REPORT ON THE COOPERATIVE MINERAL EXPLORATION IN PANAY AREA, THE REPUBLIC OF PHILIPPINES

PHASE Ⅲ

MARCH 1993

JAPAN INTERNATIONAL COOPERATION AGANCY

METAL MINING AGENCY OF JAPAN

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PREFACE

In responce to the request of the Government of the Republic of the Philippines, the Japanese Government decided to conduct a Mineral Exploration Project in Panay Area, and entrusted the survey to the Japan International Cooperation Agency(JICA) and the Metal Mining Agency of Japan(MMAJ).

The JICA and MMAJ sent to the Philippines a survey team headed by Mr. Koji HASHIMOTO from August 18th to December 15th, 1992.

The team exchanged views with the officials concerned of the Government of the Philippines, and conducted a field survey in the Panay Area. After the team returned to Japan, further studies were made and the present report has been prepared.

We hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

We wish to express our deep appreciation to the officials concerned of the Government of the Philippines for their close cooperation extended to the team.

March, 1993

Kensuke YANAGIYA
President
Japan International Cooperation Agency

Takashi ISHIKAWA
President
Metal Mining Agency of Japan

ABSTRACT

The present works were executed in three designated areas which were chosen from the results of the geological and geochemical survey enacted in year 1991 in the Panay Area, Panay Island, the Republic of the Philippines. The works consisted of trenching and diamond drilling in Mt. upao and Madarag Areas, diamond drilling and detailed geochemical survey in Nipa Area.

Andesitic pyroclastics of Sibala Formation of Palaeocene age have broad distribution in the surveyed areas occupying lower terrain while hematite stained, argillized and silicified andesitic rocks classified as the "Odiongan Volcanics" occupy the higher portion of the mountains/hills.

The drilling has revealed that the rocks designated to "Odiongan Volcanics" is in reality a highly altered variety of Sibala Formation; hematite decreases in the depths and pyrite prevails. Accordingly the term "Odiongan Volcanics" hereafter should be used to signify above mentioned highly altered, hematite stained altered andesite of Sibala Formation.

The trenching in Mt. Upao Area confirmed the existence of gold anomaly. However, three diamond drills(@ ca.300m) did not encounter any significant gold mineralization. The gold anomaly on the surface detected by geochemical survey and trenching is considered to be a kind of a product of the secondary enrichment caused by weathering, and leaching.

Drilling at Madarag Area discovered much stronger gold mineralization than that found in Mt. Upao, the highest value being 0.92g/t Au, and a disseminated sulfide copper mineralization associated with pyrite and magnetite. The occurrence is interesting but the copper grade is also sub-economic.

Moderately anomalous area in molybdenum and copper on the gossan west of Puntales village was tested by one verical drill. The rock in the hole showed extensive alteration and fracturing, but no Mo-Cu mineralization encountered. Also, the detailed geochemical survey in the area failed to depict any significant anomaly.

The detailed geochemical survey covering the southern portion of Mt. Upao(Apiton Area) detected extensive gold anomaly on the ridges. The occurrence of the anomaly is quite similar to those in Mt. Upao and Madarag Areas. Judging from the drill results obtained from both areas, the possibility to discover an economically significant gold mineralization there is considered to be rather remote.

The copper mineralization detected in the drill holes in Madarag is considered to be the most interesting and significant finding so far obtained in the surveyed area albeit the grade does not attain an economic significance.

The gold anomalies, and copper mineralization in the area should comprehensively be reviewed in more broader aspect including the tectonics and mineralization found in the neighbouring islands.

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PART I GENERAL

PART I GENERAL

CHAPTER 1 INTRODUCTION

1-1 HISTORY AND THE OBJECTIVE OF THE SURVEY

The current Cooperative Mineral Exploration Works in the year 1992, in Panay Area, located in the Panay Island, the Republic of the Philippines, were carried out in accordance with the Implement Arrangement, dated July 1990, between the Mines and Geo-Sciences Bureau(MGB) of the Philippines, and Japan International Cooperation Agency(JICA) and Metal Mining Agency of Japan(MMAJ) of Japan.

The present project areas for trenching, diamond drilling and further geochemical survey have been selected based on the results of the Geological and Geochemical Survey carried out in 1991 which in turn were defined as prospective as the consequence of the preceding works, i.e., "Cebu, Panay and Ronblon Areas, the Supra Regional Survey in the Philippines" executed in 1987, and the subsequent further detailed survey, the Survey in Panay-Sara Area implemented in 1988.

The present works involve;

- Trenching in Mt.Upao and Madarag areas,
- Diamond drilling in Mt.upao, Madarag and Nipa areas,
- and Geochemical survey in Nipa area.

Objective of the work is to contribute for the discovery of so far unknown mineralization in the project area.

1-2 CONCLUSION AND RECOMMENDATION OF THE PRECEDING WORKS

The survey executed in 1988 concluded that there were four areas where gold, copper and other non-ferrous metals were geochemically anomalous and hence recommended to execute further follow up works.
The four areas delineated were; Mt. Upao, Madarag, Nipa and Binanan areas.

The geological and geochemical survey executed in the four areas in 1991 further defined significant geochemical anomalies associated with intense alteration. Consequently the execution of further detailed works including detailed geochemical, geophysical surveys together with the confirmation by trenching and diamond drilling on some of the most significant geochemical anomalies were strongly recommended.

1-3 OUTLINE OF THE CURRENT WORKS

1-3-1 Area of the works

The areas where trenching, drilling and geochemical works have been executed are Mt. Upao, Madarag and Nipa areas as shown in Fig.I-1-1.

1-3-2 Objectives of the current works

Trenching in Mt. Upao and Madarag areas were performed to

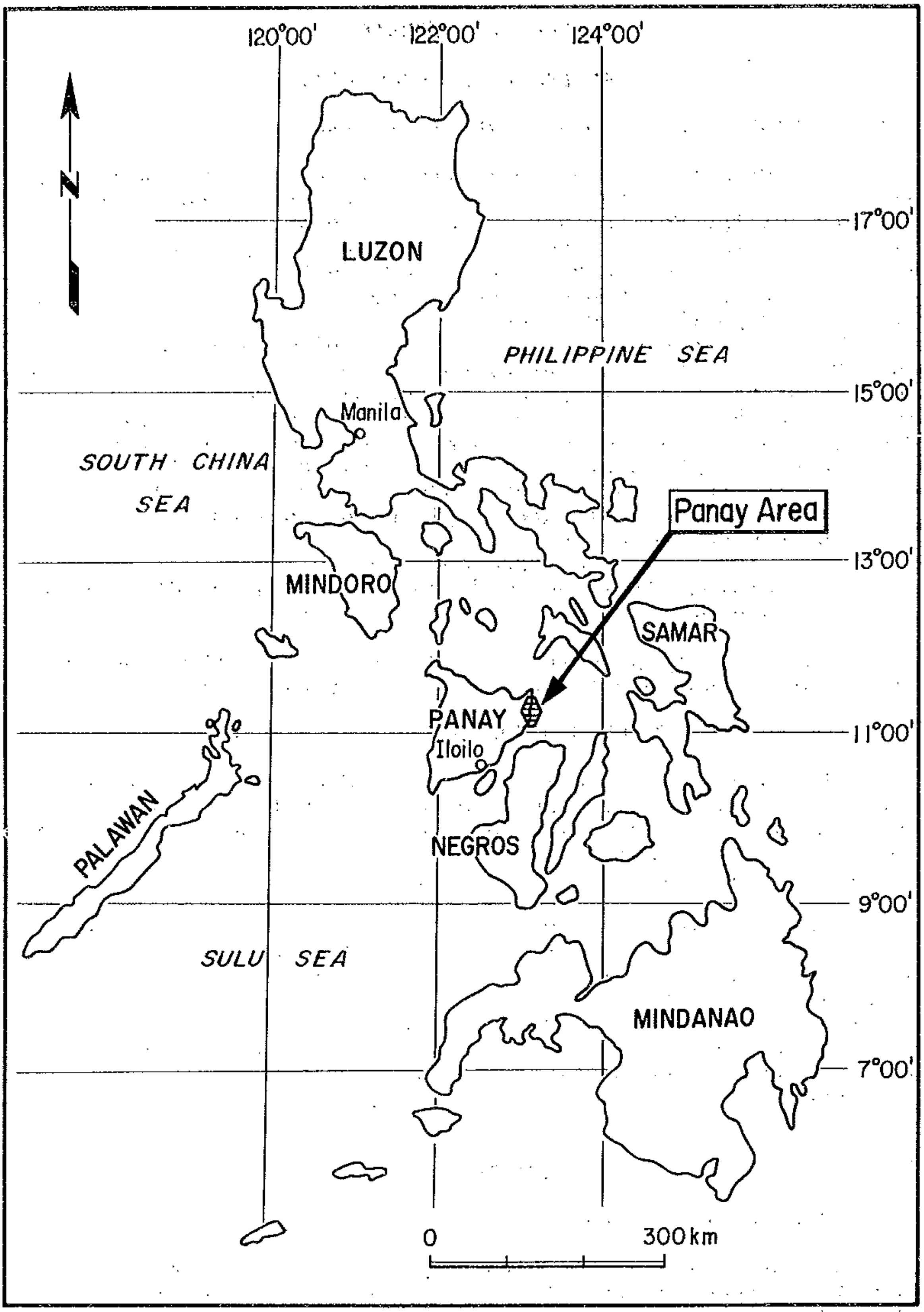


Fig. I-1-1 (a) Location of the Project Area

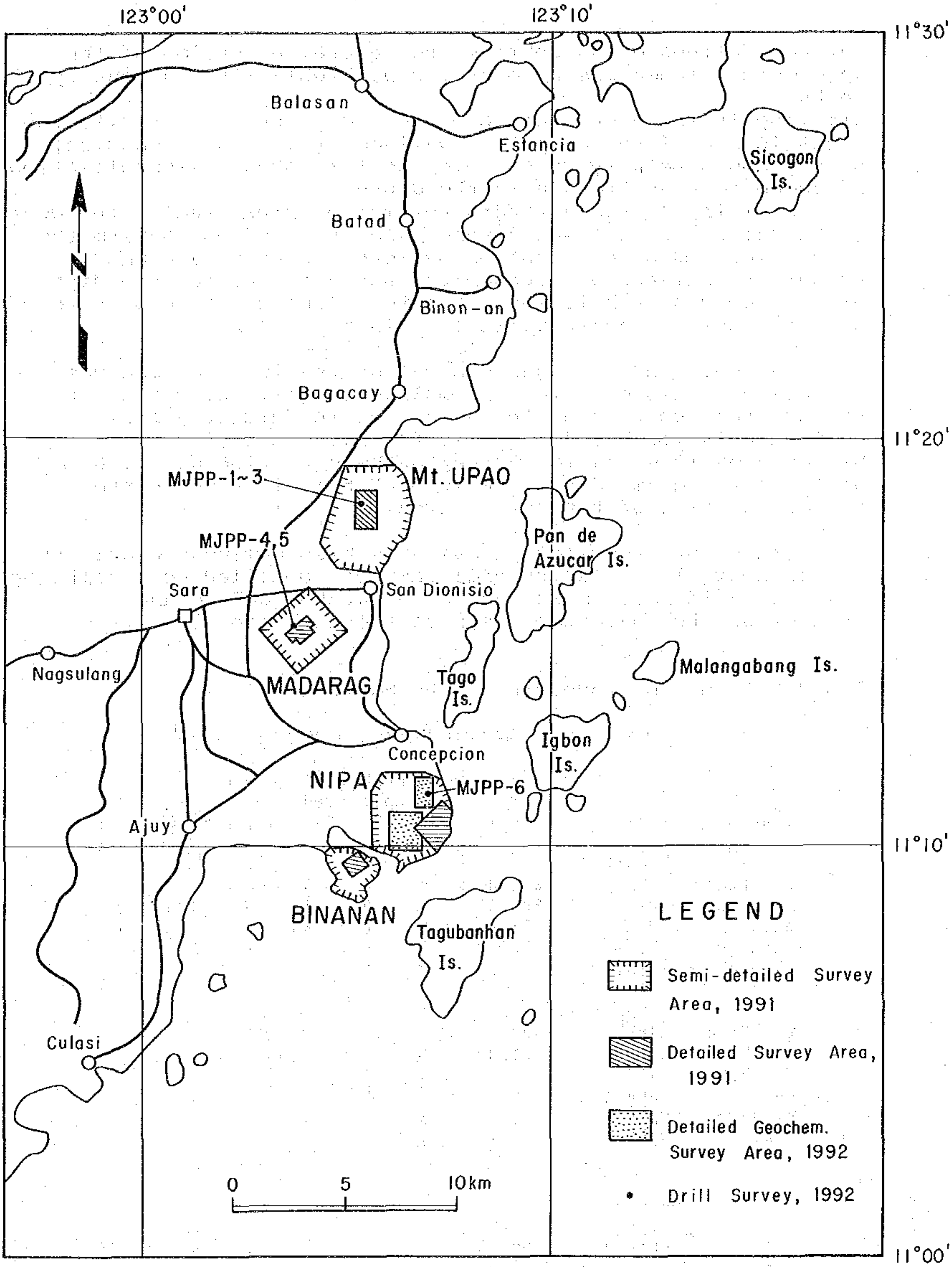


Fig. I-1-1 (b) Location of the Project Area

further delineate and confirm the lateral extension of the geochemical anomalies accompanied by highly altered country rocks.
Drilling in the areas were planned and executed to verify the significance of the anomalies defined by 1991's geochemical survey and hopefully to discover so far unknown mineralization of economic significance in the depths.

Drilling at the northern portion of Nipa area(to the west of Puntales village) was planned and executed to confirm the alteration and mineralization depicted vaguely by a weak copper and molybdenum geochemical anomaly located in a highly altered gossanous hill which might be indicating an occurrence of a porphyry type mineralization in the depth.

The detailed soil geochemical survey in Nipa area was performed in two different anomalous localities. One at the southwestern portion of the Nipa area to further define the gold anomaly roughly delineated in 1991.
Second area is situated in the northern portion of the Nipa area and the diamond drill hole MJPP-6 is located in the eastern portion of the survey area.

Since both anomalous areas have been delineated only by rather sparsely collected soil samples, detailed soil sampling based on grid pattern is needed to further define and understand the characteristics of the anomalies.

1-3-3 Method and Procedure of the Survey

Table I-1-1 Works Done in Panay, 1992

Area	Works	Length(m)	T.S.	P.S.	XRD	As'y	F.I.	Geochem Analysis
			Number of Samples collected					
	Trench							
Mt. Upao	UT-1	212.00	0	0	8	45	0	
Mt. Upao	UT-2	202.00	0	0	7	44	0	
Madarag	MT-1	75.00	0	0	3	17	0	
Madarag	MT-2	132.00	0	0	6	27	0	
Trench	Total	621.00	0	0	24	133	0	
	DDHs							
Mt. Upao	MJPP-1	300.10	0	2	6	44	0	
Mt. Upao	MJPP-2	301.00	2	3	6	41	3	
Mt. Upao	MJPP-3	300.15	0	0	3	49	0	
Madarag	MJPP-4	300.00	3	3	2	29	3	
Madarag	MJPP-5	300.91	3	1	6	87	2	
Nipa	MJPP-6	305.10	4	3	5	34	1	
	Total	1807.26	12	12	28	284	9	
	Geochem. Survey							
Nipa	Puntales	5800.00	1	0	5	4	0	108
Nipa	Mt. Apiton	10050.00	4	1	27	16	0	202
	Total	15850.00	5	1	32	20	0	310
Mt.Odiongan					1			
	Lab Tests Total		17	13	85	437	9	310

(T.S.:Thin Section, P.S.:Polished Section,
XRD:X Ray Diffraction, As'y:Assay, F.I.:Fluid Inclusion)

Trenching, diamond drilling, and follow up detailed geochemical survey in Nipa area were executed.

a) Trenching

Trenching were enacted in Mt. Upao and Madarag areas where significant geochemical anomalies of gold were detected in 1991 program. All the trenches were dug manually using iron bars and shovels and refilled immediately after the completion of mapping and sampling. The mapping of the trenches were done in the scale of 1:200. Each trench had the dimension of one meter wide, and one meter deep.

The length, number of samples collected of each trench are as follows.

Table I-1-2 List of Trenches

Trench Name	Area Name	Length (m)	Number of Samples	Direction of Trench
UT-1	Mt. Upao	212m	45	180
UT-2	Mt. Upao	202m	44	180
MT-1	Madarag	75m	17	210
MT-2	Madarag	132m	27	300

All the rock samples collected were analyzed for gold, silver, arsenic, antimony, copper, lead, zinc, molybdenum, iron, manganese, mercury, and selenium.

Works done in 1992 operation together with the laboratory tests were tabulated in Table I-1-1.

b) Drilling

Six diamond drill holes (@300m) totalling 1800m were planned and executed. Details were given in the Table I-1-3.

Table I-1-3 Diamond Drills, 1992

Drill Name	Location	Length drilled	Azimuth	declina tion	Remarks
MJPP-1	Mt. Upao	300.10m	45	-40	
MJPP-2	Mt. Upao	301.00m	90	-40	
MJPP-3	Mt. Upao	300.15m	135	-40	
MJPP-4	Madarag	300.00m	165	-40	
MJPP-5	Madarag	300.91m	210	-40	
MJPP-6	Nipa	305.10m	0	-90	

c) Soil Geochemistry

Total of three hundred and ten (310) soil sampled were collected from two grid systems in the Nipa Area of the last year.

Grid system to the west of Mt. Apiton had the base-line in N45E direction and eight cut lines at 200m intervals were set to stretch to N45W direction. Two hundred and two (202) soil samples were collected at every 50m interval stations along the cut lines and on the base line.

Grid system near Puntales village in the northern part of the Nipa Area had the base line stretching east-west and the lines were cut in direction of north-south. One hundred and eight (108) soil samples were collected along the cut lines.

The line interval was 200m and the soil samples were taken at every 50m interval along the lines.

d) Laboratory Examination/Testing

The samples from the drill core, trenches, and geochemical survey were tested and analyzed as summarized in the following table. Multi-Elemental Analysis involves the following elements; gold, silver, arsenic, antimony, copper, lead, zinc, molybdenum, iron, manganese, mercury, and selenium.

Table I-1-4 Examinations/Tests, 1992

	Drill core	Trenching	Geochemical survey
X-Ray Diffraction	28	24	32
Polished Section	12	0	1
Thin Section	12	0	5
Fluid Inclusion	9	0	0
Multi-Elemental Analysis	284	133	310
Assaying(Au,Ag,As, Sb,Cu,Pb,Zn & Mo)	(284)	(133)	20

1-3-4 Organization of the Survey Team

JAPANESE SIDE		PHILIPPINE SIDE	
Supervisors in MMAJ: K.MASUTA/T.SUZUKI		Supervisors in MGB: E.G.DOMINGO/R.L.ALMEDA	
Liaison Office MMAJ in Manila: Y. KAJITANI			
Field Works/Reporting:			
K. HASHIMOTO (Leader)	SCCL	N.V. FERRER (Co-Leader)	MGB
T. GOTOH (Geology,Geochemistry)	SCCL	A.N. APOSTOL (Co-Leader)	MGB
		J. VERASQUES (Geology,Geochemistry)	MGB
		R. VECINO (Geological Aid)	MGB
		W.J. MAGO (Geological Aid)	MGB
		J. PADILLA (Driver)	MGB
		D. LUCAS (Driver)	MGB

MGB : Mines and Geo-Sciences Bureau
MMAJ: Metal Mining Agency of Japan
SCCL: Sumiko Consultants Co.,Ltd.

1-3-5 Term of the Works

Field works: from August 18th to December 15th,1992

Reporting : from December 16th,1992 to February 28th,1993

CHAPTER 2 GENERAL GEOGRAPHY

2-1 LOCATION AND ACCESS

The project areas of the current work are; Mt. Upao, Madarag, and Nipa areas, all situated to the east of Sara in the Province of Iloilo, in the eastern Panay Island as shown in Fig.I-1-1.

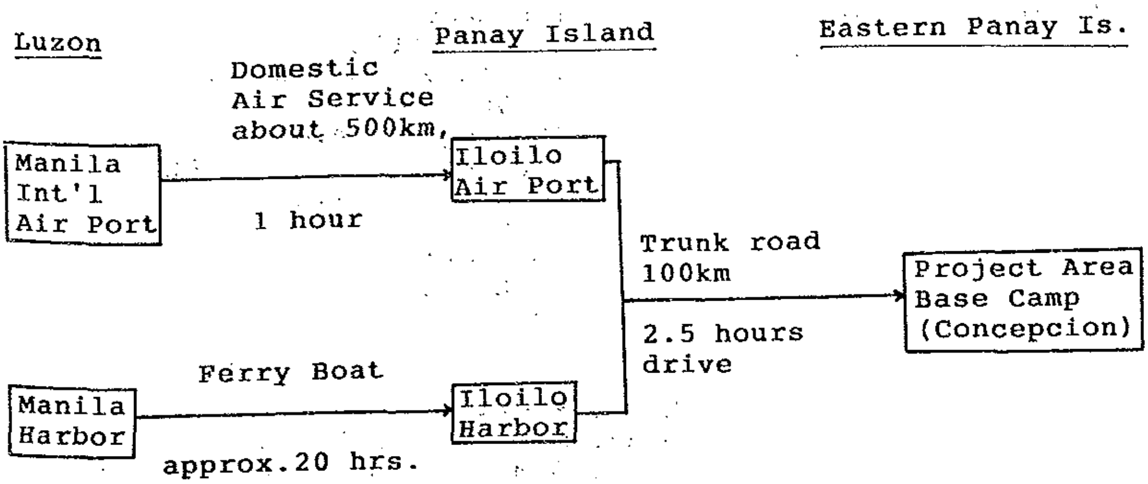
Mt. Upao area is located in the Municipality of San

Dionisio, the northern and eastern Madarag being in San Dionisio while the southern and western Madarag belongs to the Municipality of Sara. Nipa area is located in the Municipality of Concepcion.

The access to Ajuy from Iloilo City is connected by sealed road. The distance is 90km and takes 90 minutes to reach Ajuy from Iloilo. The roads beyond Ajuy are mostly not sealed yet.

The base camp for the survey was established in the SBS Iyang Beach Resort in Concepcion where ample space for various works was available and also temporary storage of the drill core was made possible by the owner of the resort, Mr. and Mrs. Nerio (Sandy) Salcedo. Although the distance from Ajuy to Concepcion is mere 14km, 30 minutes drive was needed to reach due to poor road condition in some places.

Generalized traffic access from Manila to the project area is outlined below:



2-2 TOPOGRAPHY AND WATER SYSTEM

General topography of the Panay Island is largely divided into two regions, i.e., the flat land in the east and the mountainous region in the west. The project areas are situated in the easternmost flat land.

The three project areas are respectively located in smallish mountainous to hilly regions elevated from the above mentioned flat land,the highest elevations in each area are;

340m at Mt. Upao
280m at Madarag
432m at Nipa

There are no large river system in the project areas due to their low to moderately hilly topography along the eastern coast of the Island where the areas are located.
Water from smallish creeks in the areas is being utilized for agricultural purposes.

2-3 CLIMATE AND VEGETATION

The project area is situated in the tropical monsoon climate zone in the western Pacific Ocean, and the wet season prevails generally from June to October. The period of the lowest temperature is during November to the next February. The average annual temperature in the area is around 25 degrees Celsius.

Paddy fields are cultivated in the flat lands, partly associated with sugar cane fields. Lower to middle parts of the hills in the area are mostly covered by coconut and bamboo while shrubs and grass predominate in the higher parts of the hills.

CHAPTER 3 GENERAL GEOLOGY

General geology of the eastern Panay Island has been described in the report of the Cooperative Mineral Exploration, Panay Island, in year 1988 by MGB, JICA, and MMAJ. The salient features are summarized below.

3-1 GEOLOGY AND STRATIGRAPHY

The eastern hilly region of the Panay Island which includes the project area is geologically characterized by the upheaval zone formed after the sedimentation of SIBALA Formation, which is chiefly comprised of volcanic rocks and sediments of Palaeocene ages.
SIBALA Formation is barely overlain by younger Tertiary sediments other than that of Palaeocene and lacks completely in the project area.

Guimaras Zone, composed of granitoids of Palaeogene age, extends north-southerly in the eastern mountainous region of Panay Island. The Sara Diorite exposed in the northern part of the town of Sara is considered to compose a part of Guimaras Zone.

The Negros Zone, composed of volcanics of Pliocene to Quaternary ages is situated along the eastern periphery of Guimaras Zone. The project area is situated in the northern part of the Negros Zone.

The general stratigraphy of Panay Island is summarized in Table I-3-1.

The basic to intermediate andesitic volcanics of SIBALA Formation which intercalates sporadic mudstone-sandstone, and the ODIONGAN Volcanics of Pliocene age are the most predominant rocks in the project area. The former mainly distributes in lower terrain while the latter occupied higher parts of the hills and or mountains which stretch in NNE-SSW direction unconformably overlying the latter.

The rocks that belong to Odiongan Volcanics are intensely

Table I–3–1 Stratigraphic Correlation of Geological Units in the Panay Island

	GEOLOGICAL TIME		WESTAN PANAY	PANAY CENTRAL PLAIN (Iloilo Basin)	GUIMARAS IS.	EASTERN PANAY	SURVEY AREA
QUARTERNARY	HOLOCENE		ALLUVIUM	ALLUVIUM	ALLUVIUM	ALLUVIUM	ALLUVIUM
QUARTERNARY	PLEISTOCENE		PANCICUIAN PYROCLACTIC FLOW SANTA CRUZ FORMATION	CABATUAN F.: STA BARBARA SILT M. MARAGET Ss. M. BALIC CLAY M.	GUIMARAS LIMESTONE	CABATUAN F. MARAGET Ss. M.	PAN DE AZUCAL VOLCANICS BOTLOG VOLCANICS
TERTIARY	PLIOCENE	LATE	APDO FORMATION	ULIAN FORMATION	GUIMARAS FORMATION	ULIAN FORMATION	
TERTIARY	PLIOCENE	EARLY	PAMLUPAN CONGLOMERATE	IDAI FORMATION TARAO F.: GUIMBAL MUDSTONE M. N21 ~ TUBUNGAN SILTSTONE M. N17		DINGLE F.: STO. THOMAS Ls. MEMB. SUMMIT CLASTICS M. AGEKLANA Ls. M.	
TERTIARY	MIOCENE	LATE	MAMLACBO FORMATION MAKATO FORMATION PACOL DIORITE ANTIQUE OPHIOLITE	SINGIT FORMATION: BARASAN Ss. MEMB. IGTALONGON SH M. N17 ~ N14	BATUSO VOLCANICS	PASSI F.: ASSISIG M. BAYUSO VOLCANICS SALNGAN MEMB.	
TERTIARY	MIOCENE	MIDDLE	LAGDO FORMATION MALIAO WACKES	TANIAN Ls. M LEPIDOCYCLINA MIOSYPSINA N9 ~ N8			
TERTIARY	MIOCENE	EARLY	IGSAWA PYROCLASTICS LIBACAO FORMATION	SEWARAGAN MEMB.			
TERTIARY	OLIGOCENE		PANPANAN BASALT MT. BALOG VOLCANICS				
TERTIARY	EOCENE		LUMBYAN FORMATION IGBAO SEDIMENTS				
TERTIARY	PALAEOCENE				SIBALA FORMATION GUIMARAS DIORITE 59 m.y. (K-Ar)	SIBALA FORMATION PIRLAR MONZONITE SARA DIORITE	SIBALA FORMATION TAGUBANHAN MEMB.
	PRE-TERTIARY		BURUANGA METAMORPHICS	BASEMENT		MASONSON SCHIST	

This stratigraphic correlation is based on BMG (1982) and Hashimoto, W. (1982).

silicified and argillized associating heavy limonite-hematite staining. The alteration of Odiongan Volcanics has been interpreted in the 1988 report that it was caused by an autometamorphic process associated with the younger volcanic activity.

An alternative interpretation has been proposed in 1991 that the rocks of Sibala Formation and Odiongan Volcanics are the same, i.e., Sibala Formation.
Odiongan represents simply more intensely altered portions of the same formation occupying higher parts of the hilly terrain.

However, since there were no decisive evidence to support this interpretation in 1991, the altered rocks occupying higher portions of hilly terrains were assigned to Odiongan Volcanics in accordance with the preceding report.

The diamond drilling executed in 1992 however has revealed that there is no lithologic difference between hematite stained so called "Odiongan Volcanics" and pyrite dominant "Sibala Formation" which supposedly underlies the former. Only difference is in the iron mineral species contained. Hematite mineralization seen in "Odiongan Volcanics" is an oxidation product of original pyrite mineralization.

Consequently it is concluded that the Odiongan Volcanics in the project area is in reality a highly weathered, oxidized variety of altered Sibala Formation which accompanies intense silicification, argillization and pyritization.
Therefore, the localities mapped in the preceding and current geologic map as "Odiongan Volcanics" should be regarded to show the distribution of highly altered facies of Sibala Formation, and the name "Odiongan Volcanics" represents such highly altered, hematite stained variety of Sibala Formation.

3-1-1 Mt. Upao Area

The andesite unit, weathered and reddish purple colored hematite-limonite stained, subjected also to silicification and argillization, supposedly equivalent of the "Odiongan Volcanics", is observed in higher portion of Mt. Upao and Mount Burray. Presumably because of heavy concentration of iron minerals the higher portion of the area is essentially devoid of vegetation. "Upao" means 'bald' in local language hence Mt. Upao literally is "Bald mountain",very adequate naming.

Andesitic volcanics (lava, tuff breccia, tuff) and minor intercalating mudstone designated to the Sibala Formation occupy the middle to lower parts of the hilly area.
The volcanics are propylitized extensively. Most of the lava portions are composed of fine to coarse grained porphyritic massive rocks and intercalate agglomerate, tuff breccia etc. Lava extending to NW-SE to NNW-SSE direction predominates in the central portion of the area while both side being

predominated by andesitic pyroclastic beds.

Geological structure of the area, with only few outcrops available to provide reliable measurement of strike/dip of the beds, is inferred to have a monoclinic structure that stretches NNW-SSE direction dipping 20 to 30 degrees toward west.

3-1-2 Madarag Area

Madarag area being situated only about 3km SSW of Mt. Upao naturally consists of similar geology.

Highly altered andesite of "Odiongan Volcanics" occupies the higher portion of the hill and extends to NNE-SSW direction. The andesite is variably silicified, argillized and associates a significant amount of hematite. Consequently the higher portion of the area shows reddish color and has only scant vegetation.

A syncline extending NNW-SSE direction along the eastern part of the area has been envisaged by the geological survey executed in 1988.

3-1-3 Nipa Area

The area is located approximately 9km south of the Mt.Upao area. Weathered, heavily hematite/limonite stained silicified, and argillized andesitic rocks of "Odiongan Volcanics" occupy the higher portion of the area as in the other two areas.

Sibala Formation in the area consists mostly of andesitic pyroclastics. Andesitic lava predominates in the central area while agglomerate, tuff, tuff breccia dominate in the eastern and western parts of the area.
Dark green colored basalt lava, relatively fresh and unaltered is observed along the coast line in the area.

Along the coast north of Nipa village, there is an outcrop of quartz diorite/granodiorite that displays very complex and irregular shape. The outcrop can be traced for 200m along the coast but does not have much extension toward the land. This intrusive was correlated to SARA diorite in the 1988's report.
The quartz diorite/granodiorite appears to be intruded by porphyritic andesite. The previous survey executed in 1988 concluded that the andesite here was a dyke swarm of younger age, different from the Sibala Formation. However,the andesite had quite similar appearance and chemical composition to the basaltic andesite of "Sibala Formation" and potassium-argon isotopic age determinations executed in 1991 revealed the age of the andesite as 25.7 ± 1.9Ma, while that of the intrusive as 30.1 ± 1.5Ma.

It is therefore reasonable to interpret based on the

observation of the outcrop and the isotopic ages that the quartz diorite/granodiorite is the older basement rock underlying the Sibala Formation if the andesite dated were genuine representative of the formation.
Only nearby occurrence of similar intrusive has been known to occur in the southern part of Pan de Azucar Island, but there is a possibility that the rock is the basement to the Sibala Formation and may have wide distribution beneath the shallow sea floor.
On the other hand, if the andesite belonged to a later dyke system as interpreted in the preceding report, there is no contradiction on the ages of the both although there is no known other occurrences of such a younger andesitic activity in the area other than the "Odiongan volcanics".

3-2 INTRUSIVE ROCKS

Minor occurrences of quartz porphyry, dacite are observed in the project area together with the quartz diorite-granodiorite described in previous section.

3-3 ALTERATION AND MINERALIZATION

3-3-1 Alteration

Andesitic and basaltic units of Sibala Formation are extensively propylitized;epidote, chlorite, pyrite are ubiquitous. Relatively unaltered varieties are observed along the coast line in the area.

"Odiongan Volcanics" are without exception intensely weathered, argillized and silicified associating limonite-hematite in dissemination and in irregular fissure fillings. Abundant occurrence of hematite was confirmed by the diamond drilling in Mt. Upao, and Madarag Areas in 1992.

The amount of hematite diminishes gradually and pyrite prevails in the depth. Hematite mineralization is essentially a reproduction of original pyrite through oxidation processes which occurred along the conduits, i.e., fissures, cracks, joints and faults. Hematite penetrates to 120m vertical depth at Mt. Upao while in Madarag only up to 40m.

The transition to pyrite occurs rather gradually at Mt. Upao and is easily recognized by the color change of the rock from reddish purple to greenish grey. From the observation of the drill core it is obvious that there is no lithologic difference between hematite stained so called "Odiongan Volcanics" and pyrite dominant "Sibala Formation" which supposedly underlies the former. Only difference is in the iron mineral species contained.

Consequently it is concluded that the Odiongan Volcanics in the project area is in reality a highly altered variety of Sibala Formation which accompanies intense silicification, argillization and pyritization. Pyrite bearing andesitic rocks in deeper zone also contain significant amount of magnetite.

Silicification occurs in form of quartz vein/veinlet, network and pervasive silicification associating brecciation. The surface of outcropped rock frequently shows skin depth spherical silicification which covers the surface.

There is a hill conspicuously devoid of vegetation to the west of Puntales village. The geochemical survey of 1991 detected this locality as anomalous in molybdenum and copper. Consequently one vertical diamond drill(MJPP-6) to probe the geochemical anomaly to the depth was drilled to 305m and an additional detailed geochemical survey to further confirm the significance and the extension of the Mo-Cu anomaly was executed in 1992 campaign. The drill encountered highly argillized, silicified andesitic rocks which were also intensely fractured. The strong fracturing in the area might have enhanced the formation of the gossanous rock on the surface.

Abundant alunite, associating quartz has been detected in Mt.Upao and Madarag areas in 1991 by XRD. The trenching and drilling executed in the areas confirmed strong argillization and silicification which associate gold concentration. Most abundant clay mineral in the trench samples were kaolinite and minor diaspore and pyrophyllite were detected in Mt. Upao. Some core samples contained alunite, Na-alunite, pyrophyllite and sericite.

3-3-2 Mineralization

Old workings, excavated for exploration of copper prior to the Second World War time have been known in the northern part of Nipa village. Ore materials observed in the disposals and in the workings are of quartz vein containing pyrite, minor chalcopyrite, sphalerite and galena. Some specimen contain also minor gold and silver. Veins observed in the old workings are of narrow widths and with negligible grades hence posess no economic significance.

The trenching in Mt. Upao area confirmed the existence of gold anomaly which associated with lead.
There were no ore grade gold mineralization in the drill holes.

The trenching in Madarag area also confirmed the gold anomaly. Gold here showed two different associations with other elements; one with arsenic, selenium, copper, iron, and second one with antimony against concentration of lead. The reason for the contradicting behavior of lead compared with that in Mt. Upao was not clear, but it was considered to be caused by the different degree of the concentration of elements concerned. In Madarag, sub-economic copper sulfide mineralization(max. 0.83% Cu) associated with strong pyrite-magnetite concentration was found by the drilling. The highest gold value found in the drill hole was 0.92g/t in MJPP-4 Hole. Copper in the core samples showed strong affinity with iron and gold. The drill hole MJPP-5 revealed 0.3 to 0.4% Cu at 171-237m section, and 0.1 to 0.3% Cu at 277m to the bottom of the hole. The dominant copper mineral was chalcopyrite. Around 90m, copper associated arsenic and luzonite-energite were expected to occur. The examination of the polished section however revealed digenite, and polybasite series mineral.

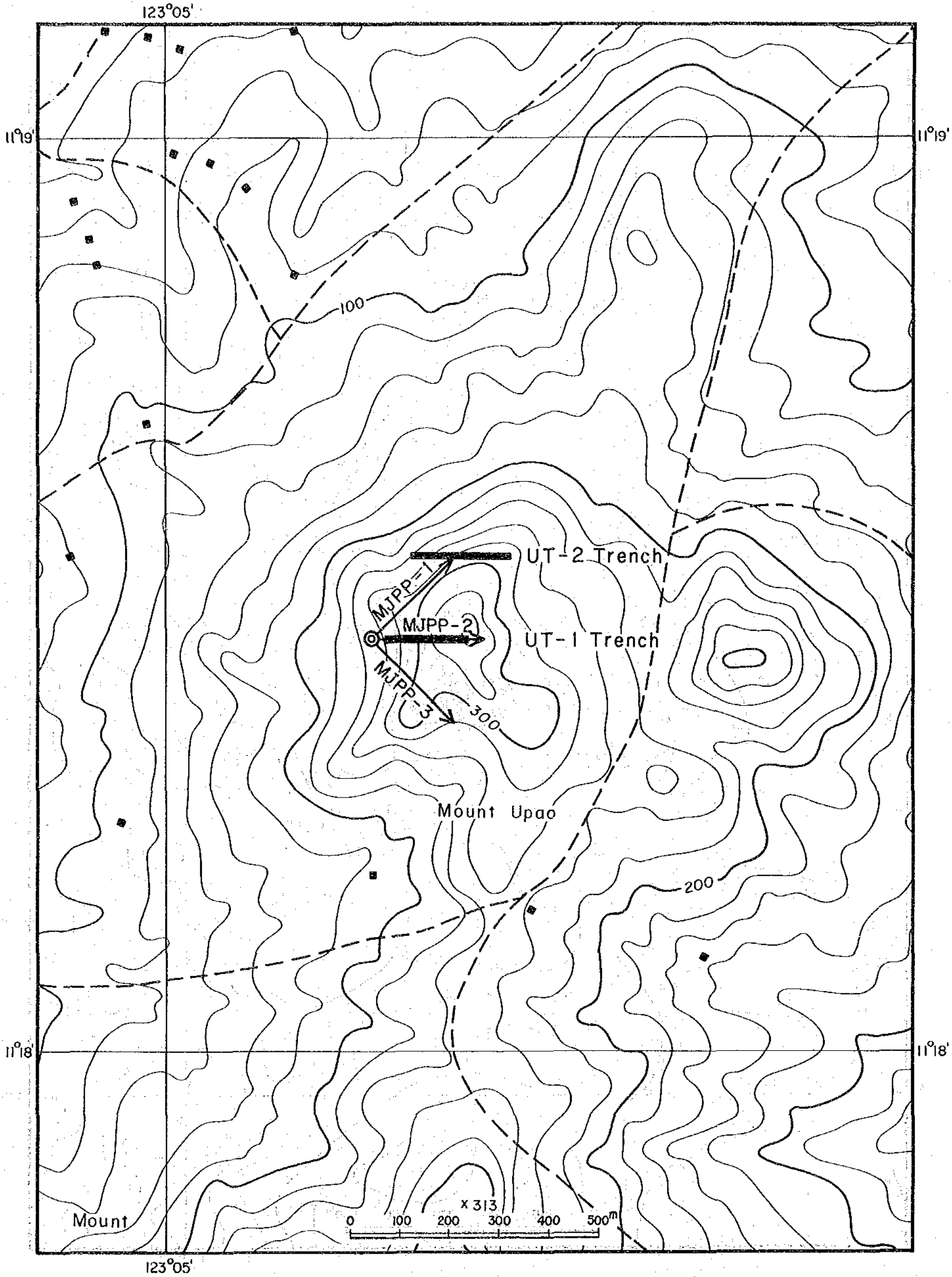


Fig. I–4–1 Location Map of Drills and Trenches, Mt. Upao Area

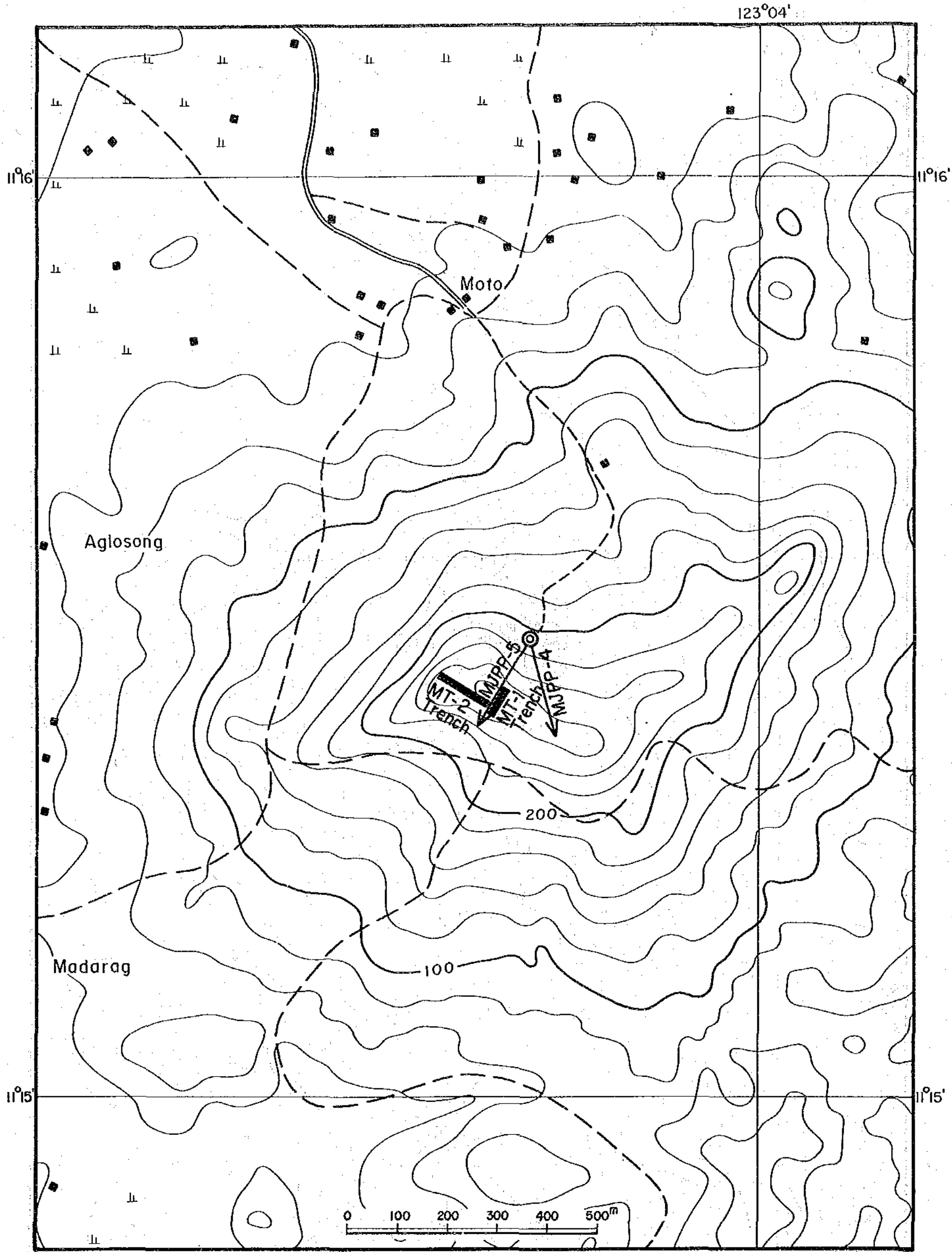


Fig. I–4–2 Location Map of Drills and Trenches, Madarag Area

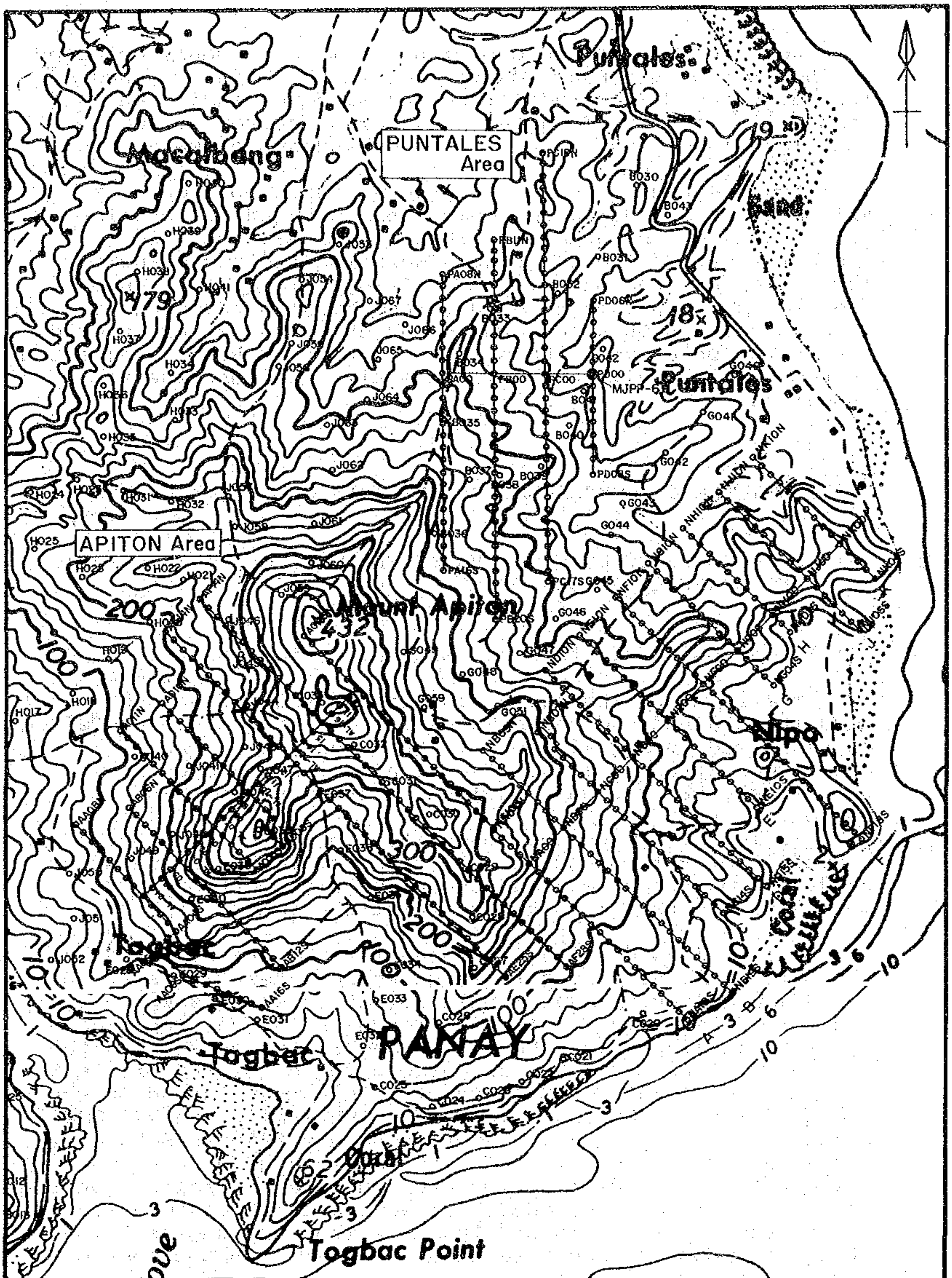


Fig. I–4–3　Location Map of Drill and Geochemical Survey, Nipa Area

Weak molybdenum and copper geochemical anomaly detected to the west of the Puntales village in the Nipa area was tested by one diamond drill and revealed no significant mineralization. The detailed geochemical survey around Puntales also revealed only minor molybdenum anomaly with limited extension.

The geochemical survey at the southern portion of Mt. Apiton where a broad gold anomaly has been known to exist by the results of the geochemical work in 1991. The gold anomalies straddling the ridges were located. Gold anomaly localized near the summits and/or ridges was not stranger in the region,i.e., same in Mt.Upao and Madarag. Judging from the experience at both areas, there may exist sub-economic gold concentration at near the surface, but it is hard to expect an economically significant gold mineralization underneath the anomalies.

CHAPTER 4 COMPREHENSIVE ANALYSIS OF SURVEY RESULTS

4-1 GEOLOGICAL STRUCTURE, CHARACTERISTICS OF MINERALIZATION AND MINERALIZATION CONTROL

4-1-1 Geologic Structure and Mineralization Control

The rocks of intensely argillized, silicified and hematite stained "Odiongan Volcanics" that have been inferred to be formed during Pliocene to Quaternary by an auto-metamorphic process associated with the volcanic activity covers only major higher portion of the mountains in the region.

Basic to intermediate andesitic volcanics of Sibala Formation of Palaeocene age which associates minor mudstone/ sandstone on the other hand occupies lower portion of the mountains and have much greater distribution.

The diamond drilling executed in 1992 has revealed that there is no lithologic difference between hematite stained "Odiongan Volcanics" and Sibala Formation which supposedly underlies the former. Only difference is in the iron mineral species contained,i.e., hematite mineralization seen in the Odiongan volcanics" is an oxidation product of the original pyrite mineralization. Consequently the areas mapped in the geologic map as "Odiongan Volcanics" stretching in NNE-SSW direction are the localities where highly altered Sibala Formation exist. The altered rocks associated with silicification, argillization and hematite mineralization thus stretching broadly in NNE-SSW direction can be interpreted as the extension of the major structure from the Negros Island which is known to associate intense alteration and some gold mineralization.

Only known mineralization in the vicinity is the vein type mineralization of pyrite, copper, lead and zinc which associates some gold in Nipa area. The veins have been explored prior to the world War II and known to have the strike of NNE-SSW and E-W.

The geochemical gold anomalies in Mount Upao Area, Apiton in Nipa Area stretch in N-S direction while some anomalies trend east-westerly. These are apparently controlled by the major structure and its derivative fracture system.

4-1-2 Characteristics of Mineralization

The vein type mineralization in Nipa Area consists mostly of quartz, and pyrite, associating chalcopyrite, gold, minor galena and sphalerite.

The copper mineralization found in Madarag Area by the drilling is associated with pyrite and magnetite in silicified andesite. There are few copper mineral associated with quartz veins/veinlets, but major portion of chalcopyrite is intergrown with pyrite. There exists very minor sulfide minerals in strongly hematitic andesite.

Copper shows strong affinity with iron and gold. It is therefore reasonable to assume that the gold anomaly on the surfacial materials(rock in the trenches) are re-arranged by weathering, oxidation and leaching processes; a sort of secondary enrichment went on at the surface transforming the original association of the elements.

Abundant epidote occurring in the silicified country rock shows that it has been formed at the latest stage of the alteration.

4-2 MINERAL POTENTIAL

4-2-1 Mount Upao Area

A gold anomaly with the threshold value of 31ppb Au stretching northsoutherly for more than 800m had been detected in 1991. Three diamond drills totalling 900m and two trenches (200m long each) were executed in 1992.

The results were disappointing and the potential for gold mineralization in the area must be greatly discounted.

4-2-2 Madarag Area

The sulfide copper mineralization associated with some gold encountered in the drill holes was geochemically significant and interesting. However, the degree of the concentration of copper and gold found in the drill holes was not sufficient enough to encourage further exploration.

4-2-3 Nipa Area

The molybdenum and copper anomaly located to the west of Puntales village was tested by MJPP-6 Hole. There was no concentration nor indication in the hole. Detailed geochemical survey in the area also did not reveal any significant anomaly hence the potential for Molybdenum-copper mineralization diminished completely.

The gold anomaly detected on near and on the ridges of the southern portion of Mount Apiton has similar characteristics with those of Mt. Upao and Madarag Areas. Judging from the results so far obtained by the drilling in

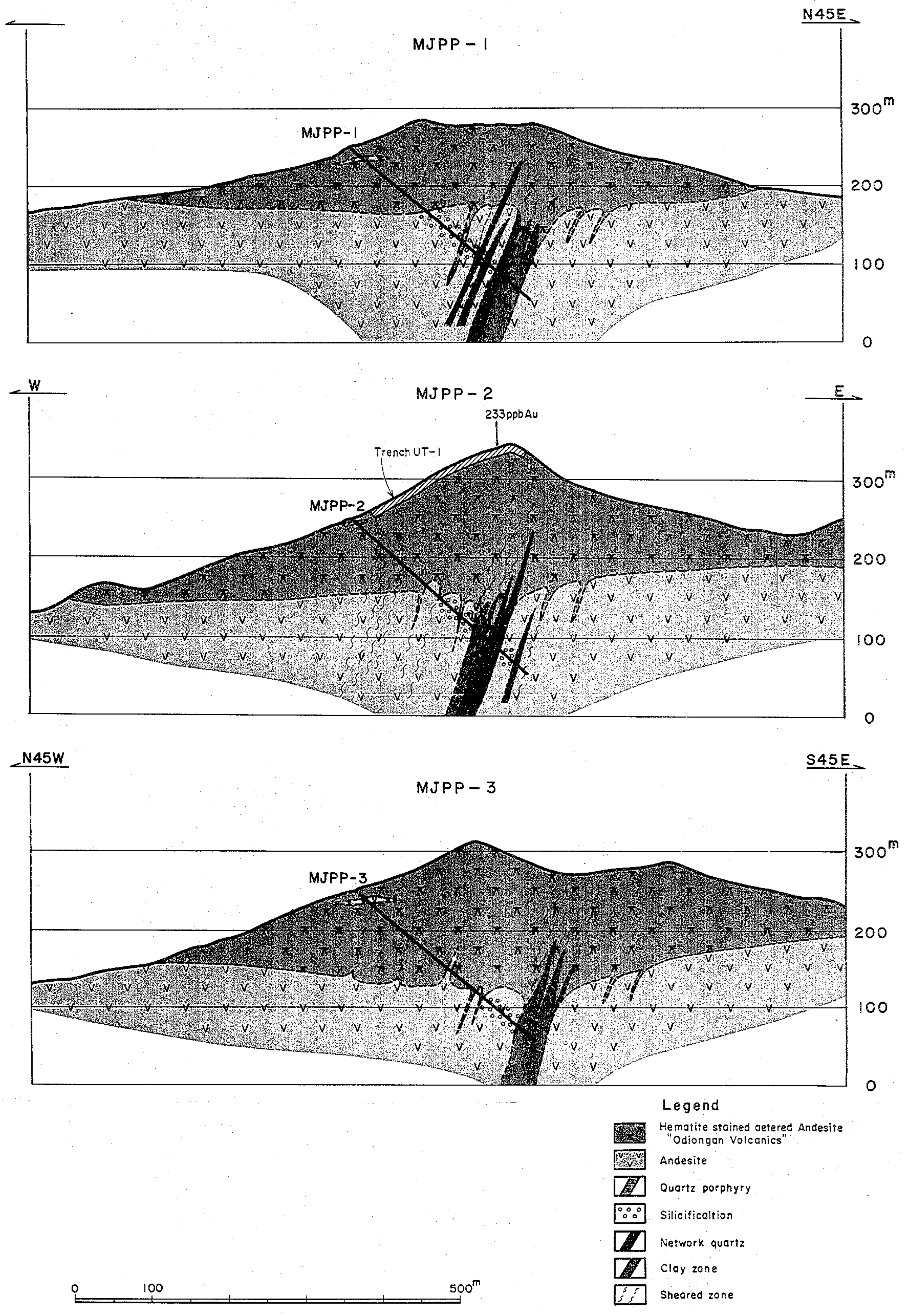


Fig. I–4–4 Cross Sections through Drill Holes, Mt. Upao Area

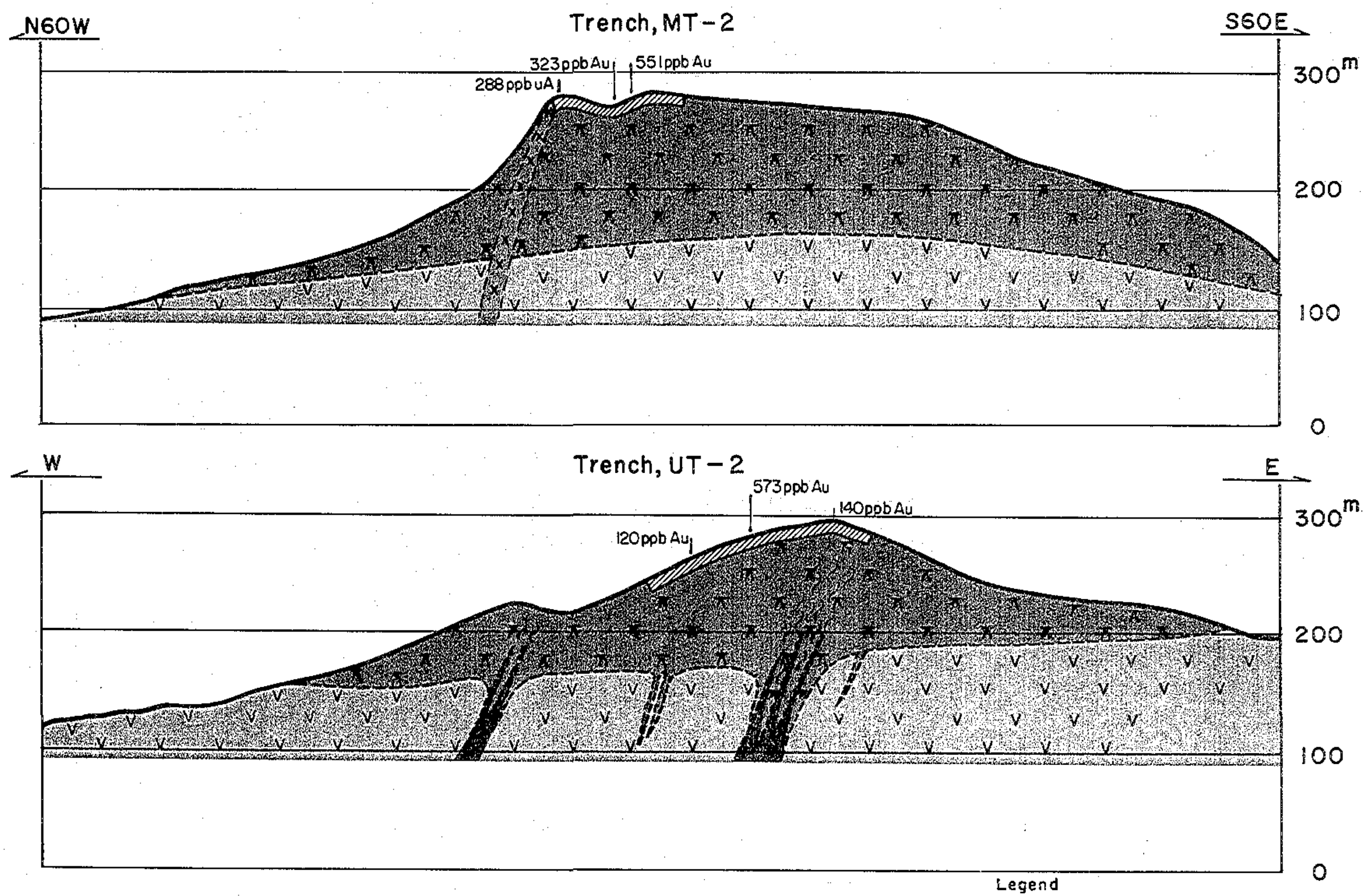


Fig. I-4-5 Cross Sections through Trenches, Mt. Upao Area

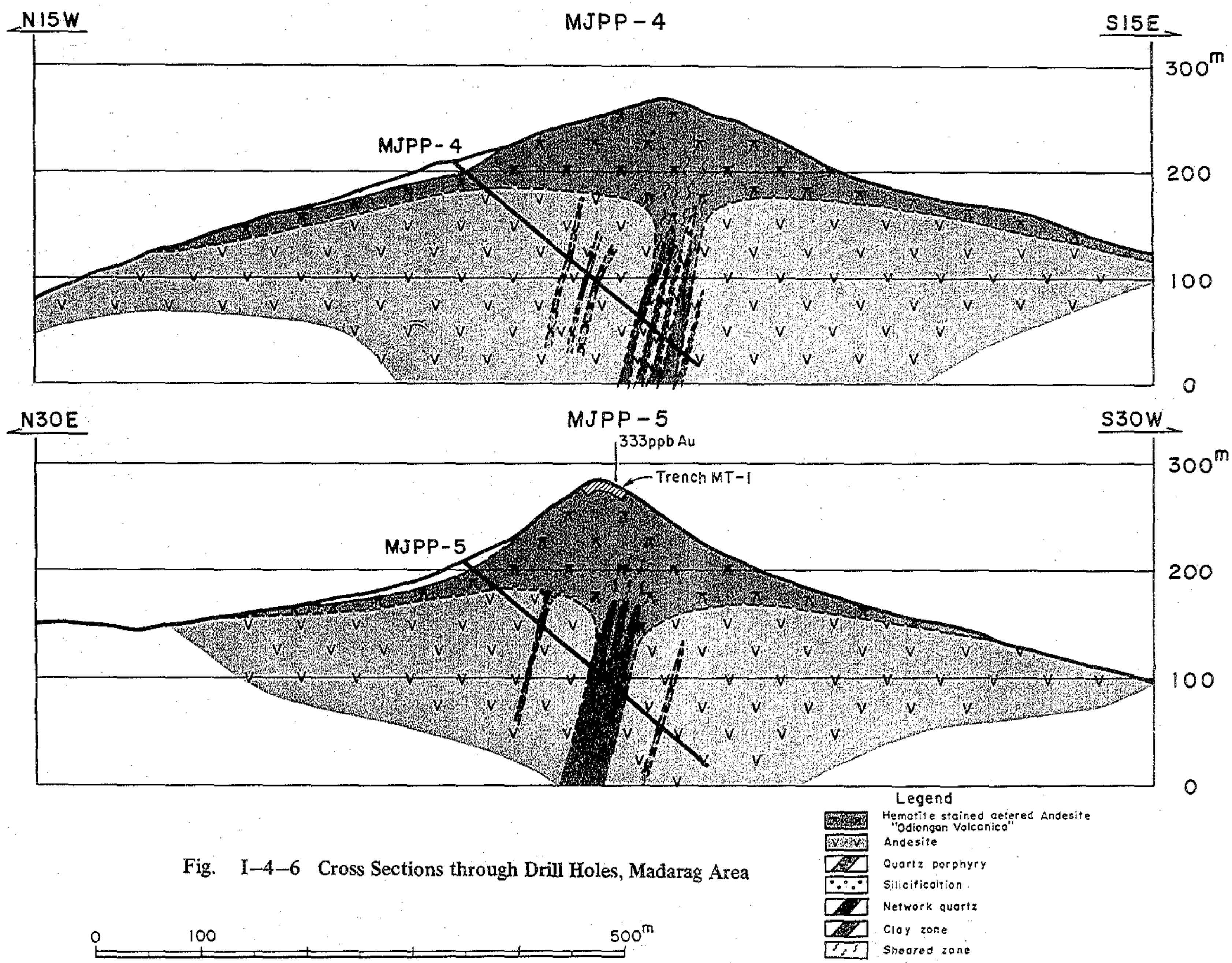


Fig. I–4–6 Cross Sections through Drill Holes, Madarag Area

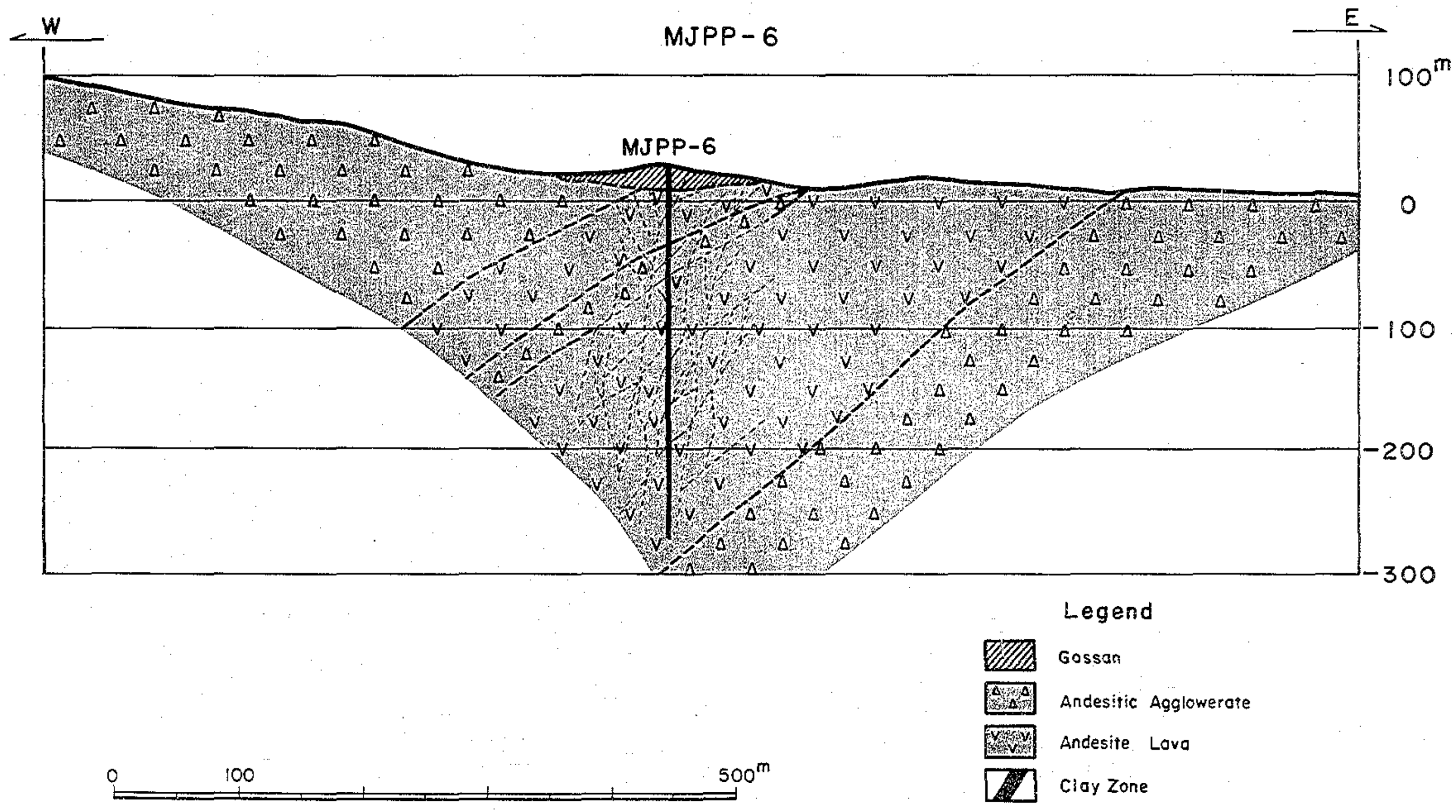
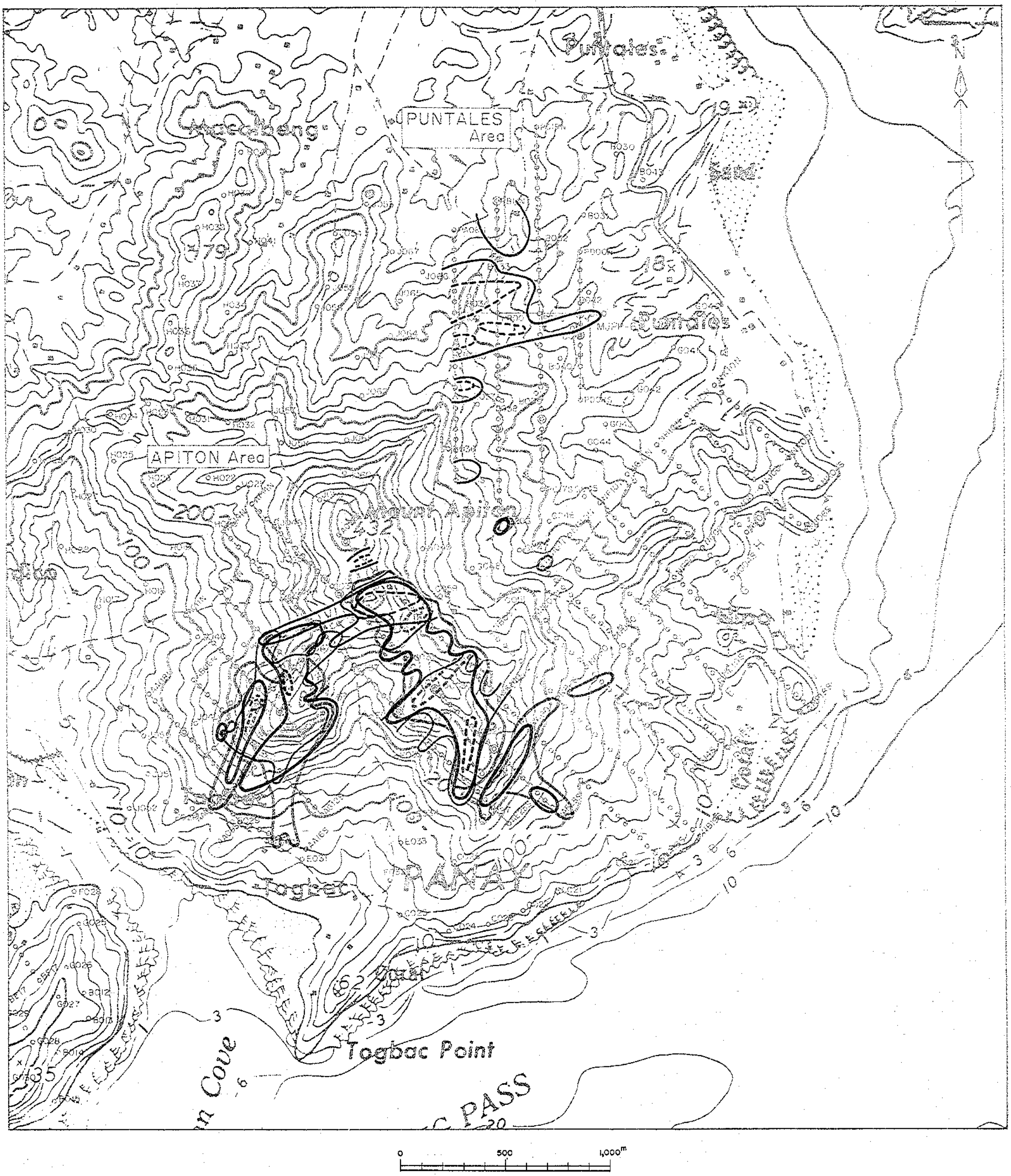


Fig. I–4–7 Cross Section through Drill Hole MJPP–6, Nipa Area



LEGEND

Au Anomaly (N=310) Puntales + Apiton Areas

Au Anomaly (N=626) All Data, Nipa Area

1st Principal component (N=310) Au (70%), As (70%), Sb (65%), Se (54%)

Mo Anomaly (N=310) Puntales + Apiton Areas

Fig. I–4–8 Comprehensive Geochemical Anomaly Map, Nipa Area, 1992

both areas, the possibility to locate economically significant gold deposits there is considered to be slim.

4-3 RELATION BETWEEN GEOCHEMICAL ANOMALY & MINERALIZATION

4-3-1 Behavior of Gold in Soil

Gold tends to concentrate with arsenic, antimony, selenium and molybdenum against the depletion of manganese and zinc. This tendency is the most common characteristic of gold in the surveyed areas. Gold is also concentrated with copper, lead and zinc together with iron.

4-3-2 Behaviour of Gold in Exposed Rock (Trench Samples)

One third of gold is found to concentrate with iron, arsenic, selenium, and copper in Madarag Area,while similar portion of gold is associated with antimony against depleting lead. In Madarag Area however, most gold associates with lead and the association of antimony is minimal. The reason to cause this discrepancy is not clear, but the different geologic situation in both areas, i.e., the existence of sub-economic copper mineralization which associates almost no lead in Madarag Area, while there is no such significant mineralization found in Mt. Upao, may responsible for this difference.

The rock samples in trenches did not carry much manganese, most of them contained less than the under the detection limit of 5ppm Mn. This contrasts with abundant manganese content in soil suggesting that manganese accumulates in the process of formation of soil with zinc.

4-3-3 Gold Concentration in Drill Core

Gold in Mt. Upao shows a strong association with selenium, and arsenic while gold in Madarag Area has strong affinity with iron and copper. The copper mineralization found in Madarag Area contains some gold and this might be the major source of the gold found in the gold anomaly on surface.

4-3-4 Geochemical Anomalies and Mineralization

Characteristic features of geochemical anomalies and possible mineralization are summarized as below.

a) Gold in soil commonly associates intimately with antimony, selenium, arsenic and molybdenum. The association of these elements suggests that there might be a hydrothermal gold mineralization beneath the soil anomaly. Manganese and zinc maintains close association in soil and they behave contradictory to the concentration of above mentioned elements.

b) Gold in rock samples on surface shows similar feature to the soil and iron joins into the above mentioned elements. Abundant iron content(hematite on the surface and pyrite in depths) in the altered rock is one of the most profound characteristic of the area, iron must have gained close association with gold through weathering and leaching processes.

c) Core samples obviously supply the information of the deeper depth. Most gold in Madarag is associated with iron and copper while in Mt. Upao with selenium, and arsenic where no major gold mineralization encountered in the drills. Selenium, arsenic, and molybdenum in Madarag are closely associated while with gold the association is very minor. In Madarag there is sulfide copper mineralization associated with gold, and this might enhanced the association with iron and copper.

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5-1 CONCLUSION

1) The drilling confirmed that the "Odiongan Volcanics" presumably underlies the Sibala Formation was highly altered andesite of the same formation. No essential difference observed, major difference being the existence of abundant hematite instead of pyrite. Subsequently the term "Odiongan Volcanics" should be limited to signify the highly altered variety of andesite of Sibala Formation, which shows characteristic purplish color due to extensive hematite staining.

2) The trenching in Mt. Upao Area confirmed the existence of gold anomaly. Three diamond drills did not encounter any significant gold mineralization in the depths. The gold anomaly on the surface detected by geochemical survey and trenching is considered to be a kind of a product of the secondary enrichment caused by weathering, and leaching.

3) Drilling at Madarag discovered a disseminated sulfide copper mineralization associated with pyrite and magnetite. The occurrence is interesting albeit the copper grade is sub-economic.

4) Moderately anomalous area in molybdenum and copper on the gossan west of Puntales village was tested by one vertical drill. The rock in the hole showed extensive alteration and fracturing, but no Mo-Cu mineralization detected. Also, the detailed geochemical survey for the anomaly failed to depict any significant anomaly.

5) The detailed geochemical survey covering the southern portion of Mt. Upao(Apiton Area) detected extensive gold anomaly on the ridges. The occurrence of the anomaly is so similar to those found in Mt. Upao and Madarag, the chance to discover an economically significant gold mineralization there is considered to be rather remote.

5-2 RECOMMENDATION FOR FUTURE

The copper mineralization detected in the drill holes in Madarag is the most interesting and significant finding so far obtained in the survey area albeit the grade does not attain the economic significance. No further follow up works can be recommended at this stage.

The extensive gold anomaly found at the southern portion of Mt. Apiton, covering around the ridges is remarkably similar to that found in Mt. Upao and Madarag Areas. The results obtained from the drilling in both areas do not support any urgent execution of the follow up work.

Molybdenum and copper potential in Puntales Area dwindled hence no further works are recommended either.

The gold anomalies, and copper mineralization in the surveyed areas should comprehensively be reviewed in more broader viewpoint including the tectonics and mineralization found in the neighbouring islands.

PART II DETAILED REPORT

PART II DETAILED REPORT

Chapter 1 Mount Upao Area

1-1 SURVEY METHOD

1-1-1 Trenching

Two trenches were dug in the direction of east-west by hand employing the local people. The dimension of the trenches were; 1 meter wide, and 1 meter deep. The trenches were filled back immediately after the completion of the mapping and sampling.

Table II-1-1-1 Trenching in Mt.Upao Area, 1992

Trench Name	Length in meter	Number of Samples	Direction of Trench
UT-1	212m	45	180
UT-2	201m	44*	180

* 1 sample missing

1-1-2 Diamond Drilling

The location of the drill holes were illustrated in Fig.I-4-1. Three holes totalling 901.25m were drilled.

Table II-1-1-2 Diamond Drilling in Mt.Upao Area, 1992

Drill Number	Length drilled	Azimuth	Declination	Drill Machine
MJPP-1	300.10m	45	-40	Tone TDC-2
MJPP-2	301.00m	90	-40	Tone TDC-2
MJPP-3	300.15m	135	-40	Longyear L34

1-2 GEOLOGY

Extensively hematite-limonite stained, argillized and partly silicified andesitic rocks of "Odiongan Volcanics" covers the higher portion of the mountain, and various andesitic volcanics and mudstone of Sibala Formation occupy the lower terrain.

The drilling executed in the area has revealed that the highly hematitized rocks of so-called "Odiongan Volcanics" change gradually to highly pyritized andesite of Sibala Formation in the depth, preserving similar alteration, texture, and highly fractured nature. Hence it is concluded that "Odiongan Volcanics" is a variety of highly oxidized Sibala Formation, significant difference being in the iron minerals contained. The transition of hematite to pyrite occurs at around the vertical depth of 200m from the top of the mountain.

Existence of highly hematitized, altered "Odiongan Volcanics" suggests that there might be some intensely altered rocks of Sibala Formation in the depth.

1-3 RESULTS

1-3-1 Trenching

1-3-1-1 Trench UT-1 (Plates 1-1 and 1-2)

About 80m out of the total length of the trench, 212m revealed the rocks in situ. The depth of the soil was 10 to 20cm.

Hematite in dissemination, pod like aggregate, and associated with quartz veinlets are seen in highly argillized andesite. Plagioclase phenocrysts are invariably altered to white clay and/or only the skeletons of them remain as 0.5 to 3mm long rectangular pores. Also the phenocrysts of mafic minerals are altered to chlorite and clay. The most abundant clay is kaoline, although significant amount of them are considered to be the product of the weathering rather than that of hydrothermal origin. The sample list together with the analytical results are shown in Table II-1-3-1.

The gold anomalies are found at near the summit of the mountain showing the highest value of 233ppb Au. The position of the anomalous gold values in the trench coincide well with those of the gold anomaly postulated from the 1991 geochemical survey.

1-3-1-2 Trench UT-2 (Plates 1-3, and 1-4)

About 80m out of the total length of the trench, 201m, revealed the rock in situ.

Similarly hematitized andesite prevails in the trench. Since the trench is situated across the northern slope of Mt. Upao, the southern wall of the trench was mapped.

The surface of the exposed rock often forms spherical silicified 1-3mm thick skin(coating) associating hematite and limonite. The existence of such silicified skin gives the rock an appearance of overall intense silicification albeit the strong silicification is only 'skin deep'. Minor quartz veinlets associated with hematite occur sporadically. Pores after plagioclase phenocrysts are ubiquitous and in some places they accompany silicification surrounding them. Plagioclase phenocrysts are invariably argillized as in the trench UT-1.

The sample list of the collected 45-rock samples and the analytical results are shown in Table II-1-3-2.

The maximum gold value of 573ppb is located at around the center of the trench(UT-2-100m) while the second highest, 302ppb Au occurs 4m east from the former. The location of these anomalous gold values in the trench coincide well with the gold anomaly depicted by the geochemical survey executed in 1991. Arsenic seems to associate with gold value showing more than 100ppm although the highest value of arsenic, 670ppm, is found to the west(at UT-2-36m) associating 20ppm Sb, and 115ppm Cu.

1-3-1-3 Principal Component Analysis on Trench-Samples

The analytical data from the trenches UT-1 and 2(n=88) were subjected to the principal component analysis based on the correlation matrix. Silver and manganese are excluded from the computation since the majority of these analytical values were under the detection limits. The statistic parameters,

Table II-1-3-1 Trench UT-1 Sample List, Mt. Upao Area

Sample No.	Description of Sample	Analytical results											
		Au	Ag	As	Sb	Cu	Pb	Zn	Mo	Fe %	Mn	Hg	Se
UT-1,000m	brwn-pur(due to limonite-hematite)	7	<0.2	54	1.2	59	7	3	3	13.50	<5	20	16.0
UT-1,005m	milky white colored arg rox	7	<0.2	20	1.2	12	21	1	4	2.30	<5	10	6.0
UT-1,010m	grey-purple colored alt andesite	13	<0.2	14	0.8	52	15	2	5	10.50	<5	10	1.8
UT-1,015m	red-purple colored alt andesite	12	<0.2	70	1.0	19	8	2	3	10.20	<5	50	12.0
UT-1,019m	weakly silcif.band(2mm) bg.alt ad	26	<0.2	32	1.6	22	61	1	5	3.40	<5	20	5.6
UT-1,025m	yellow colored due to limonite	8	<0.2	46	1.8	15	11	3	6	9.00	30	40	4.2
UT-1,030m	grey-purple colored alt andesite	20	<0.2	12	1.2	36	36	1	4	3.70	<5	30	1.6
UT-1,035m	dark purple band(2cm) bg.alt ad	99	<0.2	20	2.2	50	35	1	7	6.70	<5	40	1.4
UT-1,041m	2mm silicif.band bg. alt andesite	233	<0.2	14	1.4	32	67	1	5	5.80	<5	30	2.0
UT-1,045m	grey colored altered andesite	103	<0.2	14	1.0	8	70	<1	3	4.70	<5	30	2.8
UT-1,050m	weakly silicif.alt andesite	199	<0.2	26	0.4	5	42	<1	2	2.90	<5	30	4.6
UT-1,055m	red purplish colored alt andesite	17	<0.2	48	1.2	12	61	1	6	7.20	<5	40	12.0
UT-1,059m	black spotted porous andesite	70	<0.2	36	1.2	32	6	3	6	14.30	<5	40	2.4
UT-1,065m	grey colored altered andesite	76	<0.2	32	0.6	8	14	1	2	3.60	<5	10	3.6
UT-1,070m	5mm wide hard band bg. alt andesite	13	<0.2	26	1.0	19	17	1	2	5.20	<5	10	3.0
UT-1,075m	opaline spot(2mm across) bg.alt ad	33	<0.2	42	0.8	14	4	4	2	7.70	<5	30	5.4
UT-1,080m	weakly silicified alt andesite	8	<0.2	32	0.4	7	3	1	2	8.40	<5	30	6.8
UT-1,085m	weakly silicif alt andesite	5	<0.2	26	0.6	6	9	2	2	7.60	<5	20	13.0
UT-1,090m	black spots(hm-lm) bg.alt andesite	7	<0.2	46	0.6	18	5	1	2	5.50	<5	20	6.6
UT-1,095m	partially silicif. alt andesite	4	<0.2	38	0.4	8	10	2	3	7.00	<5	20	7.4
UT-1,100m	hm-lm vein(5mm) bg.alt andesite	4	<0.2	32	0.4	11	6	3	2	7.40	<5	10	4.2
UT-1,105m	weakly silicif,porous wh v(2mm) bg	25	<0.2	50	2.2	86	40	2	4	12.50	<5	20	19.0
UT-1,110m	weakly silicif porous alt andesite	4	<0.2	94	0.8	13	2	2	3	7.70	<5	20	12.0
UT-1,115m	ditto	1	<0.2	14	0.4	11	3	1	2	6.50	<5	10	6.0
UT-1,120m	black spots bg.porous alt andesite	3	<0.2	22	1.2	10	3	4	2	5.60	<5	10	12.0
UT-1,125m	spotty wh clay bg.red alt andesite	4	<0.2	36	1.0	39	5	1	3	6.40	<5	20	8.4
UT-1,130m	1-2mm wide bk v bg.alt andesite	5	<0.2	50	1.2	26	2	1	2	8.10	<5	10	7.8
UT-1,135m	dark purple alt andesite	4	<0.2	36	1.0	20	8	1	3	6.20	<5	20	6.4
UT-1,138.6m	yel-brwn/dk pur colored bands bg.	5	<0.2	50	1.8	31	6	1	2	7.50	<5	20	7.6
UT-1,140m	ditto alt ad, with no silicif.	4	<0.2	70	1.0	32	4	2	2	6.60	<5	30	8.2
UT-1,145m	light grey colored alt andesite	6	<0.2	146	2.2	25	8	2	20	6.00	<5	30	15.0
UT-1,150m	bk spots(Mn ox?) & 1mm pores bg.	5	<0.2	54	0.6	84	6	3	3	10.40	<5	20	10.2
UT-1,155m	reddish grey colored alt andesite	2	<0.2	16	0.4	18	8	1	2	6.60	<5	20	8.0
UT-1,160m	grey-brown colored alt andesite	13	<0.2	114	1.8	40	8	2	2	10.50	<5	30	14.0
UT-1,166m	1mm wide qtz v bg. alt andesite	5	<0.2	24	1.0	12	71	2	39	2.50	10	20	1.4
UT-1,170m	grey-brown alt andesite	13	0.3	10	1.0	64	4	4	4	14.80	<5	20	19.0
UT-1,175m	milky wh porous alt andesite	5	<0.2	30	0.2	105	5	3	6	5.60	<5	20	1.2
UT-1,179m	dk gry v(1mm-5mm) bg.alt andesite	2	<0.2	122	0.6	250	4	11	10	12.00	10	20	6.4
UT-1,183m	2mm wh qtz v bg. wk silicif alt ad	2	<0.2	26	0.8	8	4	1	3	3.20	<5	20	7.8
UT-1,187m	weakly silicif alt andesite	1	<0.2	70	0.6	76	12	6	22	10.30	<5	20	4.0
UT-1,191m	thin hm-lm bands bg. alt andesite	9	<0.2	2	0.8	5	20	<1	23	1.10	<5	20	<0.2
UT-1,195m	wk silicif lt brown alt andesite	7	<0.2	2	0.2	3	4	2	<1	0.10	<5	20	<0.2
UT-1,200m	gry-pur colored alt andesite	15	<0.2	2	0.6	5	23	<1	1	2.20	<5	20	7.8
UT-1,205m	ditto	19	<0.2	34	0.6	8	3	1	2	4.70	<5	20	9.0
UT-1,212m	dk grey-pur colored alt andesite	3	<0.2	6	0.4	9	3	1	1	9.30	<5	20	19.0

Au,Hg in ppb, Fe in %, other elements in ppm

Table II-1-3-2 Trench UT-2 Sample List, Mt. Upao Area

Sample No.	Description of Sample	Analytical Results											
		Au	Ag	As	Sb	Cu	Pb	Zn	Mo	Fe %	Mn	Hg	Se
UT-2,001m	grey-brownish alt.Andesite	25	<0.2	30	1.8	145	20	1	<1	7.20	<5	20	7.2
UT-2,005m	strong lm-hm in stringers	2	<0.2	98	0.8	21	4	<1	<1	5.00	<5	10	6.4
UT-2,012m	wk silicif..nodule like hm	11	<0.2	24	<0.2	85	9	1	1	11.50	<5	30	5.6
UT-2,015m	hm-lm vein bg.weak arg.rock	8	<0.2	12	0.4	176	15	1	2	11.50	<5	20	9.0
UT-2,018m	wk silicif.hm-lm in film/vlts	2	<0.2	12	0.4	11	20	1	<1	1.30	<5	10	1.8
UT-2,021m	arg.hm-lm stained andesite	8	<0.2	36	1.4	15	35	<1	1	7.40	<5	20	12.0
UT-2,025m	gry-purple arg.rock w plg skelton	36	<0.2	48	1.2	20	32	2	2	4.30	<5	20	5.4
UT-2,027m	wk sil-hm-lm vlets(filmy to 1mm)	<1	<0.2	4	0.4	14	13	2	<1	3.50	<5	10	6.2
UT-2,032m	grey colored altered andesite	11	<0.2	4	0.8	5	25	<1	2	1.20	<5	10	0.8
UT-2,036m	ditto,with local wk silicif.	35	<0.2	670	20.0	115	35	1	<1	8.50	<5	10	7.2
UT-2,040m	wh qtz v(max.1mm) bg.alt ad	30	<0.2	22	1.2	11	30	1	3	6.50	<5	20	6.0
UT-2,045m	grey colored altered andesite	120	<0.2	118	2.8	10	62	1	2	4.80	<5	20	8.8
UT-2,050m	kaoline rich altered andesite	7	<0.2	4	0.2	5	10	<1	2	1.10	<5	10	2.2
UT-2,055m	grey colored altered andesite	12	<0.2	130	1.0	14	15	1	<1	6.50	<5	10	8.8
UT-2,060m	light brown colored alt andesite	30	<0.2	24	0.2	92	30	<1	2	4.90	<5	20	7.8
UT-2,065m	banded hm-lm bg.weakly silcif.rox	4	<0.2	42	0.6	9	14	1	1	3.40	10	10	5.2
UT-2,068.5m	weakly silicif alt andesite	4	<0.2	140	0.8	13	2	<1	<1	6.30	<5	10	9.6
UT-2,073m	light grey colored alt andesite	23	<0.2	64	1.0	64	17	<1	2	4.50	<5	30	5.4
UT-2,078m	ditto	2	<0.2	36	0.6	6	4	<1	1	2.70	<5	10	5.2
UT-2,081.3m	1cm qtz vein bg. wk silicif rox	32	<0.2	100	6.0	8	3	<1	2	3.90	<5	20	5.2
UT-2,088.3m	weakly altered andesite	11	<0.2	50	6.4	1	20	<1	1	0.30	<5	10	1.0
UT-2,094m	red-purple colored alt andesite	66	<0.2	24	1.4	4	34	<1	<1	4.80	<5	30	7.4
UT-2,100m	ditto	573	<0.2	130	5.2	29	73	1	3	10.00	<5	50	22.0
UT-2,104m	weakly silicif.alt andesite	302	<0.2	104	2.0	47	13	<1	3	6.50	<5	30	13.0
UT-2,111.5m	red-purple colored alt andesite	33	<0.2	86	10.0	36	12	3	2	16.30	<5	30	13.6
UT-2,116m	grey colored altered andesite	16	<0.2	4	0.8	18	37	<1	2	4.10	<5	20	5.6
UT-2,120.5m	qtz v(2mm) bg. alt andesite	13	<0.2	224	7.4	71	3	2	4	12.50	<5	20	12.6
UT-2,126m	grey-purple colored alt andesite	10	<0.2	30	1.8	17	11	1	4	8.00	<5	20	9.0
UT-2,130.4m	hm-lm vein(5mm) bg.silcif andesite	76	<0.2	14	0.8	36	4	<1	9	5.10	<5	10	5.2
UT-2,136m	grey-purple colored alt andesite	4	<0.2	26	1.0	24	20	1	3	9.00	<5	10	8.4
UT-2,143.5m	grey colored breccia bg.alt and.	2	<0.2	28	1.2	9	34	<1	2	5.20	<5	10	6.4
UT-2,148m	light brown colored alt andesite	43	<0.2	4	0.2	197	2	1	2	3.80	<5	20	5.2
UT-2,155.3m	dark grey banded hm-lm bg.alt ad	20	<0.2	20	0.8	180	10	2	2	4.80	<5	20	5.4
UT-2,160m	reddish purple colored alt andesite	11	<0.2	6	0.6	34	69	1	3	3.90	<5	20	4.0
UT-2,165m	dark brown colored alt andesite												
UT-2,170m	weakly silicified alt andesite	15	<0.2	6	1.0	62	39	128	2	5.30	15	20	6.2
UT-2,174.4m	opaline qtz vein bg.alt andesite	140	<0.2	134	11.5	196	18	3	1	11.40	<5	30	14.8
UT-2,180.6m	weakly silicif. gry-pur colored ad	7	<0.2	10	1.2	37	7	3	2	7.60	<5	20	35.0
UT-2,185.5m	dark brown colored alt andesite	10	<0.2	24	1.4	37	43	<1	2	5.90	<5	20	7.8
UT-2,190m	milky white colored alt andesite	7	<0.2	8	1.2	15	22	1	2	3.40	<5	30	4.4
UT-2,194m	5mm hm vein bg.gry-pur alt ad	4	<0.2	4	0.4	50	3	1	1	7.10	<5	20	8.0
UT-2,197m	5mm hm-qtz vein bg. alt andesite	<1	<0.2	12	0.6	27	9	2	1	10.80	<5	10	6.4
UT-2,200m	weakly silicif. alt andesite	2	<0.2	28	<0.2	43	3	1	1	8.30	<5	20	10.8
UT-2,201m	white compact carbonate rox	1	<0.2	[illegible]	0.2	3	5	<1	1	1.30	<5	10	2.6

Au, Hg in ppb; Fe in %; other elements in ppm correlation matrix are shown in Table II-1-3-3, and II-1-3-4 respectively. All the analytical values of the elements excepting that of iron can be approximated by log-normal distribution hence they are converted to logarithmic values.

a) CORRELATION

Following combination of the elements are rather highly correlated; Cu-Fe(+0.60), As-Sb(+0.61), Se-Fe(+0.46), Au-Pb(+0.53), and Au-Hg(+0.45).

Table II-1-3-3 Statistic Parameters, Trenches in Mt.Upao

COMP. NAME	UNIT	NUM. DATA	MAXIMUM	MINIMUM	MEAN (M)	STD. DEV. (SD)	M-2*SD	M-SD	M+SD	M+2*SD
Au	ppb	86	573	1	11.4	0.583 *	0.8	3.0	43.5	166.4
Ag	ppm	1	0.3	0.3	0.30	0.000 *	0.30	0.30	0.30	0.30
As	ppm	88	670	2	27.0	0.499 *	2.7	8.6	85.3	268.9
Fe	%	88	16.30	0.10	6.527	3.426	-0.325	3.101	9.953	13.380
Cu	ppm	88	250	1	21.5	0.467 *	2.5	7.3	63.0	184.7
Mn	ppm	5	30	10	13.5	0.186 *	5.7	8.8	20.7	31.8
Hg	ppb	88	50	10	18.8	0.193 *	7.7	12.0	29.3	45.7
Mo	ppm	79	39	1	2.6	0.330 *	0.6	1.2	5.6	12.0
Pb	ppm	88	73	2	11.9	0.439 *	1.6	4.3	32.7	89.9
Sb	ppm	86	20.0	0.2	0.97	0.387 *	0.16	0.40	2.37	5.78
Se	ppm	86	43.0	0.8	6.34	0.322 *	1.44	3.02	13.31	27.98
Zn	ppm	66	128	1	1.7	0.334 *	0.4	0.8	3.6	7.8

* OF STD. DEV. IS SHOWN IN LOGARITHMIC SCALE

Table II-1-3-4 Correlation Matrix, Trenches in Mt.Upao,1991

	Au	As	Fe	Cu	Hg	Mo	Pb	Sb	Se	Zn
Au	---	86	86	86	86	78	86	84	84	64
As	0.153	---	88	88	88	79	88	86	86	66
Fe	0.064	0.457	---	88	88	79	88	86	86	66
Cu	0.149	0.269	0.595	---	88	79	88	86	86	66
Hg	0.450	0.142	0.325	0.247	---	79	88	86	86	66
Mo	0.041	0.127	0.060	0.190	0.228	---	79	77	78	61
Pb	0.526	-0.075	-0.222	-0.030	0.159	0.246	---	86	86	66
Sb	0.423	0.609	0.338	0.180	0.234	0.092	0.265	---	84	64
Se	0.030	0.365	0.491	0.246	0.235	-0.166	-0.240	0.233	---	65
Zn	-0.111	0.035	0.321	0.313	0.109	0.141	-0.089	-0.009	0.061	---

*NOTE ; VARIANCES AND COVARIANCES ARE DIVIDED BY N-1
NUM. OF DATA IS WRITTEN IN RIGHT-UPPER PART
CORR. COEF. IS WRITTEN IN LEFT-BOTTOM PART

b) PCA

The results of the Principal Component Analysis(PCA) were summarized in Table II-1-3-5.

1st Principal Component

Having the eigen value of 2.808, the component accounts for 28% of the total variance of the population(2.808/10). Fe(61%), As(48%), Sb(45%), Cu(42%), Se(31%), Hg(32%), and Au(19%) show significant contribution in the component....Here after, the contribution of the relevant elements in the component are shown in percentage figures in parenthesis. The component indicates the re-concentration of iron and other elements associated with the weathering, and leaching processes at the exposed surface. Gold shows much larger contribution in the second principal component.

2nd Principal Component
The component has a contribution of 20%, and Pb(71%), together with Au(50%) show large contribution. Apparently the component indicates the lead and gold concentration.
Zn(39%), and Mo(37%) have large contribution in the 3rd Principal Component although these elements do not show any anomalous concentration in the data set hence no practical meaning attributable.

Table II-1-3-5 PCA, Trenches in Mt.Upao Area, 1992

PRIN COMP	EIGEN VALUE	CONTRIB	CUM CONTRIB		Au	As	Fe	Cu	Hg	Mo	Pb	Sb	Se	Zn
P 1	2.915	0.292	0.292	EIGENVECTOR	.253	.404	.459	.380	.333	.133	.045	.393	.324	.167
				FACTOR LOADING	.432	.690	.783	.649	.568	.227	.077	.671	.553	.285
				CONTRIBUTION	.187	.477	.613	.421	.323	.052	.006	.450	.306	.081
P 2	1.952	0.195	0.487	EIGENVECTOR	.507	-.059	-.286	-.146	.205	.210	.602	.229	-.288	-.228
				FACTOR LOADING	.708	-.082	-.400	-.204	.287	.294	.842	.320	-.403	-.318
				CONTRIBUTION	.501	.007	.160	.042	.082	.086	.708	.102	.162	.101
P 3	1.355	0.136	0.622	EIGENVECTOR	-.115	-.291	.066	.322	.161	.524	.108	-.308	-.316	.536
				FACTOR LOADING	-.134	-.339	.077	.374	.188	.610	.126	-.359	-.368	.623
				CONTRIBUTION	.018	.115	.006	.140	.035	.372	.016	.129	.135	.389
P 4	0.990	0.099	0.721	EIGENVECTOR	-.326	.494	-.064	-.077	-.489	.463	.014	.337	-.269	-.021
				FACTOR LOADING	-.324	.492	-.064	-.076	-.487	.460	.014	.335	-.268	-.021
				CONTRIBUTION	.105	.242	.004	.006	.237	.212	.000	.112	.072	.000
P 5	0.770	0.077	0.798	EIGENVECTOR	-.178	.048	-.035	-.183	.464	.540	-.287	-.215	.207	-.514
				FACTOR LOADING	-.156	.042	-.030	-.161	.407	.474	-.234	-.189	.182	-.451
				CONTRIBUTION	.024	.002	.001	.026	.166	.225	.055	.036	.033	.203
P 6	0.640	0.064	0.862	EIGENVECTOR	-.078	.092	-.152	-.693	.300	.005	-.052	.187	.147	.577
				FACTOR LOADING	-.063	.073	-.121	-.554	.240	.004	-.042	.149	.117	.461
				CONTRIBUTION	.004	.005	.015	.307	.058	.000	.002	.022	.014	.213

1-3-2 Diamond Drilling

Table II-1-1-2 shows the three diamond drills executed to examine the gold anomaly in the depths depicted by the geochemical survey in 1991. The drill site is situated 200m west of the summit of Mount Upao(340+m ASL). The drill rigs employed were TONE TDC-2 and LONGYEAR L-34. The details of the drill rigs, pumps and so on are tabulated in the appendix. The drilling were commenced with HQ and finished with NQ or BQ.
The drilling operation were done by Saint Port Machinery Corporation of Philippines under the direction of Sumiko Consultants Co.,Ltd.

1-3-2-1 MJPP-1 Hole

a) Geology
To 146.35m: Heavily hematite stained argillized andesite with characteristic red-purplish color. From 146.35m, the rock changes to pyrite impregnated greenish-bluish grey colored

andesite associating variable degree of silicification.
Details are as follow.

0.00-5.35m: reddish brown colored weakly argillized andesite with strong hematite and limonite dissemination and veining. 5.12-5.19m; light grey colored fine grained quartz vein standing at 57 degrees to core axis.

5.35-6.06m: greenish grey colored moderately silicified and weakly argillized fine grained andesite with 7% pyrite dissemination.

6.06-16.48m: reddish brown colored argillized soft andesite which contains strongly silicified blebs. The boundary of the blebs are obscure and often gradational.
Hematite and limonite veinlets and/or dissemination are ubiquitous in the section composing 10% of total volume.
11.54-12.20m; strongly argillized clayey zone with abundant hematite and limonite.

16.48-18.65m: grayish purple colored strongly argillized andesite. The cracks are dominated by hematite and limonite.

18.65-25.37m: strongly argillized andesite that contains strongly silicified blebs with abundant(10%) hematite in vein/dissemination.

25.37-26.48m: grey purple colored strongly argillized andesite. the cracks exhibits slickenside structure.

26.48-28.25m: weakly argillized porous andesite with hematite limonite dissemination. Abundant pores in the section reaches 10mm across.

28.25-34.60m: reddish brown colored strongly argillized andesite with 10% hematite. the rock in the section are badly fractured.

34.60-45.70m: dark reddish brown colored porous andesite. The pores in the section are smaller, ranges from 1mm to 4mm. Hematite in veinlets and dissemination and in cracks are ubiquitous.

45.70-60.45m: alternating hematite rich bands that stand at 10 to 30 degrees to the core axis and milky white argillized andesite. The widths of the band; 10-40mm. Hematite occupies about 20% of the total volume.

60.45-86.75m: reddish brown colored porous weakly argillized andesite with 15-20% hematite in veins/dissemination. The size of the pores ranges from needle point to 2mm. The predominant clay mineral is kaolinite.

86.75-100.50m: alternating silicified and argillized andesite; the section between 94.70 and 94.85m is greenish colored andesite with 10% pyrite. The following sections are badly fractured;
86.75-87.70m, 89.10-89.80m, 90.80-91.40m ,96.75-97.40m, 98.40-99.15m, and 100.20-100.50m.

100.50m-114.65m: reddish brown colored porous andesite with 1-5mm pores. Milky white colored argillized(kaolinite) varieties occur sporadically as patches and or blocks. Hematite occurs as dissemination and in veinlets(0.5-3mm wide), total amount of hematite around 20% by volume.

114.65-115.17m: dark grey colored, moderately silicified andesite with 20% very fine grained pyrite dissemination. discontinuous kaolinite veinlets(5-20mm long) observed throughout the section.

115.17-116.85m: reddish brown colored argillized andesite with 20% hematite dissemination.

116.85-117.80m: dark grey colored strongly silicified porous andesite with 15% pyrite dissemination. White clay(kaolinite) filling 2-5mm wide cracks are ubiquitous.

117.80-118.62m: weakly argillized hematite rich(20%) porous andesite.

118.62-121.45m: strongly silicified porous andesite with abundant black pyritic quartz veinlets and white quartz veinlets. Pyrite content of this section is around 20%. 2mm wide kaolinitic clayey veinlets also observed in the section.

121.45-126.60m: reddish brown colored moderately argillized porous andesite with 20% hematite dissemination.

126.60-146.35m: dark grey colored strongly silicified porous andesite with 15-20% disseminated pyrite and/or in veinlets. Irregularly oriented fissures(1-3mm wide) filled with clay are observed.

Following sections are fractured zones containing hematite(10-20%): 127.85m;standing at 21 degrees to core axis.

129.00m; 40 deg to core axis
132.15m; 30 deg to core axis
133.05m; 32 deg
134.65m; 60 deg
135.70m; 50 deg
145.80m; 25 deg

4mm wide fine grained quartz veinlet observed at 127.85m.

146.35-154.25m: strongly silicified andesite. Lighter colored portion contains epidote replacing plagioclase together with pyrite. Darker colored portion contains 20% pyrite in networks and dissemination.Epidote apparently formed at the last stage of the alteration.

154.25-154.80m: ditto, subrounded pyrite masses(5-10mm across) are surrounded by quartz aggregates.

154.80-157.00m: dark grey colored strongly silicified andesite with 30% pyrite dissemination. Epidote exists replacing plagioclase phenocrysts and infilling discontinuous, latest stage minute cracks.

157.00-159.00m: similar rock with 20% pyrite. At 158.25m; 70mm wide white fine grained quartz vein.

159.00-162.88m: dark grey strongly silicified andesite with 20% pyrite dissemination. 159.00-159.30m; fine grained quartz network zone.

162.88-165.20m: light yellowish brown colored strongly argillized and fractured zone with poor recovery of core(22%).

165.20-179.00m: dark grey colored strongly silicified porous andesite with 20-25% pyrite consisted of dissemination and 0.5-3mm wide veinlets. Most pyrite grains are extremely fine hence display black color. Epidote in 0.5mm wide irregular fissures and replacing plagioclase phenocrysts are ubiquitous. 1-5mm wide quartz veinlet occurs in every 20cm core length.

179.00-183.50m: dark grey colored weakly argillized andesite with fine grained pyrite which occupies 15% of the volume. White clay veinlet (5mm wide) most probably composed of kaolinite standing at 30 degrees to the core axis occurs at 182.60m.

183.50-184.20m: 20% disseminated hematite bearing argillized zone.

184.20-185.80m: grey colored weakly argillized andesite with 7% pyrite dissemination.

185.80-191.70m: *grey colored strongly silicified andesite* with 15% pyrite in dissemination and in 0.5-2mm wide veinlets. Epidote occurs as spots in plagioclase and in microfissures that cut all other structures suggesting the epidote was formed in the latest stage of the alteration. Hematite bearing fissures are seen in the following sections; at 186.10m 15cm wide fissure standing at 17 degrees to the core axis, and at 188.40m 10cm wide fissure where the fissure stands at 20 degrees.

191.70-193.15m: dark grey colored, strongly silicified andesite with 20% disseminated pyrite.

193.15-196.70m: reddish brown to milky white colored argillized andesite containing 15% hematite dissemination.

196.70-207.35m: dark grey colored strongly silicified andesite with 20 to 30% pyrite in dissemination and in 20mm long 0.5mm to 1mm wide undulating bands which stand perpendicular to the core axis. The latter predominates in 205.20-206.0m, epidote filling microfissures are also common in the section. Black 'tiger skin pattern' wavy bands(patches) composed of very fine grained pyrite(15%) are ubiquitous in the section. Following sections contain quartz network zones; 198.65-199.85m, and 201.0-202.20m, composed of 0.5-10mm wide veinlets. Hematite is seen at 199.86-200.15m,the central portion being badly fractured and argillized which is responsible for the introduction of hematite.

207.35-208.00m: strongly silicified andesite with 15% pyrite dissemination. Network of quartz composed of 0.5mm to 5mm wide quartz veinlets ubiquitous in the section.

208.0-209.15m: reddish brown colored moderately silicified andesite with 20% hematite dissemination.

209.15-213.55m: dark grey colored strongly silicified and brecciated andesite. White quartz network ubiquitous together with 0.5-20mm wide 'black veins' that are consisted from very fine quartz and micro grains of pyrite. Epidote in micro-fissures apparently formed at the latest stage of the alteration are frequently observed.

213.55-214.90m: porous strongly silicified andesite with 20% pyrite in dissemination and in 0.5 to 3mm wide veinlets.

214.90-218.25m: strongly silicified grey colored andesite with 20% pyrite *occurring in similar form* as in the previous section. 216.05-216.50m; brecciated and strongly silicified, quartz network bearing section.

218.25-221.50m: dark grey colored strongly silicified and brecciated andesite with 25% pyrite. White quartz network and discontinuous black veins composed of micro pyrite and quartz occur throughout the section. Epidote filling microfissures also seen in the section.

221.50-222.55m: dark grey colored strongly silicified porous andesite with 25% pyrite in dissemination and in 0.5-5mm wide veinlets.

222.55-229.70m: strongly silicified, brecciated andesite with 25% pyrite. White quartz network and black veins occur in the section. Epidote occur as spot in quartz and replacing phenos in andesite, and also filling irregular microfractures.

229.70-231.95m: dark grey colored strongly silicified porous andesite with 30% pyrite dissemination.

231.95-239.75m: grey colored strongly silicified andesite with 15% pyrite in dissemination and in 0.5-2mm wide veinlets.

Brecciated structure are seen in the following section; 232.90-233.70m. At 238.0m there is a 45mm wide vein composed of fine grained quartz and kaolinitic clay.

239.75-248.40m: strongly silicified and brecciated andesite with 25% pyrite dissemination and in veinlets. Black vein cutting white fine grained quartz veinlet observed. At 248.35m, eye shaped aggregate of epidote observed.

248.40-250.65m: dark grey colored weakly argillized andesite with 15% pyrite dissemination.

250.65-252.40m: dark grey colored strongly argillized and fractured andesite with 10% pyrite dissemination. Core recovered are all fragmental.

252.40-254.90m: chocolate colored clay accompanying 10mm diameter rounded breccia of andesite.No pyrite observed.

254.90-267.20m: light grey colored clay zone with 2% fine grained pyrite.

267.20-287.60m: grey colored clay zone with fine grained pyrite dissemination of 3-5%.

287.60-289.40m: chocolate brown colored clay. 10-20mm diameter rounded breccia of andesite observed in the clay. The clay zone extensively continues from 252.40m to 289.40m.

289.40-300.10m(End of the Hole): dark grey colored weakly silicified fine grained andesite with 2% pyrite dissemination. 20% magnetite contained in the section as 1-2mm wide elliptical spot. 8mm wide anhydrite veinlet can be seen at 295.20m. There are 10-veinlets (0.5-3mm wide) per every one meter of core. There are abundant irregular cracks in the section hence the core tends to crumble very easily.

b) Analytical Results of the Core Samples

Twelve Elements(Au, Ag, As, Sb, Cu, Pb, Zn, Fe, Mo, Se, and Mn) were analyzed and the sample list together with the results are tabulated in Table II-1-3-6. Although several sections showed significant pyritization, silicification, there were no sample which attained an ore grade. The core below 118m contained 0.005 to 0.020% copper.

1-3-2-2 MJPP-2 Hole

a) Geology

To 164.2m: heavily hematite stained argillized andesite with variably reddish to purple color. From 109.5 to 164.2m; transition zone to pyritic andesite.

Details are as follow.

0.00-3.00m: grey-brown moderately argillized andesite accompanying irregularly shaped hematite-limonite veinlets(1-2mm wide). 1.25-3.00m: badly crushed core.

3.00-3.58m: brown colored argillized andesite, or fine grained tuff. The rock contains breccia of 1-2cm diameter-argillized brown colored altered andesite.

3.58-6.60m: 1-2cm diameter-grey-brown andesite breccia bearing brownish colored altered(argillized) fine grained andesite, or tuff. Slickensides can be observed suggesting intense shearing and fracturing.

5.07-5.22m: moderately silicified parts surrounding small druse/vugs associating with hematite-limonite.

6.60-12.30m: reddish brown colored argillized andesite, the color due to ubiquitous hematite and limonite. Up to 1% pyrite

in grey colored portion.
9.75-10.15m: porous, argillized soft clayey material.
Fractures of 30 deg. to the axis of the core predominate around at 10.70m.

12.30-15.30m: intensely crushed core recovered. The rock is similar to the above.

15.30-22.40m: yellowish brown to red-purple colored argillized andesite. The color changes with the amount of hematite and limonite in the rock. White spots after plagioclase phenos are visible locally.

22.40-95.47m: red-purple colored argillized andesite, milky white clay (kaolinite) along cracks. 26.30-27.80m: badly crushed core. 1cm wide quartz vein at 28.58m, standing at 35 degr. to the core axis. The peripheral part of the vein shows black or dark red-purple color due to heavy concentration of hematite-limonite.
36.00-36.31m: light grey colored fine grained silicified rock in shape of quartz veinlet/breccia(1cm diameter).
37.50-37.97m: dark brown colored hematite-limonite bands bearing silicified rock. There are also minute (1-4mm) silicified spots surrounded by hematite-limonite in the rock.
44.20-49.10m: dark reddish brown strongly hematitic zone.
at 49.42m,2cm hematite-quartz vein.
49.10-53.40m: light grey-brown colored argillized rock.
Locally there are strongly silicified breccia like portions.
52.00-53.40m: badly broken core.
53.40-57.60m: yellowish light grey colored argillized, with local weakly silicified portions.
57.60-68.15m: red-brown argillized altered andesite. At 60.67m there is a white qtz vein(2.5cm). 57.6-59.2:badly broken core recovered.
At 61.00m, hematite-quartz vein(5-10mm). 68.15-69.60m: fine grained opaline undulating/folding quartz vein (7cm wide) throughout the section. 69.6-71.80m: abundant silicified pores bearing silicified,argillized zone.
71.80-94.0m: reddish brown colored hematite-limonite rich arg-altered zone, locally there are 1-2mm qtz veins and strongly silicified breccia like portions.
71.80-73.90m, 79.24-79.80m, 83.12-84.05m,and 84.40-87.10m: badly broken core.

94.00-100.95m: brecciated pale grey colored andesite(tuff breccia?), max size of breccia;10cm.
94.18-94.31m: light grey mudstone.
From 95.47m: the color of rock changes to greenish, due to the paucity of hematite.

100.95-125.70m: alternating zones of; greenish grey colored strongly silicified zone, and hematite bearing silicified drusey rock. Argillized plagioclase phenos in greenish andesite are absent in strongly silicified varieties, only cavity/pores are visible.
At 107.75m, first occurrence of pyrite (2%).
109.50-110.0m: 1.5% pyrite
116.17-116.48m:5% pyrite
119.0-119.85m: 3% pyrite
121.0-121.93m: 3% pyrite
122.5-122.95m: 3% pyrite

125.70-135.00m: green/grey colored zone. Strongly silicified portion has plenty of pore. Average pyrite content of the section: 5%.

127.5-128.78m: 8% py associating with strongly silicified porous rock.

128.63m, 6-10mm wide clay-qtz vein; 132.50m, 15mm wide strongly silicified pyrite bearing zone.

133.32m, 30mm wide white soft clay vein.

135.00-145.05m: Alternating occurrences of hematitic rock and pyritic greenish grey rock. 141.73m:5-10mm white clay vein.

136.95-137.5m: contains 7% pyrite.
139.71-140.47m:contains 5% pyrite.
140.9-142.55m: contains 3-5% py.

145.05-147.60m: strongly argillized and fractured zone containing slickensides with no particular orientation. Also there are 5mm wide white clay veins.

147.60-152.70m: grey colored weakly argillized andesite with 3% pyrite. Hematite still visible in cracks.
At 152.20m; 10mm wide white clay quartz vein.

152.70-164.20m: Alternating occurrence of hematitic rock and pyritic greenish grey rock. Some hematitic portion with off white color are strongly silicified.
Reddish portion shows stronger arg'n. pyritic greenish grey colored portion with stronger silicification contains 1-3mm pores, while less silicified portion contains white argillized plagioclase phenos.

154.15-155.6m: contains 3% pyrite.
156.4-156.8m: ditto
159.1-159.82m: ditto
161.38-162.8m: contains 8% pyrite.

164.20-171.00m: greenish grey colored strongly silicified andesite. white clay and hematite visible in cracks and or joints.

164.2-165.0m: contains 7% pyrite.
165.0-165.7m: contains 5% pyrite.
165.7-170.0m: contains 7-12% py.

171.00-175.23m: greenish grey colored argillized andesite.
171.35-171.6m, 172.5-172.8m, and 174.0-174.9m: strongly argillized and fractured. At 172.0m; 15-20mm wide milky white clay vein.

175.23-175.79m: reddish brown colored hematitic porous andesite.

175.79-183.19m: greenish grey weakly argillized andesite with local silicification. Argillized portion contains plagioclase phenos and silicified portion have plenty minute to 2mm pores.
At 181.4m; 7-10mm wide white to light grey colored qtz-clay vein.

176.5-176.98m, 177.76-177.98m, 178.5-179.05m, and 182.45-182.86m: strongly argillized zones with white clay.

183.19-183.85m: silky white v fine pyrophyllite zone. **The existence of pyrophyllite confirmed by XRD.**

183.85-186.70m: strongly silicified zone with 12% pyrite. At 186.48m; 2cm wide white clay vein,the periphery(10cm) of the zone contains 20% pyrite.

186.70-187.15m: strongly argillized zone.

187.15-188.70m: dark grey colored weakly argillized and silicified andesite with 15% pyrite throughout the section.

188.70-188.84m: clay-pyrite-qtz veins.

188.84-190.10m: dark grey colored strongly silicified andesite with 15% pyrite.

190.10-191.00m: white clay-quartz bearing strongly silicified zone.
191.00-193.55m: bluish grey colored strongly silicified andesite with 5% pyrite dissemination. Strongly silicified zones are porous, while weakly silicified portion retains white argillized plagioclase phenos.
193.55-197.05m: off white quartz vein associating epidote(max 20mm) network zone.The periphery(3-5mm) of the qtz veins contain up to 40% pyrite.
197.05-206.62m: bluish grey colored weak to moderately silicified andesite with 8-10% pyrite; Following sections are strongly silicified, and contain irregular pyrite veins(max 5mm) and patchy aggregate of py concentration;
198.18-199.0m, 199.65-201.90m, and 203.05-204.32m.
206.62-210.90m: red-brown moderately silicified andesite with filmy-veinlet hematite.Strongly silicified portion are porous(1-3mm radius). At 207.50m and 209.10m there remain 10cm wide remnant of bluish grey andesite with 5% pyrite.
210.90-232.60m: light grey purple colored moderately argillized andesite with filmy to sparse network with 2mm wide hematite veinlets.Strongly argillized zones; 210.90-211.60m, and 213.01-215.40m contain 3% pyrite and show purplish grey color.
Following sections are strongly fractured and associate purplish grey clay; 225.05-226.10m, 228.23-228.40m, and 229.60-230.36m.
232.60-233.70m: brownish purple colored weak to moderately silicified andesite. Strongly silicified portions are porous(max 2mm) with hematite veinlets(film to 3mm). Black hematite-limonite film fills in the cracks.
233.70-244.40m: 2-20mm wide quartz vein/network bearing bluish grey colored strongly silicified zone with 12% pyrite dissemination. The qtz veins contain epidote specks. 239.75-240.65m: dark grey colored conspicuously porous (av.2mm) section.
244.40-246.60m: quartz vein with epidote and pyrite specks. Also contain 2-4cm radius subrounded breccia like fine grained pyrite aggregates(20% pyrite).
246.60-254.81m: similar to 233.7-244.4m, white quartz vein or network zone with epidote specks. The width of the individual qtz veins ranges from 2 to 20mm. Bluish grey colored rock in the section contains 12% pyrite and has very porous(max 2mm) strongly silicified pumice like portion with 10% pyrite at; 253.55-253.92m.
254.81-256.60m: bluish grey colored strongly silicified andesite associating pyrite concentrated breccia like aggregates(av.5mm, max 20mm) which contain 20% pyrite. 3-7mm wide quartz veins surround the breccia.
256.60-276.93m: weak-moderately silicified andesite with 5-7% pyrite dissemination. Patchy strongly silicified portion has porous texture with 1-2mm pores.
271.70-273.50m; badly fractured zone with grey colored clay.
276.93-282.85m: dark blue-grey colored strongly silicified andesite with qtz network(1-20mm wide) associating 5% pyrite. Vein qtz occupies 15-20% of the section. Epidote visible in qtz vein and in the rock.
282.85-293.26m: bluish grey silicified andesite.
Silicification get weaker toward the bottom,being strong to

Table II-1-3-6 DDH MJPP-1 Sample List, Mt. Upao Area

Sample No.	Description of Sample	Interval: From	Interval: To	Width (m)	Au g/t	Ag g/t	As %	Sb %	Cu %	Pb %	Zn %	Fe %	Mo %
UD-1-1	wk silicif ad w 7%py	5.35	6.06	0.71	<0.02	<0.2	0.002	<0.001	0.008	<0.001	<0.001	4.80	<0.001
UD-1-2	wk silicif ad w hematite	21.05	21.90	0.85	<0.02	<0.2	0.002	<0.001	0.001	<0.001	<0.001	5.30	<0.001
UD-1-3	wk silicif/arg ad w hematite	45.70	46.40	0.70	<0.02	<0.2	0.001	<0.001	0.003	<0.001	<0.001	4.00	<0.001
UD-1-4	wk arg ad w 20% hematite	60.45	61.50	1.05	<0.02	<0.2	<0.001	<0.001	0.003	<0.001	<0.001	2.60	<0.001
UD-1-5	hm bg ad w py bg grn ad(15cm)	94.40	95.05	0.65	<0.02	<0.2	<0.001	<0.001	0.004	<0.001	<0.001	6.80	<0.001
UD-1-6	str silicif ad w 20% py	118.62	119.37	0.75	<0.02	<0.2	<0.001	<0.001	0.019	<0.001	<0.001	3.80	<0.001
UD-1-7	ditto	119.37	120.66	1.29	<0.02	<0.2	<0.001	<0.001	0.016	<0.001	<0.001	4.15	<0.001
UD-1-8	str silicif porous ad w 20%py	138.35	140.00	1.65	<0.02	<0.2	<0.001	<0.001	0.014	<0.001	<0.001	4.30	<0.001
UD-1-9	ditto	143.97	145.10	1.13	<0.02	<0.2	<0.001	<0.001	0.013	<0.001	<0.001	3.20	<0.001
UD-1-10	ditto w epidote	150.60	151.80	1.20	<0.02	<0.2	0.001	<0.001	0.020	<0.001	<0.001	3.60	<0.001
UD-1-11	str silicif ad w 20%py & epid	153.40	154.80	1.40	<0.02	<0.2	<0.001	<0.001	0.010	<0.001	<0.001	2.95	<0.001
UD-1-12	ditto, with 30% py	154.80	155.90	1.10	<0.02	<0.2	<0.001	<0.001	0.009	<0.001	<0.001	2.40	<0.001
UD-1-13	ditto, w 30%	155.90	157.00	1.10	<0.02	<0.2	0.001	<0.001	0.009	<0.001	<0.001	2.40	<0.001
UD-1-14	ditto w 20% pyrite	157.00	158.05	1.05	<0.02	<0.2	<0.001	<0.001	0.010	<0.001	<0.001	3.20	<0.001
UD-1-15	ditto with 20% pyrite	158.05	159.00	0.95	<0.02	<0.2	0.001	<0.001	0.009	<0.001	<0.001	2.60	<0.001
UD-1-16	ditto	159.00	160.47	1.47	<0.02	<0.2	<0.001	<0.001	0.010	<0.001	<0.001	3.00	<0.001
UD-1-17	str silicif ad w 15% py	165.80	167.00	1.20	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	1.90	<0.001
UD-1-18	ditto w 15% py & epidote	170.65	171.85	1.20	<0.02	<0.2	<0.001	<0.001	0.005	<0.001	<0.001	2.80	<0.001
UD-1-19	str silcf ad w 25%py & epid	174.50	176.00	1.50	<0.02	<0.2	<0.001	<0.001	0.009	<0.001	<0.001	4.30	<0.001
UD-1-20	25mm qv bg str silcf w 15%py	177.70	179.00	1.30	<0.02	<0.2	0.004	<0.001	0.009	<0.001	<0.001	4.35	<0.001
UD-1-21	ditto ad w q ntwk & 30%py	198.68	199.85	1.17	<0.02	<0.2	<0.001	<0.001	0.012	<0.001	<0.001	4.40	<0.001
UD-1-22	ditto w 25%py epid bg	201.00	202.20	1.20	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	3.45	<0.001
UD-1-23	wavy py patches bg,ditto	205.40	206.00	0.60	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	3.45	<0.001
UD-1-24	brecciated,bk v bg ditto	209.75	210.75	1.00	<0.02	<0.2	<0.001	<0.001	0.009	<0.001	<0.001	2.70	<0.001
UD-1-25	ditto	210.75	212.40	1.65	<0.02	<0.2	<0.001	<0.001	0.011	<0.001	<0.001	2.90	<0.001
UD-1-26	ditto	212.40	213.55	1.15	<0.02	<0.2	0.001	<0.001	0.015	<0.001	<0.001	3.60	<0.001
UD-1-27	ditto	218.25	219.35	1.10	<0.02	<0.2	<0.001	<0.001	0.011	<0.001	<0.001	4.10	<0.001
UD-1-28	ditto,hm in cracks	219.35	220.65	1.30	<0.02	<0.2	<0.001	<0.001	0.011	<0.001	<0.001	3.55	<0.001
UD-1-29	ditto ,no hm	220.65	221.40	0.75	<0.02	<0.2	<0.001	<0.001	0.009	<0.001	<0.001	3.40	<0.001
UD-1-30	str silcf,brx,wh q/bk v,ep bg	228.15	229.20	1.05	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	3.50	<0.001
UD-1-31	q ntwk w 25%py,ep in fiss	239.75	241.12	1.37	<0.02	<0.2	<0.001	<0.001	0.007	<0.001	0.003	3.00	0.004
UD-1-32	ditto w v minor cp	243.10	243.90	0.80	<0.02	<0.2	0.001	<0.001	0.012	<0.001	<0.001	4.00	<0.001
UD-1-33	25%py bg,q ntwk w ep	243.90	245.00	1.10	<0.02	<0.2	0.001	<0.001	0.012	<0.001	<0.001	4.50	<0.001
UD-1-34	str silcf porous ad	245.00	246.40	1.40	<0.02	<0.2	<0.001	<0.001	0.005	<0.001	<0.001	3.00	<0.001
UD-1-35	ep eye bg,wh q ntwk w 25%py	247.70	248.40	0.70	<0.02	<0.2	0.002	<0.001	0.011	<0.001	<0.001	2.90	<0.001
UD-1-36	str arg ad w/ 10%mt & 2%py	287.50	289.50	2.00	<0.02	<0.2	0.001	<0.001	0.009	<0.001	0.003	3.70	<0.001
UD-1-37	20% mt & 2%py bg wk arg ad	298.80	300.10	1.30	<0.02	<0.2	<0.001	<0.001	0.012	<0.001	0.010	5.10	<0.001
UD-1-38	dk grey clay	250.65	252.40	1.75	<0.02	<0.2	<0.001	<0.001	0.004	<0.001	0.001	3.90	0.001
UD-1-39	chocolate colored clay	252.40	254.90	2.50	<0.02	<0.2	0.002	<0.001	0.011	0.001	0.002	4.80	<0.001
UD-1-40	light grey clay	260.30	261.50	1.20	<0.02	<0.2	0.002	<0.001	0.010	0.001	0.009	4.70	<0.001
UD-1-41	ditto	262.50	267.20	4.70	<0.02	<0.2	0.002	<0.001	0.010	0.002	0.012	4.90	<0.001
UD-1-42	grey colored clay	267.70	269.20	1.50	<0.02	<0.2	0.001	<0.001	0.012	<0.001	0.007	5.00	<0.001
UD-1-43	ditto	271.30	273.00	1.70	<0.02	<0.2	0.002	<0.001	0.011	0.001	0.001	4.00	<0.001
UD-1-44	ditto	276.20	277.26	1.00	<0.02	<0.2	0.002	<0.001	0.009	0.001	0.001	4.80	<0.001

Table II-1-3-7 DDH MJPP-2 Sample List, Mt. Upao Area

Mt. UPAO DDH No.MJPP-2

Sample No.	Description of Sample	Interval in m: From	Interval in m: To	Width (m)	Au g/t	Ag g/t	As %	Sb %	Cu %	Pb %	Zn %	Fe %	Mo %
UD-2-1	1-2cm sil brx bg purple Ad	3.00	3.58	0.58	<0.02	1.0	0.003	<0.001	0.005	<0.001	<0.001	4.20	0.001
UD-2-2	local micro-druse(sil) bg	5.07	5.22	0.15	<0.02	0.4	0.003	<0.001	0.006	<0.001	<0.001	5.60	<0.001
UD-2-3	1cm gry qv bg dk pur Ad	28.50	28.62	0.12	<0.02	0.3	0.001	<0.001	0.004	0.001	<0.001	2.30	<0.001
UD-2-4	1cm brx & qv bg porous Ad	36.00	36.31	0.31	<0.02	0.5	0.002	<0.001	0.007	0.002	<0.001	4.40	<0.001
UD-2-5	1cm hm v bg.porous Ad	45.30	46.80	1.50	<0.02	<0.2	0.004	<0.001	0.006	0.002	<0.001	5.50	<0.001
UD-2-6	2-10mm hm bg.wk sil porous ad	46.80	48.30	1.50	<0.02	0.6	0.008	<0.001	0.003	<0.001	<0.001	6.80	<0.001
UD-2-7	2cm hm-qtz v bg.silicif porous	49.10	49.53	0.43	<0.02	0.2	0.002	<0.001	0.005	<0.001	<0.001	5.40	<0.001
UD-2-8	hm-qzt v bg.mod silicif ad	60.53	61.86	1.33	<0.02	0.2	0.004	<0.001	0.004	<0.001	<0.001	5.50	<0.001
UD-2-9	.5-1cm opaline qtz v bg.silic	68.15	69.60	1.45	<0.02	0.2	0.002	<0.001	0.003	<0.001	<0.001	3.70	<0.001
UD-2-10	1mm hm vlets bg wk arg Ad	75.60	77.70	2.10	<0.02	0.2	0.003	<0.001	0.004	<0.001	<0.001	6.80	<0.001
UD-2-11	ditto	77.70	78.88	1.18	<0.02	0.2	0.003	<0.001	0.003	<0.001	<0.001	6.70	<0.001
UD-2-12	milk-wh v fn grained silicif	95.47	96.43	0.96	<0.02	0.2	0.002	<0.001	0.001	<0.001	<0.001	2.40	<0.001
UD-2-13	brecciated str silicif ad	98.60	99.85	1.25	<0.02	<0.2	0.001	<0.001	0.003	<0.001	<0.001	1.30	<0.001
UD-2-14	str silicif porous andesite	109.60	109.98	0.38	<0.02	<0.2	<0.001	<0.001	0.016	<0.001	<0.001	1.60	0.001
UD-2-15	drusy str silicif ad	110.39	111.31	0.92	<0.02	0.2	<0.001	<0.001	0.001	<0.001	<0.001	2.40	<0.001
UD-2-16	ditto	115.60	116.17	0.57	<0.02	<0.2	0.004	<0.001	0.001	<0.001	<0.001	1.70	<0.001
UD-2-17	str silicif ad with 5% py	116.17	116.48	0.31	<0.02	<0.2	0.001	<0.001	0.018	<0.001	<0.001	1.50	<0.001
UD-2-18	str silicif bands(2-4cm) bg.	116.48	117.80	1.32	<0.02	<0.2	0.001	<0.001	0.001	<0.001	<0.001	2.00	<0.001
UD-2-19	7-8% py bg str silicif ad	131.24	131.40	0.16	<0.02	<0.2	0.002	<0.001	0.020	<0.001	<0.001	4.00	<0.001
UD-2-20	str silicif,py in brx	143.15	144.20	1.05	<0.02	<0.2	0.001	<0.001	0.017	<0.001	<0.001	5.00	<0.001
UD-2-21	arg+silicif alt ad	153.05	154.15	1.10	<0.02	<0.2	0.002	<0.001	0.005	0.001	<0.001	2.90	<0.001
UD-2-22	ditto	154.15	154.80	0.65	0.02	0.2	0.001	<0.001	0.038	<0.001	<0.001	2.60	<0.001
UD-2-23	1.5cm clayey v bg.silicif ad	170.20	171.00	0.80	<0.02	6.2	0.003	<0.001	0.032	<0.001	<0.001	10.00	<0.001
UD-2-24	8mm clay-qtz v bg.wk silicif	181.15	181.55	0.40	<0.02	<0.2	0.003	<0.001	0.040	<0.001	<0.001	4.50	<0.001
UD-2-25	2cm wh clay-qzt v bg,py to 20%	186.02	186.70	0.68	<0.02	<0.2	0.001	<0.001	0.024	<0.001	<0.001	5.30	<0.001
UD-2-26	ditto,with py vlts	188.70	189.20	0.50	<0.02	<0.2	<0.001	<0.001	0.018	<0.001	<0.001	5.50	<0.001
UD-2-27	ntwk of clay/qtz	190.10	191.00	0.90	<0.02	<0.2	<0.001	<0.001	0.015	<0.001	<0.001	5.50	<0.001
UD-2-28	2cm q-v str silic andesite	194.17	195.42	1.25	<0.02	<0.2	<0.001	<0.001	0.012	<0.001	<0.001	1.90	<0.001
UD-2-29	str silic 15% fn py bg ad	198.18	199.00	0.82	<0.02	<0.2	0.003	<0.001	0.014	<0.001	<0.001	2.20	<0.001
UD-2-30	ditto,15% in patches	203.05	204.32	1.27	<0.02	<0.2	0.004	<0.001	0.020	<0.001	<0.001	2.90	<0.001
UD-2-31	fn grnd qtz-v with py	244.40	245.86	1.46	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	3.60	<0.001
UD-2-32	ditto	245.86	246.60	0.74	<0.02	<0.2	<0.001	<0.001	0.007	<0.001	<0.001	2.20	<0.001
UD-2-33	irreg patchy py/qtz v bg	254.81	256.60	1.79	<0.02	<0.2	<0.001	<0.001	0.030	<0.001	<0.001	4.60	<0.001
UD-2-34	qtz ntwk(1-20mm) bg ad	276.93	278.02	1.09	<0.02	<0.2	0.001	<0.001	0.014	<0.001	<0.001	4.30	<0.001
UD-2-35	ditto	278.02	279.03	1.01	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	3.10	<0.001
UD-2-36	ditto	279.03	280.45	1.42	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	3.30	<0.001
UD-2-37	ditto	280.45	281.65	1.20	<0.02	<0.2	<0.001	<0.001	0.008	<0.001	<0.001	3.90	<0.001
UD-2-38	ditto	281.65	282.85	1.20	<0.02	<0.2	<0.001	<0.001	0.007	<0.001	<0.001	3.80	<0.001
UD-2-39	purp-grey clay	213.00	214.30	1.30	<0.02	<0.2	0.003	<0.001	0.013	<0.001	<0.001	5.40	0.001
UD-2-40	ditto	229.60	230.60	1.00	<0.02	<0.2	0.003	<0.001	<0.001	0.001	<0.001	5.40	0.002
UD-2-41	light gry clay	145.60	147.60	2.00	<0.02	<0.2	0.003	<0.001	0.021	<0.001	0.001	4.70	<0.001