried out within Parcels A and B-1 of the MPSA contract area in April 2015 located in Gonzaga, Buguey and Aparri (portion), Cagayan to provide sub- surface information on the stratigraphy, character and structure of unconsolidated sediments. The survey consisting of high-resolution seismic reflection profiling and continuous bathymetric measurements was undertaken primarily to precisely map water depths, characterize submarine topographic features, subsurface stratigraphy of consolidated sediments and to identify, delineate and map areas with potential economic occurrences of magnetite bearing sand bodies in the area.

High-resolution seismic profiling was carried out simultaneous with bathymetric measurements along pre-determined survey tracklines. Traverse lines were oriented almost perpendicular to the general trend of the shoreline and spaced at 500 to 1,000 meters interval. Figure 9 shows the proposed traverse lines within the eastern segment of the mineral tenement of JDVCRC covering/adjoining the municipal waters of Ballesteros, Aparri, Buguey and Gonzaga, Cagayan. The traverse lines running NNE-SSW and NNW-SSE were spaced at 1 km interval with the option of using a closer interval (i.e. 500-meter) in areas where on-site preliminary analysis of the data indicates promising sites. The picture in Figure 10 shows a schematic representation of the seismic reflection and bathymetric surveys.




*Source: JDVCRC FER*

**Figure 9.** Pre-determined Tracklines Along the Eastern Segment of the JDVCRC Tenement




Source: JDVCRC FER

**Figure 10**. Schematic Representation of Seismic Reflection and Bathymetric Surveys

The complete set of the seismic reflection survey equipment was sourced from Hydronav Services (Singapore) Pte Ltd on contract rental basis including the assignment of field technician during the course of the survey. The Delph Seismic Analog Acquisition Unit was used as central control and signal processing module.

The bathymetric survey was carried out using a dual frequency Teledyne Echotrac MK-III high precision echo sounder set at frequencies of 200 KHz and 33 KHz. A total of 452 line-kilometers of bathymetric traverses were accomplished to produce a more detailed and precise bathymetric map in the area. Figure 11 shows the actual traverse lines within the eastern segment of the JDVCRC tenement area. The dotted gray lines represent the additional bathymetric measurements. Surfer V.11 software was used in constructing bathymetric contours and 3-D representation of the seabed.

a) Squid 2000 sparker array

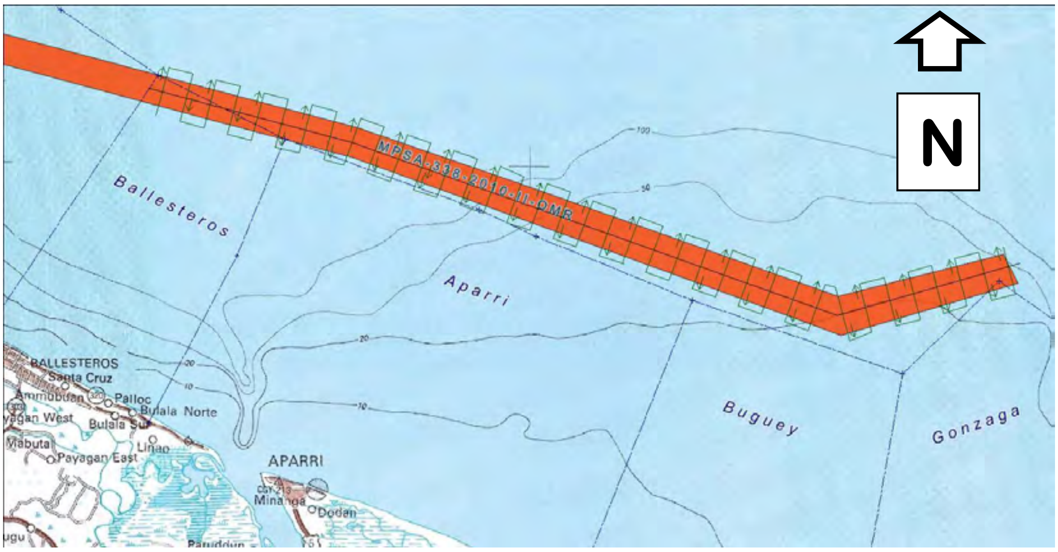
b) HVC-2000 high power cable

c) CSP-D2000 capacitor bank

d) 12-element hydrophone streamer

*Source: JDVCRC FER*

**Photo 2.** Equipment Used in Seismic Profiling




*Source: JDVCRC FER*

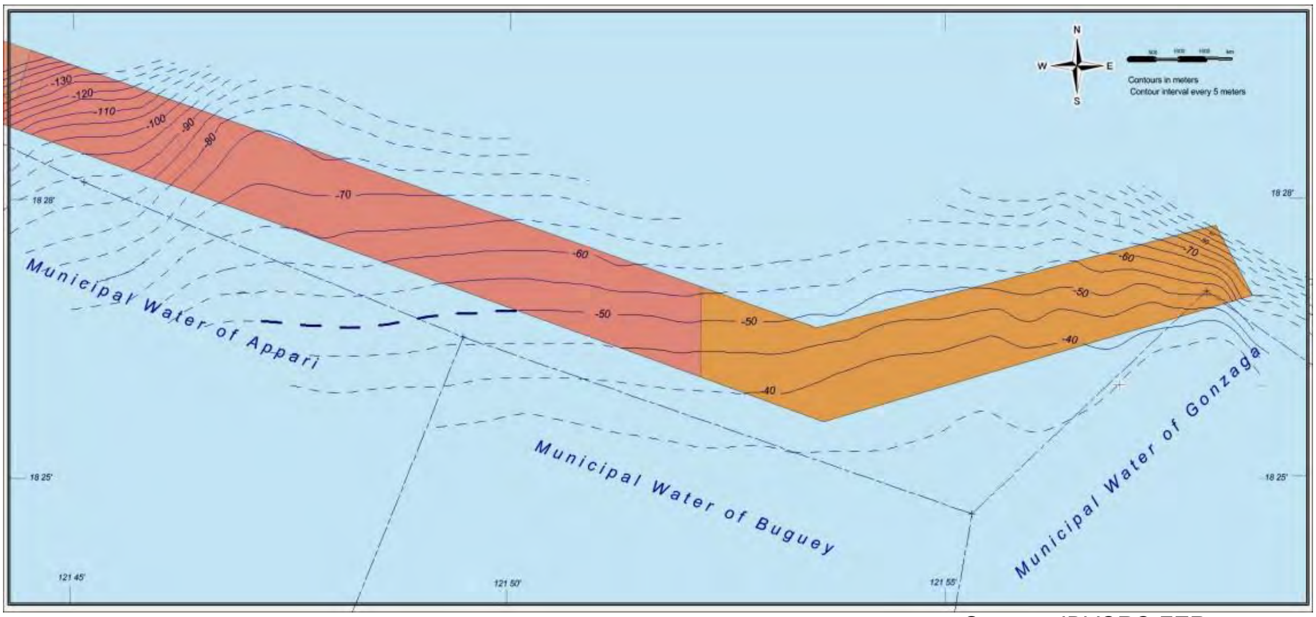
**Figure 11.** Location of Actual Traverse lines Within the Eastern Segment of the JDVCRC Tenement

The marine geophysical survey undertaken in the study area generated a total of 187.3 line-kilometers of high-resolution seismic reflection data and a total of 377.3 line-kilometers of bathymetric data. The additional echosounder measurements of about 190 kilometers were accomplished in order to get a more precise seabottom topographic configuration of the submarine delta within and adjacent to the municipal waters of Aparri, Buguey and Gonzaga, Cagayan. Figure 12 shows the actual traverse lines within the study area.

The deltaic sediment sequence is believed to compose largely of progradational sediments that potentially host possible economic occurrences of magnetite and other associated minerals.

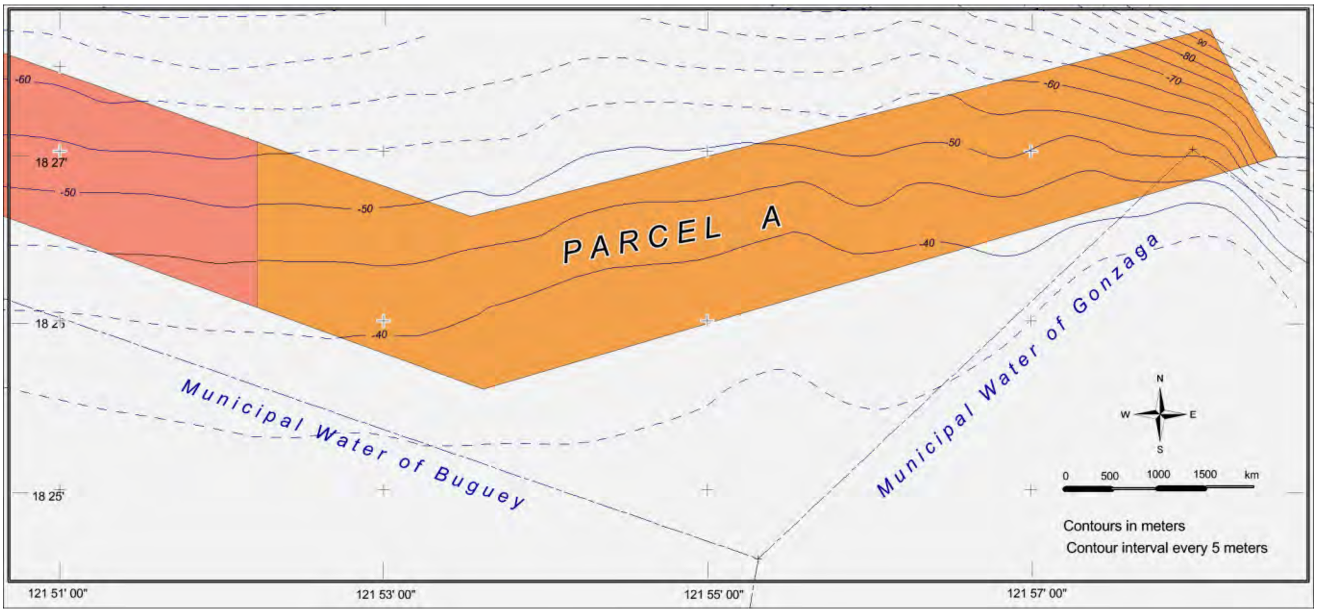
Analysis of the bathymetric contours shown in the NAMRIA 1:250,000 topographic map (Figure 13) indicates contrasting submarine topography of the seabed east and west of the mouth of Cagayan River. A gentler slope of the seabed prevails on the eastern side of offshore Cagayan from the mouth of Cagayan River towards the town of Santa Ana. In contrast, the seabed west of Cagayan River shows a moderate slope of about -1.4% slope from the shoreline of the town of Ballesteros to a distance of 3,600 meters (where the -50 meter contour is encountered) seaward. The slope of the seabed from the Town of Buguey to a distance of 24,500 meters (up to -50 meter contour line) has a relatively gentler slope of about -0.2%.

Result of the bathymetric survey of the eastern segment of MPSA-338-2010-II-OMR is shown in Figures 12 and 13. The bathymetric contours are presented at 5-meter interval.




*Source: JDVCRC FER*

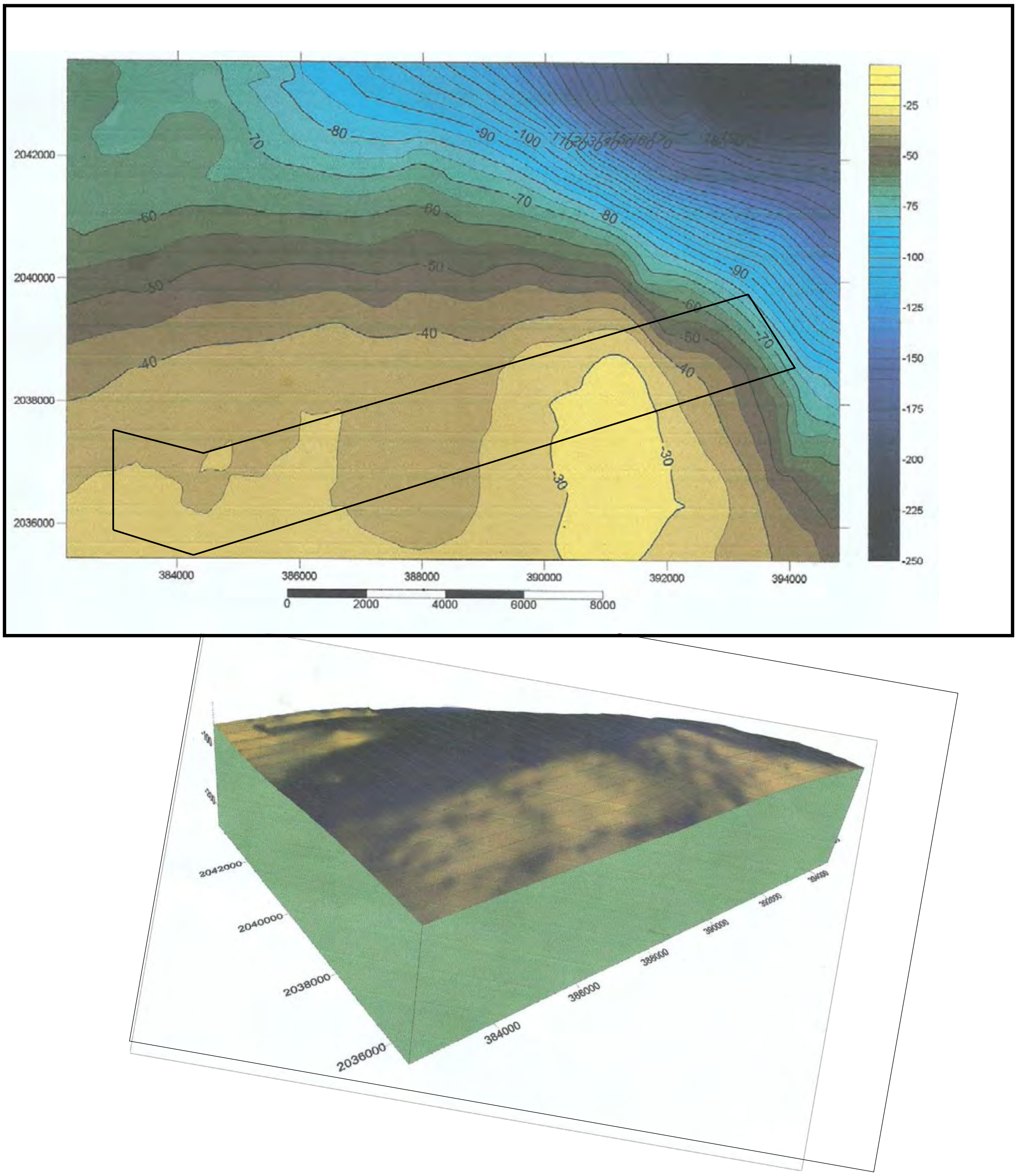
**Figure 12.** Bathymetry of the Eastern Segment of MPSA-338-2010-II-OMR




*Source: JDVCRC FER*

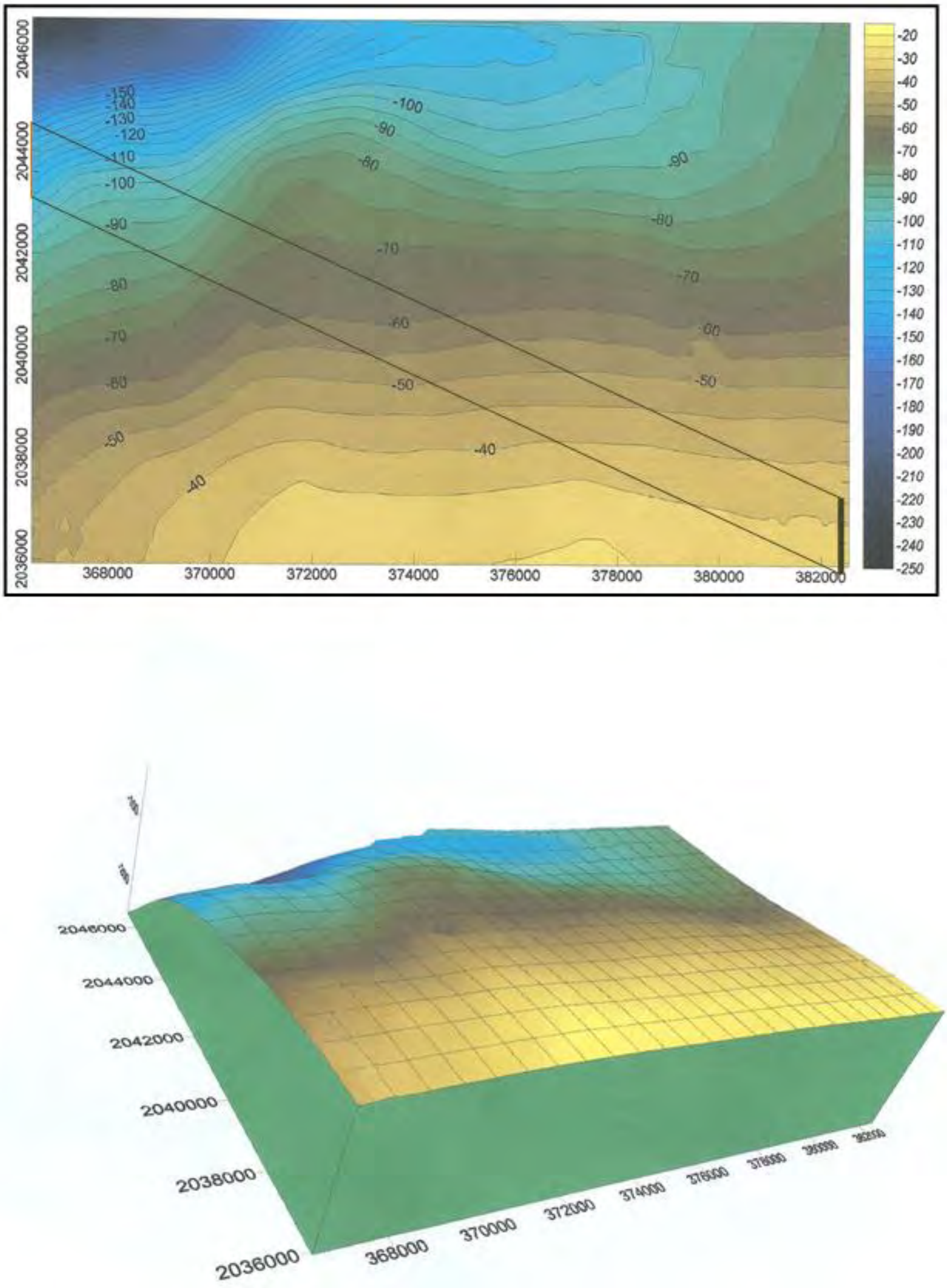
**Figure 13:** A More Detailed View of the Bathymetry of the Eastern Segment of the Tenement Area.

Figures 14 and 15 graphically present the color-filled contour maps and 3-D presentations of the seabed of the eastern portion of MPSA-338-2010-II-OMR.




*Source: JDVCRC FER*

**Figure 14.** Color-filled Bathymetric Map of the Easternmost Segment of the JDVCRC Tenement Area




*Source: JDVCRC FER*

**Figure 15:** Color-filled Contour Map and 3-D Illustration of the Seabed of the JDVCRC Tenement Area

Results of data interpretation reveal that the unconsolidated sediment section underlying the contract area was deduced to be divided into four (4) distinct units characterized by their different internal seismic reflection patterns and separated by distinct reflection horizons. For purposes of identification, these units have been designated as **Unit 1**, **Unit 2**, **Unit 3 and Unit 4** (from top to bottom).

*Unit 1:*

Unit 1 generally consists of recent sediments of beach deposits along the shore grading into finer sediments offshore. It is characterized by parallel to divergent reflection patterns. Due to the influence of the Kuroshio Current flowing from the East Philippine Sea and deflected towards the Babuyan Channel, the finer sediments particularly on the eastern part of the area are transported towards the west. This unit generally consists of silt to fine grained sand with variable amounts of magnetite sand.

*Unit 2:*

This unit is inferred to generally comprise of fine to medium sand of fluviatile to shallow marine origin. The internal reflection pattern consists of sigmoidal to chaotic patterns. There appears to be a gradational change to Unit 1 sediments which are characterized by a weak parallel reflection pattern with some oblique reflections nearer "shore". This unit is inferred to consist of shallow marine sediments deposited nearshore or at the shoreline.

*Unit 3:*

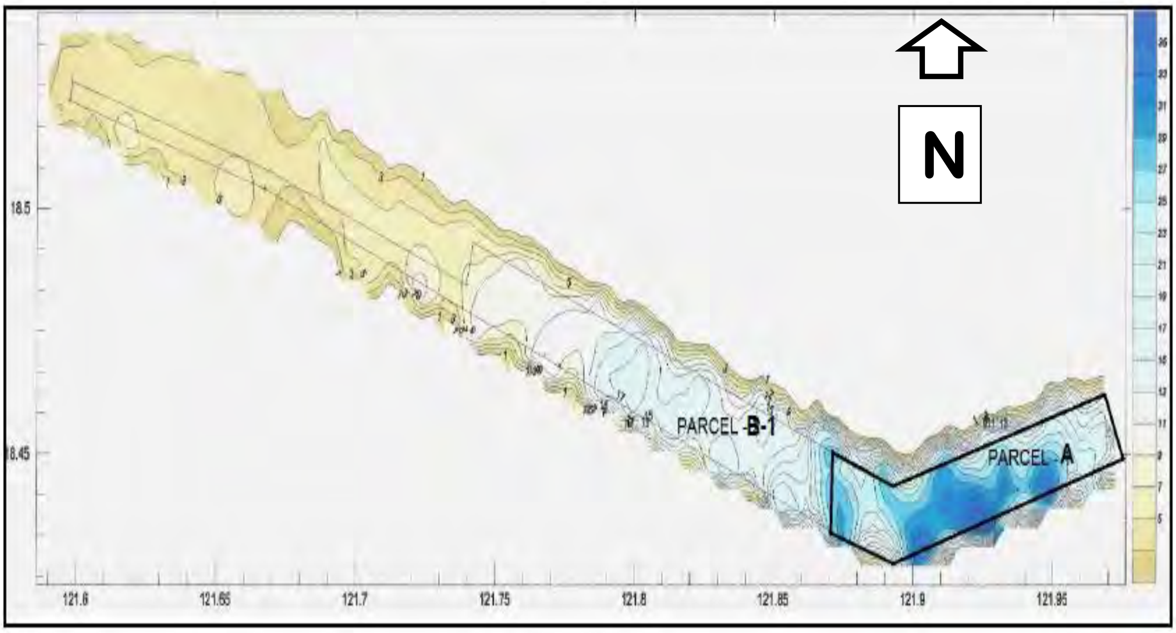
Characterized by parallel to seaward dipping/sigmoidal reflections and consists of the prograded shoreline deposits characterizing the eastern part of the contract area. It is deduced to consist essentially of fine to medium – grained sand materials. This Unit together with Unit 2 is believed to host valuable detrital mineral deposits particularly magnetite sand accumulations. Representative seismic profiles in the eastern and western parts of the area are shown in Figures.

*Unit 4:*

The oldest unconsolidated sediment sequence in the area is Unit 4 that generally shows parallel to divergent and in some places hummocky reflection patterns. It is inferred to consist predominantly of older mud to silty sediment sequences. Underlying this unit is the acoustic basement which in, some instances coincide with the bedrock. In seismology, the term acoustic basement is generally referred to as the surface, below which strata cannot be penetrated by seismic signals or cannot be imaged by seismic data. The acoustic basement surface covered by the survey, so far, is interpreted to be a relatively strong and irregular reflector.

Based on the analysis and interpretation of seismic reflection data gathered in the area, the seismo-stratigraphic units that can be considered as the most promising targets for magnetite sand exploration are Units 2 and 3. Table 5 shows the tabulation of the individual thicknesses of Unit 1 and the combined Units 2 and 3. It will be observed in the tabulation and in the contour map in Figure 17 that the sediments are thicker in the eastern portion of the tenement, which is identified here as Parcel A. The area to the west is called Parcel B-1. The sediments are observed to be thinning out going westward to Parcel B-1. These thicknesses were determined from the meticulous interpretation of the seismic reflection profiles of the seismic reflection survey lines shown in Annex 4. On the average, the thicknesses of the sediments per Unit are as mathematically computed follows:

| | Unit 1 (meters) | Unit 2 (meters) | Total (meters) |
|---|---|---|---|
| **Parcel A** | 6.8 | 19.0 | 25.8 |
| **Parcel B-1** | 3.0 | 6.8 | 9.80 |




Source: JDVCRC FER

**Figure 16.** Color-filled Contour Map Showing the Various Thicknesses of Identified Sand-bearing Horizons Consisting of Seismo- stratigraphic Units 1, 2 and 3.

## 5.0 REGIONAL GEOLOGIC SETTING

### 5.1 Regional Geology

The Cagayan Valley is a major intermontane structural basin containing folded and faulted late Tertiary eugeosynclinal deposits measuring 250 kilometers long and 80 kilometers wide (***Figure 17***). The oldest sedimentary rock in the basin is the Oligocene to Miocene marine sediments consisting of shale, chalk, turbidites and limestone. Regional uplift in the Plio-Pleistocene resulted in the deposition of transitional marine and fluvial sediments of the Ilagan and Awidon Mesa Formations. The latter is a thick sequence of pyroclastic and fluvial sediments that conformably overlies the Ilagan Formation but unconformably overlies the folded Miocene and Pliocene strata in the foothills of the Cordillera.

## 5.2 Tectonic Setting

The N-S trending Cordillera Central, a 300 km-long and 90 km wide, is one of the major tectonic unit of Northern Luzon (***Figure 18***). Acid plutonic rocks form the core of the mountain chain, the outer shell of which consists of shallow to deep sea sedimentary rock formations with intercalated volcanics. The uplift of the Central Cordillera batholith started during the Miocene. The Sierra Madre Range likewise consists of the acidic plutonic intrusive bodies. The third morpho-tectonic unit is the Caraballo Mountains, which serve as the connection of the southern segment of the Central Cordillera and the Sierra Madre. These three morpho-tectonic units form the catchment basin of the N-S oriented Cagayan River Valley. The fault-bounded Cagayan Valley, 200 km long and about 50 km wide, is surrounded by these mountains, except on the northern side

## 5.3 Stratigraphy

The area of interest has a good potential for magnetite mineralization due to the presence of rock units/lithology that are good source of heavy minerals such as magnetite which are of products of continuous weathering and erosion from the mountains particularly at the northern Sierra Madre. Below are the geologic rock formations in the area and their position in the stratigraphic column as shown in Figure 19.

- **Abuan Formation**

  The Abuan Formation, which was named as Abuan River Formation by MMAJ-JICA (1989), is the oldest formation in the western part of the Northern Sierra Madre and presumably comprises part of the basement of the Cagayan Valley sedimentary sequence. It is a heterogeneous mixture of basaltic to andesitic flows, pyroclastics and sedimentary rocks widely distributed in the southwest part of Divilaca River and northern and western part of Maconacon River. The age deposition of the Abuan formation is inferred to be before Early Oligocene, probably Eocene. The thickness of this formation was not indicated by MMAJ- JICA (1989).

- **Dibuluan Formation**

This formation, named by MMAJ-JICA (1989) as Dibuluan River Formation, is found along the western flanks of the Northern Sierra Madre Range. It embodies the principal position of the westward-dipping monoclinical structure of the Cagayan Basin. It unconformably overlies the Abuan Formation and is unconformably overlain by the Ibulao Limestone along Dibuluan River and elsewhere in the southeastern end of the Cagayan Valley Basin (Aurelio and Billedo, 1987). The Dibuluan Formation consists mainly of basic volcanic flows, volcanic breccias and pyroclastic rocks, with interbeds of clastic rocks.

The clastic rocks in the lower portions generally consists of well-indurated brownish gray to greenish gray feldspathic wacke with minor intercalated intraformational conglomerate, while the upper portions are marked by thin to medium beds of green siltstone and light green to red, well-indurated mudstone. Radiometric K-Ar dating of a sample of basic lava flow of the Dibuluan Formation gave an age of 29 Ma, equivalent to late Early Oligocene (Billedo, 1994).

- **Quaternary Alluvium**

The Cagayan Valley basin is overlain by various assemblages of Quaternary alluvium resulting from weathering and erosion of the older rocks and natural transport of minerals by rivers, wind and current. These are accumulations of detrital minerals or placer minerals that compose most of the Quaternary alluvium within the Cagayan River Valley and the Cagayan Basin.

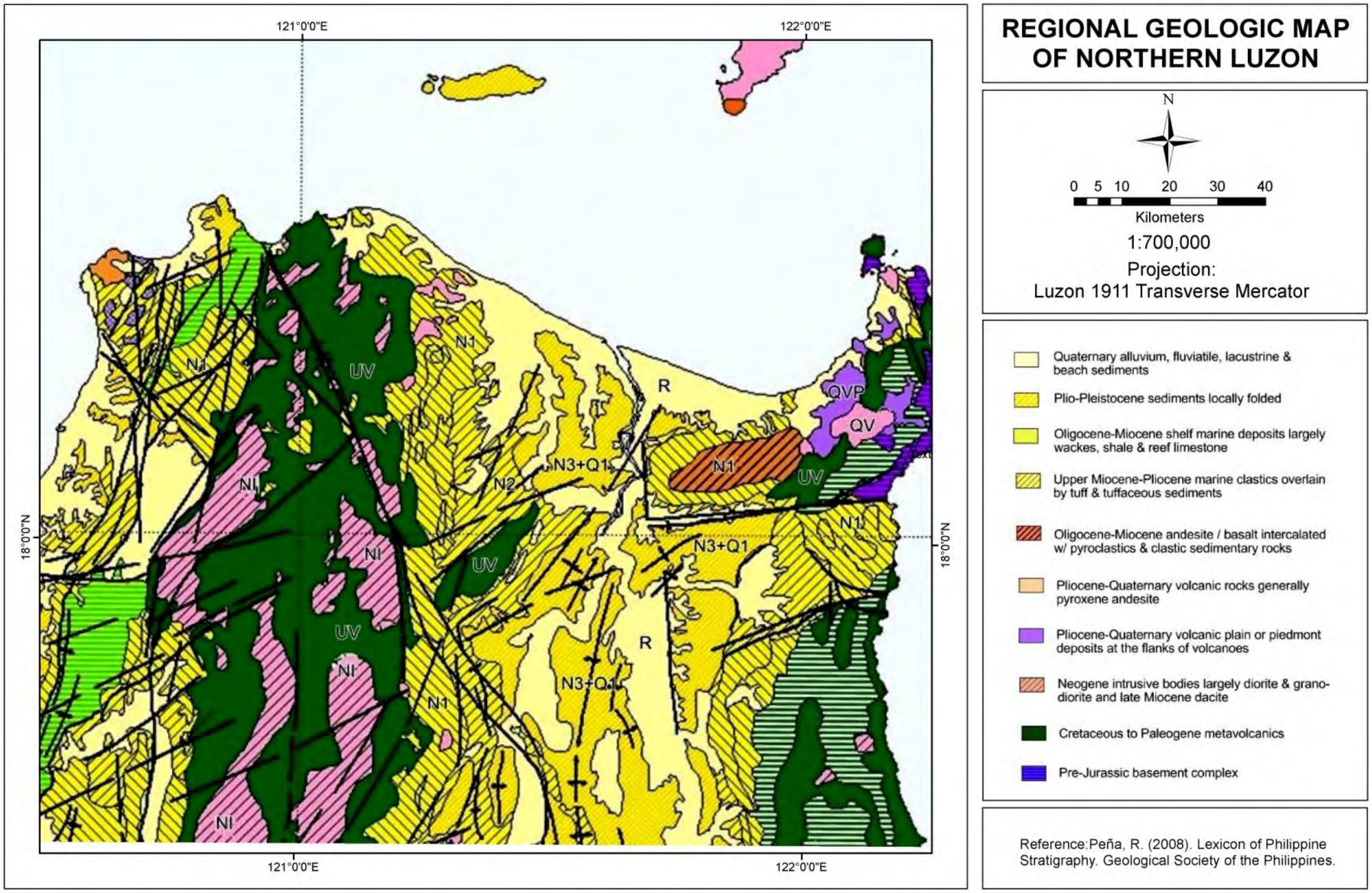



**Figure 17.** Regional Geologic Map of Northern Luzon

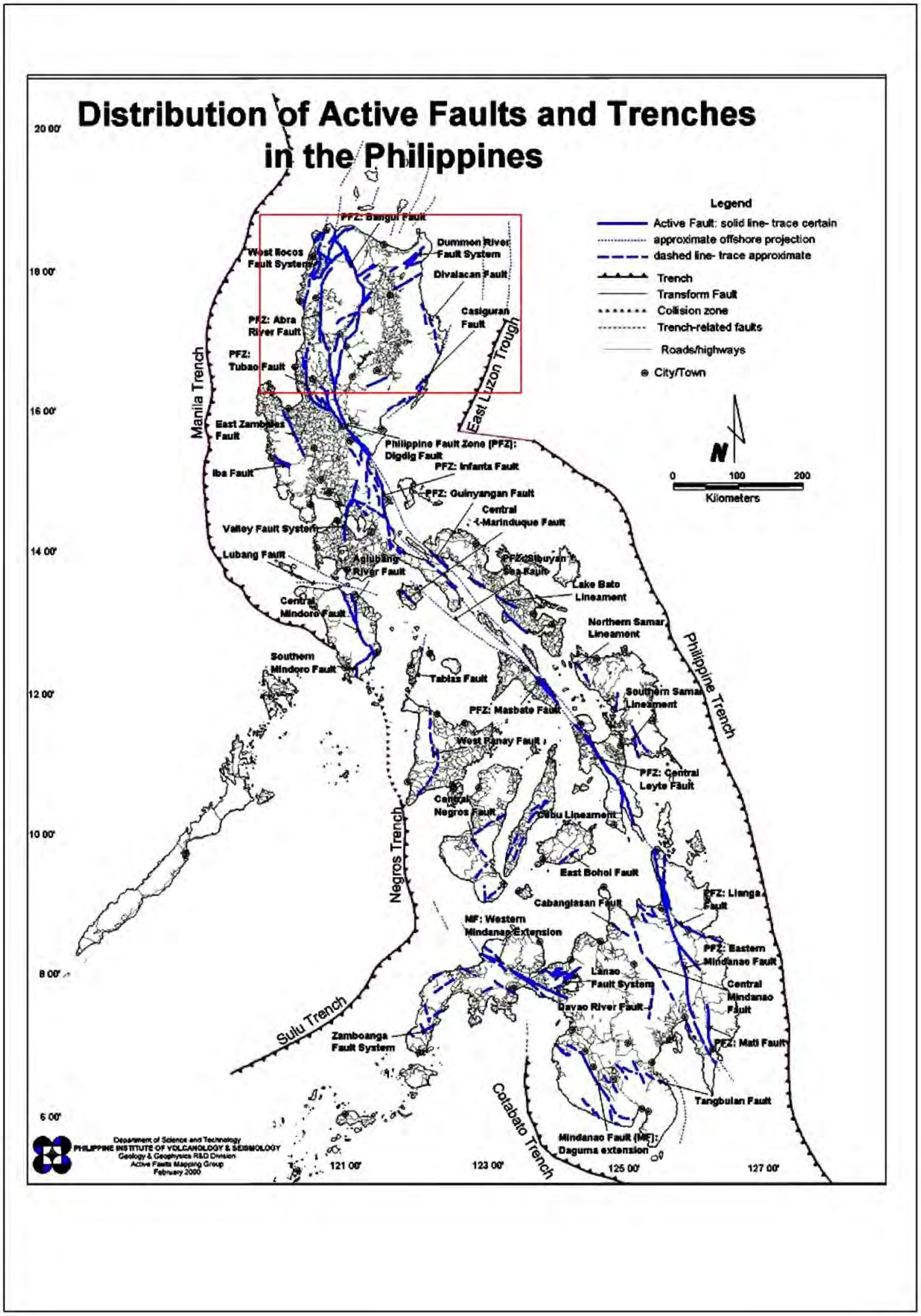
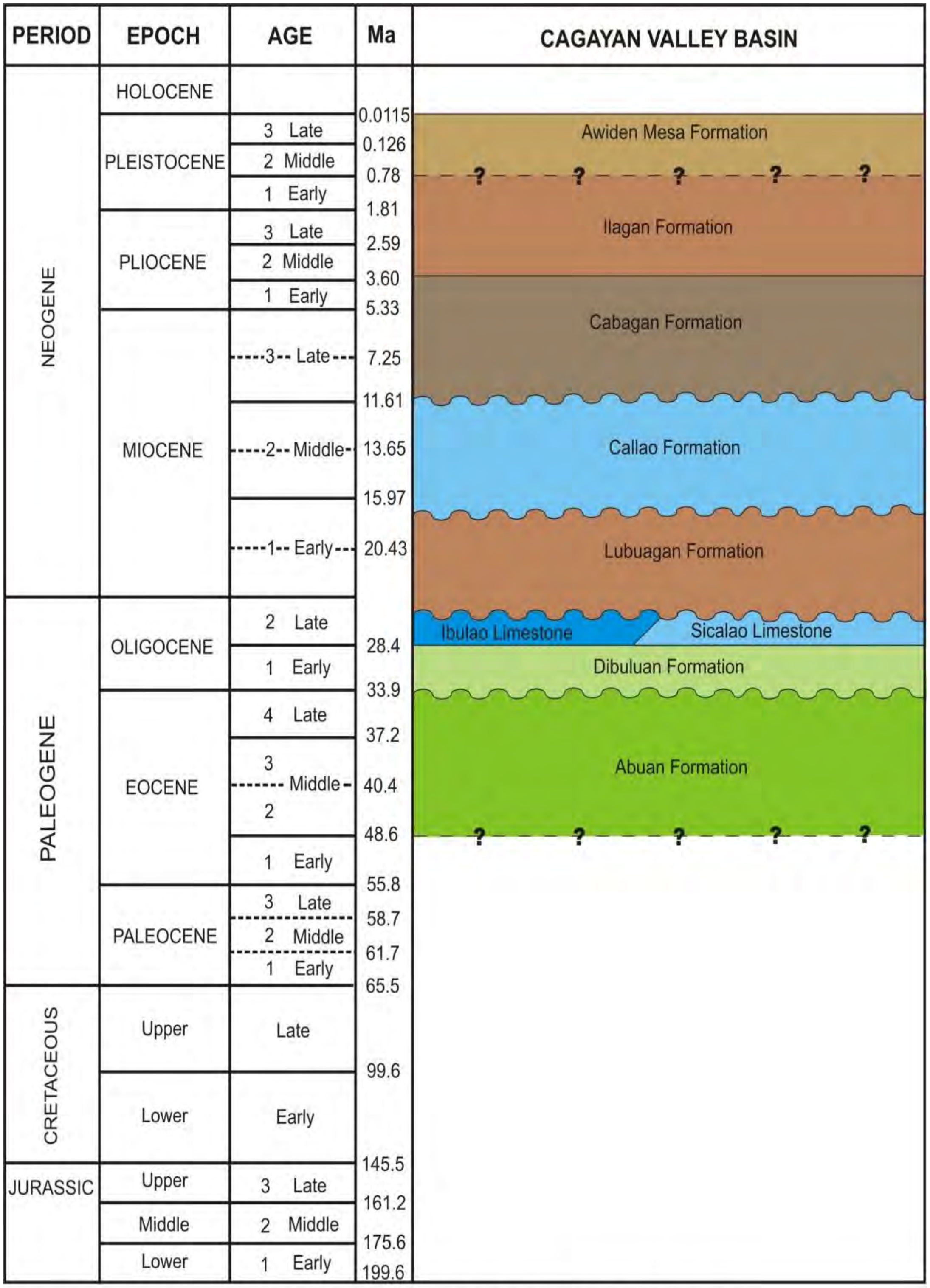



**Figure 18**. Tectonic Map of the Philippines




Equivalent Ma values for boundaries of periods and epochs and age age boundaries adopted from Geologic Time Scale 2004 (Gradstein and others, 2004)

*Source: GOP 2010*

**Figure 19**. Stratigraphy of Cagayan Valley Basin

## 6.0 LOCAL GEOLOGY

The Titano-Magnetite sand within JDVCRC MPSA area are offshore deposits found at the seabed of Babuyan Channel. The rock formations that may have contributed as source of magnetite and other associated placer minerals include the volcanic, pyroclastics and sedimentary derivatives of the older rocks of Abuan and Dibuluan Formations from the hinterlands. These volcanic flows intercalated with pyroclastic and sedimentary rocks and intrusions of diorite, quartz diorite and andesitic to dacitic rocks commonly have specks of magnetite that were disintegrated from the host rocks during weathering process and eventually transported and concentrated through river systems and through the winnowing actions of waves tides and currents.

## 7.0 DEPOSIT TYPE AND MINERALIZATION

### 7.1 Deposit Type

The deposit type in the JDVCRC MPSA area is an Iron Ore that can be classified Titano-Magnetite sand offshore deposit. The sand is being transported materials from the weathering of volcanic rocks, intrusive rocks and sedimentary derivatives of the older rocks of Abuan and Dibuluan Formations from the hinterlands. The sand and the contained titano-magnetite being the most resistant materials transported by rivers and creeks to the seas and re-worked by long shore current.

### 7.2 Mineralization

The iron mineralization in the MPSA area consists of magnetite ($Fe_3O_4$) concentration in beach and alluvial sand in the seabed of Babuyan Channel. Economic deposits generally contain 15 to 30 % magnetite or magnetic fraction (MF) which can be concentrated by magnetic separation to yield about 55 to 62 % Fe. The magnetite concentrate usually contains impurities of titanium and vanadium which interfere with the smelting process, thus lowering the quality of the iron ore; however, the value of the magnetite concentrate is however enhanced when the titanium and/or vanadium content are high enough to produce special steel.

# 8.0 MGB FIELD VALIDATIONS

## 8.1 Methodology

The undersigned MGB personnel validated the acceptability of the declared mineral resources of JDVCRC through: 1) Confirmation of deposit type/mineralization in the project area and collection of check samples for variance and statistics study; 2) in-situ assessment and quality acceptability of the mining contractor's existing set up of analytical laboratory for sampling, assaying, and handling of assay results; 3) confirmation of parameters used in the resource estimation and resource models; and 4) gathering of basic exploration data and validating the integrity of database.

The **MGB-CO** technical personnel inspected the **JDVCRC's** core house, sample preparation facility located in Sta. Ana, Cagayan. A total of three (3) representative check samples were taken and will be subjected to chemical analysis upon return to MGB-CO for Quality Assurance/Quality Control (OA/QC) study and to determine the overall reliability of field sample preparation techniques, the accuracy of analytical data supplied by JDVCRC and finally to ensure that analytical results were free of bias.

The JDVCRC resource geologists provided the latest compiled drillhole database used during resource modelling and subsequent calculation of tonnages. MGB-CO geologists will import the drillhole database of JDVCRC to GEMS v.6.8 software which will be recalculated and subjected to geostatistical analysis and block modelling.

## 8.2 Verification of deposit type and mineralization, Collection of check samples and Results of Check Samples Analyses

### 8.2.1 Verification of deposit type and mineralization

The field validation verified the deposit type and mineralization of JDVC though their Siphon Vessel with 3-stage magnetic separator and processing apparatus on board located 15-km offshore of Gonzaga, Cagayan (***Photos 2 to 11)***. Processed iron ore concentrate is very fine, deep black with assay grade of >57%Fe based on XRF (***Photo 10***). The verified deposit type/mineralization and assay grade in the project site conform to the data and values declared in the CP-signed Final Exploration Report (FER).

**Photo 2**. Twin engine motor boat used going to Siphon Vessel of JDVCRC located 15km-offshore of Gonzaga, Cagayan, travel time of which is 2-hr though rough sea.

**Photo 3**. JDVCRC Siphon vessel with magnetic separator and processing apparatus on board located 15-km offshore of Gonzaga, Cagayan.

**Photo 4.** Transfer from motorboat through vertical ladder going to the Siphon Vessel.

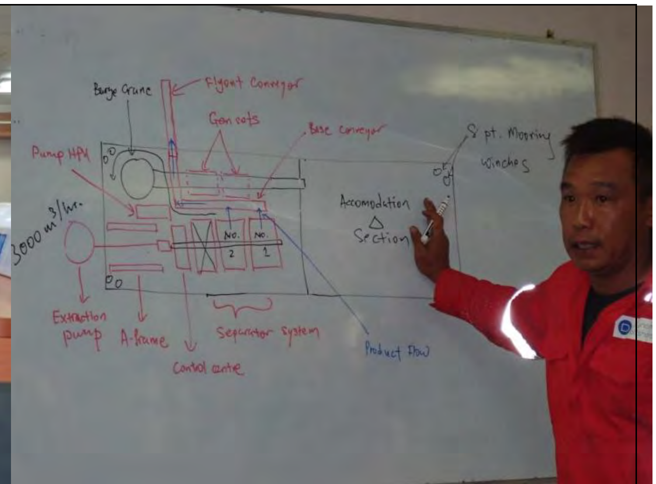



**Photo 5**. Introduction lecture, safety orientation explanation of production and processing of magnetite sand.

**Photo 6**. Operation set-up for magnetite extraction

**Photo 7.** 3-stage magnetic separator system

**Photo 8**. Extraction/siphon pump

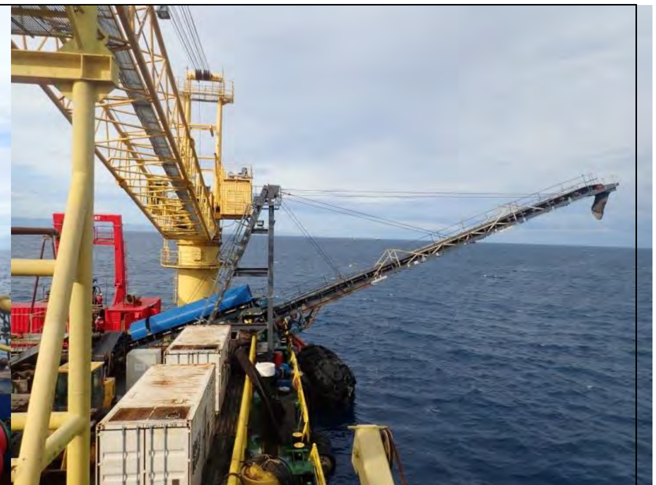


**Photo 9**. Flyout conveyor where waste materials will go back to the sea

**Photo10**. Samples of magnetite sand after processing.

**Photo 11.** MGB Validation Team with JDVC staff at roof top of Siphon Vessel.

### 8.2.2 Collection of Check Samples for Laboratory Analysis

Check samples for laboratory analysis were taken by the MGB validating team from the core house facility of JDVCRC office in Times Street, Quezon City (***Photos 12 to 14, Figure 20***). A total of three (3) drill core samples comprised of magnetite sand materials were randomly collected from the representative mineralized samples. The MGB used analytical volumetric titration method using K-dichromate for Iron (Fe) ore determination.

**Determination of Total Iron (Fe) by Titration with Standard Potassium Dichromate ($K_2Cr_2O_7$)**

1. Take 50 ml aliquot from the solution in the volumetric flask in step A.7 and transfer to 250 ml beaker. Dilute / fill up to 100ml with distilled water and boil.
2. Add $NH_4OH$ drop by drop until all the iron is precipitated. Boil.
3. Allow the precipitate to settle. Filter thru Whatman filter paper No. 1 and wash the sides of the beaker and the filter paper containing the precipitate for about 5 times with hot distilled water. Discard the filtrate.
4. Return the precipitate to the beaker where precipitation took place and dissolve the precipitate adhering to the filter paper with 1:1 hydrochloric acid and then wash with hot distilled water thoroughly. Remove the filter paper from the beaker.
5. Make up to about 50 – 75 ml with distilled water and boil. Add $SnCl_2$ solution drop by drop until solution turn colorless, adding 1 to 2 drops in excess.[1] Cool.
6. Add 10 ml of saturated $HgCl_2$ while stirring.[2]
7. Add 20 ml of titrating solution and 2-3 drops of diphenylamine indicator.
8. Titrate with standard potassium dichromate ($K_2Cr_2O_7$) solution to a violet end point.
9. Compute the total Fe.

$$\% \text{ Fe} = \underline{(V \times T)_{K2Cr2O7}} \qquad \text{where } T = \% \text{ Fe - g / ml}$$

$$\% \text{ Fe} = \frac{(V \times N)_{K2Cr2O7} \times 55.85/1000}{\text{weight of sample in grams}} \times 100$$

$$\% \text{ Fe}_2\text{O}_3 = \% \text{ Fe} \times \frac{\text{Fe}_2\text{O}_3}{2\ \text{Fe}} = \% \text{ Fe} \times 1.4297$$

**Figure 20.** Analytical Method of MGB for Fe Determination

### 8.2.3 Results of Check Samples Analyses

Check samples were collected during field validation and sent back to MGB for metallurgical testing, the results of which are subjected to computation of Relative Percentage Error (RPE) between assay results of JDVCRC samples and MGB to determine relative variations and bias. The RPE is an indicator of variability between samples, the average error measures any bias that may occur; unbiased sample comparison has an RPE value close to zero with minimal spread about this average value. Formula for computation of RPE is:

**RPE**= ((X-Y)/ (0.5)*(X+Y))*100 wherein X=original assay, Y=duplicate assay.

Adopting the standard procedure for Quality Assurance (QA)/Quality Control (QC) studies, a total of three (3) check samples or about 5% out of the total 28 sample intervals used in the resource estimation were collected during the field validation (***Photos 12 to 14***). The MGB used analytical volumetric titration method using K-dichromate for Iron (Fe) ore determination. The **JDVCRC** sample analyses were carried out in Intertek Manila by using **XRF method (x-ray fluorescence).**

The comparison of the analysis results conducted by MGB and JDVRC can be summarized by the relative percentage errors (RPE) and the correlation as shown in **Figure 21 and Table 4**. After computation of RPE for the 3 check samples concluded that the RPE outliers may have resulted from different instrumentations and analysis methods used by MGB and JDVCRC. Considering the number of samples used, the analysis results of the RPE showed relatively good errors/ allowable error (<17%) and indicating good repeatability and correlation (R^2).

**Table 4.** MGB-JDVCRC Comparative %Magnetite Fraction (MF) Analysis

| | % MF |
|---|---|
| No. of Pairs | 3 |
| Average RPE | 16.93 |
| Correlation | 0.36 |

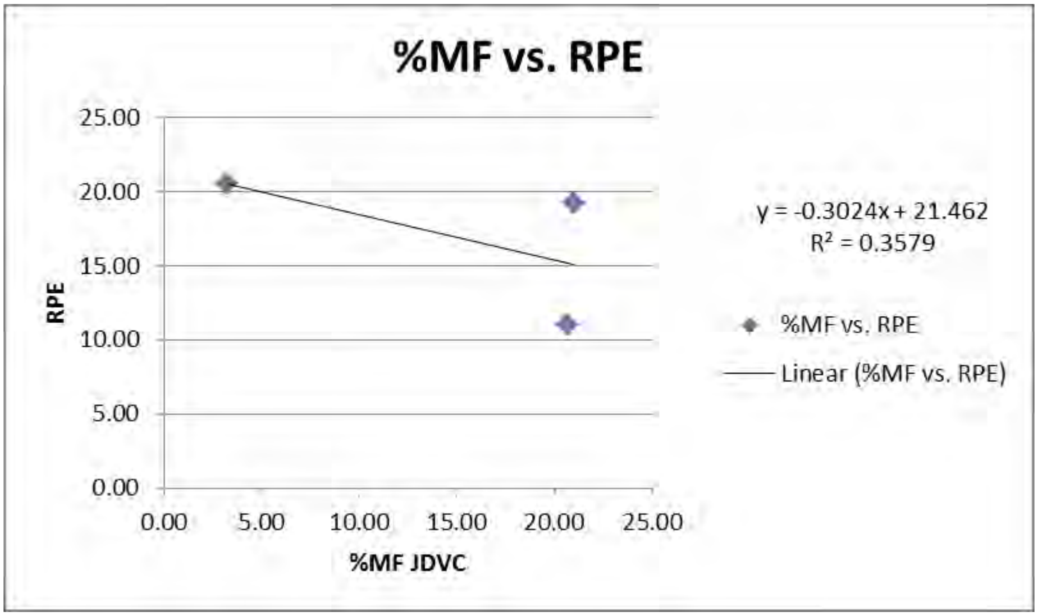



**Figure 21**. RPE for %MF

## 9.0 MINERAL RESOURCE ESTIMATION

### 9.1 JDVCRC Mineral Resource Estimate

JDVC Resources Corporation (**JDVCRC)** used conventional polygon method of assigning the areas of influence according to grade and drillhole distance to perform its mineral resource modelling and resource computations (***Figure 22 to 26)***. A total of 10 drillholes and 28 sample intervals were used for the geological modelling and subsequent resource estimation. JDVC did not set a cut-off grade since selective mining is not applicable in offshore areas. Additionally, a 100% recovery was also used by the company in declaring the mineral resource estimates. All analytical methods (XRF, Sieve analysis, Density measurement, etc, are done on 5-meter composite samples. Specific gravity value of 1.69 DMT/m3 at 0% cut-off grade was adopted by JDVCRC in the tonnage calculation. The complete results of their estimates are shown below:

**Table 5.** JDVCRC Mineral Resource Estimate

| Level | Hole-ID | Volume ($m^3$) | Tonnage (DMT) | Grade (%MF) | DMT Conc. |
|---|---|---|---|---|---|
| | | **INDICATED** | | | |
| **0-5** | GN18 | 14,134,498.64 | 23,887,302.69 | 26.58 | 6,349,245.06 |
| | GN30 | 6,260,618.75 | 10,580,445.68 | 3.23 | 341,748.40 |
| | GN33 | 11,977,837.40 | 20,242,545.20 | 22.56 | 4,566,718.20 |
| | GN48 | 13,066,734.48 | 22,082,781.26 | 24.87 | 5,491,987.70 |
| | GN58 | 11,252,573.11 | 19,016,848.56 | 24.94 | 4,742,802.03 |
| | GN68 | 10,862,507.44 | 18,357,637.57 | 26.98 | 4,952,890.62 |
| Sub Total | | **67,554,769.80** | **114,167,560.95** | **23.16** | **26,445,391.99** |
| **5-10** | GN18 | 21,167,829.31 | 35,773,631.53 | 43.87 | 15,693,892.15 |
| | GN30 | 11,600,678.95 | 19,605,147.43 | 21.01 | 4,119,041.47 |
| | GN33 | 16,404,741.02 | 27,724,012.32 | 41.89 | 11,613,588.76 |
| | GN48 | 15,073,202.66 | 25,473,712.50 | 46.55 | 11,858,013.17 |
| | GN58 | 14,792,031.51 | 24,998,533.24 | 47.29 | 11,821,806.37 |
| | GN68 | 14,539,173.62 | 24,571,203.41 | 43.15 | 10,602,474.27 |
| Sub Total | | **93,577,657.05** | **158,146,240.41** | **41.55** | **65,708,816.19** |
| **10-15** | GN18 | 22,232,822.30 | 37,573,469.69 | 24.89 | 9,352,036.61 |
| | GN30 | 7,183,350.15 | 12,139,861.75 | 20.71 | 2,514,165.37 |
| | GN33 | 18,130,900.05 | 30,641,221.08 | 23.63 | 7,240,520.54 |
| | GN48 | 15,950,498.10 | 26,956,341.79 | 25.41 | 6,849,606.45 |
| | GN58 | 14,510,689.13 | 24,523,064.63 | 27.89 | 6,839,482.73 |
| | GN68 | 19,498,536.83 | 32,952,527.24 | 23.89 | 7,872,358.76 |
| Level | Hole-ID | Volume ($m^3$) | Tonnage (DMT) | Grade (%MF) | DMT Conc. |
| Sub Total | | **97,506,796.56** | **164,786,486.19** | **24.68** | **40,668,170.45** |
| **15-20** | GN18 | 13,339,693.38 | 22,544,081.81 | 12.58 | 2,836,045.49 |
| | GN33 | 19,433,900.05 | 32,843,291.08 | 11.65 | 3,826,243.41 |
| | GN48 | 17,519,498.10 | 29,607,951.79 | 12.66 | 3,748,366.70 |
| | GN58 | 18,284,781.30 | 30,901,280.40 | 10.24 | 3,164,291.11 |
| | GN68 | 22,483,264.39 | 37,996,716.82 | 13.56 | 5,152,354.80 |
| Sub Total | | **91,061,137.22** | **153,893,321.90** | **12.17** | **18,727,301.51** |
| | GN68 | 9,150,510.69 | 15,464,363.07 | 18.86 | 2,916,578.87 |
| Sub Total | | **9,150,510.69** | **15,464,363.07** | **18.86** | **2,916,578.87** |
| Grand Total | | 358,850,871.32 | 606,457,972.52 | 25.47 | 154,466,259.02 |
| | | **INFERRED** | | | |
| **0-5** | GN01 | 5,452,567.28 | 9,214,838.69 | 59.20 | 5,455,184.51 |
| | GN02 | 9,049,637.80 | 15,293,887.88 | 45.20 | 6,912,837.32 |
| | GN03 | 9,851,788.01 | 16,649,521.73 | 46.70 | 7,775,326.65 |
| | GN04 | 13,030,214.43 | 22,021,062.39 | 45.40 | 9,997,562.32 |
| Sub Total | | **37,384,207.51** | **63,179,310.69** | **47.71** | **30,140,910.80** |


**Figure 22.** Polygon Plan for Level 0 to 5 meters


**Figure 23.** Polygon Plan for Level 5 to 1 0 meters


**Figure 24.** Polygon Plan for Level 10 to 15 meters


**Figure 25.** Polygon Plan for Level 15 to 20 meters


**Figure 26.** Polygon Plan for Level 20 to 25meters

## 9.2 MGB Mineral Resource Estimate

### 9.2.1 Parameters Used in the Resource Estimation

The mineral resource estimate conducted by MGB made use of the same database used by the JDVC in its resource computations. The integrity of the database, number of drillholes and sample intervals were checked by MGB technical personnel before being utilized for geologic modelling and resource calculation. The procedure of the mineral resource estimation by MGB included basic statistical analysis, geological modelling and volumetrics and tonnage calculations. The construction of the polygons signifying the area of influence of each drillhole was done using SURPAC v6.8.1. Statistical analysis, geological modelling and resource computations were done using GEMS v6.8.1.

The polygons were constructed using Surpac v 6.8.1. In polygon method (***Figure 27)***, the area of influence is equivalent to half of the distance from one sample to another. The midpoints between samples were determined in order to mark the extent of the area of influences. These distances were used to construct polygons representing the areas of influence for each sample. These polygons were then used for the rendering of geological models.

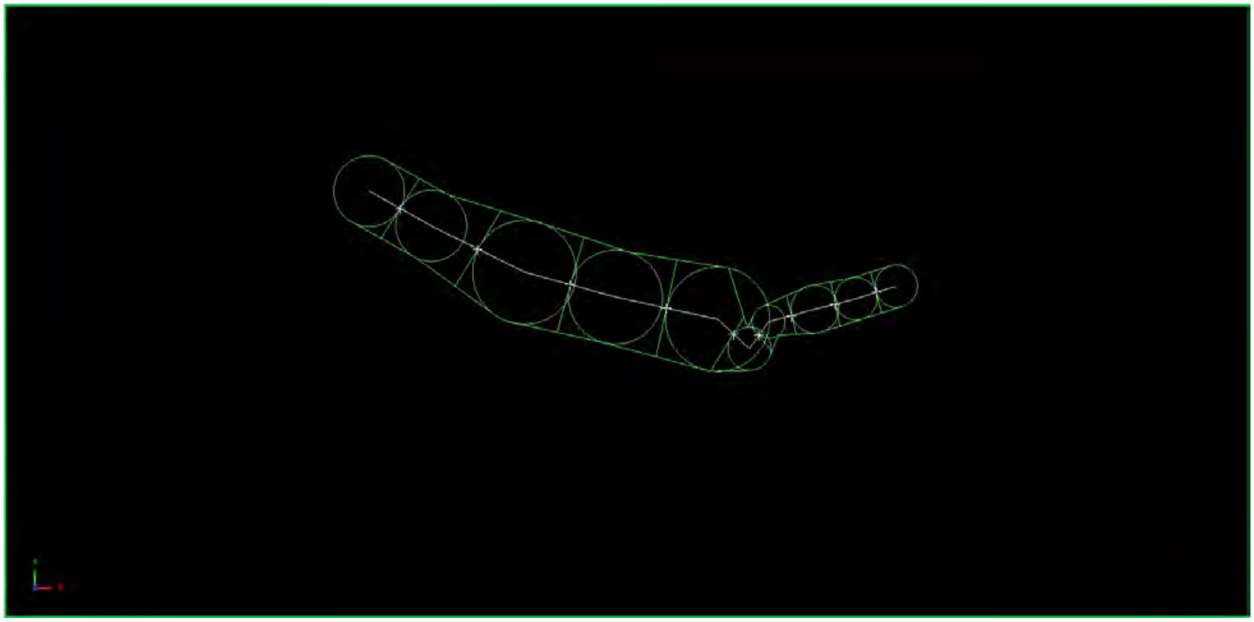


**Figure 27**. Polygon method using Surpac v6.8.1

The average magnetic fraction contents used in the calculation are the average of the sum of products of thickness of the horizon and average magnetic fraction contents. The volume of raw sand is computed by multiplying the area of sand with the average thickness of sand horizon. The tonnage of the raw sand is computed by multiplying the volume with specific gravity of raw sand (1.69 dmt/$m^3$). The tonnage of the magnetite sand was calculated by multiplying the tonnage of raw sand with the with the average magnetic fraction

A total of 10 drillholes and 28 sample intervals were used for the resource estimate. MGB set the cut-off grade to 5% MF and recovery at 90%. The geological modelling was also done using the polygon method, which is similar to that used by the JDVC in their resource estimates. Interpolation of grade values was deemed to be not applicable considering the distances of the drillholes of JDVC. For this reason, block modelling was also deemed not necessary. Instead, solids representing the area of influence of each drillhole and the thicknesses show the sample intervals. A dry density of 1.69 dmt/ $m^3$ was used in the calculation of tonnage, which was also the same density used by the JDVC.

### 9.2.2 Basic Statistics

Basic statistical analysis was done to determine data variance from the sample analysis results that may arise from the geological interpretation of the deposit, sampling practices, and laboratory analyses (***Table 6***). Basic statistical analysis consisted of all 28 sample intervals from all 10 drillholes used. After statistical analysis, it is imperative that dispersion of grades especially in %MF Fe does not deviate much from the mean grades. GEMS (Version 6.8) was used to perform the univariate statistical analysis for %MF value subjecting each mineralized domain to this process. The histogram for %MF is shown in **Figure 28.**

**Table 6**. Summary of Basic Statistics

| Variable | %MF |
|---|---|
| Number of samples | 28 |
| Min.value (Grade %) | 3.23 |
| Max. value (Grade %) | 59.3 |
| Mean | 28.32 |
| Median | 24.90 |
| Geometric mean | 24.49 |
| Variance | 193.52 |
| Standard deviation | 13.91 |
| Coefficient of Variance | 0.49 |

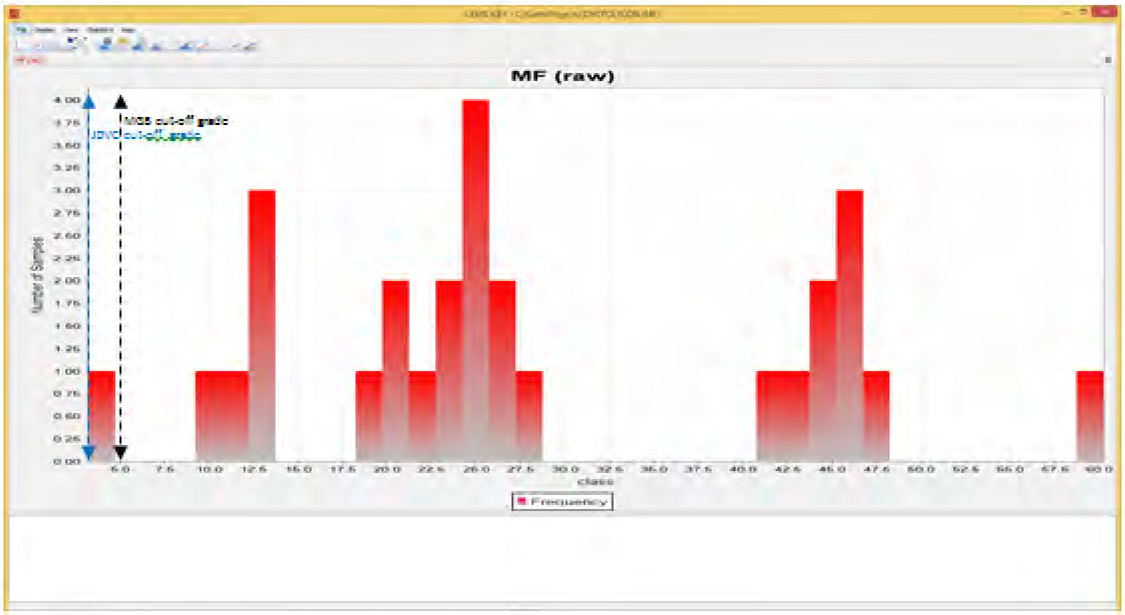



**Figure 28**. Histogram showing the % MF grades of the samples of JDVC.

### 9.2.3 Geologic Model Rendering

The extent of the deposit was based on the area of influence of the drillholes which was determined by the conventional polygon method (***Figure 29***. In the polygon method, the radius of the area of influence of a sample is equivalent to half of the distance from one sample to another. The thicknesses were based on the sample intervals used by the JDVC which is 5 meters. After constructing the extents of the polygon of each sample, geological solids were constructed based on these polygons and the thicknesses of the sample intervals. After the geological model was constructed, it was clipped using the MPSA boundaries of JDVC to ensure that the deposit calculated is within the bounds of the claim area.

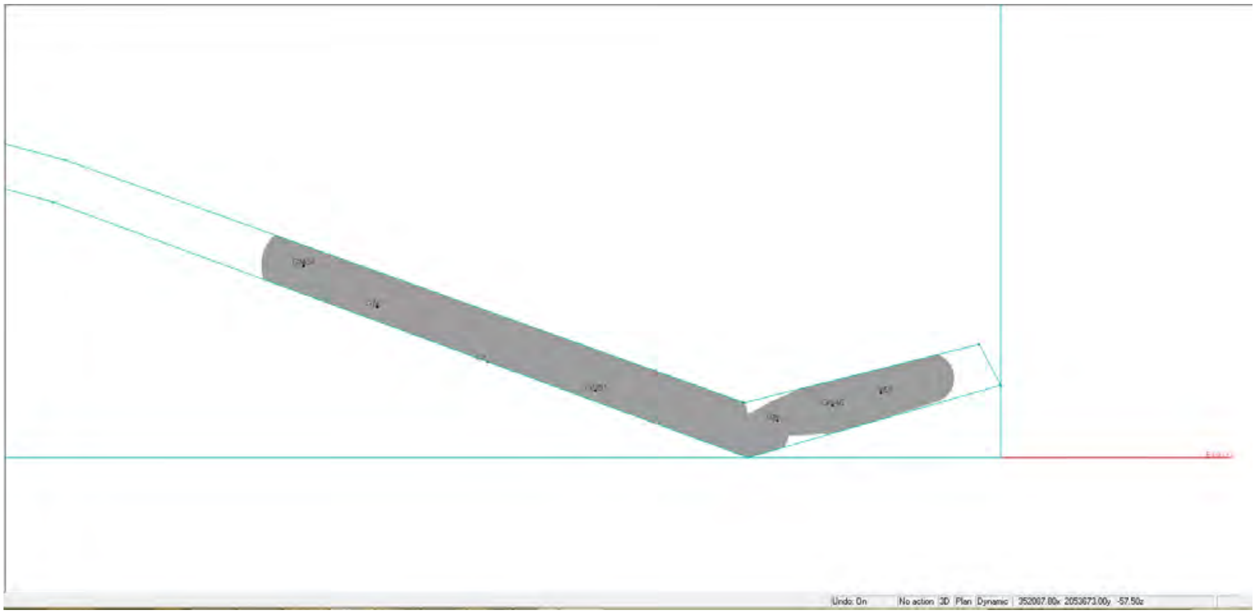


**Figure 29**. Geological solid showing the magnetite sand with the tenement area of JDVC

### 9.2.4 Mineral Resource Classification Used

The **Mineral Resource of JDVCRC** herein refers to the titano-magnetite sand resource that has been blocked by high-resolution seismic reflection profiling, echo sounder and geological sampling through confirmatory offshore drilling. The vertical extent and horizontal limit of the deposit were defined by means of logging of drill cores and incorporated with the updated bathymetric survey of the project area.

Mineral Resource computed is categorized/classified as Measured to Inferred Mineral Resource on the basis of drillhole spacing and geologic continuity, in this case 2km x 2km and >2km drillhole spacing were used to delineate ore outlines for Measured and Inferred categories, respectively. The following categories were used in the reporting of mineral resource:

- **Indicated Mineral Resource** is part of a Mineral Resource in which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a ***high*** level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity. ***In this report, measured mineral resource refers to the offshore***

***magnetite resource that has been drilled by confirmatory drilling at 2km x 2km grid based on*** based on the result of the interpretation of the seismic reflection profiling data.

- **Inferred Mineral Resource is** part of a Mineral Resource in which tonnage, grade and mineral content can be estimated with a ***low*** level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, working and drill holes which may be limited or of uncertain quality and reliability. An Inferred Mineral Resource has a lower level of confidence than that applying to an Indicated Mineral Resource**.** ***In this report, measured mineral resource refers to the offshore magnetite resource that has been drilled by confirmatory drilling at >2km distance based on*** based on the result of the interpretation of the seismic reflection profiling data.

### 9.2.5 MGB's Summary of Mineral Resource Estimate

The procedure of the mineral resource estimation by MGB included basic statistical analysis, geological modelling and volumetrics and tonnage calculations. The construction of the polygons signifying the area of influence of each drillhole was done using SURPAC v6.8.1. Statistical analysis, geological modelling and resource computations were done using GEMS v6.8.1.

After MGB field validation and manipulation of the JDVCRC drillholes used in the resource estimation, the undersigned estimated a grand total raw offshore magnetite sand resource of **512,971,918.94** DMT with weighted average grade of **26.51% MF**(***Table 7a, b and c, Figure 30 and 31***). The cut-off grade of 5%MF came out to be the most economical cut-off considering the trade-offs in the reduction in mining and processing cost over the decrease in concentrates expected to be produced. Furthermore, it can be observed in the histogram that a small size of the sample has a very low grade (MF < 5%). Thus, it was deemed necessary to set a cut-off grade of 5%

**Table 7a: JDVC and MGB summary of resource estimates**

| | JDVC | | MGB | |
|---|---|---|---|---|
| **Level** | **Tonnage (DMT)** | **Grade (%MF)** | **Tonnage (DMT)** | **Grade (%MF)** |
| **MEASURED RESOURCE** | | | | |
| 0-5 meters | 114,167,560.95 | 23.16 | 121,598,620.18 | 25.40 |
| 5-10 meters | 158,146,240.41 | 41.55 | 131,123,235.97 | 42.89 |
| 10-15 meters | 164,786,486.19 | 24.68 | 131,123,235.97 | 24.86 |
| 15-20 meters | 153,893,321.90 | 12.17 | 121,598,620.18 | 12.19 |
| 20-25 meters | 15,464,363.07 | 18.86 | 7,528,206.63 | 18.86 |
| **Total** | **606,457,972.52** | **25.47** | **512,971,918.94** | **26.51** |
| **INFERRED RESOURCE** | | | | |
| **0-5 meters** | **63,179,310.69** | **47.71** | **177,800,022.17** | **49.68** |

The **inferred resource of 177.80 million DMT** at 53.49.68%MF was not included in the total mineral resource estimate since the only mineral resource categories allowed for DPMF are measured and indicated classification.

**Table 7b. GRADE TONNAGE CURVE**

| Cut-off grade | Tonnage | Grade |
|---|---|---|
| 0% | 580551705.26 | 26.08 |
| 1% | 580551705.26 | 26.08 |
| 2% | 580551705.26 | 26.08 |
| 3% | 580551705.26 | 26.08 |
| 4% | 569968798.83 | 26.51 |
| 5% | 569968798.83 | 26.51 |

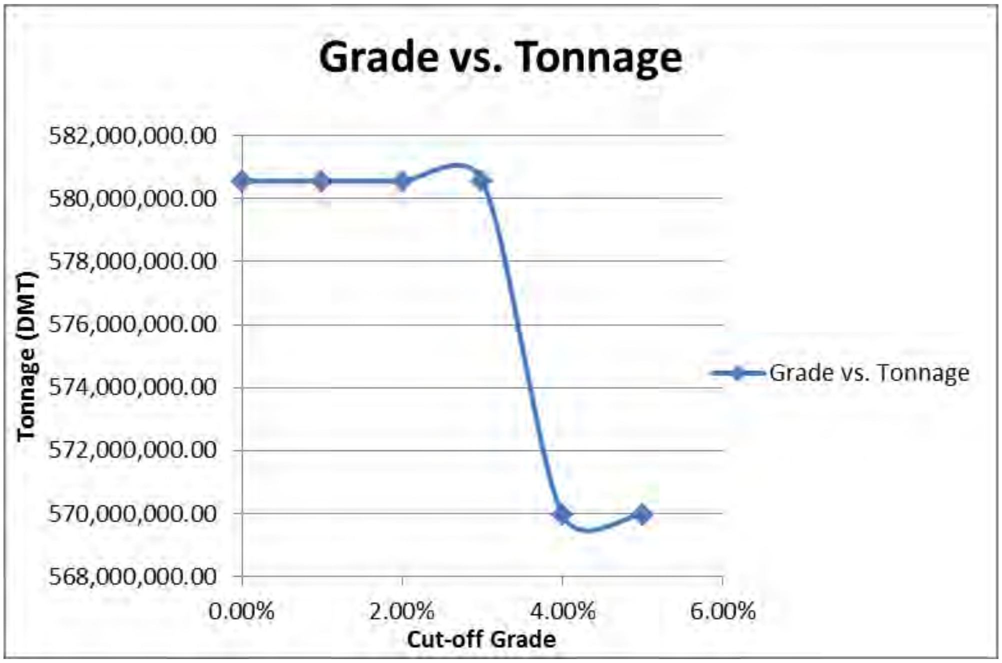



**Figure 30.** Grade Tonnage Curve

### 9.2.6 Variations in the JDVC and MGB Resource Estimates

Variations in the tonnage and grade estimates of MGB and JDVC can be observed in Table 7. It should be noted that different softwares were used in the construction of the polygons and determination of the area. This may result to slight differences in the resource estimates. The total measured mineral resource estimate by MGB of 512,971,918.94 MT is less than that of JDVC (606,457,972.52 DMT) by 93,486,053.58 DMT with weighted average grade of 26.51 % MF compared to that of JDVC which is 25.47 %. The difference between the estimates can be accounted to different cut-off grades and % recovery used. While the JDVC did not set any cut-off grades and % recovery, MGB used a 5%MF cut-off grade and 90% recovery. Overall, the measured mineral resource estimates of MGB is lower by 93,486,053.58 DMT with grade difference of 1.04 % MF.

## 10.0 CONCLUSION AND RECOMMENDATION

Based on the Amended Feasibility Study (FS) of JDVCRC, the **initial projected** 10-year production schedule is set at an annual extraction rate of 6.91 million DMT. In consideration of the estimated grand total offshore raw magnetite sand resource of **512,971,918.94 DMT** classified as Measured category at cut-off grade of 5% MF with weighted average grade of 26.51%MF, the projected mine life is **more than 25 years** and stands sufficient to support JDVCRC's Offshore Magnetite Sand Project, with good potential for additional measured and/or indicated resource that will be blocked by in-fill drilling program with inferred resource of 177.80 million DMT at 49.68%MF

In view of the foregoing discussions, it is hereby concluded that the JDVCRC's Declaration of Mineral Resource Estimate of JDVC Resources Corporation's Offshore Magnetite Project under MPSA No. 338-2010-II-OMR is acceptable and compliant to the Philippine Mineral Reporting Code (PMRC) of 2007 and guidelines of the Department of Environment and Natural Resources (DENR) Administrative Order (DAO) No. 2010-09.

**Prepared by:**

**Resty C. Gomez**
Senior Science Research Specialist

**Anne Karla M. Navarro**
Geologist II

## 11.0 REFERENCES

Liwanag, R.E. 2015. Final Exploration Report of JDVCRC Offshore Magnetite Sand Project, CP Report to JDVC Resources Corporation.

Climate Map of the Philippines based on the Modified Corona Classification

Mines and Geosciences Bureau, 2010. Geology of the Philippines, 2nd ed.

Peña, R.E. 2008. Lexicon of the Philippine Stratigraphy. Geological Society of the Philippines, Mandaluyong City.

| RESOURCE CLASSIFICATION | HOLE ID | DEPTH (m) | VOLUME (cu.m.) | DENSITY | TONNAGE (DMT) | %MF | %FE | TOTAL TONNAGE (DMT) | %MF | %FE |
|---|---|---|---|---|---|---|---|---|---|---|
| INFERRED | GN01 | 0-5 | 33,708,643.93 | 1.69 | 56,967,608.24 | 59.3 | | 56,967,608.24 | 59.30 | |
| INFERRED | GN02 | 0-5 | 31,920,128.64 | 1.69 | 53,945,017.41 | 45.2 | | 53,945,017.41 | 45.20 | |
| INFERRED | GN03 | 0-5 | 29,031,769.14 | 1.69 | 49,063,689.84 | 46.7 | | 49,063,689.84 | 46.70 | |
| INFERRED | GN04 | 0-5 | 22,236,251.30 | 1.69 | 37,579,264.70 | 45.4 | | 37,579,264.70 | 45.40 | |
| INDICATED | GN18 | 0-5 | 25,410,145.14 | 1.69 | 42,943,145.29 | 26.58 | 62.05 | 171,772,581.15 | 26.98 | 61.65 |
| INDICATED | | 5-10 | 25,410,145.14 | 1.69 | 42,943,145.29 | 43.87 | 61.53 | | | |
| INDICATED | | 10-15 | 25,410,145.14 | 1.69 | 42,943,145.29 | 24.89 | 60.45 | | | |
| INDICATED | | 15-20 | 25,410,145.14 | 1.69 | 42,943,145.29 | 12.58 | 62.58 | | | |
| INDICATED | GN30 | 5-10 | 6,262,074.81 | 1.69 | 10,582,906.44 | 21.01 | 61.8 | 21,165,812.87 | 20.86 | 61.59 |
| INDICATED | | 10-15 | 6,262,074.81 | 1.69 | 10,582,906.44 | 20.71 | 61.38 | | | |
| INDICATED | GN33 | 0-5 | 12,067,221.47 | 1.69 | 20,393,604.28 | 22.56 | 62.53 | 81,574,417.12 | 24.93 | 61.83 |
| INDICATED | | 5-10 | 12,067,221.47 | 1.69 | 20,393,604.28 | 41.89 | 61.52 | | | |
| INDICATED | | 10-15 | 12,067,221.47 | 1.69 | 20,393,604.28 | 23.63 | 61.23 | | | |
| INDICATED | | 15-20 | 12,067,221.47 | 1.69 | 20,393,604.28 | 11.65 | 62.03 | | | |
| INDICATED | GN48 | 0-5 | 15,734,912.14 | 1.69 | 26,592,001.52 | 24.87 | 60.58 | 106,368,006.07 | 27.37 | 61.29 |
| INDICATED | | 5-10 | 15,734,912.14 | 1.69 | 26,592,001.52 | 46.55 | 62.12 | | | |
| INDICATED | | 10-15 | 15,734,912.14 | 1.69 | 26,592,001.52 | 25.41 | 62.35 | | | |
| INDICATED | | 15-20 | 15,734,912.14 | 1.69 | 26,592,001.52 | 12.66 | 60.09 | | | |
| INDICATED | GN58 | 0-5 | 14,360,438.94 | 1.69 | 24,269,141.81 | 24.94 | 60.5 | 97,076,567.22 | 27.59 | 61.04 |
| INDICATED | | 5-10 | 14,360,438.94 | 1.69 | 24,269,141.81 | 47.29 | 61.49 | | | |
| INDICATED | | 10-15 | 14,360,438.94 | 1.69 | 24,269,141.81 | 27.89 | 60.37 | | | |
| INDICATED | | 15-20 | 14,360,438.94 | 1.69 | 24,269,141.81 | 10.24 | 61.78 | | | |
| INDICATED | GN68 | 0-5 | 12,373,778.16 | 1.69 | 20,911,685.09 | 26.98 | 60.38 | 92,011,414.39 | 26.16 | 61.36 |
| INDICATED | | 5-10 | 12,373,778.16 | 1.69 | 20,911,685.09 | 43.15 | 62.58 | | | |
| INDICATED | | 10-15 | 12,373,778.16 | 1.69 | 20,911,685.09 | 23.89 | 61.06 | | | |
| INDICATED | | 15-20 | 12,373,778.16 | 1.69 | 20,911,685.09 | 13.56 | 61.74 | | | |
| INDICATED | | 20-22 | 4,949,511.26 | 1.69 | 8,364,674.04 | 18.86 | 60.53 | | | |

| | | | |
|---|---|---|---|
| **TOTAL INDICATED** | **569,968,798.83** | **26.51** | **61.45** |
| **TOTAL INFERRED** | **197,555,580.19** | **49.68** | |

**Table 7c**. MGB's Summary of Magnetite Sand Resource Estimate of JDVCRC at cut-off grade of 5% MF.

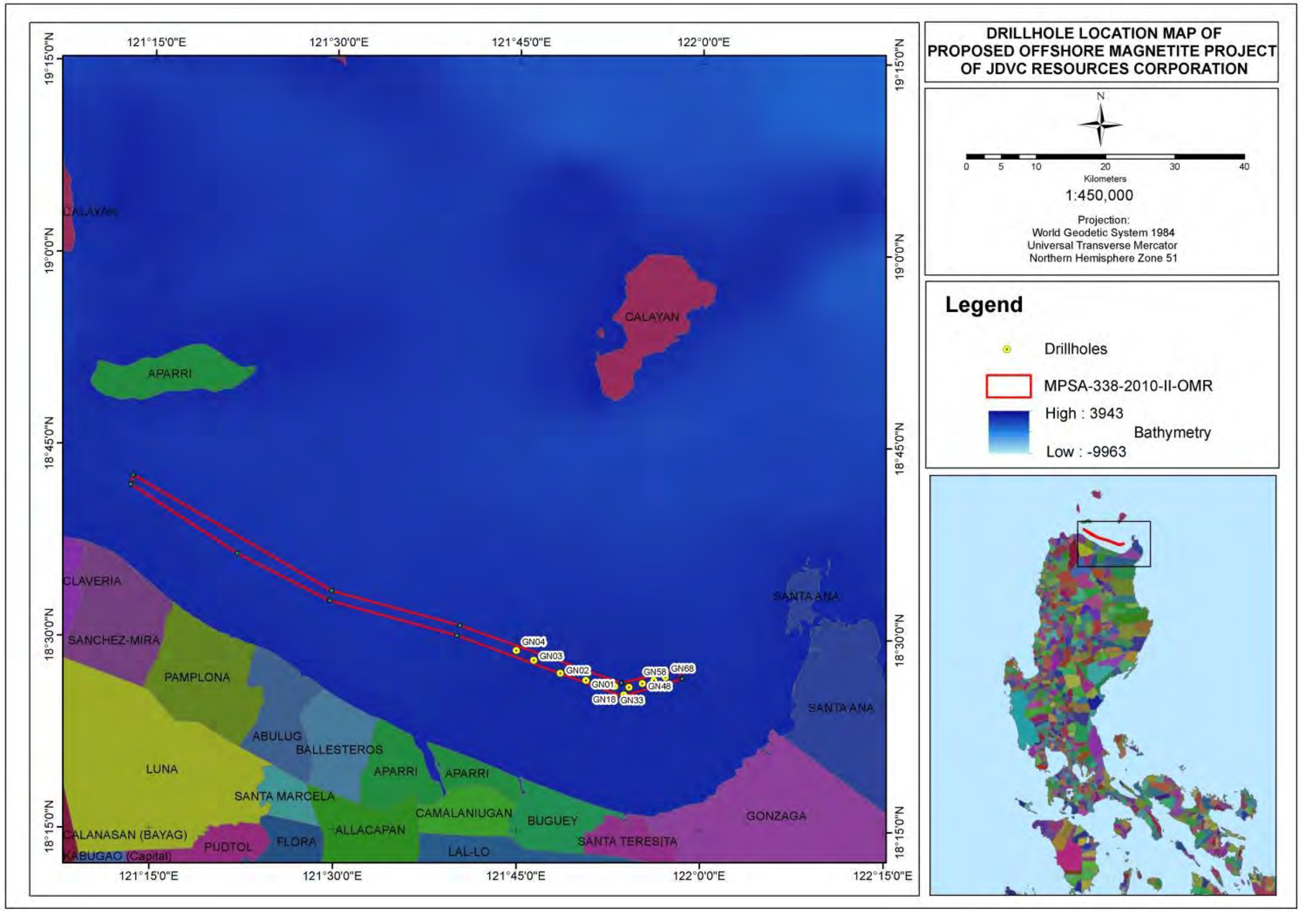
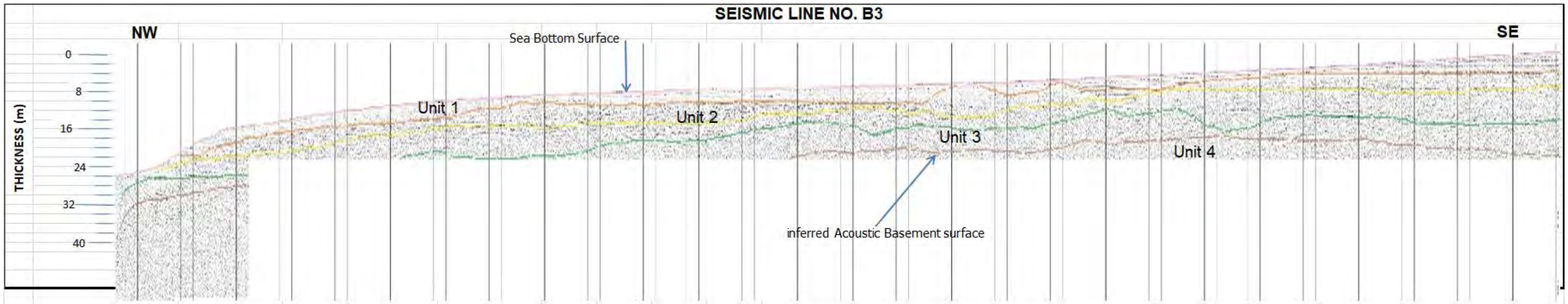



**Figure 31.** Drillholes Used by MGB in the Resource Estimation

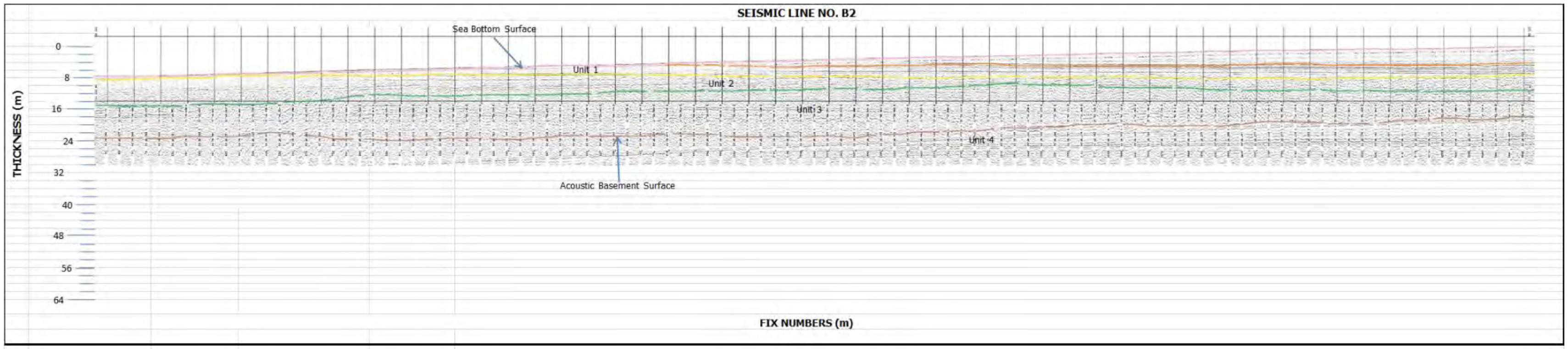
## REPRESENTATIVE SEISMIC PROFILES

### I. NW – SE Lines

### A. Line B3

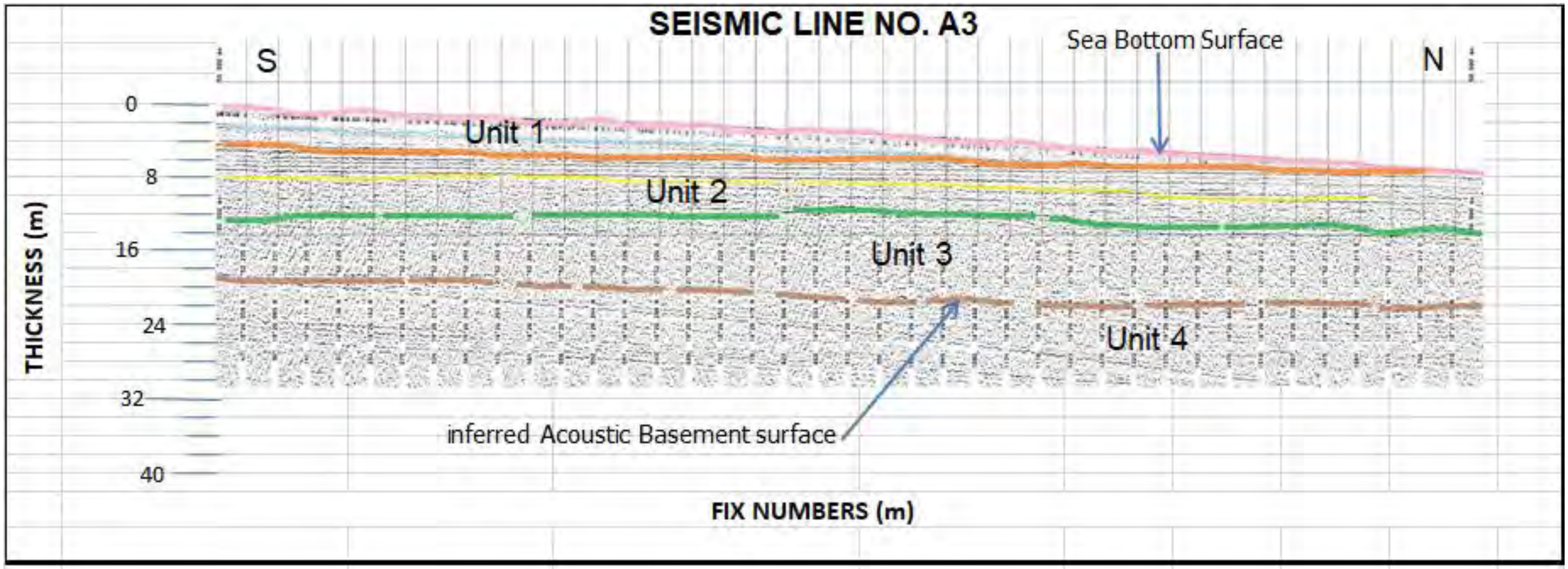



**Unit 1** is essentially characterized by reflection-free to parallel sub-parallel reflection patterns deduced to consist essentially of mud to silty mud sediments. The thickness of this unit is relatively variable with an average of about 4 to 5 meters. **Unit 2** is generally characterized by relatively strong stratified divergent to sigmoidal to chaotic in some places internal reflection patterns and is inferred to consist predominantly of fine to medium grained most possibly sand-sized deposits. It has an average thickness of about 8 to 10 meters. **Unit 3** is characterized by irregular, discontinuous and faintly chaotic to hummocky reflection patterns and is deduced to consist essentially of silty sand to muddy sand deposit. It has an average thickness of about 5 meters. **Unit 4 –** The "acoustic basement" surface underlying the study area.

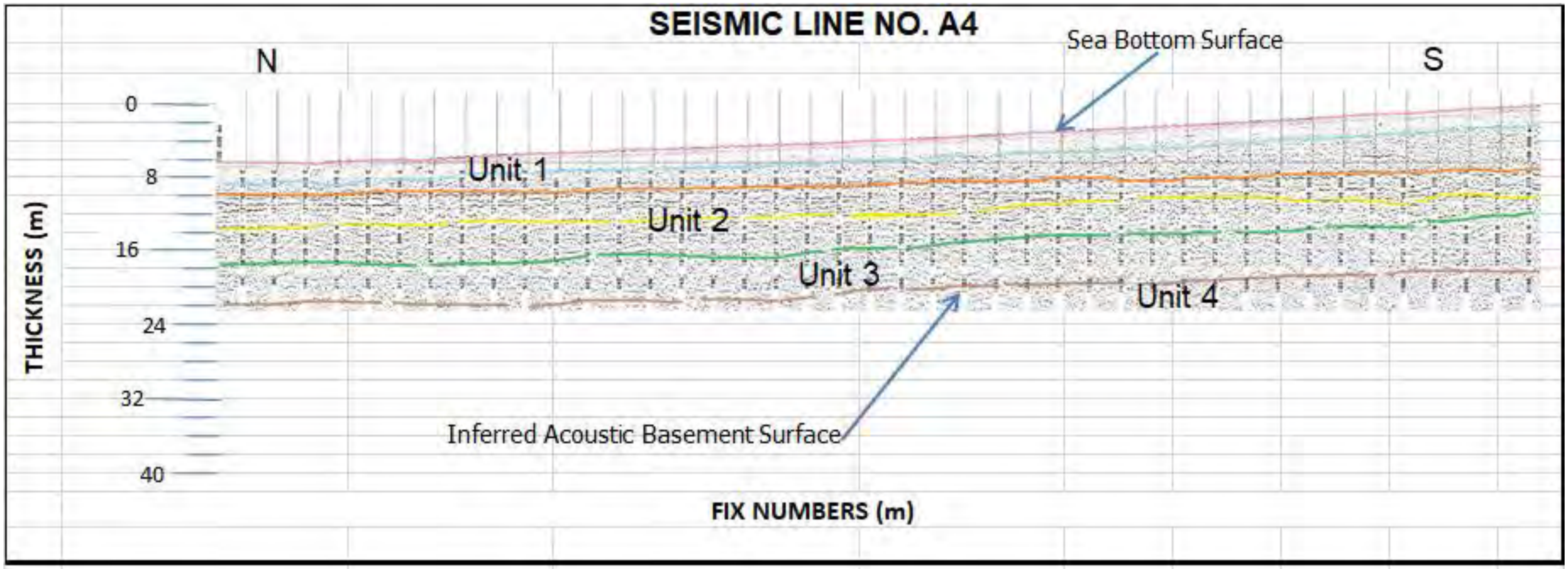



**Unit 1** is essentially characterized by reflection-free to parallel sub-parallel reflection patterns deduced to consist essentially of mud to silty mud sediments. The thickness of this unit is relatively variable with an average of about 4 to 5 meters. **Unit 2** is generally characterized by relatively strong stratified divergent to sigmoidal to chaotic in some places internal reflection patterns and is inferred to consist predominantly of fine to medium grained most possibly sand-sized deposits. It has an average thickness of about 8 to 10 meters. **Unit 3** is characterized by irregular, discontinuous and faintly chaotic to hummocky reflection patterns and is deduced to consist essentially of silty sand to muddy sand deposit. It has an average thickness of about 5 meters. **Unit 4 –** The "acoustic basement" surface underlying the study area.

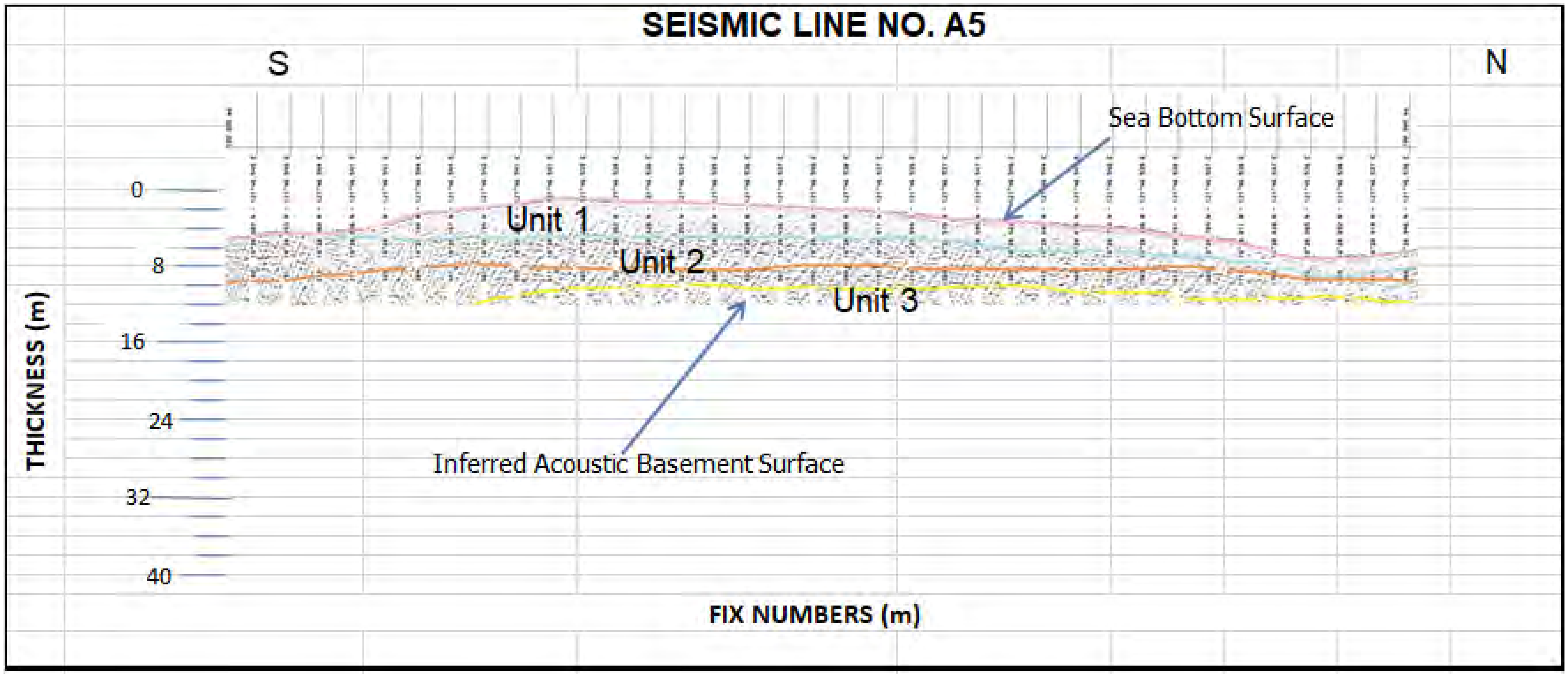
**II. N – S / S – N Lines**




**Unit 1** is essentially characterized by reflection-free to parallel sub-parallel reflection patterns deduced to consist essentially of mud to silty mud sediments. The thickness of this unit is relatively variable with an average of about 4 to 5 meters. **Unit 2** is generally characterized by relatively strong stratified divergent to sigmoidal to chaotic in some places internal reflection patterns and is inferred to consist predominantly of fine to medium grained most possibly sand-sized deposits. It has an average thickness of about 8 to 10 meters. **Unit 3** is characterized by irregular, discontinuous and faintly chaotic to hummocky reflection patterns and is deduced to consist essentially of silty sand to muddy sand deposit. It has an average thickness of about 5 meters. **Unit 4 –** The "acoustic basement" surface underlying the study area.




**Unit 1** is essentially characterized by reflection-free to parallel sub-parallel reflection patterns deduced to consist essentially of mud to silty mud sediments. The thickness of this unit is relatively variable with an average of about 4 to 5 meters. **Unit 2** is generally characterized by relatively strong stratified divergent to sigmoidal to chaotic in some places internal reflection patterns and is inferred to consist predominantly of fine to medium grained most possibly sand-sized deposits. It has an average thickness of about 8 to 10 meters. **Unit 3** is characterized by irregular, discontinuous and faintly chaotic to hummocky reflection patterns and is deduced to consist essentially of silty sand to muddy sand deposit. It has an average thickness of about 5 meters. **Unit 4 –** The "acoustic basement" surface underlying the study area.

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