ANNEX –A

SECRETARY'S CERTIFICATE

SECRETARY'S CERTIFICATE

I, **RODEL M. BATOCABE**, being the Corporate Secretary of Oriental Synergy Mining Corporation, with principal business address at No. 139 Joy Street, Barangay Balingasa, Quezon City, hereby certify that in a special meeting of the Board of Directors held on May 16, 2006, in which meeting there was a quorum present and acted throughout, the following resolutions were unanimously adopted and approved, to wit:

> "RESOLVED, AS IT IS HEREBY RESOLVED, that the Chief Executive Officer, Mr. Frank Chun Wai Lao, is authorized to execute the Deed of Assignment involving 2 parcels of land covering a total area of 827.88 hectares (Parcel I-791.20 hectares and Parcel II-36.68 hectares) located at Barangays Dona Helen and Wilson in the Municipalities of Basilisa and San Jose, respectively, Surigao Del Norte and another parcel of land covering an area of 1,482,537 hectares located at Basilisa, Surigao Del Norte, which include the assignment of the respective Exploration Permit Applications of F.S. Borja Mining and Trading Corporation covering said parcels of land in favor of Oriental Synergy Mining Corporation;
>
> RESOLVED FURTHER, that the Chief Executive Officer, Mr. Frank Chun Wai Lao, is authorized to sign, execute and accept the terms and conditions of the Mining Tenement, including, but not limited to, Exploration Permit, Mineral Production Sharing Agreement (MPSA), Small-Scale Mining Permit (SSMP), and other documents which the Philippine Government may require in connection with the foregoing."

I FURTHER CERTIFY that the above resolution has not been nullified, repealed, amended, or modified and that the same remain in full force and effect as of the date of this certification.

IN WITNESS WHEREOF, I have hereunto set my hand this 20th day of June 2006.

RODEL M. BATOCABE
Corporate Secretary

SUBSCRIBED AND SWORN, to before me this 13 day of JUL 2006, in QUEZON CITY, affiant exhibiting to his CTC No. 08116692 issued on January 5, 2006 issued at Pasig City.

ATTY HECTOR B. CENTENO
NOTARY PUBLIC
PTR NO. 715286
IBP NO. 643380
DATE ISSUED: 1/3/06
ISSUED AT QUEZON CITY
VALID UNTIL DEC. 31, 2006

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ANNEX – B

LOCATION MAP
OR
SKETCH PLAN

ANNEX – C

TWO (2)-YEAR EXPLORATION WORK PROGRAM

TWO – (2) YEAR EXPLORATION WORK PROGRAM

INTRODUCTION

This Exploration Work Program (ExWP) is prepared by the undersigned to form part of the application for Mineral Production Sharing Agreement (MPSA) of **Oriental Synergy Mining Corporation** covering a certain area located within the Surigao Mineral Reservation (SMR).

Considering that the SMR is notable for laterite and saprolite deposits, which is potential for nickel and chromite mineralization and the demand for nickel and chromite are continuously increasing at present, the objectives of this ExWP are (1) to determine the potential for **nickel and chromite** mineralization of the applied area and (2) to determine the viability of developing and exploiting the nickel and chromite deposit(s) to be found therein. However, other valuable minerals of commercial quantity to be found within the Project Area will also be given attention.

1.0 NAME AND ADDRESS OF THE APPLICANT

Name	:	**ORIENTAL SYNERGY MINING CORPORATION**
Address	:	**139 Joy Street, Barangay Balingasa, Quezon City**
Contact Person	:	**Frank C.W. Lao** **Chief Executive Officer**
Telephone Nos.	:	**(032) 330-5636 or 38**
Fax Nos.	:	**(032) 330-5637**

2.0 LOCATION OF THE PROJECT

The Project Area, which is covered by an MPSA application, is located in Barangay Urbiztondo, Municipality of Claver, Province of Surigao Del Norte, within Parcel I of the SMR and specifically bounded by the following technical description:

Corners	Latitude	Longitude
1	9° 30' 00.00"	125° 46' 00.00"
2	9° 33' 00.00"	125° 46' 00.00"
3	9° 33' 00.00"	125° 47' 00.00"
4	9° 33' 00.00"	125° 47' 00.00"

Figure 1 shows the specific location of the applied area.

3.0 AREA COVERAGE

The Project Area covers an area of **one thousand twelve and 0158/10000 (1,012.0158) hectares**.

4.0 PROJECT AREA DESCRIPTION

4.1 Terrain/Physiography

"General Description - The main topographic feature of Surigao Province is the Diwata Mountain Range. This range forms the western border of the province, but only cuts across the south-western corner of the iron reservation[1], in a north-westerly direction. Roughly the Diwata commence in the extreme southern corner of the province and trend in a north-westerly direction to the eastern side of Lake Mainit. To the west of the range is the famous Agusan

[1] **Established under Executive Order No. 63, now well known as Parcel I of the Surigao Mineral Reservation.**

Valley, through which the northward flowing Agusan River winds its way to Butuan Bay. On the east, isolated mountain peaks and small ranges fill in the central part of Surigao Province, its southern portion being more flat and having more marginal lands along the coast than the central or northern parts. Wile the general trend of the Diwatas are northwesterly there many bends in the crest line and near the center of the marked out government reservation is Mt. Legaspi, rising to an elevation of 1170 meters above sea-level and forming a conspicuous feature of the landscape. To the north and south-east of this prominent land mark are other peaks whose elevations vary from 500-924 meters. In general, the land slopes eastward to the coast, but the slope is not regular or continous. These slopes are dissected into ridges, the crests of which are broad and comparatively flat and have a general east-west trend. The slopes of the western range have been notched by the eastern flowing drainage channels. In short, the north and east of Mt. Legaspi is deeply incised, the streams flowing through narrow precipitous valleys.

Topographic Relief – East of the western highlands, mentioned above, the whole topography has been modified by erosion, the ridges are rounded and the valleys have been deepened; the general features of the bedrock, except in some of the erosion cuts, has been marked by lateritic iron ore. Much of the interior region adjacent to the eastern coast of Surigao has the appearance of a plateau. The elevation of the iron areas varies from 122 to approximately 500 meters.

The outline of the sea coast is very irregular and is marked by narrow beaches and sea cliffs. The coastline is broken by several prominent points and bays between Gigacuit and Cantilan. The most important of the latter is Dahican Bay. The land rises abruptly above the western bay side and in places the cliffs are almost vertical.

There are many irregularities in the surface of the ore bodies. Several deeply incised V-shaped valleys cut the district, and may be interpreted as evidence of uplift. In general, they are narrow, comparatively short, and deep. Water falls near the head waters of these streams are common. There is much field evidence to show that some of the streams follow zones of weakness in the bed rock, shear zones and faults being common in the district. The original consequent drainage of this region has been modified as uplift took place. The stream systems are now subsequent rather than consequent - - - that is, they are adjusted to the structures. As a rule, stream sources rise in cirque-like depressions, caused by the erosion of the soft ore.

These peculiar erosion basins have the appearance of bad land topography and are extremely common throughout the whole iron area.[2]"

The Municipalities of Claver and Carrascal are generally mountainous and geotectonically within the eastern limb of the Eastern Mindanao Ridge, a complex NNW-SSE trending island-arc structure.

The Project Area is characterized by moderately sloping to hilly topography with slope ranging from 10% to 40%. The Project Area has an elevation ranging from 10 to 456 meters above sea level (see Figure 1).

4.2 Accessibility

The Project Area is accessible from Surigao City, thru a one (1)-hour land transport via provincial road connecting Surigao del Norte and Surigao del Sur.

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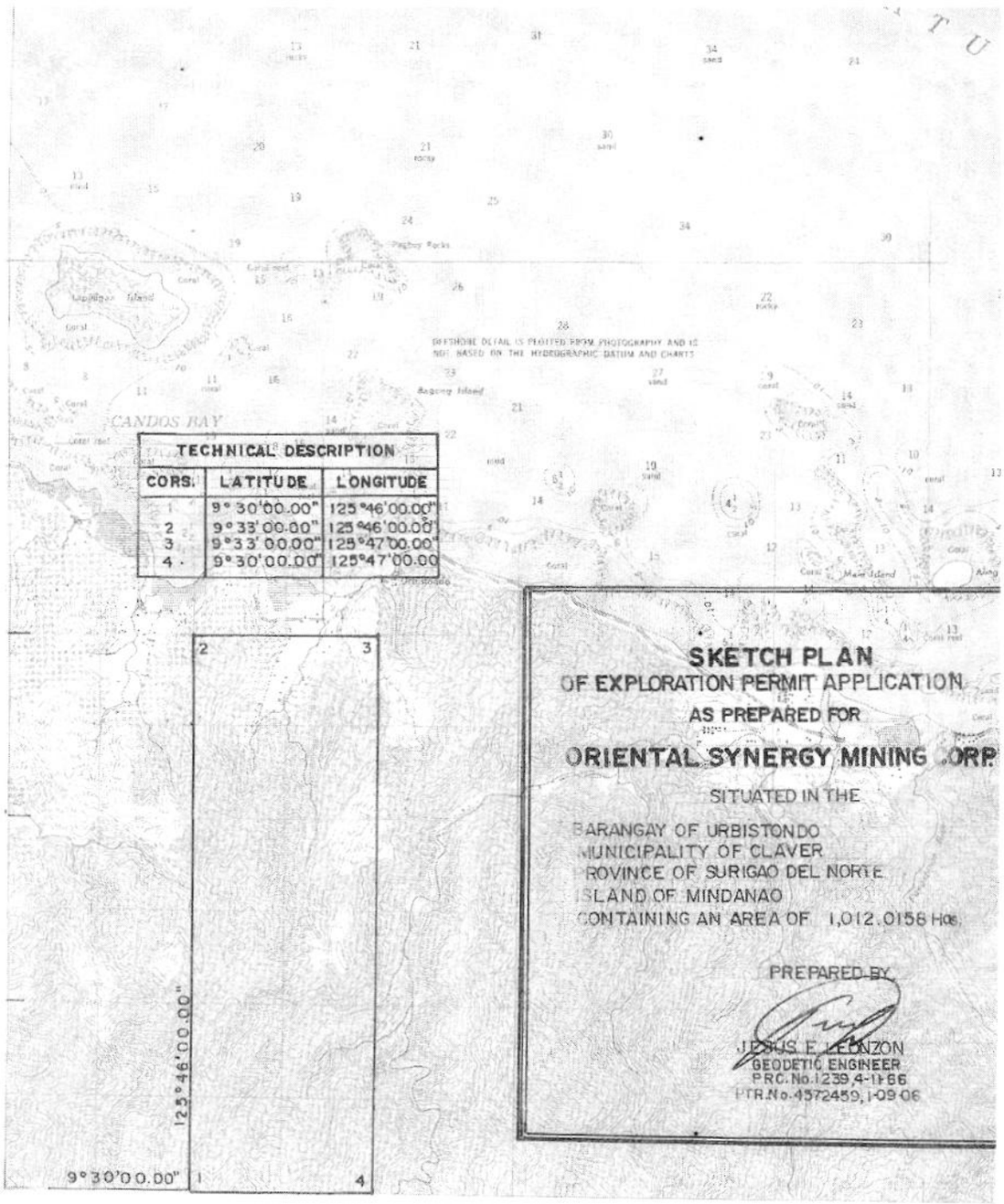
2 **Excerpt from *"GEOLOGICAL REPORT ON THE SURIGAO ORES for the COMMONWEALTH OF THE PHILIPPINES, National Development Company, Manila by Dean F. Frasche, Chief Geological Survey Division, 1938"***

Figure 1



Surigao City can be reached from Manila via one (1)-hour regular air faring transport to Cebu City, thence another 30 minute connecting flight to Surigao or a two-hour direct from Manila to Surigao. Or thru a three-day sea/land faring transports from Manila to Surigao.

Surigao City can also be reached by two-hour land transports from Butuan City. Butuan City can be reached from Manila by air and sea transportations.

4.3 Drainage Systems

The Project Area is situated on the western side of the Mindanao Island and is drained by several, generally short, northerly-flowing streams/creeks, i.e., Hemoyowon and Urbiztondo Creeks that eventually empty into the Hinatuan Passage. The streams exhibit a dendritic drainage pattern.

4.4 Vegetation

The Project Area is covered with tropical jungle of dipterocarp variety. Although the laterite areas along the coastal areas are barren or covered with thin vegetal foliage, densely forested areas are also found farther inland. Iron wood, locally known as "Magkuno," Felichenia linearis, locally known as "hagsam," and types of tropical tree called nickel tree or "paguspos" predominate in the semi-barren areas.

4.5 Land Use

The Major land use and capability of the Project Area including its immediate vicinity, being declared as part of the SMR, is **Mining**. At present, there is a nickel mining operation in the immediate vicinity of the Project Area: the mining operations of Taganito Mining Corporation.

Only some and relatively small portion of the Project Area is being used by the concerned barangays for agricultural purposes. Since the Project Area is mostly covered by lateritic soil, the Project Area is generally not suitable for agricultural purposes.

4.6 Climate[3]

The Province of Surigao del Norte is considered by PAGASA to be under the Type II of the modified Coronas Classification of Philippine Climate, which is based on very pronounced maximum rain period generally occurring in December to January, although there is not a single dry month which is typical of areas along or very near the eastern coast of the country. The province is open to the northeast monsoon.

Meteorological data was collected from the nearest Climatological Station of PAGASA in Surigao City for periods covering 1961 to 1995. Surigao City is located some 40 km southwest of the proposed project area.

Based on the Surigao City data, the climatologic normals computed from 1961 to 1995 are as follows: monthly average of temperature ranges from a low of 22.60°C to a high of 32.50°C with an annual maximum average of 31.04°C and an annual minimum average of 23.46°C. Mean monthly temperatures reading ranges from 25.80°C to 28.25°C. The hottest month of the year is June with mean temperatures ranging from 24°C to 32.50°C. The coldest month is December with mean temperatures of 23.10°C to 29.60°C.

For the climatologic normals, the factor of relative humidity averages annually at 84%. The highest relative humidity recorded is 88% during the month of January. The lowest recorded relative humidity of 80% is felt during the month of August.

The area experiences prevailing winds with velocities annually averaging 3 meters per second. The general wind direction for the months of December to February is northeast,

[3] **Climatologic Data gathered from the Philippine Atmospheric and Geophysical Service Administration (PAGASA) and the Department of Public Works and Highways (DPWH).**

while for the months of March to May it is easterly. For June to August, the area experiences southwesterly winds gradually shifting to west-southwest during September and to the west during October. For the month of November the average wind direction is easterly. The annual wind direction is taken as easterly.

The vapor pressure in the area averages at 30.03 millibars on a year. The highest vapor pressure is recorded during May with monthly average of 31. 40 millibars, while the lowest is during February with 28.50 millibars.

Cloud cover averages at 6 ockta per annum with the cloudiest days for the months of June to March. The least clouds are experienced during the months of April and May with an average of 5 ockta. Thunderstorms are frequent during June to November ranging from 6 to 8 days of thunderstorm per month. The least thunderstorms occur during the months of December to April with ranges of 1 to 4 days of thunderstorms per month. The annual total days of thunderstorms is taken at 59. The months with the most number of lightning days are August and October with an average of 17 days. On the other hand, the lightning days are not found during February.

Data on evaporation rates where not available in Surigao, however, the nearest available data are from the PAGASA Station at the Musuan, Bukidnon Station averaged at 5.5 mm in a year. The highest evaporation rate is on April at 8.0 mm while the lowest is 4.2 mm during the month of July.

The climatologic extremes computed from 1903 to 1995 are as follows: the highest monthly average of temperature is 37.5°C taken on 15 June 1987 while the lowest was on 24 February 1905 at 18.2°C. The low end of the high temperatures is from 24.6°C in 18 December 1905 while the high end of the low temperatures 20.8°C recorded on 18 May 1972.

For the climatologic extremes computed from 1950 to 1995, the area experiences winds with velocities annually averaging 34.6 meters per second. The highest wind velocity was recorded on 21 December 1986 with 56 meters per second. The lowest for the extremes is 20 meters per second during 26 February 1968. The general wind direction for the months of January 10 March is north-northeast to northwest, while for the months of April to June it is west-southwest to south-southwest. For July to August, it varies from west-northwest to west-southwest.

The lowest sea level pressure during the period 1949 to 1995 is recorded at 981.80 millibars on 27 October 1991 while the highest was on 17 January 1959 with 1,019.5 millibars.

Rainfall data were taken from the records of the climatological station of PAGASA in Surigao City. A review of the PAGASA data tells that the annual rainfall in the area is 1,142 mm. The dry months are from December to May with monthly rainfall ranging from 40.6 mm to 97.0 mm. The driest month is April with rainfall totaling only 40.6 mm over a 5-day period. The west months are June to November with monthly rainfall ranges of 105.8 mm to 157.6 mm. The wettest month is October with rainfall registering at 157.6 mm over a period of 16 days.

The most number of tropical cyclones passed over the area during the month of November followed by the month of December. No tropical cyclone affected the area in the months of June, July and September. For the other months, there was minimal threat of tropical cyclone passage over the area. The annual frequency of occurrence of tropical depression is at 0.14, tropical storm is at 0.27 and typhoon at 0.35. The remainder of the months showed minimal threat of tropical cyclone passage over the area. During severe storms the Surigao Channel may not be navigable by launches,

resulting in the isolation of the island. This may happen once or twice a year and may last up to eight days. In the local Visayan language, this phenomenon is known as "Walo-Walo" (from Walo meaning eight).

5.0 DESCRIPTION OF EXPLORATION PROGRAM

5.1. Research Work

5.1.1. Survey of previous work/s on the area

5.1.1.1. Nature or type of study or undertaking

The available data collected/researched that was undertaken in the Project Area are (a) *"GEOLOGICAL REPORT ON THE SURIGAO ORES for the COMMONWEALTH OF THE PHILIPPINES, National Development Company, Manila"* by Dean F. Frasche, Chief, Geological Survey Division, Bureau of Mines, 1938, and (b) *"REPORT OF INVESTIGATION NO. 35"* re: *"PRELIMINARY REPORT ON THE INVESTIGATION OF THE NICKEL-IRON REOSURCES OF THE 1914 SURIGAO IRON ORE RESERVATION"* by Rodrigo G. Rigor, Mining Engineer II, Bureau of Mines, 1962.

5.1.1.2. Duration

The first study was undertaken during the period October, 1937 to June 15, 1938.

The second study was undertaken on February to August, 1961, anchored on the following studies:

1. Exploration works/study conducted by Mr. Wilford S. Wright, then Technical Adviser of ICA Mining Division and Mr. Melanio D. Manigque, Mining Engineer II, and other technical personnel of the Bureau of Mines on October to December, 1957;

2. Resumption of the exploration work by Mr. Melanio D. Manigque and other technical personnel on April to December, 1958 and February to December, 1959;

3. Continuation of the exploration work by Mr. Segismundo A. Haligañga and other personnel of the Bureau of Mines from December, 1959 to May, 1960.

5.1.1.3. Coverage

The exploration activities cover the entire Parcel I of the Surigao Mineral Reservation.

5.1.1.4. Results (Regional Geology)

The first study is conducted primarily to show that Parcel I of the Surigao Mineral Reservation has iron deposits of enormous tonnage.

The second study is conducted primarily to investigate the nickel and iron resources of the same reservation area.

While the above studies contain information that will greatly help in correlating the future exploration works, however, we believed that there is still a need to conduct further research studies to secure exploration studies conducted by the MGB for chromite deposits and to enhance the existing information especially on the results of recent exploration activities, especially quadrangle mapping, conducted by the MGB and United Nations Revolving Fund for Natural Resources Exploration (UNRFNRE).

The following geologic information will greatly help us in the conduct of exploration activities.

a. Geology from Dean F. Frasche's Geological Report

With the reconnaissance made by Pratt and Lednicky in 1915, little geological work has been done in the Surigao Area. In a general way, these early workers worked out, or tried to delimit, the western extension of the western overlying sedimentaries. According to them, this contact is marked by and escarpment which strikes more sharply to the east and finally bends and strikes north making a narrow loop only to terminate on the north shore of Carrascal Bay. This contact has not been

checked or traced out by the author, but it is certain that there is a sedimentary igneous contact in the interior almost nothing has been worked out in regard to the historical geology of this region.

A great deal of the interior region adjacent to the eastern coast of Surigao has the appearance of a plateau, rising 125 to 924 meters above sea-level. The slopes from the western interior descend in a gentle manner to the eastern sea board. Upon these slopes, the wide spread lateritic iron deposits occur in blanket form, the ore being thin or totally absent in the erosion gullies and valleys. This ore mantle varies in thickness, and rests directly on a basement complex of serpentinized ultra-basic rocks.

Basement Complex – the area under discussion is underlain by a series of ultra-basic rocks here named the basement complex. This complex extends from the barrio of Capandan south along the coast to Carrascal Bay, its westward extensions are unknown. In surface area, it represents approximately 60 square kilometers and is thought to be the oldest rock formation in the Surigao district, probably dating form Pre Miocene time.

Kinds of Rocks – The rocks of the basement complex are represented in their order of abundance by serpentines, altered

peridotites (?) and perhaps some altered diorites and andesites. Fragments and well worn pebbles of andesite have been found in the vicinity of Dahican Bay but their relationships to the older altered complex are unknown. However, in the northern part of the reservation, near kilometer 87 on the Provincial Road, fresh andesite outcrops appear to intrude and cut the older basements.

Serpentine – This rock covers a larger part of the area and has been formed as an alteration product of the original peridotite (?) and other basic rocks. Locally, it can be found in the bottom of the erosion cuts and along the faces of the sea cliffs. Often, where the surface ore-mantle has been stripped off by erosion, it can be found in large areas. In most exposures, the serpentine can be seen grading down into a more dense dark-green to black peridotitic rock. Small veins and stringers of a hydrous magnesium nickel silicate are commonly found in the serpentine. Near Kilometer 90 on the Surigao Provincial Road, and on the northern end of Dahican Peninsula small boulders of high grade chromite float have been found to be associated with serpentinites.

Peridotites (?) – The peridotites are exposed as boulder and large masses in place in the erosion cuts and along the faces of the sea-cliffs. Thy grade in color

from dark green to black, are extremely hard and often show small phenocrysts of olivine. Petrographic studies of these rocks showed the olivine has altered to antigorite and serpentinite.

Diorite – The diorite and andesites have been recognized both from hand specimens and Petrographic sections. Although gabbros have been reported they have not as yet been determined with certainty.

Structure – The entire basement complex is extremely fractured and faulted. No fault patterns have been observed or worked out, and, though much faulting exists, the extent, magnitude and importance of faulting has yet to be determined. It is felt that after more detailed filed work has been carried on the structural and stratigraphic relationship between the basement and the western high-land formations will be determined.

b. Geology from Report of Investigation No. 35

General Geology .

In 1914 reservation area is underlain chiefly by a complex assemblage of serpentinized ultramafic rocks, metavolcanic rocks, amphibolite schist, talc-chromite

The serpentinized ultramafic rocks underlie the eastern half of the area, flanked on the northwest and southeast by Tertiary clastic sedimentary rocks, limestone and basalt. Amphibiolite schist and metavolcanic rocks of probable pre-Tertiary age predominate on the southwestern portion. These earlier-formed rocks were included by the ultramafic rocks probably during the late Cretaceous time but definitely before Eocene times. Isolated remnants of Eocene limestone capping the serpentinized ultramafic rocks are found at the north central portion of the reservation. Wright, et. al.[4], suggested that serpentinization of the ultramafic rocks subsequently followed after their emplacement. Field studies indicate the presence of two general types of ultramafic rocks, namely, dunite and pyroxene peridotite.

It is probable that a long period of erosion must have taken place sometime in late Tertiary time which extensively eroded the limestone and clastic sedimentary rocks capping the serpentinized ultramafic mass. Progressive uplift probably began in Pleistocene time followed by peneplanation. The ensuing, most significant event was characterized by the tropical chemical weathering of the serpentinized ultramafic

[4] **Wright, W.S., et. al., 1958, Iron-Nickel-Cobalt Resources of Nonoc-Awasan- S. Dinagat Islands in Parcel II of the Surigao Mineral Reservation, Mindanao; Publication 17, Special Project Series, Phil Bu. Of Mines, Manila**

rocks and their clastic derivatives which consequently formed the nickel-iron resources of the 1914 Surigao Iron Ore Reservation. It can be seen, therefore, that the areal distribution of the ultramafic rocks has a bearing on the nickel-iron resources of the reservation.

Description of the Nickeliferous Deposits

Origin of the Deposits

The nickeliferous deposits consist of laterite and decomposed serpentinite. The deposits represent the residual products developed in place by chemical weathering of the serpentinized ultramafic rocks. D.A. Frasche[5] proved by petrographic evidence that the degree of alteration of the original mineral constituents of the serpentine rock increases upward to the iron ore. Such progressive destruction of the country rock is ascribed to the action of percolating ground water. He concluded that by this process, great quantities of soluble materials such as silica, magnesia and lime have been removed and the insoluble constituents of the serpentine rock such as iron and chromium, alumina, have accumulated to form the nickeliferous laterite deposits. The lateritic end product contains almost no magnesia and very little

[5] **Frasche, D.F., 1941, Origin of the Suirgao Iron Ores; Econ. Geology, Vol. 36, p. 230-305.**

silica even though it originally constituted about 75% of the parent rock.

General Features

Despite the wide area underlain by serpentinized ultramafic rocks, the important nickeliferous deposits are found only along the northeastern coastal area of the 1914 reservation extending form southern Adlay northwestward to Urbiztondo, Claver. Small and scattered lateritic tracts are also found capping the more gentle ridges on the southwestern part of the reservation particularly at Baoy and Mt. Legaspi Range.

The reddish-brown lateritic soil capping the gentle ridges consists mainly of limonite and hematite with subordinate amount of magnetite. Near the surface and a few meters downward, small hard hematite and limonite pellets or shots are predominant. These pellets or shots increase in quantity and size toward the surface and sometimes are often found cemented into limonitic crust.

The presence of different colors in the laterite zone as observed in road cuts, test pits and natural exposures led to the recognition of at least three zones, each zones being transitional to the next lower zone. The first zone which lies on the topmost layer exhibits form dark reddish

brown to moderate brown color peculiar to lateritic deposits in other tropical regions. The middle zone of zone 2 is light-brown to yellowish-brown, and zone 3 representing the base of the laterite displays variegated colors of yellowish-brown, yellow, red, pale greenish-yellow and black. High nickel is usually contained in this zone which extends downward to the upper part of the decomposed serpentinite. However, in some places, the enriched zone is entirely in the decomposed zone.

De Vletter[6] stated two factors that satisfy nickel concentration or enrichment, as follows:

1. Decomposition of serpentine with removal of its principal constituents, namely magnesia and silica, and consequent residual concentration of metallic components.

2. Dissolution of nickel from uppermost layers of laterite and its re-precipitation in the lower layers and transition zone.

Because of the inter-relation between solution and redeposition which represent a continuous process, the position of the enriched zone gradually moves downward.

6 **Vletter de, D. R., 1955, How Cuban Nickel Ore was Found; Engineering and Mining Journal, Vol. 156, No. 10, p. 84-87.**

Underlying the laterite mantle is the light yellowish green to greenish and soft decomposed serpentinite. Being the basal portion of the two deposits, this ore contains higher nickel than the overlying laterite soil.

The decomposed serpentinite ore displays greenish hues from pale greenish-yellow to greenish-gray. The contact between the overlying laterite and the decomposed serpentinite is very irregular.

Field identification of the decomposed serpentine ore can be made by noting the color alone. The occurrence of light yellowish-green to light-green in preponderance to brown or red is characteristic of all decomposed zone encountered in the reservation. However, there are instances where the greenish material occurs in equal proportion with the brown or red. In this case, a sharp contact between the laterite and decomposed serpentinite may not be visible in the field. The position of the contact will then be based on the iron content rather than by color alone.

5.1.1.5. Conclusion

The above information will be very useful in the conduct of exploration activities in the Project

Area considering that Project Area is part of the Mineral Reservation subject of the study. However, there is a need to conduct research studies for collection of all available data to correlate the results of exploration activities to be undertaken.

5.1.2. Research, compilation and review

This activity involves gathering of all the results of exploration activities conducted by the MGB. This activity would certainly help especially in correlating the results of future activities.

5.1.2.1. Geochemical/geophysical data

Geochemical information of the Project Area that may be collected will be compiled and evaluated in order to determine whether or not it is economical to pursue the conduct of exploration activities.

5.1.2.2. Lithological data

Lithological data will also be collected. It is interesting to note that the Project Area is located near the contract area of Taganito Mining Corporation. Hence, there is a great possibility that the Project Area has similar lithology with the said area.

5.1.2.3. Mineralization/alteration studies

As earlier mentioned, SMR is notable for laterite and saprolite deposits, which is potential for nickel and chromite mineralization. This will be confirmed during the actual exploration activities.

5.1.2.4. Various thematic maps covering the target area

Base maps in a scale of 1:10,000 will be prepared which will used to plot all the geological information of the Project Area.

5.1.2.5. Targets

Duration : Two (2) months, to commence upon granting of the EP.

Manpower : One (1) Mining Engineer

Estimated Cost:

Salary incl. 13th month pay* @ PhP20,000.00/month	PhP 43,333.30
Transportation Expenses	8,000.00
Photocopying	6,000.00
Supplies and Materials	6,000.00
Total	**PhP 63,333.00**

* **Pro-rated amount for 13th month pay**

Output : Compiled technical reports and collated data.

5.2. Reconnaissance/Regional Survey or Studies

5.2.1. Geological Mapping/Alteration Studies

Nature or Type of Survey: This involves the investigation/ evaluation of the surface indications and geologic features of the area such as lithology, mineralization, intensity and type of alteration, etc., that would indicate/establish the identifying promising areas. The actual field survey will include geological traverses along drainage channels, road cuts, and other surface structures. Compass and tape mapping might be resorted along sections with prominent exposures or mineralization. The survey will focus on the distribution of the laterite deposits in the Project Area.

Coverage : The whole Project Area (1,012.0158 hectares).

Duration : Three (3) months

Tools : Global Positioning System (GPS) Unit, brunton compass, sample picks, etc.

Manpower : One (1) Mining Engineer and two (2) Geologic Aides

Estimated Cost:

Salary(ies) incl. 13th month*			PhP107,250.00
Engineer @ PhP20,000.00/mo.	=	*PhP65,000.00*	
Aides @ PhP6,500/mo.	=	*42,250.00*	
Tools and supplies			21,000.00
GPS Unit	=	*10,000.00*	
Brunton Compass	=	*5,000.00*	
Sample picks	=	*1,000.00*	
Supplies	=	*5,000.00*	
Transportation Expenses			15,000.00
Field Office/Field camps			50,000.00
Communication Expenses			6,000.00
Others, i.e., photocopying, film developing, etc.			4,000.00
Total			**PhP 203,250.00**

* **Pro-rated amount for 13th month pay**

Output : Reconnaissance Geological Report with base maps in scale of 1:10,000 indicating all the results of the activity.

5.2.2. Geochemical Survey

Nature or Type of Survey: The reconnaissance geochemical survey will be undertaken to determine the geochemically anomalous areas by systematic collection of samples The survey is the systematic collection of stream sediments samples in pre-selected points from the base of the slopes and ridge and stream sediments.

Coverage : The whole Project Area (1,012.0158 hectares)

Duration : Three (3) months, simultaneously undertaken with the reconnaissance geological mapping.

Sampling Media/ Sample Type: Stream sediments will be collected by sieving in the size of minus 2 mm. and minus 80-mesh. Rock floats by identification and selective sampling.

Sampling Density/ Estimated Number of Samples:

Each of the minus 2 mm and minus 80-mesh stream sediments, and rock samples will be taken at a density of one (1) sample for every one (1) square kilometer. Thus, approximately eleven (11) samples will be collected for each of the sample type or a total of forty-five

(33) samples weighing at least one kilogram per sample.

Mode of Analysis/ Target Elements:

The samples will be sent to the MGB Regional Office No. XIII, for determination of nickel and chromite contents.

Tools : GPS Unit, brunton compass, sample picks, etc.

Manpower : One (1) Mining Engineer and two (2) Geologic Aides (same geologic team who will conduct the reconnaissance geological mapping).

Estimated Cost: Considering that this activity will be undertaken simultaneously with the geologic mapping, only the analysis cost amounting to PhP27,000.00 will be the cost for this activity, broken down as follows:

Nickel, including cobalt content,
33 samples @ PhP300.00
= PhP 9,900.00

Chromite
33 samples @ PhP 300.00
= PhP 9,900.00

Total **PhP 19,800.00**

Output : Reconnaissance geochemical report with map/s showing the specific location and assay results of sediment/rocks samples collected.

5.3. Semi-Detailed Survey or Follow-up Studies

5.3.1. Geological Mapping or Follow-up Studies

Nature or Type of Survey: This activity involves mapping of outcrops along creeks and other exposures. This will be undertaken to accurately map and delineate the rock types, alteration mineralogy and structures such as faults, folds, dip of strata in prospective areas, etc.

Coverage : The coverage of this activity will be dependent on the results of reconnaissance studies. It is assumed that five hundred (500) hectares will be the coverage of this study.

Duration : Three (3) months

Tools : GPS Unit, brunton compass, sample picks, etc.

Manpower : One (1) Mining Engineer and two (2) Geologic Aides

Estimated Cost:

Salary(ies) incl. 13th month*			PhP107,250.00
Engineer @ PhP20,000.00/mo.		*= PhP65,000.00*	
Aides @ PhP6,500/mo.		*= 42,250.00*	
Tools and supplies			21,000.00
GPS Unit	=	*10,000.00*	
Brunton Compass	=	*5,000.00*	
Sample picks	=	*1,000.00*	
Supplies	=	*5,000.00*	
Transportation Expenses			15,000.00
Field Office/Field camps			50,000.00
Communication Expenses			6,000.00
Others, i.e., photocopying, film developing, etc.			4,000.00
Total			**PhP 203,250.00**

* **Pro-rated amount for 13th month pay**

Output : Reconnaissance Geological Report with map/s in scale of 1:10,000 indicating all the results of the activity.

5.3.2. Geochemical Survey

Nature or Type of Survey: Delineated anomalous areas during the interpretation of regional geochemical data will be re-evaluated into a closer density.

Coverage : The same coverage with that of semi-detailed geological mapping, which is 500 hectares.

Duration : Three (3) months, simultaneously undertaken with the semi-detailed geological mapping.

Sampling Media/ Sample Type: Stream sediments will be collected by sieving in the size of minus 2 mm. and minus 80-mesh. Rock floats by identification and selective sampling.

Sampling Density/ Estimated Number of Samples:

Each of the minus 2 mm and minus 80-mesh stream sediments, and rock samples will be taken at a density of one (1) sample for every three hundred (300)-meter grid interval. Hence, at least fifty (50) samples will be collected for each of the sample type or a total of one hundred fifty (150) samples.

Mode of Analysis/ Target Elements:

The samples will be sent to the MGB Regional Office No. XIII, for determination of nickel and chromite contents.

Tools : GPS Unit, brunton compass, sample picks, etc.

Manpower : One (1) Mining Engineer and two (2) Geologic Aides (same geologic team who will conduct the semi-detailed geological mapping).

Estimated Cost: Considering that this activity will be undertaken simultaneously with the geologic mapping, only the analysis cost amounting to will be the cost for this activity.

Nickel, including cobalt content,
150 samples @ PhP300.00
= PhP 45,000.00

Chromite
150 samples @ PhP 300.00
= PhP 45,000.00

Total **PhP 90,000.00**

Output : Semi-detailed geochemical report with map/s showing the location and assay results of sediments/rocks samples.

5.3.3. Subsurface Investigation

There are two types of subsurface investigation that will be implemented under this activity: Test pitting and Auger drilling. These will be undertaken in the most promising or favorable sites to determine the persistence of the structures/mineralized/altered zones at limited depth. It is assumed that one hundred fifty (150) hectares are promising areas identified in the previous survey.

5.3.3.1. Auger Drilling

No. of Auger Holes : Auger holes will be dug at 100 meters x 100 meters grid interval or a total of one hundred fifty (150) auger holes with average depth of eight (8) meters or a total meterage of one thousand two hundred (1,200) meters.

Sampling Density and No. of Samples:

Samples will be taken at a density of one (1) sample for every 2-meter depth, hence, six hundred (600) soil samples are expected during this stage.

Duration : Five (5) months

Equipment : Auger drill

Manpower : One (1) Mining Engineer and two (2) laborers

Estimated Cost:

Salary(ies) incl. 13th month*	PhP 178,750.00
Engineer @ PhP20,000.00/mo.	*- 108,333.33*
Aides @ PhP6,500/mo.	*- 70,416.67*
Equipment	60,000.00
Transportation Expenses	25,000.00
Communication Expenses	10,000.00
Assaying/Analysis of Samples**	180,000.00
600 Samples @ PhP 300.00	
Others, i.e., supplies, photocopying, film developing, etc.	10,000.00
Total	**PhP 463,750.00**

* **Pro-rated amount for 13th month pay**

** **Based from the undersigned's experience, if nickel mineralization is present, chromite mineralization is not economically feasible, or vice versa. Hence, the analysis cost is intended for one type of minerals only.**

Output : Auger drilling Report with base map, using a topographic map prepared in Item 5.4 below, and vertical cross sections in a scale of

1:2000 showing the auger holes and its corresponding assay results.

5.3.3.2. Test Pitting

No. of Test Pits : Test pits will be dug at 200 meters by 200 meters grid interval or a total of thirty eight (38) test pits with dimension of 1 meter by 2 meter and average depth of eight (8) meters or a total meterage of three hundred four (304) meters.

Sampling Density and No. of Samples:

Samples will be taken at a density of one (1) sample for every one (1) meter depth of the test pits, hence, three hundred four (304) geochemical soil samples are expected during this stage.

Duration : Six (6) months

Tools : Pick mattocks, shovels, carpentry tools, etc.

Manpower : One (1) Mining Engineer and three (3) laborers

Estimated Cost:

Salary(ies) incl. 13th month*	PhP 256,750.00
Geologist @ PhP20,000.00/mo.	*- 130,000.00*
Aides @ PhP6,500/mo.	*- 126,750.00*
Tools and supplies, incl. timber supports	80,000.00
Transportation Expenses	30,000.00
Communication Expenses	20,000.00
Assaying/Analysis of Samples** 304 Samples @ PhP 300.00	91,200.00
Others, i.e., photocopying, film developing, etc.	4,000.00
Total	**PhP 481,950.00**

* **Pro-rated amount for 13th month pay**

** **If nickel mineralization is present, chromite mineralization is not economically feasible, if present, and vice versa. Hence, the analysis cost is intended for one type of minerals only.**

Output : Report on the Result of Test Pitting Activities with map/s, using a topographic map prepared in Item 5.4 below, and vertical cross sections in a scale of 1:2000 showing the test pits and its corresponding assay.

5.4. Topographic Survey

Topographic survey will be undertaken to establish the topographic configuration of the Project Area to provided accurate ground control points to determine where the actual exploration activities will be undertaken. Survey controls will be necessary to the conduct of exploration works. The topographic survey will also be needed in planning, construction and development works and ore reserve calculations. The said activity, however, will be undertaken thru Contractual Basis.

Coverage : The whole Project Area (1,012.0158 hectares)

Duration : Three (3) Months

Equipment : Transit, Tape and Stadia Rod, etc.

Manpower : MGB deputized Geodetic Engineer and laborers, i.e., tape man, rod man, etc. (the exact manpower requirement will be determined by the Surveying Contractor).

Estimated Contractual Cost: **PhP 300,000.00**

Output : Maps in scale of 1:5,000, 1:2000, 1:1000 and 1:500, such as base/topographic maps, etc.

5.5. Detailed Geologic Survey

5.5.1. Detailed Geological Mapping

The detailed geological mapping program will be carried out as limited exploration works during semi-detailed geologic survey failed to note some important soil geochemical anomalies.

Coverage : The same area covered by subsurface investigations, which is one hundred fifty (150) hectares.

Duration : Four (4) months

Tools : GPS Unit, brunton compass, sample picks, etc.

Manpower : One (1) Mining Engineer and two (2) Geologic Aides

Estimated Cost:

Salary(ies) incl. 13th month*	PhP143,000.00
Engineer @ PhP20,000.00/mo.	*= PhP86,666.67*
Aides @ PhP6,500/mo.	*= 56,333.33*
Supplies	5,000.00
Transportation Expenses	20,000.00
Field Office/Field camps	50,000.00
Communication Expenses	15,000.00

Others, i.e., photocopying, film developing, etc. 4,000.00

Total **PhP 237,000.00**

* **Pro-rated amount for 13th month pay**

Output : Detailed Geological Report with base map/s in scale of 1:10,000 and 1:2,000, using a topographic map prepared by contracted Geodetic Engineer under Item No. 5.4. above, indicating all the results of the activity.

5.5.2. Geochemical Survey

Nature or Type of Survey: The geochemical survey will be carried out to gain a better understanding of the geochemical characteristics of the laterite deposits that will help to established highly anomalous areas which will be subjected to future x-ray drilling activities. Closely spaced grid system for sampling point location and control will be utilized.

Coverage : The same area covered by detailed geological mapping will be the coverage of this activity, which is one hundred fifty (150) hectares.

Duration : Four (4) months, simultaneously undertaken with the detailed geological mapping.

Sampling Media/
Sample Type: Stream sediments will be collected by sieving in the size of minus 2 mm. and minus 80-mesh. Rock floats by identification and selective sampling.

Sampling Density/
Estimated Number of Samples:

Each of the minus 2 mm and minus 80-mesh stream sediments, and rock samples will be taken at a density of one (1) sample for every grid interval of 100 meters by 100 meters. Hence, one hundred fifty (150) samples will be collected for each of the sample type or a total of four hundred fifty (450) samples.

Mode of Analysis/
Target Elements:

The samples will be sent to the MGB Regional Office No. XIII, for determination of its nickel and cobalt content.

Tools : GPS Unit, brunton compass, sample picks, etc.

Manpower : One (1) Mining Engineer and two (2) Geologic Aides (same geologic team who will conduct the detailed geological mapping).

Estimated Cost: Considering that this activity will be undertaken simultaneously with the geologic mapping, only the analysis cost amounting to will be the cost for this activity.

450 samples @ PhP 300.00

= **PhP 135,000.00**

Output : Detailed geochemical report and maps with assay results of sediments/rocks samples.

5.5.3. Subsurface Investigation

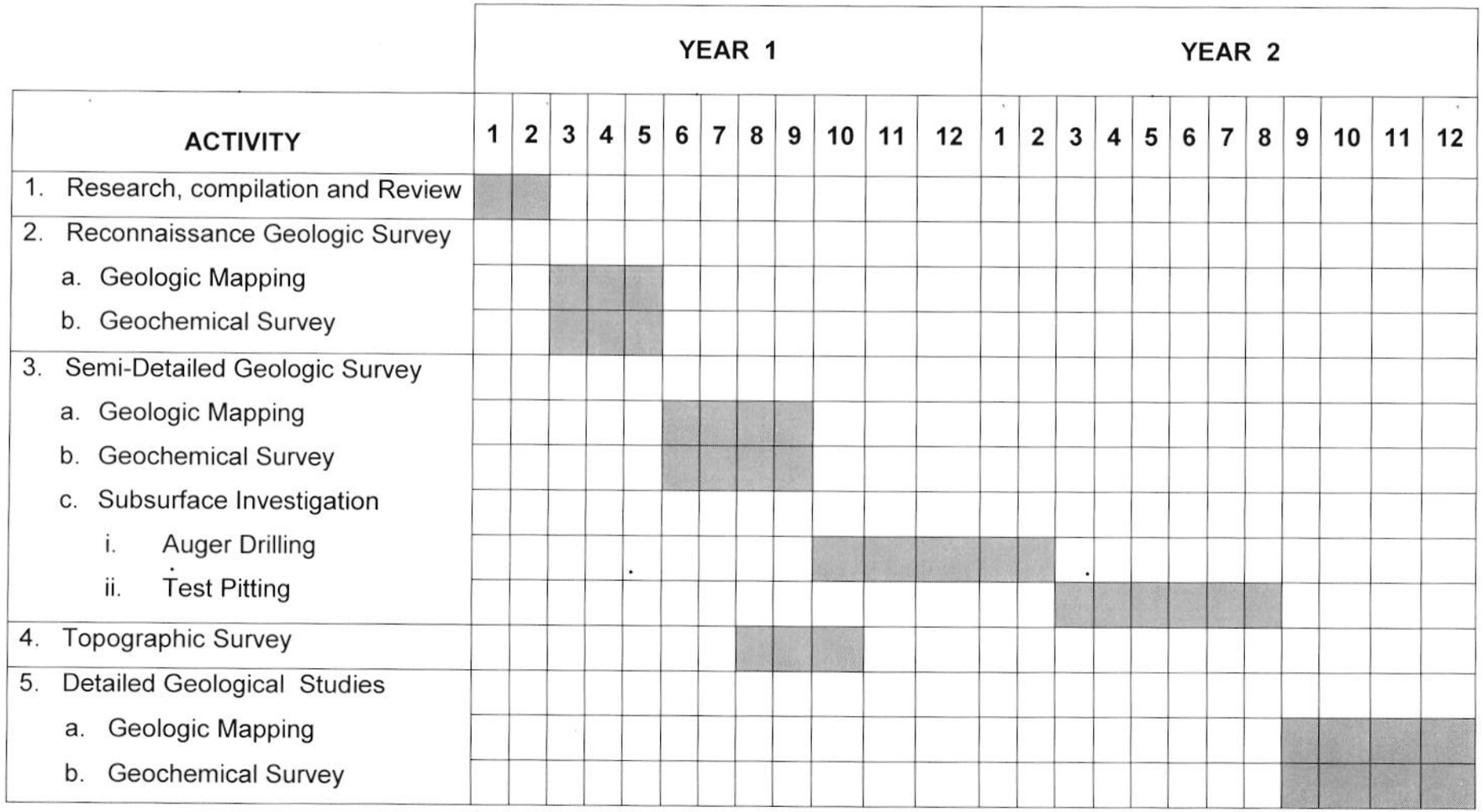
Detailed Subsurface Investigation by x-ray drilling will be undertaken in case the results of the above exploration activities indicate highly anomalous area(s). But this will be undertaken during the EP that may be renewed (3rd and 4th year).

5.6. Total Estimated Exploration Cost

		1st year	2nd year
1.	Research, compilation and review	PhP 63,333.00	
2.	Reconnaissance Geological Studies		
	a. Geological Mapping	203,250.00	
	b. Geochemical Survey	19,800.00	
3.	Semi-detailed Geological Studies		
	a. Geological Mapping	203,250.00	
	b. Geochemical Survey	90,000.00	
	c. Subsurface Investigation		
	i. Auger Drilling	278,250.00	185,500.00
	ii. Test Pitting		481,950.00
4.	Topographic Survey	300,000.00	
5.	Detailed Geologic Studies		
	a. Geological Mapping		237,000.00
	b. Geochemical Survey		135,000.00
TOTAL		**PhP1,157,883.00**	**1,039,450.00**
		≈ PhP1,160,000.00	**1,040,000.00**

GRAND TOTAL: PhP 2,200,000.00

6.0. SCHEDULE OF ACTIVITIES



6. Preparation of Reports	
a. Quarterly Reports	
b. Annual Reports	

7.0 PREPARED BY:

CARLOS V. ESCANO

Mining Engineer

PRC No. 2379

PTR No. 4184826 E

Issued on January 5, 2006

Issued in Makati City

8.0 APPROVED BY:

FRANK C.W. LAO

Chief Executive Officer

Oriental Synergy Mining Corporation

ANNEX– D

ENVIRONMENTAL WORK PROGRAM

MGB Form No. 16-1

ENVIRONMENTAL WORK PROGRAM

1.0 NAME AND ADDRESS OF THE APPLICANT

Name : **ORIENTAL SYNERGY MINING CORPORATION**

Address : **139 Joy Street, Barangay Balingasa, Quezon City**

Contact Person : **Frank C.W. Lao**
Chief Executive Officer

Telephone Nos.: **(032) 330-5636 or 38**

Fax Nos. : **(032) 330-5637**

2.0 TYPE AND NATURE OF THE PROJECT

2.1 Project Description

The proposed initial project is Exploration. Considering the demands for nickel and chromite are continuously increasing at present, the main minerals to be explored are nickel and chromite. As such, the purposes of the Project is to determine the potential for **nickel and chromite** mineralization of the applied area and (2) to determine the viability of developing and exploiting the nickel and chromite deposit(s) and determination of the viability of developing and exploiting the said minerals to be found therein using socially accepted procedures but least negative impact on the environment. However, other valuable minerals of commercial quantity to be found therein, will also be given attention.

2.2 Type and Nature of Mineral Deposit(s)

The Surigao Mineral Reservation (SMR) is notable for laterite and saprolite deposits, which are potential for nickel and chromite mineralization. The confinement of nickel deposits will be found in the ultramafics and in relatively lower ground compare to lumpy chromite deposits.

3.0 GENERAL LOCATION AND COVERAGE AREA OF THE PROJECT

3.1 Location and Accessibility

The Project Area, which is covered by an application for Mineral Production Sharing Agreement, is located in Barangay Urbiztondo, Municipality of Claver, Province of Surigao Del Norte, within Parcel I of the SMR and specifically bounded by the following technical description:

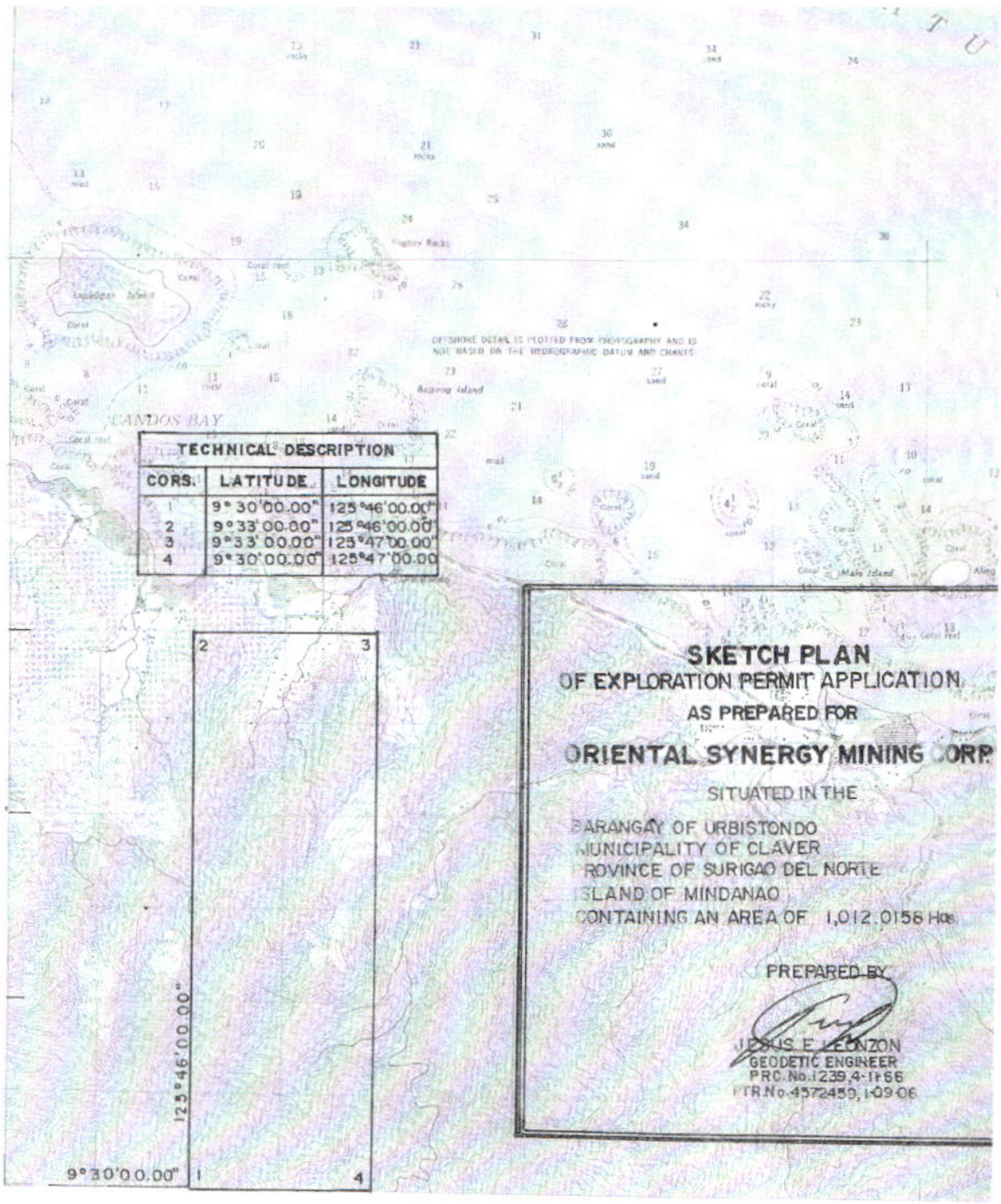
Corners	Latitude	Longitude
1	9° 30' 00.00"	125° 46' 00.00"
2	9° 33' 00.00"	125° 46' 00.00"
3	9° 33' 00.00"	125° 47' 00.00"
4	9° 33' 00.00"	125° 47' 00.00"

Figure 1 shows the specific location of the Project Area.

The Project Area is accessible from Surigao City, thru a one (1)-hour land transport via provincial road connecting Surigao del Norte and Surigao del Sur.

Surigao City can be reached from Manila via 1-hour regular air faring transport to Cebu City, thence another 30 minute connecting flight to Surigao or a two-hour direct from Manila to Surigao. Or thru a three-day sea/land faring transports from Manila to Surigao.

Figure 1



Surigao City can also be reached by two-hour land transports from Butuan City. Butuan City can be reached from Manila by air and sea transportations.

3.2. Area Coverage

The Project Area covers an area of **one thousand twelve and 0158/10000 (1,012.0158) hectares**.

4.0. DESCRIPTION OF THE EXISTING ENVIRONMENT WHERE WORK IS PROPOSED TO BE UNDERTAKEN

4.1. Land Environment

4.1.1. Topography/Physiography

"General Description - The main topographic feature of Surigao Province is the Diwata Mountain Range. This range forms the western border of the province, but only cuts across the south-western corner of the iron reservation[1], in a north-westerly direction. Roughly the Diwata commence in the extreme southern corner of the province and trend in a north-westerly direction to the eastern side of Lake Mainit. To the west of the range is the famous Agusan Valley, through which the northward flowing Agusan River winds its way to Butuan Bay. On the east, isolated mountain peaks and small ranges fill in the central part of Surigao Province, its southern portion being more flat and having more marginal lands along the coast than the central or northern parts. Wile the general trend of the Diwatas are northwesterly there many bends in the crest line and near the center of the marked out government reservation is Mt. Legaspi, rising to an elevation of 1170 meters above sea-level and forming a conspicuous feature of the landscape. To the north and south-east of this prominent land mark are other peaks whose elevations vary from 500-924 meters. In general, the land slopes eastward to the coast, but the slope is not regular or continous. These slopes are dissected into ridges, the crests of which are

[1] **Established under Executive Order No. 63, now well known as Parcel I of the Surigao Mineral Reservation.**

broad and comparatively flat and have a general east-west trend. The slopes of the western range have been notched by the eastern flowing drainage channels. In short, the north and east of Mt. Legaspi is deeply incised, the streams flowing through narrow precipitous valleys.

Topographic Relief – East of the western highlands, mentioned above, the whole topography has been modified by erosion, the ridges are rounded and the valleys have been deepened; the general features of the bedrock, except in some of the erosion cuts, has been marked by lateritic iron ore. Much of the interior region adjacent to the eastern coast of Surigao has the appearance of a plateau. The elevation of the iron areas varies from 122 to approximately 500 meters.

The outline of the sea coast is very irregular and is marked by narrow beaches and sea cliffs. The coastline is broken by several prominent points and bays between Gigacuit and Cantilan. The most important of the latter is Dahican Bay. The land rises abruptly above the western bay side and in places the cliffs are almost vertical.

There are many irregularities in the surface of the ore bodies. Several deeply incised V-shaped valleys cut the district, and may be interpreted as evidence of uplift. In general, they are narrow, comparatively short, and deep. Water falls near the head waters of these streams are common. There is much field evidence to show that some of the streams follow zones of weakness in the bed rock, shear zones and faults being common in the district. The original consequent drainage of this region has been modified as uplift took place. The stream systems are now subsequent rather than consequent - - - that is, they are adjusted to the structures. As a rule, stream sources rise in cirque-like depressions, caused by the erosion of the soft ore.

These peculiar erosion basins have the appearance of bad land topography and are extremely common throughout the whole iron area.[2]"

The Municipalities of Claver and Carrascal are generally mountainous and geotectonically within the eastern limb of the Eastern Mindanao Ridge, a complex NNW-SSE trending island-arc structure.

The Project Area is characterized by moderately sloping to hilly topography with slope ranging from 10% to 40%. The Project Area has an elevation ranging from 10 to 456 meters above sea level (see Figure 1).

4.1.2. Land Use/Capability

The Major land use and capability of the Project Area including its immediate vicinity, being declared as part of the SMR, is **Mining**. At present, there is a nickel mining operation in the immediate vicinity of the Project Area: the mining operations of Taganito Mining Corporation.

Only some and relatively small portion of the Project Area is being used by the concerned barangays for agricultural purposes. Since the Project Area is mostly covered by lateritic soil, the Project Area is generally not suitable for the agricultural purposes.

Further study will be undertaken to further enhance the existing information during the term of the EP that may be granted.

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2 **Excerpt from *"GEOLOGICAL REPORT ON THE SURIGAO ORES for the COMMONWEALTH OF THE PHILIPPINES, National Development Company, Manila by Dean F. Frasche, Chief Geological Survey Division, 1938"***

4.1.3. Pedology[3]

The soil in the province is basically clay and sandy loam type. The soil in the mainland area is generally classified as loam soil (50% Anao-aon/Malimono Clay Loam and 50% Kabatohan Clay Loam) characterized as permeable, moderately drained and highly suitable for agriculture. The Dinagat island soil is primarily Dinagat clay loam which comprised 70%, Kabatohan loam 20%, and 10% of Bolinao clay steep phase. It is characterized as friable, slightly sticky and granular in nature.

The soil type in Siargao island is : 80% Bolinao clay, 10% Bolinao Clay, Steep Phase, and 5% Jamoyaon clay loam. The island of Bucas Grande is highly acidic due to the presence of mineral ores thereby needing careful soil management.

SOIL TYPE IN SURIGAO DEL NORTE

LOCATION	%	BY SOIL TYPE
Dinagat/Dinagat	70%	Dinagat Clay Loam
	20%	Kabatohan Loam
	5%	Bolinao Clay, Steep Phase
	5%	Others
Siargao	80%	Bolinao Clay
	10%	Bolinao Clay, Steep Phase
	5%	Jamoyaon Clay Loam
	5%	Others
Bucas Grande	60%	Kanatohan Clay
	40%	Bolinao Clay, Steep Phase
Middle & East Bucas Grande	100%	Dinagat Clay Loam
Anao-aon - Malimono	60%	Malimono Clay Loam
	20%	Kabatohan Clay Loam
	20%	Malalag Clay Loam
Surigao River Valley	50%	Sison Clay Loam
	15%	Bad-as Sandy Loam

[3] **Source: *"SOCIO ECONOMIC AND DEMOGRAPHIC PROFILE OF SURIGAO DEL NORTE, CY2003 EDITION"* compiled by Provincial Planning and Development Office**

	15%	Malimono Clay
	10%	Anao-aon Clay
	5%	Surigao Clay
	5%	Others
Bacuag	40%	Jasaan Clay
	40%	Balinao Clay
	15%	Badas Sandy Loam
	5%	Other
Gigaquit - Claver	40%	Kabatohan Clay
	40%	Sapa Clay Loam
	20%	Other
Alegria/Mainit	10%	Kabatohan Clay Loam
	30%	Sison Clay Loam
	10%	Bolinao Clay
	5%	San Manuel Sandy Clay Loam
	10%	Malalag Clay Loam
	22%	Malimono Clay Loam
	12%	Mountain Soils + Others

SOURCES: PAO, derived from Bureau of Soils Maps

The Proponent commits to conduct further study on Pedology to enhance the existing information during the term of the EP that may be granted.

4.2. Water Environment

4.2.1. Water Quality

Records of the National Water Resources Council (1982), now called as the National Water Resources Board (NWRB), indicate that groundwater statistics from Surigao Del Norte exhibit the static well level (SWL) ranges from 0.61 to 7.62 m. below ground surface (mbgs) or an average of 2.72 mbgs. The province-wide specific capacity ranges from 0.25 liter per second per meter (lps/m) to 1.45 lps/m.

Water quality sampling will be undertaken to establish baseline information such as physico-chemical, trace elements, ph, conductivity and other factors affecting the water quality, during the first three months of the EP that may be granted.

4.2.2. Hydrology

The Project Area is situated on the western side of the Mindanao Island and is drained by several, generally short, northerly-flowing streams/creeks, i.e., Hemoyowon and Urbiztondo Creeks that eventually empty into the Hinatuan Passage. The streams exhibit a dendritic drainage pattern.

4.3. Climatology/Meteorology[4]

The Province of Surigao del Norte is considered by PAGASA to be under the Type II of the modified Coronas Classification of Philippine Climate, which is based on very pronounced maximum rain period generally occurring in December to January, although there is not a single dry month which is typical of areas along or very near the eastern coast of the country. The Province is open to the northeast monsoon.

Meteorological data was collected from the nearest Climatological Station of PAGASA in Surigao City for periods covering 1961 to 1995. Surigao City is located some 40 km southwest of the proposed project area.

Based on the Surigao City data, the climatologic normals computed from 1961 to 1995 are as follows: monthly average of temperature ranges from a low of 22.60°C to a high of 32.50°C with an annual maximum

[4] **Climatologic Data gathered from the Philippine Atmospheric and Geocphysical Service Administration (PAGASA) and the Department of Public Works and Highways (DPWH).**

average of 31.04°C and an annual minimum average of 23.46°C. Mean monthly temperatures reading ranges from 25.80°C to 28.25°C. The hottest month of the year is June with mean temperatures ranging from 24°C to 32.50°C. The coldest month is December with mean temperatures of 23.10°C to 29.60°C.

For the climatologic normals, the factor of relative humidity averages annually at 84%. The highest relative humidity recorded is 88% during the month of January. The lowest recorded relative humidity of 80% is felt during the month of August.

The area experiences prevailing winds with velocities annually averaging 3 meters per second. The general wind direction for the months of December to February is northeast, while for the months of March to May it is easterly. For June to August, the area experiences southwesterly winds gradually shifting to west-southwest during September and to the west during October. For the month of November the average wind direction is easterly. The annual wind direction is taken as easterly.

The vapor pressure in the area averages at 30.03 millibars on a year. The highest vapor pressure is recorded during May with monthly average of 31. 40 millibars, while the lowest is during February with 28.50 millibars.

Cloud cover averages at 6 ockta per annum with the cloudiest days for the months of June to March. The least clouds are experienced during the months of April and May with an average of 5 ockta. Thunderstorms are frequent during June to November ranging from 6 to 8 days of thunderstorm per month. The least thunderstorms occur during the months of December to April with ranges of 1 to 4 days of thunderstorms per month. The annual total days of thunderstorms is taken at 59. The months with the most number of lightning days are August and October with an average of 17 days. On the other hand, the lightning days are not found during February.

Data on evaporation rates where not available in Surigao, however, the nearest available data are from the PAGASA Station at the Musuan, Bukidnon Station averaged at 5.5 mm in a year. The highest evaporation rate is on April at 8.0 mm while the lowest is 4.2 mm during the month of July.

The climatologic extremes computed from 1903 to 1995 are as follows: the highest monthly average of temperature is 37.5°C taken on 15 June 1987 while the lowest was on 24 February 1905 at 18.2°C. The low end of the high temperatures is from 24.6°C in 18 December 1905 while the high end of the low temperatures 20.8°C recorded on 18 May 1972.

For the climatologic extremes computer from 1950 to 1995, the area experiences winds with velocities annually averaging 34.6 meters per second. The highest wind velocity was recorded on 21 December 1986 with 56 meters per second. The lowest for the extremes is 20 meters per second during 26 February 1968. The general wind direction for the months of January 10 March is north-northeast to northwest, while for the months of April to June it is west-southwest to south-southwest. For July to August, it varies from west-northwest to west-southwest.

The lowest sea level pressure during the period 1949 to 1995 is recorded at 981.80 millibars on 27 October 1991 while the highest was on 17 January 1959 with 1,019.5 millibars.

Rainfall data were taken from the records of the climatological station of PAGASA in Surigao City. A review of the PAGASA data tells that the annual rainfall in the area is 1,142 mm. The dry months are from December to May with monthly rainfall ranging from 40.6 mm to 97.0 mm. The driest month is April with rainfall totaling only 40.6 mm over a 5-day period. The west months are June to November with monthly rainfall ranges of 105.8 mm to 157.6 mm. The wettest month is October with rainfall registering at 157.6 mm over a period of 16 days.

Six (6) tropical cyclones occurred during the past 49-year period, which is an average of 0.12. The month of December had the most number of frequencies of tropical cyclone passage in the area, with an average of 0.04, followed by the months of March, August, October and November. No tropical cyclone crossed the area for the rest of the year.

The most number of tropical cyclones passed over the area during the month of November followed by the month of December. No tropical cyclone affected the area in the months of June, July and September. For the other months, there was minimal threat of tropical cyclone passage over the area. The annual frequency of occurrence of tropical depression is at 0.14, tropical storm is at 0.27 and typhoon at 0.35. The remainder of the months showed minimal threat of tropical cyclone passage over the area. The waters in the western embayments of Dinagat Island are quiet during the severest storms but very rough in the open sea and Surigao Channel. During severe storms the Surigao Channel may not be navigable by launches, resulting in the isolation of the island. This may happen once or twice a year and may last up to eight days. In the local Visayan language, this phenomenon is known as "Walo-Walo" (from Walo meaning eight).

4.4. Geological/Geomorphological Environment

a. Geology based from the *"GEOLOGICAL REPORT ON THE SURIGAO ORES for the COMMONWEALTH OF THE PHILIPPINES, National Development Company, Manila"* by Dean F. Frasche, Chief, Geological Survey Division, Bureau of Mines, 1938

With the reconnaissance made by Pratt and Lednicky in 1915, little geological work has been done in the Surigao Area. In a general way, these early workers worked out, or tried to delimit, the western extension of the western overlying sedimentaries.

According to them, this contact is marked by and escarpment which strikes more sharply to the east and finally bends and strikes north making a narrow loop only to terminate on the north shore of Carrascal Bay. This contact has not been checked or traced out by the author, but it is certain that there is a sedimentary igneous contact in the interior almost nothing has been worked out in regard to the historical geology of this region.

A great deal of the interior region adjacent to the eastern coast of Surigao has the appearance of a plateau, rising 125 to 924 meters above sea-level. The slopes from the western interior descend in a gentle manner to the eastern sea board. Upon these slopes, the wide spread lateritic iron deposits occur in blanket form, the ore being thin or totally absent in the erosion gullies and valleys. This ore mantle varies in thickness, and rests directly on a basement complex of serpentinized ultra-basic rocks.

Basement Complex – the area under discussion is underlain by a series of ultra-basic rocks here named the basement complex. This complex extends from the barrio of Capandan south along the coast to Carrascal Bay, its westward extensions are unknown. In surface area, it represents approximately 60 square kilometers and is thought to be the oldest rock formation in the Surigao district, probably dating form Pre Miocene time.

Kinds of Rocks – The rocks of the basement complex are represented in their order of abundance by serpentines, altered peridotites (?) and perhaps some altered diorites and andesites. Fragments and well worn pebbles of andesite have been found in the vicinity of Dahican Bay but their relationships to the older altered complex are unknown. However, in the northern part of the reservation, near kilometer 87 on the Provincial Road, fresh andesite outcrops appear to intrude and cut the older basements.

Serpentine – This rock covers a larger part of the area and has been formed as an alteration product of the original peridotite (?) and other basic rocks. Locally, it can be found in the bottom of the erosion cuts and along the faces of the sea cliffs. Often, where the surface ore-mantle has been stripped off by erosion, it can be found in large areas. In most exposures, the serpentine can be seen grading down into a more dense dark-green to black peridotitic rock. Small veins and stringers of a hydrous magnesium nickel silicate are commonly found in the serpentine. Near Kilometer 90 on the Surigao Provincial Road, and on the northern end of Dahican Peninsula small boulders of high grade chromite float have been found to be associated with serpentinites.

Peridotites (?) – The peridotites are exposed as boulder and large masses in place in the erosion cuts and along the faces of the sea-cliffs. Thy grade in color from dark green to black, are extremely hard and often show small phenocrysts of olivine. Petrographic studies of these rocks showed the olivine has altered to antigorite and serpentinite.

Diorite – The diorite and andesites have been recognized both from hand specimens and Petrographic sections. Although gabbros have been reported they have not as yet been determined with certainty.

Structure – The entire basement complex is extremely fractured and faulted. No fault patterns have been observed or worked out, and, though much faulting exists, the extent, magnitude and importance of faulting has yet to be determined. It is felt that after more detailed filed work has been carried on the structural and stratigraphic relationship between the basement and the western high-land formations will be determined.

b. Geology based from the *"REPORT OF INVESTIGATION NO. 35"* re: *"PRELIMINARY REPORT ON THE INVESTIGATION OF*

***THE NICKEL-IRON REOSURCES OF THE 1914 SURIGAO IRON ORE RESERVATION"* by Rodrigo G. Rigor, Mining Engineer II, Bureau of Mines, 1962.**

General Geology

In 1914 reservation area is underlain chiefly by a complex assemblage of serpentinized ultramafic rocks, metavolcanic rocks, amphibolite schist, talc-chromite

The serpentinized ultramafic rocks underlie the eastern half of the area, flanked on the northwest and southeast by Tertiary clastic sedimentary rocks, limestone and basalt. Amphibiolite schist and metavolcanic rocks of probable pre-Tertiary age predominate on the southwestern portion. These earlier-formed rocks were included by the ultramafic rocks probably during the late Cretaceous time but definitely before Eocene times. Isolated remnants of Eocene limestone capping the serpentinized ultramafic rocks are found at the north central portion of the reservation. Wright, et. al.[5], suggested that serpentinization of the ultramafic rocks subsequently followed after their emplacement. Field studies indicate the presence of two general types of ultramafic rocks, namely, dunite and pyroxene peridotite.

It is probable that a long period of erosion must have taken place sometime in late Tertiary time which extensively eroded the limestone and clastic sedimentary rocks capping the serpentinized ultramafic mass. Progressive uplift probably began in Pleistocene time followed by peneplanation. The ensuing, most significant event was characterized by the tropical chemical weathering of the serpentinized ultramafic rocks and their clastic derivatives which consequently formed the nickel-iron resources of the 1914 Surigao Iron Ore Reservation. It can be seen, therefore, that the areal distribution of the ultramafic rocks has a bearing on the nickel-iron resources of the reservation.

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5 **Wright, W.S., et. al., 1958, Iron-Nickel-Cobalt Resources of Nonoc-Awasan- S. Dinagat Islands in Parcel II of the Surigao Mineral Reservation, Mindanao; Publication 17, Special Project Series, Phil Bu. Of Mines, Manila**

Description of the Nickeliferous Deposits

Origin of the Deposits

The nickeliferous deposits consist of laterite and decomposed serpentinite. The deposits represent the residual products developed in place by chemical weathering of the serpentinized ultramafic rocks. D.A. Frasche[6] proved by petrographic evidence that the degree of alteration of the original mineral constituents of the serpentine rock increases upward to the iron ore. Such progressive destruction of the country rock is ascribed to the action of percolating ground water. He concluded that by this process, great quantities of soluble materials such as silica, magnesia and lime have been removed and the insoluble constituents of the serpentine rock such as iron and chromium, alumina, have accumulated to form the nickeliferous laterite deposits. The lateritic end product contains almost no magnesia and very little silica even though it originally constituted about 75% of the parent rock.

General Features

Despite the wide area underlain by serpentinized ultramafic rocks, the important nickeliferous deposits are found only along the northeastern coastal area of the 1914 reservation extending form southern Adlay northwestward to Urbiztondo, Claver. Small and scattered lateritic tracts are also found capping the more gentle ridges on the southwestern part of the reservation particularly at Baoy and Mt. Legaspi Range.

The reddish-brown lateritic soil capping the gentle ridges consists mainly of limonite and hematite with subordinate amount of magnetite. Near the surface and a few meters downward, small hard hematite and limonite pellets or shots are predominant. These pellets or shots increase in quantity and size toward the surface and sometimes are often found cemented into limonitic crust.

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6 **Frasche, D.F., 1941, Origin of the Suirgao Iron Ores; Econ. Geology, Vol. 36, p. 230-305.**

The presence of different colors in the laterite zone as observed in road cuts, test pits and natural exposures led to the recognition of at least three zones, each zones being transitional to the next lower zone. The first zone which lies on the topmost layer exhibits form dark reddish brown to moderate brown color peculiar to lateritic deposits in other tropical regions. The middle zone of zone 2 is light-brown to yellowish-brown, and zone 3 representing the base of the laterite displays variegated colors of yellowish-brown, yellow, red, pale greenish-yellow and black. High nickel is usually contained in this zone which extends downward to the upper part of the decomposed serpentinite. However, in some places, the enriched zone is entirely in the decomposed zone.

De Vletter[7] stated two factors that satisfy nickel concentration or enrichment, as follows:

1. Decomposition of serpentine with removal of its principal constituents, namely magnesia and silica, and consequent residual concentration of metallic components.

2. Dissolution of nickel from uppermost layers of laterite and its re-precipitation in the lower layers and transition zone.

Because of the inter-relation between solution and redeposition which represent a continuous process, the position of the enriched zone gradually moves downward.

Underlying the laterite mantle is the light yellowish green to greenish and soft decomposed serpentinite. Being the basal portion of the two deposits, this ore contains higher nickel than the overlying laterite soil.

7 **Vletter de, D. R., 1955, How Cuban Nickel Ore was Found; Engineering and Mining Journal, Vol. 156, No. 10, p. 84-87.**

The decomposed serpentinite ore displays greenish hues from pale greenish-yellow to greenish-gray. The contact between the overlying laterite and the decomposed serpentinite is very irregular.

Field identification of the decomposed serpentine ore can be made by noting the color alone. The occurrence of light yellowish-green to light-green in preponderance to brown or red is characteristic of all decomposed zone encountered in the reservation. However, there are instances where the greenish material occurs in equal proportion with the brown or red. In this case, a sharp contact between the laterite and decomposed serpentinite may not be visible in the field. The position of the contact will then be based on the iron content rather than by color alone.

4.5. Biological Environment

4.5.1. Plants

The Project Area is covered with tropical jungle of dipterocarp variety. Although the laterite areas along the coastal areas are barren or covered with thin vegetal foliage, densely forested areas are also found farther inland. Iron wood, locally known as "Magkuno," Felichenia linearis, locally known as "hagsam," and types of tropical tree called nickel tree or "paguspos" predominate in the semi-barren areas.

Further study will be undertaken to further enhance the existing information during the term of the EP that may be granted.

4.5.2. Animals

Fauna or animal life observed consists of birds (doves, grass birds and quails) and domesticated animals like cows, carabaos, dogs and goats.

The Proponent commits to undertake comprehensive study to account all the terrestrial animals and plants in the Project Area.

4.6 Socio-Economic Environment[8]

4.6.1 Demography

4.6.1.1. Population Distribution/Trends

Per 2000 NSO Survey, the Province's total population is 481,416 or an increase of 8.86% from the 1995 survey of 442,203 with an annual growth rate of 1.71%. Population density has also increased from 161 persons per square kilometer in 1995 to 175 in 2000. Household population correspondingly increased by 10.74% from 83,658 in 1995 to 92,645 households in 2000. It has a projected population of 515,929 in 2003.

The Province ranked 4th in terms of population per province which contributed 17.32% of the entire population of Caraga Region and 0.47% of the entire population of the country.

Young population is relatively high. There are 71 young dependents for every 100 working population (15-64 years old). In contrast, old dependency ratio (65 & above) was very low with only 7 old dependents to every 100 working population. There are about 78.29% (346,185) of the total population who are young (0-39 years old) of which 40% (175,672) are male and 30% female.

[8] **Source: Socio-Economic and Demographic Profile of Surigao Del Norte, CY 2003**

4.6.1.2. Number of Births/Deaths

Some 11,308 livebirths were reported in 2002 with a decrease of 816. This implies that family planning program really work-out in the province. Of the total births, 51.38% (5,810) were males and 48.62% female and majority (5,081) were born at home. Surigao City being the highly urbanized center, still has the highest birth registration followed by the Municipality of Dapa while Burgos has the least number of registration.

Deaths on the other hand had increased by 10.79% from 2001 to 2002. Of the total deaths (2,238), 56.43% are males and 43.57% are females. Most death cases (732) had occurred at home. The Municipality of Claver had the highest number of cases (82) followed by San Jose municipality.

4.6.1.3. Poverty Incidence

The Province has high poverty incidence of 56%, but this rate is lowest in the region. It is decreasing from 58.3% in 1991. Per 2000 NSCB report, poverty incidence has decreased to 25% with 22,878 poor families below poverty threshold with only PhP8,651.73 annual per capita poverty threshold and it has the lowest incidence among the four provinces of Caraga Region.

4.6.2. Economic Profile

4.6.2.1. Labor Force and Employment

The Province registered some 305,000 persons in the working age of 15 and above based on the 2000 NSO Survey. Of the total persons belonging to the

working age, 208,000 persons or 68.1% were in the labor force while 97,000 or 31.9% were considered not in the labor force. Of those in the labor force 204,000 or 98% were employed while 4,000 or 2% were unemployed. Employment rate in Surigao del Norte is higher than the rest of the Provinces of Caraga Region. Generally, more men were employed accounting 73.14% while women employees were only 26.85%. Likewise, unemployment registered 62.81% for women, slightly higher than men which posted 37.19%. It was noted that employment for both sexes was heavy between ages 15 up to 34 and was declining at age 35.

NSO data indicated that population distribution involving 15 years old and above was almost equal in both urban and rural areas (49.77% urban, 50.23% rural). Urban - based workers accounted for 26.54% or 66,764 while rural-based reached to 67,259 or 26.74% of the total working age of the province. In both areas male employees consistently outnumbered their women counterpart (urban: 69.11% male, 30.89% female; rural : 77.16% male, 22.84% female).)

Labor force survey show urban-based workers' participation to stand at 49.82% as against rural-based 50.19%. Among the major industry groups, Agriculture, Fishery and Forestry exhibited the highest employment with 71,696 or 53.50% while Electricity, Gas and Water was the lowest posting at 32%.

Labor force participation in 1980, 1985, 1990 and 1995 indicated men's participation rate consistently exceeded that of women. In 1995, participation rate was 71% for men and 38.6% for women.

Employment rates in 1990 showed males to be dominant with 94.8% employment rate (98,032 employed) as against women's participation rate of 79.9% (35,991 employed). On the other hand, women exhibited a higher unemployment rate of 20.1% over men's 5.2%. Employment rate for both sexes was highest in Surigao mainland at 91.4%. Siargao and Dinagat Islands posted identical employment rate at 89%. In Siargao and Dinagat however, unemployment rate was higher at 11% compared to mainland's 8.6%.

4.6.2.2. Family Income and Expenditures

Some 18,419 families were earning a yearly average family income of PhP25,611.00 and spent an average of PhP25,501.00. A small number of 480 affluent families were earning yearly an average of PhP261,053.00 and spent only around PhP73,018.00. On the average, considering all income classes, a family in the province exhibited an average yearly income of PhP47,556.00 and yearly expenditures of PhP40,427.00.

In 1994 NSO data, a total of 98,180 families posted an average per capita income of PhP10,539.00 and average per capita expenditure of PhP8,746.00. In particular, the highest per capita income class (PhP50,000.00 and over) displayed a PhP74,376.00 average per capita income, while that of the lowest class (under PhP2,500.00) per capita income was only PhP2,034.00.

On sources of income, 43,023 families (44%) were engaged in various entrepreneurial activities such as crop farming and gardening (16%), fishing (15%) and

wholesale and retail (7%). About 33,931 families (35%) were wage and salary earners and 21,226 or 21% were dependent of other sources like crop-sharing and cash-receipts, support, assistance and relief from domestic source.

Distribution of family expenditures revealed that food consumed at home posted the highest expenditure (57.6%). This is followed by rent/rental value of occupied dwelling units (7%) and fuel, light & water (5.1%).

Per NSO report, the Gonsumer Price Index (CPI) for all items was increasing from 165.3 in 2000 to 174.0 in 2001. Inflation rates also rise up from 4.1 in 2000 to 5.3 in 2001 while decreasing for the purchasing power of peso from 0.60 to 0.57. In 2001, "the housing and repairs" commodity group has the highest average consumer price index (225.0) followed by the "fuel, light and water" group (178.1) and the least went to the household furnishing, operations or miscellaneous group.

4.6.2.3. Agriculture & Natural Resources

- **Crop Production**

Overall production of crops for Year 2002 totalled to 557,716.30 metric tons. This year crop production showed a remarkable increase of 130% compared to last year's production of 241,793.70 metric tons. However, harvest area has decreased from 143,294 hectares in 2001 to 142,374 hectares in 2002.

Coconut land comprised the biggest area of 110,500.00 hectares while coffee had only 30.0

hectares. In terms of production, coconut had decreased its yield from 102,969.26 metric tons in 2001 to 93,386.37 metric tons in 2002. Coconut farmers all over the province numbered 46,053.

Absolute palay area reached a total of 18,609 hectares of which 11,175 hectares (60.05%) were irrigated and 7,434 hectares (39.95%) rainfed. Palay production showed a slight decreased of 1.7% from 65,699.00 metric tons in 2001 to 64,584.00 metric tons in 2002. Palay consumption requirements for 2002 resulted to a deficit of some 406,045 metric tons.

Production was very low in other crops particularly cacao (95 hectares), coffee (30 hectares), and abaca (50 hectares) at 42.0 metric tons, 21.25 metric tons and 131.0 metric tons respectively.

- **Poultry & Livestock**

Livestock and poultry has an aggregate population of 637,487 heads. Chicken topped the list with 445,580 representing 69.9%.

There was a reported surplus of 3,506,913 kgs. of carabeef and 17,770 kgs. of duck in the province. Moreover, surplus of 2,341,276 kilograms was registered on pork production also.

Consumption requirements for beef and chicken surpassed production. For beef, consumption was estimated at 625,453 kgs. but production yielded only 412,596 kgs. which

resulted to 212,857 kgs. deficit. Chicken has registered a deficit of 2,395,104 kgs. while goat production registered a surplus of 24,498 kgs. for the whole province.

There are 17 commercial livestock and poultry farms in the entire province with 9,263 animals. Chicken and ducks have the highest population of 3,770 heads and 4,695 heads, respectively. Animals slaughtered in abattoirs totaled to 516,540 heads of which 497,273 heads were chicken.

- **Fishery & Aquatic Resources**

Total fishery production of the province showed a decreasing trend on fish catch volume on commercial, municipal marine, inland and aquaculture which totalled to 54,463.4 metric tons for the year 2002 as compared to 62,616.8 metric tons in 2000. An overall 14.97% decrease was registered in year 2002 altogether with the downward trend on the fishery components for this year.

Although there was a decrease of fish production but still the total consumption requirements is sufficiently supplied and a surplus of 34,963,594 kgs. was recorded in 2002.

- **Mineral Resources**

Metallic reserves registered a total of 14,678,155.8 metric tons. Nickel Silicate Ore posted a 55.08% share of the total reserves or

8,084,178.8 MT, while Gold and Copper have a deposit of 3,596,700 metric tons. Iron Ore has 2,103,767 metric tons and chromite has 893,510 metric tons.

For the non-metallic, limestone has 230,720,716 metric tons and silica deposits has 148,173,727 metric tons. For the year 2002, there were no existing Permit Holders for Guano and Phosphate.

Under the Mineral Production, a total of 1,406,260 DMT was noted for the Nickel Silicate Ore with a corresponding value of PhP1,102,408,166.30. These products are exported to Japan and Australia with a corresponding sales of PhP417,866,588 for 670,640.79 DMT of Nickel Silicate Ore. Chromite Concentrate has only 1,554.39 DMT with a value of PhP2,480,850.36.

On the other hand, Iron Ore, Silica, Clinker and Limestone has a total production of 336,423 metric tons with a total value of PhP119,726,064.18. These products are used mainly as raw materials for cement.

For year 2002, cement has a production of 5,743,050 bags while sand and gravel has 76,754.50 cu.m. for local consumption only.

4.6.3. Infrastructure/Utilities

4.6.3.1. Transportation

- **Land Transportation**

The Land Transportation Office has registered a total of 13,376 vehicles, It posted an increase of 21% from the 11,060 of last year. These transport vehicles included government, for hire and privately owned vehicles.

Government owned vehicles had the least number of 426 while privately owned vehicles had the most number of 9,942 registered vehicles.

Road Network

The province has a total road network of 2,581.81 kilometers. The National Roads constitute 15.10% with 389.808 kms; Provincial Roads comprise about 12.09% with 314.246 kms; Municipal and City Roads consist of 17.13% with 442.327 kms and the Barangay Roads is 52.30% with 1,437.44 kms.

There are about 13,466.99 linear meters of bridges, 70.50% are timber with 9,499.67 ln.m of which some of these bridges need repair. Concrete bridges constitute 20.14% with 2712.134 ln.m. Steel Bridges posted the highest increase in length due to the construction of steel bridges thru President's Bridges Program. It comprises 7.6% with 1,023.44 ln.m. The rest are Re-inforced Concrete Pipe Culverts (RCPP), Re-inforced Box

Culverts (RCBC) and spillways, which constitute 1.76%.

- **Air Transportation**

The province can be reached by air transportation from Manila and other places in the country via Cebu City. At present two airlines are serving the province. Asian Spirit serves the passengers from Cebu to Surigao City Airport while Sea Air flies Cebu to Sayak Airport.

Surigao City Airport is classified as secondary (Class D) with a dimension of 1,536 meters x 30 meters located at km 4, Surigao City. Sayak Airport is a feeder (Class G) with a runway dimension of 1,000 m x 30 m located at Brgy. Sayak, Del Carmen, Sairgao Island.

- **Sea Transportation**

The province has extensive coastline. There are four major island groups along with numerous off shore islets which are; the Mainland, Dinagat Island, Siargao Island and Bucas Grande Island. This unique geographic condition demands efficient sea transport facilities.

The national baseport is located in Surigao City. It caters small to big vessels from other cities and provinces. The Maharlika Ferry Terminal is the only ferry terminal in the province. There are also 2 fishing ports, 78 Barangay Ports, 40

Municipal Ports, 5 anchorage/beaching Areas and 9 private ports.

The records of the Philippine Ports Authority (PPA) revealed that there was a decrease of vessel traffic in almost all ports in the province. Surigao City Baseport in particular had a decrease of port-calls from 3,617 in 2001 to 3,389 in 2002 with a corresponding decrease of cargo tonnage handled from 208,997 in 2001 to 189,931 in 2003. Passenger Traffic also decreased from 694,325 in 2001 to 660,479 in 2002.

- **Water Supply and Sewerage Facilities**

The province is served with 3 water districts under Local Water Utilities Administration namely; Surigao Metropolitan Water District (SMWD), Placer Water District and Bacuag Water District. The newly created Dapa Water District is still on the construction phase of its water system. Del Carmen Rural Water Supply Association (DELCARUWASA), a private enterprise is operating a Level III Water Supply System in Del Carmen which is run by its Pastoral Council. SMWD is the biggest water district with 10,187 active connections having average monthly collection of PhP2,301,285.00. There are about 14 municipal waterworks systems in the province. Most of these systems adopt the combined system of household connections with communal faucets. It operates at flat rate.

There are 136 Level II water systems. Most of these are utilizing spring sources. Often times

these systems encounter maintenance problems because water service is commonly free in the rural areas. LGU is subsidy sustaining its operation. Level I facilities are common in rural areas majority of which are owned privately. Such facilities are of different types of wells equipped with hand pumps or developed spring with transmission line and one communal faucet.

On irrigation, of the 120 Communal Irrigation Systems (CIS), 11 are privately owned systems, the rest are government owned which were mostly constructed by the National Irrigation Administration. These systems service an area of 6,382 hectares which reflected a slight increase of 46 hectares as compared in 2001 but with a slight decrease of 328 farmer beneficiaries from 7022 of last year.

- **Power**

The National Power Corporation (NPC) is supplying power in the province through the three electric cooperatives namely; SURNECO in the mainland, DIELCO in Dinagat Island and SIARELCO in Siargao Island and Bucas Grande Island.

SURNECO was serving 183 barangays with 35,516 connections in 2002. The barangays served constituted 90.15% of the 203 barangays in the 11 mainland municipalities and Surigao City. It supplied power at 24 hour operation daily. Its average monthly residential consumption was 175,251 kwh and 84,642 kwh for average

commercial consumption. The industrial connection had the least average monthly consumption of 19,723 kwh.

SIARELCO had completely energized the 131 barangays in Siargao and Bucas Grande Islands. Some of these barangays were served by generating sets. It has served 13,928 households with 17,783 households still unserved. Its coverage monthly consumption was 370,542.50 kwh.

Of the 100 barangays covered under DIELCO only 53 barangays were energized. It was serving 6,973 households with 11,149 households unserved. It had an average monthly consumption of 11,165.25 kwh. The system was being served with 2-250 KVA, 1-364 KVA, 3-167 KVA and 2-400 KVA generating sets.

Power rates in the mainland (SURNECO) was cheaper compared to the two electric cooperatives in the islands due to higher cost of operation in the islands.

- **Communication**

The province has sufficient communication facilities. A Central Communication Center has been installed in the Capitol Building with access to all the municipalities except Burgos. The Provincial Health Office has also a radio communication access to all of their District Hospitals and Rural Health Stations.

Although only the Surigao City has households telephone systems connection, but almost all the municipalities are served with two public calling systems; Philcom and DOTC Telephone System. About 14 municipalities have been installed with cellsites of SMART.

In 2002, there was drastic decrease of government handheld radios from 1564 to only 40 because said radios were already not functional. They were left unrepaired because of the advent of the mobile phone services.

- **Public Building**

The province has sufficient number of public buildings. It has a total of 148 Barangay Halls, 119 Multipurpose Halls, 99 Day Care Centers, 141 Barangay Health Centers, 37 Municipal and Barangay Markets and 8 Public Terminals.

5.0 DESCRIPTION OF EXPLORATION PROGRAM

For further details of the Exploration activities, please refer to the Two (2) – Year Exploration Work Program. The details of the said Exploration Program are summarized as follows:

5.1 Description of Exploration Method(s) and Equipment to be used

5.1.1 Research, compilation and review

The initial data collected was conducted within Parcel I of the SMR. There is still a further need to conduct research studies for

collection of all available data. This will be undertaken for a period of two (2) month by a licensed Mining Engineer.

5.1.2 Reconnaissance/Regional Survey or Studies

5.1.2.1. Geological Mapping/Alteration Studies

This study, which will be undertaken manually for three (3) months and will cover the whole Project Area, involves the investigation/ evaluation of the surface indications and geologic features of the area such as lithology, mineralization, intensity and type of alteration, etc., that would indicate/establish the identifying promising areas. The actual field survey will include geological traverses along drainage channels, road cuts, and other surface structures. Compass and tape mapping might be resorted along sections with prominent exposures or mineralization. The survey will focus on the distribution of the laterite deposits in the Project Area.

5.1.2.2. Geochemical Survey

The reconnaissance geochemical survey will be undertaken in the whole Project Area for a period of three months simultaneously undertaken with the reconnaissance geological mapping, to determine the geochemically anomalous areas by systematic collection of samples. The survey is the systematic collection of stream sediments samples in pre-selected points from the base of the slopes and ridge and stream sediments.

Stream sediments will be collected by sieving in the size of minus 2 mm. and minus 80-mesh. Rock floats by identification and selective sampling. Each of the

minus 2 mm and minus 80- mesh stream sediments, and rock samples will be taken at a density of one (1) sample for every one (1) square kilometer. Thus, approximately eleven (11) samples will be collected for each of the sample type or a total of thirty-three (33) samples weighing at least one (1) kilogram per sample.

5.1.3. Semi-Detailed Survey or Follow-up Studies

5.1.3.1. Geological Mapping or Follow-up Studies

This activity involves mapping of outcrops along creeks and other exposures. This will be undertaken to accurately map and delineate the rock types, alteration mineralogy and structures such as faults, folds, dip of strata in prospective areas, etc. The coverage of this activity will be dependent on the results of reconnaissance studies. It is assumed that five hundred (500) hectares will be the coverage of this study. This activity will be undertaken for a period of three (3) months using GPS Unit, brunton compass, sample picks, etc.

No equipment will be utilized.

5.1.3.2. Geochemical Survey

Delineated anomalous areas during the interpretation of regional geochemical data will be re-evaluated into a closer density. The same coverage with that of semi-detailed geological mapping, which is 200 hectares. Stream sediments will be collected by sieving in the size of minus 2 mm. and minus 80-mesh. Rock floats by identification and selective sampling. Each of

the minus 2 mm and minus 80- mesh stream sediments, and rock samples will be taken at a density of one (1) sample for every three hundred (300)-meter grid interval. Hence, at least fifty (50) samples will be collected for each of the sample type or a total of one hundred fifty (150) samples weighing at least one (1) kilogram per sample.

No equipment will be utilized.

5.1.3.3. Subsurface Investigation

There are two types of subsurface investigation that will be implemented under this activity: Test pitting and Auger drilling. These will be undertaken in the most promising or favorable sites to determine the persistence of the structures/mineralized/altered zones at limited depth. It is assumed that one hundred fifty (150) hectares are the promising areas identified in the previous survey.

Auger holes will be dug at 100 meters x 100 meters grid interval or a total of one hundred fifty (150) auger holes with average depth of eight (8) meters or a total meterage of one thousand two hundred (1,200) meters. Samples will be taken at a density of one (1) sample for every 2-meter depth, hence, six hundred (600) soil samples are expected during this stage. This will be undertaken for a period of five (5) months and will utilized "hand-held" auger drill.

Test pits will be dug at 200 meters by 200 meters grid interval or a total of thirty eight (38) test pits with dimension of 1 meter by 2 meter and average depth of

eight (8) meters or a total meterage of three hundred four (304) meters. Samples will be taken at a density of one (1) sample for every meter depth of the test pits, hence, three hundred four (304) geochemical soil samples are expected during this stage. This activity will be conducted for a period of six (6) months utilizing certain digging tools such as pick mattocks, shovels, carpentry tools, etc.

5.1.4. Topographic Survey

Topographic survey will determine where the actual exploration activities will be undertaken. Survey controls will be necessary to the conduct of detailed survey works. The topographic survey will also be needed in planning, construction and development works and ore reserve calculations. The said activity, which will cover the whole project for a duration of three (3) months, will be undertaken thru Contractual Basis.

5.1.5. Detailed Geologic Survey

5.1.5.1. Detailed Geological Mapping

The detailed geological mapping program will be carried out as limited exploration works during semi-detailed geologic survey failed to note some important soil geochemical anomalies. These activity will cover the same area subject of subsurface investigations, which is one hundred fifty (150) hectares and will be undertaken for a period of four (4) months using GPS Unit, brunton compass, sample picks, etc.

5.1.5.2. Geochemical Survey

The geochemical survey will be carried out to gain a better understanding of the geochemical characteristics of the laterite deposits that will help to established highly anomalous areas which will be subjected to future x-ray drilling activities. Closely spaced grid system for sampling point location and control will be utilized. The same area covered by detailed geological mapping will be the coverage of this activity and simultaneously undertaken with the same activity.

Stream sediments will be collected by sieving in the size of minus 2 mm. and minus 80-mesh. Rock floats by identification and selective sampling. Each of the minus 2 mm and minus 80- mesh stream sediments, and rock samples will be taken at a density of one (1) sample for every grid interval of 100 meters by 100 meters. Hence, one hundred fifty (150) samples will be collected for each of the sample type or a total of four hundred fifty (450) samples of at least one (1) kilogram per sample.

This activity will be undertaken utilizing simple tools, such as GPS Unit, brunton compass, sample picks, etc.

5.2. Preliminary processing of samples

There will be no preliminary processing of samples to be undertaken within the Contract Area. Samples will be sent to the Mines and Geosciences Bureau Regional Office No. XIII, for the determination of nickel and chromite contents of the samples.

5.3 Total Estimated Exploration Cost

The total estimated exploration cost amounts to **Two Million Two Hundred Thousand Pesos (PhP2,200,000.00)**, broken down as follows:

			1st year	2nd year
1.	Research, compilation and review		PhP 63,333.00	
2.	Reconnaissance Geological Studies			
	a.	Geological Mapping	203,250.00	
	b.	Geochemical Survey	19,800.00	
3.	Semi-detailed Geological Studies			
	a.	Geological Mapping	203,250.00	
	b.	Geochemical Survey	90,000.00	
	c.	Subsurface Investigation		
		i. Auger Drilling	278,250.00	185,500.00
		ii. Test Pitting		481,950.00
4.	Topographic Survey		300,000.00	
5.	Detailed Geologic Studies			
	a.	Geological Mapping		237,000.00
	b.	Geochemical Survey		135,000.00
TOTAL			**PhP1,157,883.00**	**1,039,450.00**
			≈ PhP1,160,000.00	**1,040,000.00**

6.0 IDENTIFICATION OF POTENTIAL EFFECTS

6.1 On Land

6.1.1 Surface Disturbance Off the Mineral Property Subject of Exploration.

Existing trails and traverse leading to the Project Area will be utilized. As such, minor clearing and upgrading will only be undertaken. There will be no impact on the topography of the area and vegetation that might increase the existing rate of erosion.

6.1.2 Surface Disturbance On the Mineral Property Subject of Exploration

6.1.2.1 Traverse and Trails

Existing trails and traverses within the Project Area will be utilized to minimize environmental impact or trails leading to exploration workings will only be constructed to transport materials and supplies needed during the exploration. This activity will affect vegetation, increase the rate of erosion and disturbance of existing animals but has minimal effect on topography.

6.1.2.2 Field/fly Camp, Staff house and Facilities

The construction of field campsite, staff house and facilities will affect the topography of the area and some vegetation due to the leveling of the ground. These might increase the existing rate of erosion if not properly address. In addition, pollution and contamination of existing environment due to man-generated waste.

6.1.2.3 During Surface Investigation

Ground disturbance during surface investigation is minor erosion due to collection of samples, minimal clearing of vegetative cover and disturbance of natural habitat.

- **Auger Drilling Activities**

The clearing of drilling sites will affect vegetative cover and topography. Thus, might increase the existing rate of erosion. It will affect the natural habitat of animals.

- **Test pitting Activities**

Effect on the environmental setting due to test pitting is minimal since this is only a narrow vertical excavation. Soil and rocks produced from the excavation will only be the one to affect the environmental setting such as increase the rate of erosion, loss of vegetation, entrapment of stray animals. However, test pits especially in those areas which are not mineralized will be immediately backfilled upon completion of the same.

- **Drilling Activities**

The clearing of drilling sites will affect vegetative cover and topography. Thus, might increase the existing rate of erosion. It will affect the natural habitat of animals. Fuel and oil spills may contaminate the water and soil in the area.

6.2 On hydrology and water quality

6.2.1 Potential generation of Acid Mine Drainage

Generation of Acid Mine Drainage is impossible, however, if possible will only be minimal. Sulfur, chlorite, chloride, nitrite is very minimal if present in the host rocks, laterite soil, and other rocks present in nickel-chromite mineralization. In addition, restoration of the exploration areas that is not mineralized will be given preferential attention in backfilling, as such, these areas will not be exposed for a long period of time (duration is one of the parameters for generation of acid mine).

6.2.2 Siltation and Pollution of Surface Waters

Siltation occurs already in the area since some portion of the area is erosion class E1. Exploration activities might induce additional erosion, soil and water contamination due to the drill equipment's use of fuel, lubricants and oil.

Pollution on surface and seawaters will be caused mainly by erosion.

However, drill holes will be plug upon completion of the drilling activities while test pits will be immediately backfilled also upon completion of the same. In addition the mitigating measures to be undertaken by the proponent will certainly help to minimize the potential effects.

6.2.3 Changes in hydrology

There will be no changes in hydrology since there will be no diversion of exiting drainage pattern. Small ponds, including its drain channels, to be constructed will be intended to collect silts caused by erosion and these are not permanent.

6.3 On the Ecology

Alternation of landform from non-productive area to mining area, if found to be feasible, will benefit immediate vicinity due to labor employment, development of community as well as the technology.

However, exploration activities and other related human activities might have significant effect such as displacement of flora and fauna due to clearing of vegetation and noise and waste generation.

Effect on natural drainage is minimal since change in topography and denudation caused by exploration activities is still tolerable. In addition, mitigating measures are to be undertaken by the proponent to prevent/minimize the damages that may be caused by the exploration activities.

6.4 On Socioeconomic Effects

During the Period, the introduction of Project over the area may very little significant effect to the socio-economic condition of the area considering the extent of work to be done and the actual fund infusion to the community is relatively small since major part of the fund will be utilized for the excavation (drilling and test pitting) activities (the fund will not revolve in the community).

However, once the area is found to be feasible for extraction and exploitation of minerals, meaning the commence of mining operation, the concerned and immediate communities will be benefited due to the labor employment and community development as well as technology advancement, etc. On the part of National and Local Government, taxes that will be generated such as but not limited to royalty, occupation fee, income tax, business tax, etc.

While the negative effects of the proposed Project (exploration activities) are confused perception by local residents due to

misinformation of project implementation, safety of workers during the excavation of test pits may be compromised, migration into the project area due to wrong speculations.

7.0 ENVIRONMENTAL MANAGEMENT MEASURES INCLUDING TOTAL COST

7.1 The following mitigating measures will be undertaken by the Proponent to prevent or minimize the effect on environmental setting caused by exploration activities, to wit:

7.1.1 Construction and Upgrading of trails and traverses

7.1.1.1 Use of existing trails and traverses;

7.1.1.2 Construction of trails and traverses will be designed and constructed in relation to contour of the area such as avoiding steep slopes of the area or highly erodable areas, limiting the grades of the traverses or trails, etc.;

7.1.1.3 Cutting of trees will be avoided as much as possible;

7.1.1.4 Sloping loose ground, especially caused by constructed trails and traverse, will be Rip-rapped or moon scrapes will be introduced to prevent the increase of rate of erosion, siltation, subsidence and landslides;

7.1.1.5 Revegetation/reforestation of the ground slopes and sides of the trails or traverses;

7.1.1.6 Conduct regular maintenance; and

7.1.1.7 After completion of exploration activities, trails and traverses will be ripped, to promote the growth of endemic plants, and revegetated/reforested.

7.1.2 Construction of field/fly camps, Staff house and facilities

7.1.2.1 Staff house with corresponding concreted septic tanks, storage house, etc. will be built within the Project Area . While fly camp/s that will be used in operation will be built removable and transferable. Small septic tanks and waste dumps for biodegradable materials will also be constructed;

7.1.2.2 Proper housekeeping will always be observed;

7.1.2.3 Recycling of solid waste will be observed. Unrecycable solid waste will be disposed in the Municipality's/Barangay's Solid Waste Disposal Area;

7.1.2.4 The fly camp will be dismantled at the end of the exploration activities;

7.1.2.5 The periphery of the staff and storage house will be replanted/reforested for beautification purposes; and

7.1.2.6 At the end of exploration period, staff and storage houses will be given to the landowner. However, if the landowner is not interested, the said facilities will be dismantled and the area covered thereby will be ripped and planted by fruit bearing trees.

7.1.3 During Exploration Activities

7.1.3.1 Revegetation/reforestation of the damage areas, denuded areas, and ground slopes to prevent erosion;

7.1.3.2 Cutting of trees and vegetation will be avoided as much as possible;

7.1.3.3 Exploration works and other disturbed areas that are not mineralized or that are not necessary for future re-evaluation work shall be rehabilitated/restored and reforested immediately;

7.1.3.4 Stockpile materials produced from drilling and testpitting will be used to restore the area (backfilling). The said stockpile materials, placed within the perimeter of each excavation, will be enclosed and the height of the stockpiles will be minimize along slopes to prevent erosion and siltation;

7.1.3.5 The topsoil shall be stockpiled separate from the subsoil for proper backfilling and revegetation. And as much as possible, stockpiles or erosion prone areas shall be provided with drain channels to prevent erosion.

7.1.3.6 Fencing of excavations, using ropes and twigs, as well as warning device/signs will be provided to prevent entrapment of stray animals or accident to by-passers;

7.1.3.7 Test pits during its active state will be provided with a canvass roof not only to prevent water from going into the excavation and disrupt the work schedule but also to protect the health of the workers;

7.1.3.8 Handling of toxic and hazardous materials - there will be no toxic and hazardous materials to be used during the duration of the exploration period. If the said materials refer to the lubricants, fuels and oils that will be used by drilling equipment, these will be handled carefully in the storage room, while drilling and refueling areas will be provided with bunds and lined with impervious materials to prevent soil contamination. In addition, biodegradable drilling fluids shall be used as much as possible;

7.1.3.9 Drilling equipment/machines will always be lubricated to minimize noise pollution;

7.1.3.10 Refueling will be carefully undertaken i.e., using fuel pump and hose, etc.;

7.1.3.11 Water recycling will be implemented through provision of water tanks/ponds in each drill site; and

7.1.3.12 Avoid throwing of trash in the field. A waste pit on a specific site away from the any source of water will be designated for waste duping of organic waste. Garbage drums will be provided as depository of domestic solid and non-degradable waste. This will be collected for disposal to the Municipality's/Barangay's Solid Waste Disposal Area. If possible, refuse, such as cans, bottles, etc., shall be recycled or sold.

7.1.4 Small ponds

7.1.4.1. Water ponds, including its drain channels, at a considerable distance below the exploration workings and erosion prone areas will be provided for assurance that all

the silts are collected while in some areas it will be constructed when it is deemed necessary;

7.1.4.2. Desiltation on the said ponds shall be done regularly to make/act efficiently. Silt materials will be immediately used in the rehabilitation of the excavated areas.

7.1.4.3. Once erosion is almost negligible (very minimal), the said ponds will be rehabilitated and reforested; and

7.1.5 Waste Pits

7.1.5.1 A waste pit on a specific site away form the any source of water will be built for waste dumping of organic waste;

7.1.5.2 Fencing of waste pits, using ropes and twigs, as well as warning device/signs will be provided to prevent entrapment of stray animals or accident to by-passers;

7.1.5.3 After completion of the exploration activities, the said pit will be rehabilitated and reforested.

7.1.6 Other mitigating measures/commitments

7.1.6.1 The Proponent and its employees will be made aware regarding the local restrictions, and environmental sensitive and risk areas within the Project Area;

7.1.6.2 The staffs and workers will undergo training in mining conditions, fire prevention and control measures, pollution prevention and cleanup procedures, hazardous material use and handling, occupational health and safety, etc.;

7.1.6.3 Staffs and workers shall be provided with safety gadgets such as hard hats, safety boots and goggles, dust mask, etc.

7.1.6.4 Whenever the potential for acid generation and other effluents are identified, a plan for the disposal of acid generating materials and the prevention of acid mine drainage shall be submitted to the Bureau for review;

7.1.6.5 Prior to start, during and after the implementation of Exploration activities, an ***Information, Communication***

and Education (ICE) Campaign shall be conducted to inform the immediate community and to address whatever problems/issues may arise;

7.1.6.6 A ***nursery*** will be established and maintained to propagate seedlings to be used in the reforestation;

7.1.6.7 The residents of the concerned barangay will be given priority on the hiring of laborers. *Provided* that they should satisfy/pass the medical examination as an assurance they are indeed fit to work;

7.1.6.8 Any incident/accidents that will happen will be reported to the concerned Government Agency;

7.1.6.9 Research and studies will continuously undertaken by the proponent to further improve the mitigating measures as well as research and studies on the vegetation that will thrive and will give best result on soil stabilization to minimize erosion; and

7.1.6.10 Monitoring of the Project Area will be continuously undertaken even after the Exploration Period to assure that impacts are properly mitigated.

7.2 To implement the above mitigating measures, **the Proponent commits to spend a minimum amount of Two Hundred Twenty Thousand (PhP220,000.00).**

8.0. Schedule of Environmental Activities

ACTIVITY	YEAR 1												YEAR 2												COST (PhP)
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
A. Environmental Activities																									
1. IEC Campaign																									
2. Training of Staffs/laborers																									
3. Setting up of Nursery, incl. propagation of seedlings.																									
4. Construction and Maintenance of Settling Ponds																									
5. Slope Stabilization (rip-rap, slope reduction…)																									
6 Equipment Maintenance incl. designation of refueling areas and provision of bunds and lining of impervious materials.																									
7. Backfilling of test pits																									170,000.00
8. Maintenance of excavated materials																									
9. Rehabilitation/revegetation/ reforestation																									
10. Other Mitigating measures																									

11. Monitoring and Maintenance of Environmental Activities	
B. BASELINE INFORMATION GATHERING	
1. Water Quality	20,000.00
2. Hydrology Study	5,000.00
3. Flora and Fauna	5,000.00
4. Community Study	10,000.00
5. Air Quality	5,000.00
C. Preparation of Semi-Annual and Annual Reports	5,000.00
Total Cost	**220,000.00**

9.0. Matrix of Environmental Effects, Mitigating Measures and Corresponding Cost

AREA	SOURCE	POTENTIAL EFFECT	MITIGATING MEASURES	COST (PhP)
Outside of the Project Area	Construction, restoration or upgrading of access routes from the Barangay site	loss of vegetation siltation/ turbidity erosion	- We shall use existing access tracks as much as possible. - We shall put up settling ponds and/or sediment traps where it is deemed necessary. We shall: - Minimize height of muck stockpile/s along slopes; - Provide proper drain channels and direct the flow to siltation/sediment traps; - Minimize stockpiling and accumulation of unwanted debris or waste; - Promote the growth of grasses/shrubs along roadsides and over the stockpiles to prevent it from erosion; - Conduct regular road maintenance.	10,000.00
On the Project Area	Provision of base camp	Domestic waste generation	- A waste segregation scheme will be introduced to encourage recycling and to lessen the volume of waste generation. - Biodegradable waste will be dumped in pits, which will be covered with soil and revegetated before site abandonment.	5,000.00
	Excavations (for settling ponds, camp construction, test pits, vibro/winkie drilling, drill pad preparation)	Depression of selected areas due to excavations	- We commit to backfill the area immediately after target completion. - Ripping shall be conducted at compacted areas. - Immediately backfilling of excavations upon work completion. - Revegetation or reforestation after project completion but before abandonment to give ample time for rehabilitation measures maintenance.	10,000.00

		Proliferation of insects particularly mosquitoes Entrapment of stray animals or accident to passersby	- Proper drainage shall be provided to prevent accumulation of water from any excavation. - Immediate backfilling of excavations upon work completion. - Fencing of excavations using ropes and twigs. - Provide warning devise/signs to as safety reminders to by-passers. - Immediate backfilling of excavations upon work completion.	10,000.00
		erosion	- The topsoil shall be stockpiled separate from the subsoil for proper backfilling and revegetation and each stockpile shall be maintained at considerable heights and low angles. - Stockpiles or erosion prone areas shall be provided with drain channels to prevent erosion. - As much as possible the stockpile shall be put at the low-prone erosion areas or at the upper side of the excavations so that whatever will be eroded goes back to the excavated portion. - Enclosure of stockpile.	10,000.00
		Soil compaction Loss of vegetation	- Ripping the contour to promote natural plant growth; and - To ensure that slopes are stabilized to prevent erosion and loss of vegetation, moon scrapes will be introduced. - Encourage the growth of natural vegetation by spreading the stockpiled topsoil; - Maintain and/or establish a nursery during the exploration program for progressive rehabilitation; - As much as possible the natural specie of the area will be maintained.	30,000.00

Hydrology and Water Quality	excavation	siltation	- Immediate backfilling of test pits and plugging of drill holes. Immediately after the desired samples are taken or after the study of the area is completed. - Test pits during its active state will be provided with a canvass roof not only to prevent water from going into the excavation and disrupt the work schedule but also to protect the health of the workers.	15,000.00
	Use of drilling chemicals	Water and soil contamination	- Biodegradable drilling fluids shall be used as much as possible; - Refueling areas shall be provided with bunds and lined with impervious materials to prevent soil contamination; - Water recycling will be implemented through provision of water tanks/ponds in each drill site.	10,000.00
	Clearing of vegetation	Siltation/turbidity	- Provide silt/sediment traps; - Provide temporary silt ponds and permit the release of clear water only. Desiltation shall be done regularly to make the said ponds efficient. Silt materials will be either mixed with the soil stockpile or be immediately used in the progressive rehabilitation of the project.	15,000.00
	camping	Contamination of river water due to generation of human related waste	- Campsites will be located at least 100 meters away from creeks and/or river system and it will be provided with proper latrine facilities. - A waste segregation scheme will be introduced to encourage recycling and to lessen the volume of waste generation. - Biodegradable waste shall be buried in pits while non-recyclable non-biodegradable waste shall be brought out of the site for disposal at the Municipality's designated dumpsite.	5,000.00

Ecology	clearing of vegetation and noise generation	Displacement/loss of flora and fauna Loss of rare species of flora and fauna	- Vegetation clearing will be avoided as much as possible and noise generation will be kept to its barest minimum. - Areas identified as special habitat of flora and fauna will be avoided and its existence will be reported to concerned government agencies.	
	waste generation	foul odor, health problem, water pollution, visual nuisance, may displace sensitive flora and fauna	- A specific site away from any source of water will be designated for waste dumping, organic waste will be buried in pits while the inorganic waste will be collected and taken out of the site for possible recycling or disposal to Municipal dumpsite.	
Socio-economic Effect	Project implementation	Displacement of socio- economic activities	- Promote employment opportunities by giving local residents priority on job available in relation to this project. - Provide a just compensation to private property owners that may be disturbed by the project.	20,000.00
	Misinformation on project implementation	Disharmonious relationship between the residents and the Contractor	- Conduct IEC activities before the project implementation to keep the personnel, residents and the LGU well-informed of the programs of the company - Keep an open communication with the community through a conduct of regular meetings to give an update on the status of the project. - Meet the community after the project has been accomplished to give them the information with regard to the findings and future company plans involving the area, if there is any.	10,000.00
	Unsafe working condition	Health hazards to workers	- All employees shall be provided with protective equipment and proper medical attention will be accorded to them regularly; - Training on safety and proper equipment handling shall be provided to all personnel.	20,000.00

	Increase of migration	Disharmonious relationship with residents and loss of traditions/culture	- Limit the hiring of non-resident workers to technical personnel; - Priorities for employment shall be given to all residents of the concerned Municipality/Province.	
TOTAL COST				**170,000.00**

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