PN ABT-942
93005

VALUATION OF THE BAGACAY PYRITE MINE SAMAR, PHILIPPINES

Prepared for

International Privatization Group
Price Waterhouse

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International Mineral Resource Consultants

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Prepared by

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PAH Project No. 1236.03
September 4, 1992

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1.0 INTRODUCTION

Pincock, Allen & Holt, Inc. (PAH), was retained by the International Privatization Group (IPG) to conduct a review of Philippine Pyrite Corporation's (PPC, a wholly owned subsidiary of the Philippine Phosphate Fertilizer Company) Bagacay Mine operations and assets. The Bagacay mining operations and minerals rights have been leased to PPC by APT. A privatization scheme has been designed by which both entities will contribute their assets to form a new joint-venture company. The equity participation in the venture is to be determined by the relative contributions. The new company will then be privatized with APT and PPC participating in the proceeds according to their equity holding.

PAH's scope of work was to determine the relative value of the contributed assets and therefore the equity participation of both APT and PPC in the new company. Additionally PAH determined an indicative value for the eventual disposal of the new company to the private sector.

PAH's investigation included visits to both APT and PPC headquarters in June 1992 as well as a site visit to the Bagacay operation during the week of July 5th, 1992. Facilities were reviewed and operating data collected by Mr. Mark G. Stevens, Senior Geologist, and Mr. Richard Addison, Principal Process Engineer. Project management and valuations were conducted by William Pincus VP and Manager of Mineral Economics. Upon return to PAH's U.S. offices, the results from the site visit were compiled and the evaluation completed.

The opinions and conclusions presented in this report by PAH are based on certain information furnished by PPC. While exercising reasonable professional judgement in the acceptance and use of the information provided, PAH does not warrant or guarantee the accuracy of this information.

All units of measurement presented in this report are in terms of metric units, unless otherwise stated. Tonnage figures are dry, metric tonnes (tonnes). Commodity and base metal content is reported in percent and precious metal content is reported in grams or grams per tonne. All costs are in US dollars. Historic costs, reported in US dollars are converted at the then prevailing exchange rates. Current and projected costs use a rate of P 25 to US$ 1.00.

PAH appreciates the full cooperation and assistance of PPC and APT personnel in providing the necessary information to prepare this review.

2.0 EXECUTIVE SUMMARY

2.1 Introduction

The Bagacay mining property is currently leased by the Philippine Pyrite (PPC), a wholly owned subsidiary of Philphos from the Asset Privatization Trust (APT). APT acquired the mineral rights and the then existing surface facilities through foreclosure of the Marinduque Mining Company.

The property had been operated by Marinduque through the mid 1970's. Copper was the principal economic mineral. Philphos/PPC began pyrite mining operations in the mid 1980's. Initial mining was conducted under a letter of understanding between PPC and Marinduque. When APT acquired the assets they signed an official lease agreement with Philphos.

PPC invested substantial sums to rehabilitate the existing facilities which had fallen into a state of disrepair. This amount is being recovered as a credit against lease rentals and royalties. PPC has also brought their own assets in the form of certain equipment to the property. Mining operations are currently being conducted at a rate of 1000 tonnes per day of ore. The agreement specifies that only pyrite can be recovered.

A privatization scheme has been devised by which APT will contribute its physical assets and mining rights to a newly formed company (NEWCO). PPC will contribute its physical assets and receive credit for certain development, rehabilitation and other accounts. The relative ownership of the new company (equity participation) will be based on the relative value of the contributions.

NEWCO will then be sold to private investors. APT and PPC will participate in the proceeds according to their ownership positions.

2.2 Geology and Reserves

The Bagacay deposit consists of Kuroko-type massive sulfide mineralization within the older basement volcanic and volcaniclastic rocks. In the immediate vicinity of the mine the rocks consist of highly altered rhyolitic and dacitic volcanics and tuffs, with andesitic dikes and sills. The felsic units contain relict phenocrysts of bipyramidal quartz. The rhyolite and dacite units are hydrothermally altered with strong argillization that is underlain and interlayered with layers of strong silicification and disseminated pyrite.

The mineralization consists of fine to medium grained massive pyrite, chalcopyrite, bornite, sphalerite and galena. The silver and gold bearing minerals tetrahedrite and tennantite are also reported. Quartz and occasional barite and gypsum occurs with the mineralization. Copper content decreases with depth from the top of the massive sulfide body, from chalcopyrite rich to pyrite rich. Marinduque had divided the ore into four categories:

1. Direct-shipping, high-grade copper ore
2. Yellow (high chalcopyrite) ore
3. Black (high sphalerite) ore
4. Pyrite ore

The pyrite resource/reserve for the Bagacay Mine has been estimated by PPC using a cross-sectional polygon method. The resource/reserve includes the Palosapis, Guila-Guila, and Taft deposit areas. The resulting pyrite resource consists of 7,955,000 tonnes (dry) at an average grade of 36.13 percent sulfur, as of December 31, 1991. The resource is a tabulation of all pyrite material at the specified cutoff, without regard to any mining considerations.

An ultimate pit, which included consideration of haulroad access, was designed by the PPC staff for the extraction of the pyrite ores. The pit limit was transferred to the cross sections with the sulfur polygons for the determination of the mineable reserve portion of the pyrite geologic resource. The resulting mineable reserve includes 3,494,000 tonnes (dry) of massive sulfide at an average grade of 35 percent sulfur, with a stripping ratio of 0.99 : 1 (waste to ore), as of December 31, 1991.

The copper resource/reserve for the Bagacay Mine has been estimated by PPC using a cross sectional polygon method similar to that used for pyrite. However, polygons were interpreted onto the sections to reflect the areas with a copper content greater than or equal to 0.2 percent. The cutoff grade used is a measure for tabulation purposes and was not calculated by PPC. The resulting copper resource consists of 3,268,000 tonnes (dry) at an average grade of 0.92 percent copper, as of December 31, 1991. The resource is a tabulation of all copper material at the specified cutoff, without regard to any mining considerations. Better grades of copper are present in the Palosapis and Guila-Guila area and copper content in all areas tend to decrease with depth.

A mineable copper reserve estimate has not been calculated by PPC, but it is in the range of 45 to 80 percent of the currently defined copper resource that occur within the pyrite pit limits and would likely have a slightly higher average copper grade than the resource. A reasonable assumption is that the copper reserves are 65 percent of the copper resource (15 percent occurs below the ultimate pit bottom and 20 percent occurs beyond the pit margins). A revised ultimate pit should be created that takes into consideration the economic benefit of both the pyrite and the copper.

Geologic resources of carbonaceous material exist in the Rosy-Purita and Char areas. Estimates by Marinduque as of December 31, 1980 indicate resources of

approximately 165,000 tonnes averaging ten percent copper. This material is not included in the PPC resource estimate.

Additional pyrite and copper resources occur in partially drilled areas along the massive sulfide trend to the northwest and to the southeast. Drilling to the northeast has identified massive sulfide resources in the Main Orebody, Sodyang, and Soriano.

2.3 Facilities, Production and Costs

The mining, processing, and infrastructure facilities at Bagacay consist of the following basic components:

- A small open-pit mine
- A 1,000-tonne per day capacity flotation concentrator
- A 20-kilometer long aerial-rope tramway and ocean pier
- Infrastructure facilities for a remote mining operation

Most of the components of these facilities existed prior to the resumption of operation as a pyrite-only mine in 1985. However, certain additions and improvements have been made to the operation by PPC. These are as follows:

- Rehabilitation of the flotation concentrator. (The plant was in a seriously deteriorated condition and not operational at the time of re-initiating operations.)
- Construction of a new Mobile Equipment Shop.
- Building of tailing impoundments, TP-5, TP-6, and the emergency pond.
- Building of roads to TP-4 and TP-6.
- Stripping of overburden from the open pit (Palosapis area).

- Major maintenance work undertaken on mobile equipment, the flotation plant, and the tramway.

The Bagacay Mine is an open pit operation that was initially worked for copper from 1957 until 1981. PPC initiated the production of pyrite in 1985, which continues through the present time. The planned production rate is 1,000 tonnes per day of pyrite. PPC's contractual arrangement with APT precludes the recovery of any other commodities or metals during the course of their operations.

Initial mining by Marinduque was focused on copper production and consisted of the mining of high-grade, direct-shipping ore and of milling ore. The copper grades of the ores decreased with time as mining progressed deeper into the massive sulfide mineralization. Production was from various pits developed on higher grade copper zones within the deposit. At the time of Marinduque's final production in the early 1980's the yearly ore grade was averaging approximately two percent copper.

Since resuming production from the mine in 1985, PPC has mined pyrite for the making of sulfuric acid used for fertilizer manufacture. Mining has taken place largely from the Guila-Guila pit area. PPC has recently completed the prestripping in the Palosapis mine area, with any ore material taken to the mill for processing. The mining operation has largely been inactive during 1992, with most of the production coming from the reprocessing of the old Marinduque Tailings Pond Number 4. From 1985 through 1991, 1,880,000 tonnes of pyrite ore were mined by PPC with an average grade of 36-percent sulfur.

The ore processing plant at Bagacay was constructed in 1959 at minimum cost. As such, it was built, for the most part, with used machinery and timber framing. The ore bins, which are relatively small, are made of reinforced concrete, and the thickener tanks are of wood-stave construction. The plant is built on a steep hillside

which, while facilitating gravity flow, severely restricts maintenance access. The entire plant is in one building.

The plant is designed to handle sticky ore; thus, it incorporates a washing plant which follows primary crushing in a jaw crusher. The rest of the circuit is conventional, incorporating two additional stages of crushing, two stages of grinding (rod mill followed by ball mills), separate slime and sands flotation, and dewatering of concentrates. One unusual aspect of the plant, as currently operated, is that the coarse fraction from the ball mill grinding circuits (cyclone underflows) are not subject to further upgrading but are simply reground and join flotation concentrates as final pyrite concentrate.

The entire flotation concentrator is in an extremely dilapidated state: there are very frequent equipment and system failures; there is no preventative maintenance (repairs are executed only following break-downs); and there is a minimum of clean-up work so that there is excessive accumulation of spillage and trash in and around the plant. To partially compensate for the failures there are numerous by-pass systems to allow the plant to stay operational where possible; thus, the flow sheet is constantly changing and variations of the basic system described are frequent.

Most of the pyrite concentrates are shipped from the mine to the pier at Canaybon via a 20-kilometer long aerial-rope tramway from the mill to the pier. The tramway has a maximum carrying capacity of about 1,500 tonnes per day with the system in perfect working order, sufficient buckets, and round-the-clock operation. At present, the operating capacity of the system is about 250 tonnes per day, a consequence of the poor condition of the cables, buckets, and ancillary equipment.

Facilities at the pier consist of a deep-water ship-berthing pier that can take ships of up to 8,000-tonne capacity, a concentrate storage building that has three bins

capable of storing up to 25,000 tonnes, a system of three conveyors for ship loading, and two diesel-electric generators for power supply. Ship loading is conducted by a contractor at a cost of $0.065 per tonne of concentrate.

The tramway and pier facilities are generally in poor condition due to inadequate maintenance.

The Bagacay Mine is far from established communities; thus, substantial infrastructure is required for its operation including on-site housing of senior employees and provision of community services for them. In general, the infrastructure is in fair condition.

Pyrite ore mining and processing was going well, averaging about 800 tonnes per day of ore processed up until 1990, but has since started to slump, particularly in the last year. Mining of pyrite ore was stopped in June, 1992 and it is intended not to restart mining until all the tailings in tailings containment TP-4 have been processed. With mining currently suspended, most of the mining personnel have been laid off, including the mine superintendent.

The tailings in TP-4 are expected to continue to provide plant feed for the next four months. PPC are planning to partially rehabilitate the comminution sections of the plant while processing of mined ore is suspended so that, when mining re-starts, the plant will be in better condition to process the ore.

Typical analysis and allowable minimum and maximum values of the pyrite concentrate are as follows:

Sulfur	44 percent; 44 percent minimum
Iron	44 percent
Copper	0.26 percent
Chlorine	0.04 percent
Arsenic	380 ppm; 600 ppm maximum
Moisture	9 - 11 percent; 11 percent maximum

Particle Size Analysis	68 percent passing 200 mesh

The pyrite concentrate is coarser than that purchased from other sources by Philphos and is useful to blend with other pyrite to make a coarser feed to the burner.

Production in future years could, with the rehabilitation of mine and plant equipment, easily match past production in the period 1987 through 1990. Thus, future production is shown using figures which are about average for those years.

Production parameters and expected costs are shown in Table 2-1. Projected future costs, based on the rehabilitation of the facilities and equipment, are approximately the same as those that were incurred in the period 1987 though 1990.

In order to get the facility operating at close to the design level and to keep costs to prior levels, substantial capital expenditure is required. PAH estimate that about $4 million would be needed, divided equally between the mine, mill, and tramway and pier. Future capital expenditures averaging about $ 0.75 million per year would be needed to sustain the operation.

TABLE 2-1
Bagacay Mine, Samar, Philippines
Executive Summary

Type of Deposit	Kuroko type massive sulfide
Economic Minerals	Pyrite; possibly copper, zinc, and coal
Ownership	Philippine APT (Asset Privatization Trust) and PPFC (Philippine Phosphate Fertilizer Corporation)
History/Current Status	In production as a copper mine with pyrite by-product, 1957-1981; as a pyrite mine only, 1985-date
Location	Samar Island, Philippines
Mineable Ore Reserves	3.5 million tonnes
Average Ore Grade	35 percent sulfur
Possible Remaining Mine Life	12 years
Mining Method	Open pit; about 1:1 strip ratio
Processing Method	Comminution and flotation
Processing Rate	About 800 tonnes ore/day
Product (Pyrite Conc.) Data	
Production Rate	About 540 tonnes pyrite concentrate/day
Grade	44 percent sulfur
Shipping	Via 20-km long aerial-rope tramway to shipping port; ocean shipping to fertilizer plant
Customers	PPFC fertilizer plant at Isabel, Leyte (sole customer)
Price	$47/tonne FOB shipping port
Power Requirement	2 MW; site-based diesel-electric generators
Water consumption	3,000 gpm, from local river
No. of employees	
Mine-site	404
Manila (Makati)	9
Operating Costs	
Mine	$1.25/tonne rock mined
Mill	$6.50/tonne ore processed
Concentrate transport	$4.00/tonne concentrate
G&A	$3.50/tonne ore processed
Total Cash Costs	$21.00/tonne concentrate
Capital Costs	Requires about $4 million now; about $0.75 million/year thereafter

2.4 Determination of Equity Contribution

The determination of equity contributions to NEWCO is a difficult process due to certain complex issues. First among these is the unadjusted value of the physical assets controlled by APT and PPC. APT owns major assets on the property including the mill, tramline, support buildings and other assets. PPC has ownership of most of the mobile fleet, certain power facilities and the materials and supply inventory. Valencia Appraisal Corporation (VAC) has been contracted to perform an appraisal of these physical assets and their results form an integral part of this report.

According to the VAC report (June 1992) the value of APT assets is US$ 4.84 million. The value of PPC assets is US$ 6.34 million.

Adjustments to these appraised value must be made to accurately reflect the contributed benefit. The first adjustment is for rehabilitation costs made by PPC on APT assets including mill equipment and other general repairs. The agreed basis for this is the existing book value, less accumulated depreciation, of these improvements. According to PPC this stood at US$ 1,010 as of May 1992. These expenditures have increased the value of APT assets. Adjustment is made by deducting from APT's account and adding to PPC's account.

The lease agreement between PPC and APT allows for reimbursement of major repairs over P100,000 made by PPC on APT assets. PPC has maintained a separate account for this which was P36.9 million as of May 25 1992. This account includes construction in progress (tramway repairs), tramline assets, repairs and maintenance and other accounts receivable. This amount was reduced by P8.6 million for tramway assets and P11.5 million for repairs and maintenance, two sub headings included in this account. The tramway assets were included in the VAC appraisal of PPC assets.

PPC has already received the useful benefit of the repairs and maintenance and should receive no further credit in this accounting.

The resulting sum of P16.8 (US$ 670,000) is subtracted from APT's account and added to PPC's.

Additional value must be added to PPC's account for the development costs that they have expended on the property. These have not been included in the VAC physical asset appraisal. This includes waste rock stripping at Palosapis. These are real improvements that will add value to NEWCO; i.e. since these costs have already been incurred by PPC they will not have to be spent by the eventual buyers of NEWCO. This should be reflected in a higher selling price. The current value of development costs is US$ 301,000.

These costs have been accumulated in PPC's work in progress account. The book value, net of accumulated depreciation, according to records provided by PPC was P 14.25 million (US$ 570,000) in May, 1992.

Benefit for ownership of the mining rights has been given to APT. A capitalized lease value of US$ 1.29 million was determined. Additional value for known copper resources is also given. That value based on comparative sales of other copper reserves is US$ 1.03 making a total mineral right value of US$ 2.3 million.

This account is for advances made by PPC on APT's behalf. It covers such items as property taxes and other advances agreed in the lease contract. It does not include PPC advances for expenses over P100,000. A sum of P27.5 million (US$1.1 million) is applied to APT's account.

According to the terms of the APT/PCC lease, PCC is allowed to deduct all repairs (over P100,000) on APT assets plus other agreed advances from lease rentals and royalties. During the period of the lease PCC has deducted an amount equal to all the lease rental and royalties; i.e. they have made no payments. As PCC is receiving credit for all the rehabilitation costs incurred through adjustments described above, APT must receive credit for the withheld payments. Withheld lease rental and royalties now total US$1.32 million. This is credited to APT's account.

The equity contribution of APT and PPC to NEWCO is based on the adjusted value of their relative asset contributions. For the purpose of this valuation it is assumed that working capital contributions are restricted to material and supplies inventories. No cash, accounts receivable or other contributions are included.

The summary of asset contributions and adjustments are presented in Table 2-2. APT's contribution is 42 percent. PPC's contribution is 58 percent.

2.5 NEWCO Valuation

The purpose of this analysis was to determine an indicative value for NEWCO, i.e. the Bagacay Mine and its related facilities. The valuation has been based on discounted cash flow analysis, an income approach to value.

The analysis has been undertaken in "constant" 1992 US dollar terms, (ie., not escalated for inflation), and incorporates a period of 12 production years estimated to be the remaining mine life. Accordingly, no continuing value calculations were made. Capital and operating cost data inputs were derived from the technical analysis presented in this report. Cash flows were developed on both a "pre" and "post" tax and pre-financing, basis.

Although the potential for other mineral production, particularly copper and gold exists, it has not been included in the indicative value. At this point in time there are no quantified copper or gold reserves. Recover of copper from existing tailings is unlikely. Furthermore, considerable sums for exploration and new capital improvement will be required before any production is possible. Due to these reasons and the lack of reliability in any quantification of this potential PAH believes that a prudent buyer would assign little or no value.

TABLE 2-2
Equity Contribution to NEWCO
(US$ 000)

	APT	PPC
Physical Assets (Per VAC)	$4,840	$6,337
Rehab Cost Adjust	($1,010)	$1,010
Repairs over P100,000	($670)	$670
Mineral Rights	$2,312	
Development Costs		$301
Lease Rental Credit	$1,321	
Receivables from APT		$1,100
Totals	$6,793 42%	$9,418 58%

Net Present Value (NPV), calculations were carried out in constant terms using a range of discount rates from 15 to 25 percent. In this analysis, no attempt was made to derive an appropriate discount rate that would adequately define individual components of risk associated with acquisition of the Bagacay Mine operation.

Using a 20 percent discount rate, the pre tax cash flow generated from the Bagacay Mine would have a NPV of US$ 6.704 million.

A sensitivity analysis was performed to gauge the impact that changes in key variables have on the cash flow NPVs. The effect of a ten percent change in FOB selling price, capital and operating costs were evaluated. Table 2-3 below summarizes the results of the sensitivity analysis at various discount rates.

TABLE 2-3
Sensitivity Analysis
NPVs of Pre Tax Cash Flow (US$ Millions)

DISCOUNT RATE:	15.0%	20.0%	25.0%
BASE CASE:	9.22	6.70	4.94
CAPITAL COST:			
10 percent increase	8.47	6.04	4.34
10 percent decrease	9.97	7.37	5.54
OPERATING COST:			
10 percent increase	7.88	5.61	4.03
10 percent decrease	10.56	7.80	5.85
FOB CONCENTRATE PRICE:			
10 percent increase	13.11	9.84	7.52
10 percent decrease	5.33	3.57	2.35

2.6 Potential Copper Value

Although the above analysis includes only pyrite, considerable potential for development of new copper reserves exists. This is discussed in Section 4.0, the

geology and reserve review. It is PAH's current opinion that this potential can be best realized by developing new massive sulfide type reserves similar to those produced by Marinduque in the 1960's and 1970's. The known resources of carbonaceous copper and low grade material in the current mine area offer little prospect for significant economic benefit.

To illustrate the potential profitability of any new development PAH has constructed a hypothetical scenario by which, after an initial two year exploration and development period, copper reserves are exploited. During the initial years pyrite will continue to be produced.

Using the above assumptions the pre-tax NPV varies from US$22.1 million (15% discount rate) to US$12.5 million (25% discount rate). Annual cash flows of US$4.8 million are projected. It must be remembered that these projections are currently hypothetical and based on assumptions of what might be found and not on any known reserve. The project is very sensitive to changes in ore grade and, as such, economic projections could change substantially. A level of risk is a part of any exploration program and there is no guarantee of success. The permissive geologic environment should, however, encourage investors to take that risk.

3.0 GENERAL INFORMATION

3.1 Location

The Bagacay Mine is located approximately 600 kilometers southeast of Manila on the island of Samar. The mine is located in the central part of the island in the municipality of Hinabangan of Samar Province. A general location map is shown in Figure 3-1. A paved highway crosses the island just north of the Bagacay Mine and connects the east and west coasts.

A port facility for shipping the pyrite concentrates is located at Canaybon on the east side of the island of Samar. The concentrates are delivered to the port either by aerial-rope tramway or by truck. The pyrite concentrates are then shipped by freighter to the Philippine Phosphate Fertilizer Company plant at Isabel on the southwestern side of the island of Leyte.

An airstrip services the Bagacay Mine and chartered flights are arranged from Cebu City on the island of Cebu. Domestic airline flights fly between Manila and Cebu several times daily.

The area has a tropical climate with an annual rainfall between 4 and 5 meters. The rainy season generally is between November and March. The topography of the area is rugged and is marked by steep limestone hills with streams draining the incised valleys. Elevation in the immediate mine area range from 100 to 300 meters above sea level. Dense jungle vegetation covers the area.

3.2 History

A brief chronology of the Bagacay Mine history is as follows:

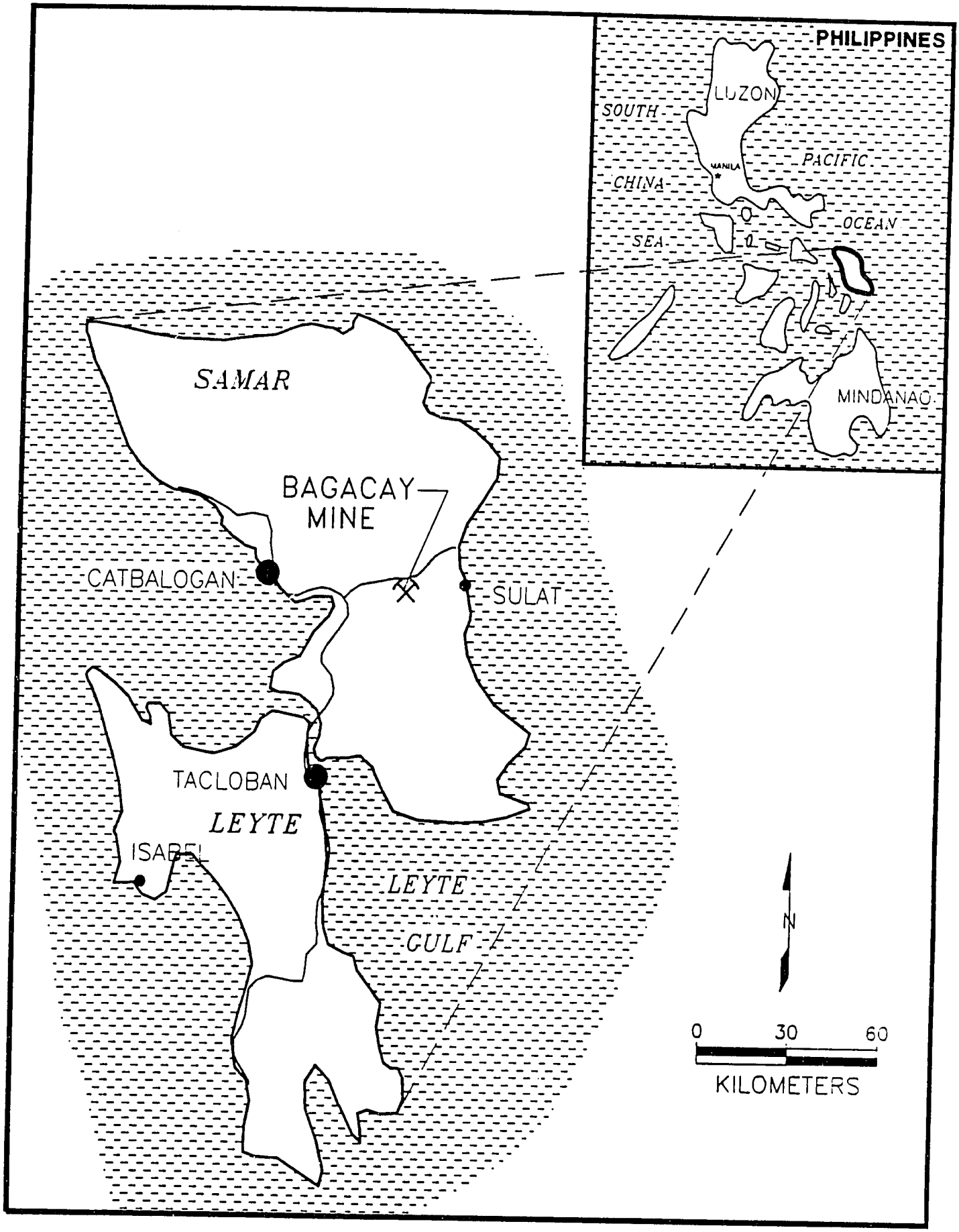

FIGURE 3-1
BAGACAY MINE GENERAL LOCATION

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Date	
1954	Discovery of deposit.
1957	Marinduque initiates production. Much of initial production is direct shipping ore.
Mid 1977	Operation temporarily suspended.
Aug. 1978	Operations resumed.
Oct. 1979	Operations suspended again. Deteriorating copper price and escalating cost of oil, spare parts, and other materials.
Mar. 1979	Operations resumed again.
Feb. 1981	Marinduque copper mining and milling operations finally ceased due to unfavorable economic conditions.
1982	Marinduque undertakes coal exploration and development.
1983	Coal exploration continues and faltering startup of coal mining operation.
July 1984	Memorandum of Agreement between Marinduque and Philphos to produce pyrite concentrates.
Late 1984	Joint foreclosure of mine by the Development Bank of the Philippines and the Philippine National Bank to satisfy indebtedness.
1985	Bagacay Mine assets transferred to the APT.
1985	Lease agreement to produce pyrite concentrates signed by APT and PPC.
1985	Production initiated by PPC.
1992	Production of pyrite concentrates by PPC continues.

3.3 Land Status

In the mid-1950's, Marinduque staked mining claims over the Bagacay deposit and adjacent areas. Philippine mining claims are 300 meters by 300 meters. Since the closure of the mine by Marinduque in the mid-1980's many of the original claims have expired. However, thirteen of these claims are still valid and are leased by PPC from APT. The thirteen claims cover the Soriano Outcrop, Main Orebody, and Palosapis areas, but not the Guila-Guila and Taft pit areas. PPC has staked additional claims covering these areas as well as much of the area originally covered by the Marinduque claims. A map of the claims is shown in Figure 3-2. PAH did not conduct a detailed verification of mineral claim validity.

The mineral claims are overlapped by several coal blocks administered by the Philippine Department of Energy Affairs. The blocks are 2,700 meters wide by 3,700 meters long. Coal Operating Contracts (COC) for two of the coal blocks have been assigned to Bagacay Development Company (BADECO), including Block 209 and Block 210. BADECO is currently mining coal on a small scale, limited tonnage basis, from underground mines northeast of the village of Bagacay. BADECO is trucking the coal to PPFC's fertilizer plant on Leyte where it is used in conjunction with coal from other sources. PPC has investigated the possibility of applying for these COC's in the future. The Bagacay coal is subbituminous and has heating values of 7,500 to 8,500 BTU/pound, but has a sulfur content averaging four percent.

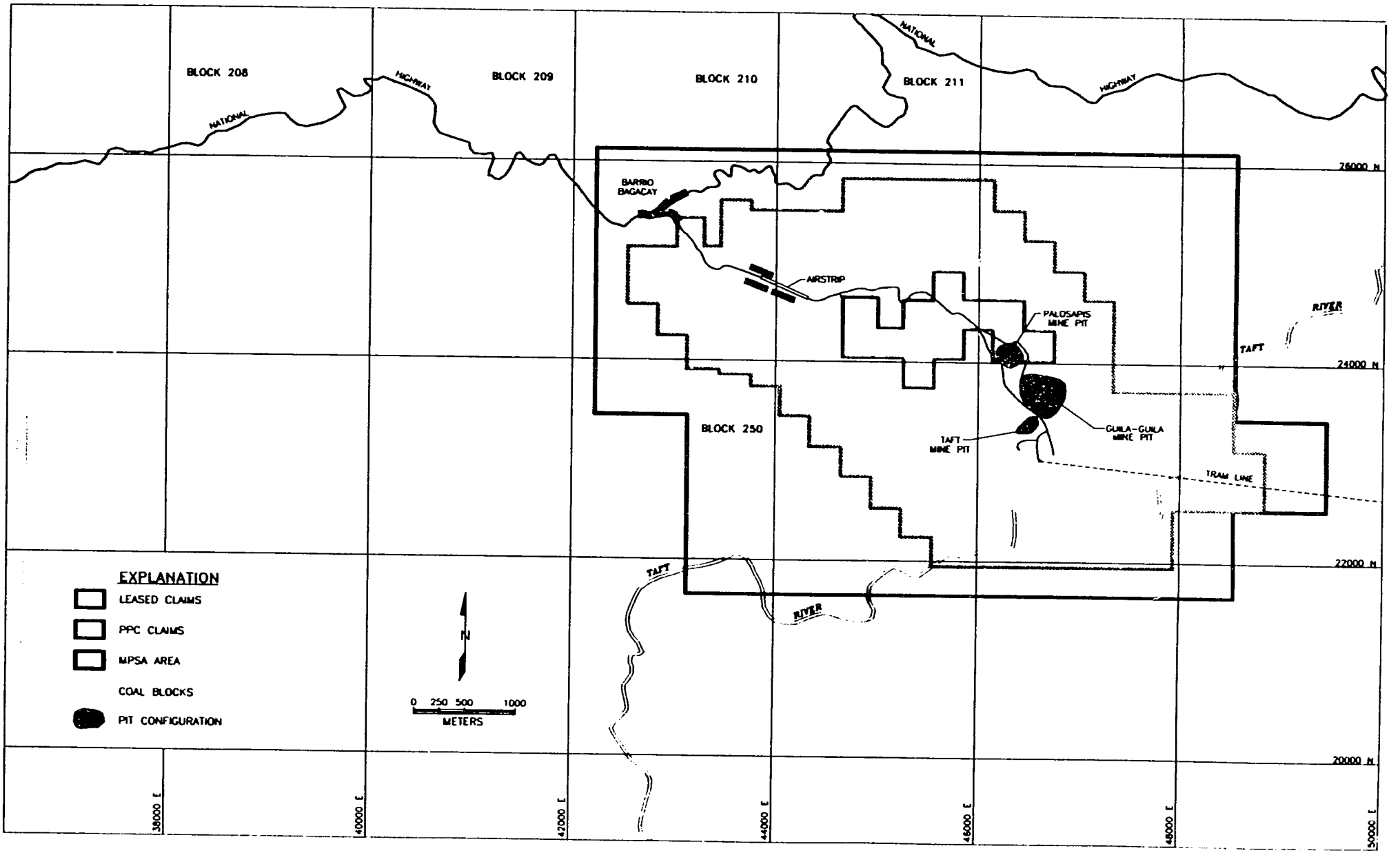

FIGURE 3-2
BAGACAY MINE CLAIM LOCATION MAP

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4.0 GEOLOGY AND RESERVE REVIEW

4.1 Regional Geology

The Bagacay Mine occurs in a region underlain by Tertiary to Quaternary age volcanic and sedimentary rocks. The older or so called "basement" rocks consist of an early Tertiary (Paleocene to Oligocene) sequence of dacitic volcanic flows, volcanic breccias, and volcaniclastics. Unconformably overlying the basement assemblage are late Tertiary (Pliocene) age sediments deposited on an erosional surface developed on the basement rocks.

The lowermost unit of the sedimentary sequence consists of interbedded clastic rocks, including sedimentary tuffs and shales derived from the erosion of the basement assemblage. Interbedded with the shales are layers and beds of carbonaceous material or low rank coal. Marine coralline limestone, ranging in thickness to over 150 meters, forms a cap rock over the area and predominates the present topography. Subsequent uplift, weathering and erosion has dissected the area, resulting in a knobby karstic topography.

4.2 Deposit Geology

The Bagacay deposit consists of Kuroko-type massive sulfide mineralization within the older basement volcanic and volcaniclastic rocks. In the immediate vicinity of the mine the rocks consist of highly altered rhyolitic and dacitic volcanics and tuffs, with andesitic dikes and sills. The felsic units contain relict phenocrysts of bipyramidal quartz. The rhyolite and dacite units are hydrothermally altered with strong argillization that is underlain and interlayered with layers of strong silicification and disseminated pyrite. Figure 4-1 shows the general geology of the mine area.

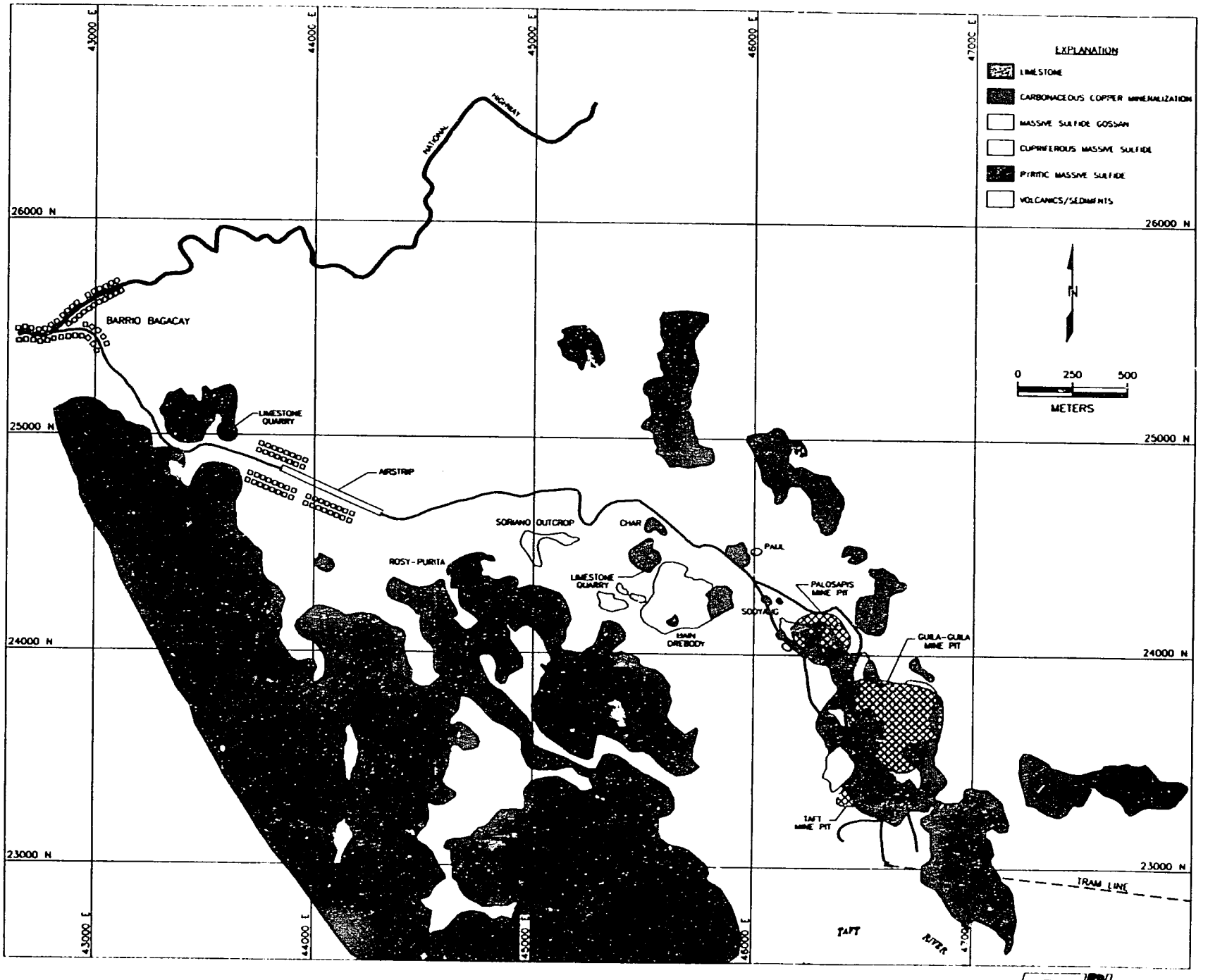

FIGURE 4-1
BAGACAY MINE GEOLOGY

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The deposit consists of pods, lenses, and beds of massive sulfide (50 to 95 percent pyrite) and massive sulfide fragmental material that is interlayered within the altered felsic volcanic sequence. Mineralization is distributed along a northwest-southeast trending zone with a length in excess of 2,000 meters and a maximum width of 600 meters. Massive sulfide beds range up to 60 meters thick and occur over an approximately 100 meter stratigraphic interval. The massive sulfide horizons have shallow dips. Minor post-mineral faulting has occurred throughout the property area. Mineralized areas along the zone include, from northwest to southeast, Soriano Outcrop, Main Ore Body, Paul, Sodyang, Palasopis, Guila-Guila, and Taft.

The mineralization consists of fine to medium grained massive pyrite, chalcopyrite, bornite, sphalerite and galena. The silver and gold bearing minerals tetrahedrite and tennantite are also reported. Quartz and occasional barite and gypsum occurs with the mineralization. Copper content decreases with depth from the top of the massive sulfide body, from chalcopyrite rich to pyrite rich. Marinduque had divided the ore into four categories:

1. Direct-shipping, high-grade copper ore
2. Yellow (high chalcopyrite) ore
3. Black (high sphalerite) ore
4. Pyrite ore

Oxidation and weathering at the surface exposure of the massive sulfide has resulted in a crusty iron oxide cap or gossan that typically is several meters thick. Underlying the gossan in areas of chalcopyrite mineralization, the deposit has locally undergone supergene enrichment of the copper content as surface exposures were leached and the dissolved copper was transported downward and redeposited. This formed the direct shipping ores. Secondary minerals include chalcocite and lessor covellite

replacement of primary sulfides, occurring upwards of several meters below the gossan.

Copper grades in the enriched zones typically ranged from 8 to 20 percent copper and consisted mainly of chalcopyrite, sphalerite, and chalcocite and was direct shipped during early operations. Copper grades typically decrease downward in the deposit into massive pyrite ores. Medium grade ores ranged from 4 to 8 percent copper and consisted of pyrite, chalcopyrite, and sphalerite. The low grade ores are largely pyritic and range up to four percent copper. In the mine pit areas most of the high and medium grade ores have been removed, with the remaining mineralization ranging from 0.3 to 3.0 percent copper.

Arsenic is present at the levels of several hundred parts per million. Recent outcrop samples for precious metals have indicated values from 0 to 8 grams of gold per tonne and 10 to 244 grams of silver per tonne. Historical mining records suggest the significance of the gold and silver content were relatively minor.

Sulfide mineralization of carbonaceous or coal beds has also been identified and mined on the property. The carbonaceous mineralization occurs in 0.5- to 5.0-meter thick low-rank coal beds associated with the clastic sequence that unconformably overlies the basement volcanic package and underlie the limestone cap. Sulfides within the carbonaceous seams consist of chalcopyrite, bornite, enargite, chalcocite, and covellite, associated with pyrite and marcasite that replace original peat or lignitic materials. The carbonaceous ores locally have been found to be of high grade, containing 10 to 25 percent copper. Broader areas of lower grade mineralization occurs. Deposits of this type occur in the Char and Rosy-Purita areas and are relatively localized. These deposits appear to be the result of chemical weathering of the massive sulfides along the Pliocene paleosurface with the redeposition of the copper syngenetically with coal deposition, in adjacent topographically low areas.

While copper-bearing coals are relatively localized, low-rank coal beds occur over much of the region and have been evaluated for energy production potential. Coal beds occur up to 5-meters thick and consist of subbituminous B grade coal. The coal has a heating value of around 7,500- to 8,500-BTU/pound, but has a sulfur content of approximately four percent. The coal is currently being mined in small scale operations near the village of Bagacay by Bagacay Development Company (BADECO).

4.3 Exploration Review

The Main orebody of the Bagacay deposit was discovered in 1954 and was followed shortly thereafter by additional discoveries in adjacent areas. The property was initially explored by trenching and core drilling. Mining of the deposits began in 1957 and was guided by earlier exploration work before the ore bodies were completely defined.

Initial exploration and mining focused on high grade, direct shipping copper ores and more than 300 exploration holes were drilled in the property, with most holes less than 50 meters deep. The holes were drilled on an irregular rhomboid grid pattern, with an average spacing from 30 to 40 meters, with much wider to nonexistent drilling towards the deposit margins. The margins of the deposit remain undefined in many areas and the complete lateral extent of the deposit remains to be delineated.

Both core and sludge were recovered from the massive sulfide zones due to variable core recovery. The average of the core and sludge grades were used for subsequent calculations. Core was routinely assayed for copper, zinc, and sulfur by Marinduque's on site laboratories.

In 1972-1973, McPhar Geophysics conducted an extensive geophysical survey over the deposit area. The survey consisted of induced polarization and resistivity measurements from the Rosy-Purita, Soriano Orebody, Char, Main Orebody, Sodyang, Palosapis, Guila-Guila, and Taft deposit areas.

In the Rosy-Purita area, a shaft was sunk and several adits were driven to evaluate the high grade carbonaceous mineralization. The shaft is currently filled with water and the adits have partially collapsed.

Since the initiation of mining by PPC in 1985, additional core holes have been drilled at select locations in active pit areas to verify pyrite reserve estimates.

4.4 Resource/Reserve Estimation

Pyrite

The pyrite resource/reserve for the Bagacay Mine has been estimated by PPC using a cross-sectional polygon method. The resource/reserve includes the Palosapis, Guila-Guila, and Taft deposit areas. For this approach east-west cross sections of the drill holes were created at 20 meter intervals. Polygons were interpreted onto the sections to reflect the areas with a sulfur content greater than or equal to 20 percent. The cutoff grade is based on economic parameters and was calculated by Vulcan Mining Consultants.

The area of the polygons were then measured for each 5 meter bench increment and projected 10 meters on either side of the section to obtain a volume estimate. The average sulfur grade of each polygon for each 5 meter bench increment was determined from the drill hole assays for that polygon/bench. To convert the material volumes into tonnes a specific gravity of 3.3 grams per cubic centimeter was used for

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TABLE 4-1
BAGACAY MINE
MINEABLE PYRITE RESERVE

MASSIVE SULFIDE

Bench	Ore Tonnes (dry)	Grade % S	Waste Tonnes (dry)	Total Tonnes (dry)	Stripping Ratio
230	12,052.8	40.11	0	12,052.8	0.00
225	65,576.7	33.43	0	65,576.7	0.00
220	185,031.0	33.09	171,288.0	356,319.0	0.93
215	235,075.5	38.41	193,518.0	428,593.5	0.82
210	229,284.0	35.09	194,571.0	423,855.0	0.85
205	190,971.0	34.36	225,576.0	416,547.0	1.18
200	174,636.0	33.23	216,918.0	391,554.0	1.24
195	100,534.5	36.23	268,047.0	368,581.5	2.67
190	162,485.1	35.31	143,637.3	306,122.4	0.88
185	223,335.9	38.35	214,943.4	438,279.3	0.96
180	269,455.5	33.11	313,803.9	583,259.4	1.16
175	219,264.3	32.37	290,198.7	509,463.0	1.32
170	340,061.4	37.60	482,587.2	822,648.6	1.42
165	538,312.5	36.13	351,126.0	889,438.5	0.65
160	357,588.0	33.91	198,900.0	556,488.0	0.56
155	190,228.5	31.17	195,039.0	385,267.5	1.03
Totals	3,493,892.7	35.00	3,460,153.5	6954046.2	0.99

TAILINGS PONDS

No. 4	250,000.0	36.17	---	250,000.0	---
No. 1&2	50,000.0	---	---	50,000.0	---
Totals	300,000.0	---	---	300,000.0	---

Note:
1. Reserves as of December 31, 1991.
2. Tailings pond Number 4 at original tonnage before reprocessing.
3. Dry tonnes calculated from wet tonnes estimated by PPC, using a ten percent moisture factor.

indicated that pyrite ore losses may be partially offset by material classified as argillized, that can consist of as much as 35 percent massive pyrite in "pockets."

The old Marinduque mill tailings represent additional pyrite reserves and are currently being processed by PPC. This material was previously processed for the copper and the pyrite and other waste minerals ended up in one of several tailings impoundments created by Marinduque. Tailings material was drilled and sampled, with subsequent material estimates made using polygonal cross section methods. Tailings pond #4 is partially reprocessed (about 40 percent), with a reported four months of production remaining; it originally contained approximately 250,000 tonnes (dry) averaging 0.99 percent copper, 1.35 percent zinc, 0.14 percent arsenic, 31.92 percent iron, and 36.17 percent sulfur. Tailings pond #1 & 2 (combined) contain (after erosion considered) approximately 50,000 tonnes (dry) averaging 2.00 percent copper and 1.80 percent zinc. PPC's tailing ponds #5 and # 6 may contain approximately 775,000 tonnes (dry), but remain to be sampled and evaluated.

Additional pyrite and copper resources occur in partially drilled areas along the massive sulfide trend to the northwest and to the southeast. Drilling to the northeast has identified massive sulfide resources in the Main Orebody, Sodyang, and Soriano Outcrop areas, which are not included in the PPC resource/reserve estimate. Estimates by Marinduque as of December 31, 1980 indicate resources in excess of one million tonnes, mostly with low copper grades. There is a reasonably good likelihood of additional zones of massive sulfide along this trend in areas where no drilling has been conducted.

Copper And Zinc

The copper resource/reserve for the Bagacay Mine has been estimated by PPC using a cross sectional polygon method similar to that used for pyrite. However, polygons

were interpreted onto the sections to reflect the areas with a copper content greater than or equal to 0.2 percent. The cutoff grade used is a measure for tabulation purposes and was not calculated by PPC. The resulting copper resource consists of 3,268,000 tonnes (dry) at an average grade of 0.92 percent copper, as of December 31, 1991. The resource is a tabulation of all copper material at the specified cutoff, without regard to any mining considerations. Better grades of copper are present in the Palosapis and Guila-Guila area and copper content in all areas tend to decrease with depth.

A mineable copper reserve estimate has not been calculated by PPC, but it is in the range of 45 to 80 percent of the currently defined copper resource that occur within the pyrite pit limits and would likely have a slightly higher average copper grade than the resource. A reasonable assumption is that the copper reserves are 65 percent of the copper resource (15 percent occurs below the ultimate pit bottom and 20 percent occurs beyond the pit margins). A revised ultimate pit should be created that takes into consideration the economic benefit of both the pyrite and the copper.

A mineable zinc resource or reserve estimate has not been calculated by PPC. A cursory inspection of drill hole assay logs suggested that for pyritic mineralization a roughly 1 to 1 correspondence between zinc and copper. On this basis it would be anticipated that the amount of zinc present is roughly similar to that of the copper.

During 1980 and 1981, before the final mine shutdown, Marinduque reported average grade for mined ore of approximately 2.2 percent copper and 3.0 percent zinc.

Geologic resources of carbonaceous material exist in the Rosy-Purita and Char areas. Estimates by Marinduque as of December 31, 1980 indicate resources of approximately 165,000 tonnes averaging ten percent copper. This material is not included in the PPC resource estimate.

Precious Metals

Recent outcrop samples for precious metals have indicated values from 0 to 8 grams of gold per tonne and 10 to 244 grams of silver per tonne. Historical mining records suggest the significance of the gold and silver content were relatively minor.

4.5 Mineral Potential

The Bagacay massive sulfide has been mined in select locations along its trend where good copper grades were found to exist. However, many areas along the trend have only been partially drilled or not drilled at all, leaving significant gaps that warrant additional exploration. To the northwest along the trend several clusters of drill holes occur around areas where higher grade copper values were found by Marinduque, with some high grade mining of near surface material. Good exploration potential for copper, zinc, and pyrite exists in the areas in and around the Soriano Outcrop, Main Orebody, and Sodyang. To the southeast, geology and geophysics suggest that the massive sulfide may continue under the mill area and further, offering additional potential for copper, zinc, and pyrite.

Regionally, several other massive sulfide target areas were identified by Marinduque and were partially evaluated. PAH did not conduct a detailed review of any of these properties, although they would seem to be good exploration targets. The Abel Prospect (Tower 7 Anomaly) occurs 1.5 kilometers to the east of the mill area, along the tram line. The Camp Number 3 Prospect occurs 2.0 kilometers to the south of the mill area.

Thirteen kilometers to the southeast another cluster of massive sulfide prospects were prospected during the 1960's and 1970's in the Trident Copper Project area.

Drilling and underground exploration at that time indicated similar geology and mineralization to that of the Bagacay deposit.

The Bagacay Mine area and surrounding region offers good exploration potential for finding additional Kuroko-type massive sulfide deposits. A systematic and well planned exploration program would be required to minimize expenses and overcome potential logistical problems. A properly funded exploration program would require $250,000 to $750,000 per year.

5.0 FACILITIES, PRODUCTION, AND COSTS

5.1 Facilities

The mining, processing, and infrastructure facilities at Bagacay consist of the following basic components:

- A small open-pit mine
- A 1,000-tonne per day capacity flotation concentrator
- A 20-kilometer long aerial-rope tramway and ocean pier
- Infrastructure facilities for a remote mining operation

Most of the components of these facilities existed prior to the resumption of operation as a pyrite-only mine in 1985. However, certain additions and improvements have been made to the operation by PPC. These are as follows:

- Rehabilitation of the flotation concentrator. The plant was in a seriously deteriorated condition and not operational at the time of re-initiating operations.

- Construction of a new Mobile Equipment Shop.

- Building of tailing impoundments, TP-5, TP-6, and the emergency pond.

- Building of roads to TP-4 and TP-6.

- Stripping of overburden from the open pit (Palosapis area).

- Major maintenance work undertaken on mobile equipment, the flotation plant, and the tramway.

In addition, PPC has contributed assets that are currently maintained for their own accounts. These include:

- Building of the new power plant.
- Mobile equipment brought in by PPC.
- The stores inventory that PPC has purchased.

There are currently 404 employees at the mine. The distribution of these employees within the major operating sections are as follows:

Mine	40
Mill	114
Tramline and pier	135
Administration	115

PPC also maintains a staff of nine people within the PPFC office in Manila. The Manila staff includes the President and the Manager of the company and several accounting people.

The mine, mill, tramway and pier, and infrastructure are described in the following text.

Mine

The Bagacay Mine is an open pit operation that was initially worked for copper from 1957 until 1981. PPC initiated the production of pyrite in 1985, which continues through the present time. The planned production rate is 1,000 tonnes per day of pyrite. PPC's contractual arrangement with APT precludes the recovery of any other commodities or metals during the course of their operations.

Initial mining by Marinduque was focused on copper production and consisted of the mining of high-grade, direct-shipping ore and of milling ore. The copper grades of the ores decreased with time as mining progressed deeper into the massive sulfide mineralization. Production was from various pits developed on higher grade copper zones within the deposit. At the time of Marinduque's final production in the early 1980's the yearly ore grade was averaging approximately two percent copper.

Since resuming production from the mine in 1985, PPC has mined pyrite for the making of sulfuric acid used for fertilizer manufacture. Mining has taken place largely from the Guila-Guila pit area. PPC has recently completed the prestripping in the Palosapis mine area, with any ore material taken to the mill for processing. The mining operation has largely been inactive during 1992, with most of the production coming from the reprocessing of the old Marinduque Tailings Pond Number 4. From 1985 through 1991, 1,880,000 tonnes of pyrite ore were mined by PPC with an average grade of 36 percent sulfur.

Mining is conducted on 5-meter benches with a planned production rate of 1,000 tonnes per day of pyrite. The PPC mine planning group has designed an ultimate pit configuration for the mining areas. Little long term mine planning is conducted for the operation. The PPC mineable reserves estimate as of December 31, 1991 is 3,494,000 tonnes of ore at an average grade of 35 percent sulfur, with a stripping ratio of 0.99:1. Copper reserves have not been calculated.

The drilling and blasting are conducted by a contractor. To achieve the necessary breakage of the rock, blastholes are placed at three meter intervals. Excavation and haulage to the mill is conducted by PPC using trucks and shovels. The prestripping from the Palosapis pit was also conducted by a contractor.

Rainfall ranging from 4- to 5-meters a year combined with the presence of clay layers in the deposit requires special operating considerations. Limestone is quarried at two locations on the property and is used as a road base for mine access and pit haulage roads to provide traction and prevent getting stuck. Loading and hauling equipment availabilities historically decline during the higher rainfall months resulting in a drop-off of material movement.

Increasingly in recent years, operation inefficiencies have also resulted from the poor condition of the mobile fleet; this has precluded reaching planned production capacity. The fleet includes both APT (from the Marinduque operation) and PPC equipment and is itemized in Table 5-1. The equipment is subject to frequent breakdowns and no replacements have been purchased to replace the ageing equipment.

Mill

The ore processing plant at Bagacay was constructed in 1959 at minimum cost. As such, it was built, for the most part, with used machinery and timber framing. The ore bins, which are relatively small, are made of reinforced concrete, and the thickener tanks are of wood-stave construction. The plant is built on a steep hillside which, while facilitating gravity flow, severely restricts maintenance access. The entire plant is in one building.

The plant is designed to handle sticky ore; thus, it incorporates a washing plant which follows primary crushing in a jaw crusher. The rest of the circuit is conventional, incorporating two additional stages of crushing, two stages of grinding (rod mill followed by ball mills), separate slime and sands flotation, and dewatering of concentrates. One unusual aspect of the plant, as currently operated, is that the coarse fraction from the ball mill grinding circuits (cyclone underflows) are not subject to further upgrading but are simply reground and join flotation concentrates

TABLE 5-1
Bagacay Mine
Mine Equipment List

Item/Number	Ownership	% Mechanical Availability	% Mechanical Utilization
Hauling			
Euclid 13t UD-2-04	APT	53.42	53.26
Euclid 13t UD-2-06	APT	18.69	55.51
Isuzu 10t IDT-101	PPC	6.47	64.52
Isuzu 10t IDT-102	PPC	10.03	54.20
Isuzu 10t IDT-103	PPC	37.01	73.03
Isuzu 10t IDT-170	PPC	38.35	55.02
Isuzu 10t IDT-171	PPC	36.13	69.35
Isuzu 10t IDT-173	PPC	16.67	61.11
Komatsu 18t KDT-180	PPC	42.64	75.52
Komatsu 18t KDT-181	PPC	45.46	72.62
Komatsu 18t KDT-182	PPC	39.80	61.26
Komatsu 18t KDT-183	PPC	14.23	61.68
Komatsu 18t KDT-184	PPC	41.04	71.18
Komatsu 18t KDT-185	PPC	33.67	78.04
Loading			
Traxcavator TX-210	APT	34.55	74.26
Traxcavator TX-211	PPC	54.94	67.84
Cat Power Shovel PS-279	PPC	85.97	76.90
Wheel Loader WL-314	PPC	39.56	39.56
Wheel Loader WL-315	PPC	65.68	81.38
Dozing			
Cat D7S BD-416	APT	20.16	66.76
Cat D7G BD-417	APT	41.76	80.67
Cat D8H BD-418	APT	13.58	69.32
Cat D8 BD-465	APT	40.16	81.00
Cat D8N BD-486	PPC	80.76	83.97
Ancillary			
Motor Grader MG-519	APT	72.70	53.20
Vibrating Compactor	APT	48.68	37.74

Note: For the year 1991.

as final pyrite concentrate. A flow diagram of the plant is presented in Figure 5-1.

Run-of-mine ore and/or reclaimed tailings are dumped on a receiving patio and moved by front-end loader over the slots of two parallel 36-inch wide apron feeders that feed the single 18- x 30-inch double-toggle jaw crusher. Located between the apron feeders and jaw crusher are vibrating grizzlies which are no longer functional and are now covered with steel plates. With the vibrating grizzlies not operational, copious amounts of water are used to move the ore across the covering plates and into the crusher.

The crusher discharge flows to two parallel horizontal drum scrubbers and thence to 3- x 6-foot vibrating screens making a 3/8-inch separation. Screen oversize is conveyed to a 36-inch gyratory crusher crushing to minus 2 inches. The gyratory crusher product is conveyed to two, 75-tonne capacity each, coarse ore bins.

Washing circuit screen undersize flows to screw classifiers. Classifier sands are conveyed to three, 100-tonne capacity each, fine ore bins. Classifier slimes are cycloned and the coarse fraction is returned to the classifiers while the fine fraction flow to a thickener ahead of slime flotation. The thickened slimes are floated in a roughing-only flotation circuit to produce final pyrite concentrate and final tailings.

The ore in the coarse ore bins is tertiary crushed in two parallel, open-circuit crushing/screening systems. One of the two systems is currently inoperative having been cannibalized to keep one operational. Ore from the coarse ore bin is fed by reciprocating feeder to a 3- x 6-foot vibrating screen making a 3/8-inch separation; the oversize is crushed in a 36-inch short-head cone crusher, and the combined screen undersize and crusher product is conveyed to the fine ore bins.

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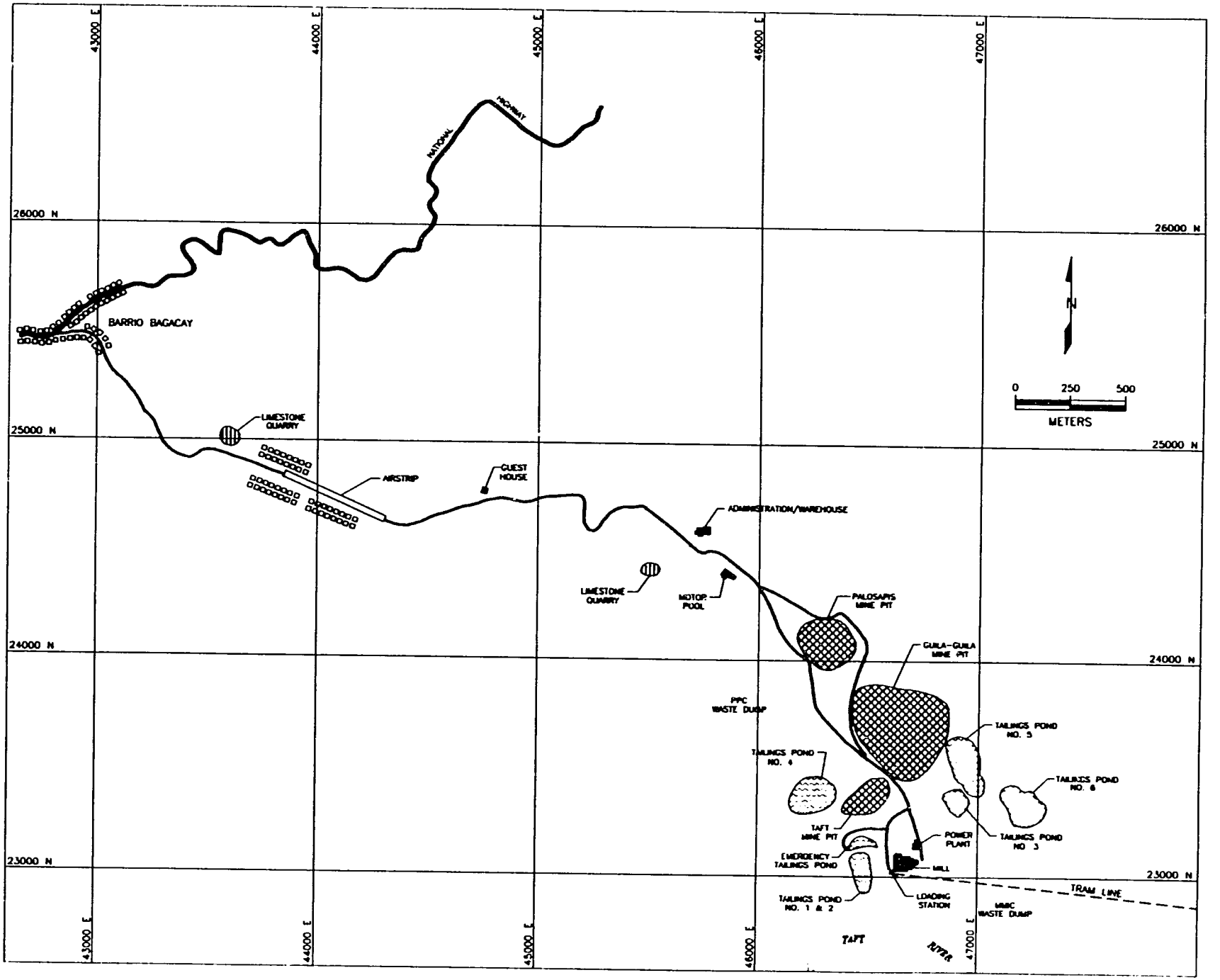

FIGURE 5-1
BAGACAY MINE GENERAL SITE LAYOUT

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Ore from the fine ore bins is conveyed to the rod mill and rod mill product is reground in three parallel ball mills. The rod mill is operated in open circuit and the ball mills in closed circuit with cyclones. Cyclone underflow is reground in secondary ball mills and passes directly to the final concentrate stream; cyclone overflow is subjected to simple rougher flotation with the concentrate joining that from slimes flotation and reground cyclone underflow to the concentrate dewatering circuit.

The combined pyrite concentrate is cycloned; the fines are thickened and the coarse fraction, together with the thickener underflow, is filtered on a disc filter. Filtered concentrates are conveyed to concrete storage bays from which they are reclaimed with a front-end loader and placed in feeder that loads the aerial-rope tramway buckets.

The tailings are pumped by a four-stage (in series) pumping system to a tailings impoundment (TP-6) located about one kilometer from the mill (see Figure 1-2). The tailings dam covers an area of about one hectare and is situated in a small valley dammed partially with limestone and partly with mine waste rock. Tailings are discharged in the upper end of the valley and decant water that collects against the dam wall is discharged by decant pipes through the dam wall into the general drainage. The dam wall for TP-6 was built by a contractor in August, 1990 and, at that time, it was considered that the initial lift (Stage 1) would provide sufficient capacity for two to three years. There appears to be enough capacity in the tailing dam for about a half year of operation.

Additional tailings impoundment capacity in TP-6 can be provided by raising the dam wall. However, access of earth-moving equipment to the dam wall is difficult and the use of mine waste rock (which has a high proportion of soft, wet clay) for part of the dam wall makes for a very weak structure that could easily fail.

In addition to TP-6 there is an emergency tailings impoundment located directly below the mill. At the time of PAH's visit the tailings pumping system was inoperative; consequently, all tailings were flowing to the emergency impoundment.

The entire flotation concentrator is in an extremely dilapidated state: there are very frequent equipment and system failures; there is no preventative maintenance (repairs are executed only following break-downs); and there is a minimum of clean-up work so that there is excessive accumulation of spillage and trash in and around the plant. To partially compensate for the failures there are numerous by-pass systems to allow the plant to stay operational where possible; thus, the flow sheet is constantly changing and variations of the basic system described are frequent.

Tramway and Pier

Most of the pyrite concentrates are shipped from the mine to the pier at Canaybon via a 20-kilometer long aerial-rope tramway from the mill to the pier. The tramway has a maximum carrying capacity of about 1,500 tonnes per day with the system in perfect working order, sufficient buckets, and round-the-clock operation. At present, the operating capacity of the system is about 250 tonnes per day, a consequence of the poor condition of the cables, buckets, and ancillary equipment.

The tramway is an awesome feat of engineering and construction. It runs in a direct line across mountainous tropical jungle, rivers, swamps, plantations, and an ocean bay. It was designed and constructed in 1964 by PHB (Pohlig-Heckel-Bleichert), a German engineering company; at the time it was built it cost approximately $4 million. The tramway is supported on 56 steel towers and is driven by a 150-hp motor located mid-way in the system. Power for the motor is provided by three 300-Watt diesel-electric generators, only one of which is normally in operation.

A telephone system interconnects the central drive station, the loading and unloading stations, and 11 of the 56 support towers where operators are located to monitor the operation of the system. The telephone system is critical to the operation of the tramway.

When the tramway has insufficient capacity, the excess pyrite concentrate is transported by road (a distance of 61 kilometers) using a contractor. The road-haulage contractor charges approximately $14.50 per tonne for transport of the pyrite concentrate, more than double the cost of tramway transportation. With the present low production rate, the policy is to avoid road hauling of pyrite concentrate entirely.

Facilities at the pier consist of a deep-water ship-berthing pier that can take ships of up to 8,000-tonne capacity, a concentrate storage building that has three bins capable of storing up to 25,000 tonnes, a system of three conveyors for ship loading, and two diesel-electric generators for power supply. Ship loading is conducted by a contractor at a cost of $0.065 per tonne of concentrate.

The tramway and pier facilities are generally in poor condition due to inadequate maintenance.

Infrastructure

The Bagacay Mine is far from established communities; thus, substantial infrastructure is required for its operation including on-site housing of senior employees and provision of community services for them. In general, the infrastructure is in fair condition.

The mine is located in the central highlands of Samar Island, a large island located on the east side of the Philippines adjoining Leyte Island. The two islands are

connected with a large bridge under which sea-going vessels can pass. The mine rents an office in the port of Tacloban City on the east coast of Leyte staffed by two people for the purchase of small emergency items.

A concrete national highway runs east/west across Samar, connecting Catbalogan on the west coast with Canaybon on the east coast, and the mine is located three kilometers off of the highway, midway between them. A concrete national highway also connects Tacloban City with Catbalogan. Respective distances between the mine and the ports mentioned are as follows:

Bagacay to Canaybon:	60 kilometers
Bagacay to Catbalogan:	61 kilometers
Bagacay to Tacloban City:	128 kilometers

In addition to road access, the mine maintains an airstrip with an 800-meter long gravel runway for light aircraft and also a heliport.

Power supply to the mine is by mine-site diesel-electric generating station. The power plant was installed at the re-commencement of operations in 1985 to replace the existing power plant which was in very poor condition. The new power plant uses three 1.6 megaWatt Yanmar (a Japanese manufacturer) units and a single 200-kiloWatt unit for auxiliaries. The generating sets had been used elsewhere prior to their installation at Bagacay. Fuel for the engines is heavy residual oil when the power load is above 50 percent and diesel oil when it is below 50 percent. The fuel is stored in vertical steel storage tanks having 490,000 liters capacity of heavy oil and 150,000 liters of diesel oil.

Maximum power demand is about two megaWatts. About 90 percent of the power generated is used by the mill with the remainder for infrastructure services. Current average power costs are about $0.11 per kiloWatt hour.

Studies have been made concerning the possibility of installing a small hydro-electric plant on the Taft River. The indications are that such a plant would have more than adequate capacity for the entire operation.

Industrial water for ore processing and power plant cooling is provided by electric-powered pumps set in the Taft river that runs below the flotation concentrator. Four 1,000-gallon-per-minute pumps, three of which are normally in operation at one time, pump the water to four, 35,000-liter capacity each, storage tanks located above the concentrator.

Domestic water is obtained from three springs located north of the housing compound. The water is led from small concrete reservoirs at each location to storage tanks. Part of the water is gravity fed from the storage tanks to where it is used and part is pumped to another gravity storage tank to serve higher locations.

The mine has an internal telephone system but there is no connection with the local telephone system on the island. Radios are used to communicate with company office in Manila, the office in Tacloban City, the PPFC plant at Isabel on Leyte, and the PPFC office in Cebu City, Cebu Island.

The operation is equipped with the usual compliment of service buildings, the principal of which are as follows:

Administration Office
Warehouses

Mobile Equipment Shop
Machine and Electrical Shop
Sample Preparation, Metallurgical Testing, and Assay Laboratory
Geology/Engineering Office

All of the buildings, with the exception of the Mobile Equipment Shop were constructed in the 1960's. The Mobile Equipment Shop was constructed in 1985.

Two separate machinery parts warehouses are kept: one stores items that existed prior to the re-commencement of operations and the other items purchased since re-commencement of operations. The value of inventory in the latter exceeds $2 million.

Employee housing on the mine property consists of the following:

1	Guesthouse
7	Senior Staff Family Houses
47	Junior Staff Family Houses
2	Duplex Houses for Keymen
1	Bachelor Staff Quarters

In addition to the housing listed, community service facilities include a 25-bed hospital, a multi-purpose gymnasium, a pelota court, church, and a small market. Government owned and operated elementary schools are situated outside the mine compound in the adjoining village of Bagacay. A service bus provides employee transportation within the mine operating area.

The company operates a fleet of mobile equipment including an assortment of jeeps, pick-ups, buses, and trucks. All of the mobile equipment is in poor condition and in need of replacement.

Security services are provided by a contractor and by government soldiers assigned to the mine area. A Philippine army brigade headquarters is located north of the mining area.

5.2 Production

The Bagacay Mine operated for 20 years, in the period 1956 to 1981 as a copper mine. Production in the 1950's was direct shipping ore and continued periodically up until 1979. Production of copper flotation concentrates started in 1959 after construction of the mill and power plant and continued until 1981. Production in the latter part of the 1970's was sporadic with periodic shutdowns. Metal content of direct shipping ore and concentrate shipped from the mine in the period 1957 to 1981 was as follows:

Copper	133,933 tons
Gold	31,000 ounces
Silver	2,135,000 ounces

A zinc concentrate was produced in a four-month period in 1973 but was abandoned because of difficulty in obtaining good recoveries and as a result of poor concentrate grades.

Pyrite was produced as a by-product of the copper plant starting in 1965. The pyrite was concentrated in a plant close to the copper concentrator but this plant was partially destroyed by a typhoon in the 1980's and has since collapsed completely. The pyrite is currently produced in what was formerly the copper concentrator.

An attempt was made to develop and exploit coal deposits on the property in starting in 1981 and 6,000 tonnes of washed coal was produced in 1983. Coal has since been produced from claims held by the mine which lapsed and were assumed by a private

developer. This coal has, over the last few years, been sold to Philphos at Isabel. The quality of the coal is very poor: it has very high moisture, high ash, low calorific value, and high sulfur content; consequently, Philphos have decided to stop further purchases of the material.

In addition to the conventional sulfide copper ore, copper also exists in lignitic coal seams on the property. Testwork undertaken to economically upgrade the copper content of the lignite have not been successful and none of this material has been economically exploited thus far.

Production data for the last three years of the operation of the Bagacay Mine as a copper mine producing by-product pyrite and the last five years of operation exclusively as a pyrite mine are presented in Table 5-2.

As shown in the table, the grade of the copper ore processed was in the range of 1.5 to 2.0 percent copper. Copper recoveries were poor, averaging about 70 percent and the concentrate grades were very poor, averaging about 15 percent copper. Low recoveries and low concentrate grades were the result of mineralogy of the ore. Processing of the ore required exceptionally fine grinding (85 percent passing 325 mesh) and the addition of a sulfidizing agent but, even so, the results were mediocre.

Pyrite ore mining and processing was going well, averaging about 800 tonnes per day of ore processed up until 1990, but has since started to slump, particularly in the last year. Mining of pyrite ore was stopped in June, 1992 and it is intended not to restart mining until all the tailings in tailings containment TP-4 have been processed. With mining currently suspended, most of the mining personnel have been laid off, including the mine superintendent.

Table 5-2
Bagacay Mine
Production Data

Item	Units	1979	1980	1981	1987	1988	1989	1990	1991	January - May 1992	Projected Future Annual Production
MINING											
Ore Mined	tonnes	224,515	152,232	19,519	344,768	414,100	388,592	375,512	474,500	105,501	292,000
Waste Mined	tonnes	567,992	378,584	14,356	254,608	369,577	130,675	258,430	399,000	124,955	292,000
Aggregate Mined	tonnes				51,277	19,833	23,082	18,509	156,800	8,538	20,000
Total Rock Mined	tonnes	792,507	530,816	33,875	650,649	803,510	542,349	652,451	1,030,300	238,994	604,000
Stripping Ratio (Waste:Ore)		2.53	2.48	0.73	0.74	0.89	0.34	0.69	0.84	1.18	1.00
Tails Extracted	tonnes									1001	0
MILLING											
Copper Ore											
Quantity Processed	tonnes	221,690	154,908	15,260							
Processing Rate	t/day	607	424	402							
Ore Grade											
Copper	percent	1.89	2.00	1.46							
Zinc	percent		2.15	4.41							
Recovery											
Copper	percent	76.66	68.49	34.45							
Copper Concentrates											
Quantity Produced	tonnes	19,327	13,745	923							
Grade											
Copper	percent	16.62	15.45	8.22							
Gold	oz/tonne	0.046	0.036	0.034							
Silver	oz/tonne	3.74	2.27	2.95							
Contained Metal											
Copper	pounds	7,081,638	4,681,694	168,804							
Gold	ounces	889	498	32							
Silver	ounces	72,625	33,416	2,726							
Pyrite Ore (Copper Ore Tailings or Mined Pyritic Ore)											
Quantity Processed	tonnes	176,731	108,884	10,815	288,949	315,125	308,691	289,589	243,419	72,351	292,000
Processing Rate	t/day	484	298	285	792	863	846	793	667	496	800
Ore Grade, Sulfur	percent	26.45	29.09	25.81	34.22	33.67	31.47	33.51	32.56	32.56	33.00
Recovery, Sulfur	percent	58.93	50.22	48.46	87.79	89.13	89.47	91.08	90.00	90.00	90.00
Pyrite Concentrates											
Quantity Produced	tonnes	58,757	33,748	3,214	191,980	214,048	195,230	197,455	144,318	51,239	197,100
Grade, Sulfur	percent	48.87	47.14	42.09	45.22	44.18	44.52	44.76	43.69	43.69	44.00

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The tailings in TP-4 are expected to continue to provide plant feed for the next four months. PPC are planning to partially rehabilitate the comminution sections of the plant while processing of mined ore is suspended so that, when mining re-starts, the plant will be in better condition to process the ore.

Typical analysis and allowable minimum and maximum values of the pyrite concentrate are as follows:

Sulfur	44 percent; 44 percent minimum
Iron	44 percent
Copper	0.26 percent
Chlorine	0.04 percent
Arsenic	380 ppm; 600 ppm maximum
Moisture	9 - 11 percent; 11 percent maximum

Particle Size Analysis	68 percent passing 200 mesh

The pyrite concentrate is coarser than that purchased from other sources by Philphos and is useful to blend with other pyrite to make a coarser feed to the burner.

Production in future years could, with the rehabilitation of mine and plant equipment, easily match past production in the period 1987 through 1990. Thus, future production is shown using figures which are about average for those years.

5.3 Costs

Unit operating costs for mining, processing, and the tramming & pier operation for the last two years of copper mining (1980 and 1981) and the last five years of pyrite mining (1987 to date) are presented in Table 5-3. The costs are exclusive of

Table 5-3
Bagacay Mine
Operating Costs

Item	Units	1980	1981	1987	1988	1989	1990	1991	January - May 1992	Projected Future Annual Production and Costs
PRODUCTION										
Rock Mined	tonnes	530,816	33,875	650,549	803,510	542,349	652,451	1,030,300	238,994	604,000
Ore Processed										
Copper	tonnes	154,908	15,260							
Pyrite	tonnes	108,884	10,815	288,949	315,125	308,691	289,589	243,419	72,351	292,000
Conc. Produced										
Copper	tonnes	13,745	923							
Pyrite	tonnes	33,748	3,214	191,960	214,048	195,230	197,455	144,318	51,239	197,100
UNIT COSTS	$/tonne									
Mining	rock mined	$2.38	$4.83	$1.22	$0.92	$1.93	$1.57	$1.06	$1.58	$1.25
Milling										
Copper Concentrator	ore proc.	$11.54	$15.21							
Pyrite Concentrator	ore proc.	$2.52	$7.57	$5.27	$6.15	$6.33	$7.59	$9.37	$13.49	$6.50
Tramming & Pier										
Copper	conc. prod.	$12.31	$17.88							
Pyrite	conc. prod.	$9.63	$16.10	$2.44	$2.97	$4.36	$5.21	$6.50	$15.02	$4.00
G&A	ore proc.			$1.97	$3.27	$3.36	$3.45	$3.74	$5.62	$3.50

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depreciation and amortization. Also included in the table are the mining and processing tonnages for the respective years.

Costs for the last years of copper mining do not include G&A costs as a separate item. A detail breakdown of the cost figures is not available but it is assumed that the G&A costs were redistributed to the mining, milling, and tramming & pier accounts.

Costs for the last five years of pyrite mining show that mining costs have been somewhat erratic but have generally averaged about $1.25 per tonne.

Milling costs have been gradually rising over the years with a dramatic increase in 1992. The increases in costs are closely allied to the drop in production rate. Milling costs are, however, higher than would be normally expected for a plant of this capacity and service. The principal reason for the higher costs is that the plant is very old, inefficient, and in a very bad state of repair.

Tramming and pier operating costs have also been gradually rising over the years for the same reasons as the mill: falling production rate and worsening state of repair.

G&A costs have been generally about $3.50 per tonne of ore processed or about $1 million per year.

Projected future costs, based on the rehabilitation of the facilities and equipment, are approximately the same as those that were incurred in the period 1987 though 1990.

In order to get the facility operating at close to the design level and to keep costs to prior levels, substantial capital expenditure is required. PAH estimate that about $4 million would be needed, divided equally between the mine, mill, and tramway and

pier. Future capital expenditures averaging about $0.75 million per year would be needed to sustain the operation.

The $4 million initial capital would be primarily used in the following areas:

- Purchase of new mobile equipment, particularly dump trucks.
- Raising the tailing dam wall on TP-6, using limestone.
- Labor, supplies, and equipment to rehabilitate the ore processing plant.
- Labor, supplies, and equipment to rehabilitate the aerial-rope tramway and pier.

The infrastructure is in fair condition and does not need extensive expenditure at this time.

6.0 EQUITY DISTRIBUTION AND NEWCO VALUATION

6.1 Introduction

A privatization scheme has been devised by which APT will contribute its physical assets and mining rights to a newly formed company (NEWCO). PPC will contribute its physical assets and receive credit for certain development, rehabilitation and other costs. The relative ownership of the new company (equity participation) will be based on the relative value of the contributions.

NEWCO will then be sold to private investors. APT and PPC will participate in the proceeds according to their ownership positions.

Two major valuation issues are outstanding. The first issue concerns the value of the relative contributions of APT and PPC to NEWCO. An appraisal of physical assets by Valencia Appraisers was the first step in this process. Three continuing problems must be resolved. What value has been added to APT physical assets by the rehabilitation carried out by PPC? What is the value of the development costs (waste stripping, road building) incurred by PPC? What is the value of the mineral rights held by APT?

The second major valuation issue is what will be the value of NEWCO as an ongoing business. This is the key issue.

The major assumptions for proceeding with the privatization are presented below:

- Both APT and PPC want to dispose of their interests in the Bagacay operation

- A single entity (NEWCO) will be formed from the contributed assets. Relative equity participation is based on contributed assets.

- NEWCO has value as an on-going concern.

6.2 Determination of Equity Contributions

Physical Asset Value

The determination of equity contributions to NEWCO is a difficult process due to certain complex issues. First among these is the unadjusted value of the physical assets controlled by APT and PCC. APT owns major assets on the property including the mill, tramline, support buildings and other assets. PCC has ownership of most of the mobile fleet, certain power facilities and the materials and supply inventory. Valencia Appraisal Corporation (VAC) has been contracted to perform an appraisal of these physical assets and their results form an integral part of this report.

According to the VAC report (June 1992) the value of APT assets is US$ 4.84 million. The value of PCC assets is $ 6.34 million.

Rehabilitation Costs

Certain adjustments, additions and subtractions must be made to the asset value of each company to more accurately reflect their relative contributions. A major issue is the value added to APT assets by rehabilitation performed upon them by PPC. When PPC took over the mine many of the assets were in an extreme state of disrepair. Considerable sums were spent to restore them to working order. All of these have added value to APT physical assets.

During meetings held with APT, PPC and IPG/PAH in June 1992 it was decided that the audited book value of PPC rehabilitation costs, less accumulated depreciation, would be used as the basis for this adjustment. According to records provided by PPC the net book value of rehabilitation costs, as of May 1992, is P 25.2 million (US$ 1.01 million). These values should be subtracted from the APT asset value and added to PPC's value.

Major Repairs Over P100,000

The lease agreement between PPC and APT allows for reimbursement of major repairs over P100,000 made by PPC on APT assets. PPC has maintained a separate account for this which was P36.9 million as of May 25 1992. This account includes construction in progress (tramway repairs), tramline assets, repairs and maintenance and other accounts receivable. This amount was reduced by P8.6 million for tramway assets and P11.5 million for repairs and maintenance, two sub headings included in this account. The tramway assets were included in the VAC appraisal of PPC assets. PPC has already received the useful benefit of the repairs and maintenance and should receive no further credit in this accounting.

The resulting sum of P16.8 (US$ 670,000) is subtracted from APT's account and added to PPC's.

Development Costs

Additional value must be added to PPC's account for the development costs that they have expended on the property. These have not been included in the VAC physical asset appraisal. This includes prestripping for the Palopsapis pit area. This is a real improvements that will add value to NEWCO; i.e. since these costs have already been

incurred by PPC they will not have to be spent by the eventual buyers of NEWCO. This should be reflected in a higher selling price.

These costs have been accumulated in PPC's work in progress account. The book value, net of accumulated depreciation, according to records provided by PPC was P 7.54 million (US$ 301,000) in May, 1992.

Mineral Rights

Determination of the value of the mineral rights controlled by APT is, at best, subjective exercise. Various factors will effect the ultimate value including amount of reserves, operating costs, metals prices, capital requirements and many others. As APT does not conduct any mining for its own account but leases the property a capitalized lease approach was chosen as most appropriate for this valuation. In addition, value was added for non-producing but potentially economic copper resources by a comparable transaction method.

The operating assumptions used for the capitalized lease method approach are presented later in this section but are briefly summarized now. Based on existing reserves a 12 year mine life is projected. Annual production of 189,000 tonnes of concentrate is forecast. Lease rentals and royalty are according to the existing contract between APT and PCC. Monthly rental is approximately US$ 16,300 in 1992 and escalates by 15 percent every two years. A royalty of US$ 0.14 is paid per tonne of concentrate. A capitalization rate of 20 percent was used.

The results are summarized in Table 6-1. A capitalized lease value of US$ 1.29 million was determined.

TABLE 6-1
BAGACAY MINE
CAPITALIZED LEASE VALUE

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
MONTHLY RENTAL	$16,319	$18,767	$18,767	$21,582	$21,582	$24,820	$24,820	$28,543	$28,543	$32,824	$32,824	$37,748
ANNUAL RENTAL	$195,828	$225,204	$225,204	$258,984	$258,984	$297,840	$297,840	$342,516	$342,516	$393,888	$393,888	$452,976
TONNES CONC PRODUCED	$142,000	$189,000	$189,000	$189,000	$189,000	$189,000	$189,000	$189,000	$189,000	$189,000	$189,000	$189,000
ROYALTY RATE	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
ROYALTY	$19,880	$26,460	$26,460	$26,460	$26,460	$26,460	$26,460	$26,460	$26,460	$26,460	$26,460	$26,460
TOTAL RENTAL & ROYALTY	$215,708	$251,664	$251,664	$285,444	$285,444	$324,300	$324,300	$368,976	$368,976	$420,348	$420,348	$479,436

NPV	
15%	$1,619,949
20%	$1,287,202
25%	$1,051,575

Two defined copper resources are also known to exist in the Bagacay area: the carbonaceous copper reserve of 165,000 tonnes at a ten percent copper grade and copper resources outlined by PPC in the current mining areas of 3.3 million tonnes of 0.92 percent copper. This resource was reduced by 35 percent to account for inevitable losses due to design of an economic pit. The combined "reserve" totals 102.5 million pounds of contained copper. Based on its analysis of over 60 copper reserve transactions (as published in its strategic study, **Review of Acquisition Costs for Copper Mines and Reserves**), PAH has assigned a value of US$ 0.01 per pound of contained copper. This results in a total value for the known copper at Bagacay of US$ 1.03 million.

Combined with the capitalized lease value of the pyrite reserves a total value of US$ 2.3 million is assigned to the mineral rights.

Receivables From APT

This account is for advances made by PPC on APT's behalf. It covers such items as property taxes and other advances agreed in the lease contract. It does not include PPC advances for expenses over P100,000. A sum of P27.5 million (US$1.1 million) is applied to APT's account.

Lease Rental/Royalty Credit

According to the terms of the APT/PCC lease, PCC is allowed to deduct all repairs (over P100,000) on APT assets plus other agreed advances from lease rentals and royalties. During the period of the lease PCC has deducted an amount equal to all the lease rental and royalties; i.e. they have made no payments. As PCC is receiving credit for all the rehabilitation costs incurred through adjustments described above,

APT must receive credit for the withheld payments. Withheld lease rental and royalties now total US$1.32 million. This is credited to APT's account.

Equity Contributions

The equity contribution of APT and PPC to NEWCO is based on the adjusted value of their relative asset contributions. For the purpose of this valuation it is assumed that working capital contributions are restricted to material and supplies inventories.

The summary of asset contributions and adjustments are presented in Table 6-2. APT's adjusted contribution is US$ 6.8 million or 42 percent. PPC's adjusted contribution is US$ 9.4 million or 58 percent.

6.3 NEWCO Valuation

The purpose of this analysis was to determine an indicative value for NEWCO, i.e. the Bagacay Mine and its related facilities. The valuation has been based on discounted cash flow analysis, an income approach to value.

The analysis has been undertaken in "constant" 1992 US dollar terms, (ie., not escalated for inflation), and incorporates a period of 12 production years estimated to be the remaining mine life. Accordingly, no continuing value calculations were made. Capital and operating cost data inputs were derived from the technical analysis presented in previous sections of this report. Cash flows were developed on both a "pre" and "post" tax and pre-financing, basis.

Modelling was based on the operating assumptions presented in sections three and four of this report. Although the potential for other mineral production, particularly

copper and gold exists, it has not been included in the indicative value. This will be discussed below.

TABLE 6-2
Equity Contribution to NEWCO
(US$ 000)

	APT	PPC
Physical Assets (Per VAC)	$4,840	$6,337
Rehab Cost Adjust	($1,010)	$1,010
Repairs over P100,000	($670)	$670
Mineral Rights	$2,312	
Development Costs		$301
Lease Rental Credit	$1,321	
Receivables from APT		$1,100
Totals	$6,793 42%	$9,418 58%

Derivation of Pro-Forma Financial Statements

Financial modelling of the Bagacay Mine project was undertaken using IFPS/Personal[T.M.], an integrated financial planning software product from Execucom Systems, Inc.

A financial model was developed to produce a Summary of Major Assumptions, (Table 6-3), a Cash Flow Schedule and Discounted Cash Flow Analysis that incorporated Net Present Value calculations, (Table 6-4).

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TABLE 6-3

INTERNATIONAL PRIVITIZATION GROUP

BAGACAY MINE, SAMAR, PHILIPPINES (BASE CASE)

SUMMARY OF ASSUMPTIONS AND REVENUE CALCULATIONS, 1993 TO 2004 (1992 Constant $US 1000s)

Year #	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	1	2	3	4	5	6	7	8	9	10	11	12
PHYSICAL PARAMETERS (Tonnes are 1000s - on Dry Weight Basis):												
Tonnes of Waste	210	280	280	280	280	280	280	280	280	280	280	280
Tonnes Ore	210	280	280	280	280	280	280	280	280	280	280	280
Total Tonnes of Material Mined	420	560	560	560	560	560	560	560	560	560	560	560
Ore Grade (% S)	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Tonnes of Concentrate Produced	142	189	189	189	189	189	189	189	189	189	189	189
FREIGHT COSTS:												
Tonnes Transported	142	189	189	189	189	189	189	189	189	189	189	189
Cost per Tonne	6.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Freight Cost	851	756	756	756	756	756	756	756	756	756	756	756
REVENUE CALCULATIONS:												
Tonnes of Concentrate	142	189	189	189	189	189	189	189	189	189	189	189
Concentrate Price (US$ /Tonne FOB)	42.16	42.16	42.16	42.16	42.16	42.16	42.16	42.16	42.16	42.16	42.16	42.16
TOTAL CONCENTRATE REVENUE	5,976	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968
Less: Freight Costs	851	756	756	756	756	756	756	756	756	756	756	756
NET REVENUE	5,126	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212
CAPITAL COSTS ($1000s):												
Working Capital	1,065	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,572	
Increase in Working Capital	65	507										-1,572
CAPITAL EXPENDITURE	4,750	750	750	750	750	750	750	750	750	750	750	750
OPERATING COSTS:												
Cost Of Material Mined ($ per Tonne)	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Mine Operating Costs ($ 1000s)	525	700	700	700	700	700	700	700	700	700	700	700
Cost of Process Operations ($ per Tonne Ore)	9.75	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Process Operating Costs ($ 1000s)	2,048	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820
TOTAL OPERATING COSTS	2,573	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520
SELLING, GENERAL & ADMINISTRATIVE EXPENSES:												
TOTAL S,G & A Costs ($1000s)	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000

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TABLE 6-4

INTERNATIONAL PRIVITIZATION GROUP

BAGACAY MINE, SAMAR, PHILIPPINES (BASE CASE)

CASH FLOW SCHEDULE, 1993 TO 2004 (1992 Constant $US 1000s)

Year #	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
	1	2	3	4	5	6	7	8	9	10	11	12
CASH FLOW CALCULATED FROM LINE ITEMS												
CASH INFLOWS:												
Total Revenue	5,976	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968	7,968
Less: Freight to FOB	851	756	756	756	756	756	756	756	756	756	756	756
NET REVENUE	5,126	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212	7,212
CASH OUTFLOWS:												
Capital Expenditure	4,758	750	750	750	750	750	750	750	750	750	750	750
Operating Costs	2,573	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520
General & Admin. Costs	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Working Capital Increase	65	507										-1,572
Excise Tax (3% of Total Revenue)	179	239	239	239	239	239	239	239	239	239	239	239
(Closure Cost - Salvage Value)												
TOTAL CASH OUTFLOW	8,567	5,016	4,509	4,509	4,509	4,509	4,509	4,509	4,509	4,509	4,509	2,937
PRE TAX CASH FLOW	-3,441	2,196	2,703	2,703	2,703	2,703	2,703	2,703	2,703	2,703	2,703	4,275
Cumulative	-3,441	-1,245	1,458	4,161	6,865	9,568	12,271	14,974	17,677	20,381	23,084	27,359
INCOME TAX CALCULATIONS												
Pre Tax Cash Flow	-3,441	2,196	2,703	2,703	2,703	2,703	2,703	2,703	2,703	2,703	2,703	4,275
Add back: Capital Expenditure	4,758	750	750	750	750	750	750	750	750	750	750	750
Increase in Working Capital	65	507										-1,572
Operating Cash Flow	1,374	3,453	3,453	3,453	3,453	3,453	3,453	3,453	3,453	3,453	3,453	3,453
Income Tax (20% Operating Cash Flow)	275	691	691	691	691	691	691	691	691	691	691	691
AFTER TAX CASH FLOW	-3,716	1,506	2,013	2,013	2,013	2,013	2,013	2,013	2,013	2,013	2,013	3,585
Cumulative	-3,716	-2,210	-198	1,815	3,827	5,840	7,852	9,865	11,877	13,890	15,903	19,487
DISCOUNTED CASH FLOW ANALYSIS												
Pre Tax Net Present Value:												
Cumulative Pre Tax Cash Flow	-3,441	-1,245	1,458	4,161	6,865	9,568	12,271	14,974	17,677	20,381	23,084	27,359
NPV at 15% discount rate	-2,993	-1,332	446	1,991	3,335	4,504	5,528	6,484	7,172	7,840	8,421	9,220
NPV at 20% discount rate	-2,868	-1,343	222	1,525	2,612	3,517	4,271	4,900	5,424	5,861	6,224	6,704
NPV at 25% discount rate	-2,753	-1,347	37	1,144	2,038	2,738	3,305	3,759	4,122	4,412	4,644	4,938
After Tax Net Present Value:												
Cumulative After Tax Cash Flow	-3,716	-2,210	-198	1,815	3,827	5,840	7,852	9,865	11,877	13,890	15,903	19,487
NPV at 15% discount rate	-3,231	-2,093	-770	381	1,382	2,252	3,008	3,666	4,238	4,736	5,168	5,838
NPV at 20% discount rate	-3,097	-2,051	-886	84	893	1,567	2,129	2,597	2,987	3,312	3,583	3,985
NPV at 25% discount rate	-2,973	-2,009	-979	-154	505	1,033	1,455	1,792	2,062	2,279	2,451	2,698

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A "base" case was developed with model logic incorporating the flexibility to run sensitivity analysis on key variables like price of pyrite concentrate, capital and operating costs.

Summary results of the cash flow and sensitivity analysis results are discussed below. The principal financial model calculations used to derive the Cash Flow Schedule and Discounted Cash Flow tables are also presented below.

Summary of Major Assumptions

The principal assumptions that determine the results of the "base case" cash flow calculations are as follows:

(1) **Annual Production.** The annual production rates have been calculated on the basis that production averages 350 days per year. Accordingly, ore production of 800 tonnes per day translates into an annual production of 280,000 tonnes yielding 189,000 tonnes per annum of concentrate product, (540 * 350 = 189,000). Total production capacity of 540 tonnes of concentrate per day was assumed to be achieved in 1994. To allow for installation of necessary capital improvements, it was assumed that 1993 production would be 75 percent of capacity.

Throughout the analysis, tonnes of product and related costs have been expressed on a dry weight basis.

(2) **Product Price.** The base case product price was derived from an actual delivery contract adjusted for freight to Isabel, Leyte from Canayban, Samar as follows:

CIF at Isabel	=	US$ 49.50 per tonne
Less:		
Sea Freight	=	US$ 7.34 per tonne
FOB price at Canayban	=	US$ 42.16 per tonne

(3) **Net Revenue.** Calculation of net revenue was made by adjusting gross revenue for the cost of freight to Canayban as follows:

Gross Revenue = Tonnes of concentrate * FOB Canayban price per tonne.
Net Revenue = Gross Revenue - Cost of over island freight to Canayban.

In view of the anticipated capital works program required to upgrade the aerial ropeway, the 1993 freight costs that allow for some road transport were assumed to be 50 percent greater than in 1994 and beyond, (ie, US$ 6.00 per tonne in 1993 and US$ 4.00 per tonne from 1994).

(4) **Capital Costs.** In order to upgrade equipment to a standard that would allow projected production rates, it has been estimated that US$ 4.0 million would be required in 1993. An additional maintenance capital expenditure of US$ 0.75 million would be required on an annual basis to provide for on going replacement of capital items.

No attempt was made to calculate depreciation schedules for existing and new capital equipment in this analysis.

(5) Operating Costs. Underlying assumptions for the development of operating cost data are detailed elsewhere in this report. Operating costs include data for labor, materials, supplies, fuel and other miscellaneous costs. It has been assumed that operating costs for the mine would be US$ 1.25 per tonne of material mined, (ore plus waste).

Plant operating costs were estimated at US$ 6.50 per tonne of ore processed from 1994, however, in 1993 they were estimated to be US$ 9.75 per tonne of ore.

(6) Working Capital Requirements. Working capital was calculated on the following basis:

> Working Capital = Inventory Value + Debtors (Accounts Receivable) - Creditors (Accounts Payable).

Inventory Value was estimated as revenue due from two months of production. Accounts receivables were estimated as one month of revenue from production and accounts payable were estimated at two months of operating costs.

An initial "in-place" working capital value of US$ 1 million was assumed. The year to year increase in working capital requirements was calculated by subtracting the current year's working capital requirements from that of each previous year.

Working capital was released at the end of the project adding to cash flow in 2004.

(7) General and Administration. An estimate of US$ 1 million per annum was used and includes an allowance for the mine site, the Makati office and all local taxes and imposts.

(8) **Excise Tax.** The excise tax was calculated at three percent of net revenue from production.

(9) **Income Tax.** Corporate tax rates for mining businesses in the Philippines is 35 percent of net income. Since depreciation of plant and equipment was not calculated, net income was not able to be determined. An estimate of income tax was made by assuming that the provision for tax would be 20 percent of operating cash flow. Operating cash flow was calculated by adding back Capital Expenditure and Increase in Working Capital to the actual Pre Tax Cash Flow.

The provision for tax was subtracted from the Pre Tax Cash Flow to give the Post Tax Cash Flow.

(10) **Mine Closure / Environmental Costs.** It was assumed that the costs of mine closure in 2004 would equate to the cash inflows resulting from the sale of plant and equipment at that time. Accordingly, no mine closure related costs were included in the analysis.

Cash Flow Schedule

Cash Flow calculations are presented by line item in Table 6-4.

Since Net Revenue from concentrate production is the only source of cash inflow, Total Cash Inflow equals Net Revenue. Total Cash Outflow comprises the sum of Capital Expenditure, Operating Costs, General and Administration, Increase in Working Capital and Excise Tax.

Total Cash Outflow was subtracted from Total Cash Inflow to determine the Pre Tax Cash Flow. The provision for tax was subtracted from the Pre Tax Cash Flow to give the Post Tax Cash Flow.

DCF Calculations

Net Present Value (NPV), calculations were carried out in constant terms using a range of discount rates from 15 to 25 percent. In this analysis, no attempt was made to derive an appropriate discount rate that would adequately define individual components of risk associated with acquisition of the Bagacay Mine operation.

The NPVs were calculated on both the pre tax and post tax cash flows. (It would be necessary to adjust the selected discount rate applied to the pre tax cash flow for the effect of tax to determine a comparable discount rate that could be applied to the post tax cash flow).

Results of the "base case" cash flow analysis for the Bagacay Mine are presented in Table 6-5 together with the discounted cash flow analysis that shows cash flow NPVs at various discount rates.

The base case incorporates the assumptions described above. and accordingly, valuations inferred from the NPVs generated from the resulting cash flows, is dependent on acceptance of these underlying assumptions and justification of the discount rate selected.

Using a 20 percent discount rate, the pre tax cash flow generated from the Bagacay Mine would have a NPV of US$ 6.704 million.

Sensitivity Analysis

A sensitivity analysis was performed to gauge the impact that changes in key variables have on the cash flow NPVs. The effect of a ten percent change in FOB selling price, capital and operating costs were evaluated. Table 6-5 below summarizes the results of the sensitivity analysis at various discount rates.

TABLE 6-5
SENSITIVITY ANALYSIS
NPVs of PRE TAX CASH FLOW (US$s Millions)

DISCOUNT RATE:	15.0%	20.0%	25.0%
BASE CASE:	9.22	6.70	4.94
CAPITAL COST:			
10 percent increase	8.47	6.04	4.34
10 percent decrease	9.97	7.37	5.54
OPERATING COST:			
10 percent increase	7.88	5.61	4.03
10 percent decrease	10.56	7.80	5.85
FOB CONCENTRATE PRICE:			
10 percent increase	13.11	9.84	7.52
10 percent decrease	5.33	3.57	2.35

It can be observed from the results of the sensitivity analysis that the NPV of the cash flows is relatively more sensitive to a change in FOB Concentrate Price than to the same relative change in either Capital or Operating Costs. The NPV of the cash flows is relatively more sensitive to changes in Operating Costs than to the same change in Capital Costs.

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For example, a using a 20 percent discount rate, a ten percent increase in FOB Concentrate Price produced a 46.8 percent increase in NPV whereas, a ten percent decrease in Operating Costs increased the NPV by only 16.3 percent. A ten percent decrease in Capital Costs increased the NPV by only 9.9 percent.

Figure 6-1 illustrates the effect of changes in these key variables on NPV at a 20 percent discount rate.

6.4 Copper Potential

Although the above analysis includes only pyrite, considerable potential for development of new copper reserves exists. This was discussed earlier in Section 4, the geology and reserve review. It is PAH's current opinion that this potential can be best realized by developing new massive sulfide type reserves similar to those produced by Marinduque in the 1960's and 1970's. The known resources of carbonaceous copper and low grade mine material are not considered to offer significant economic potential. The hypothetical deposit is a newly discovered ore body of the "massive sulfide" type similar to those mined previously by Marinduque.

To illustrate the potential profitability of any new development PAH has constructed a hypothetical scenario by which, after an initial two year exploration and development period, copper reserves are exploited. During the initial years pyrite will continue to be produced.

Production parameters for copper production are based on a review of historical information. The cash flow for this hypothetical scenario is shown in Table 6-6. The assumption used are presented below:

FIGURE 6 - 1

BAGACAY MINE - SENSITIVITY ANALYSIS

(NPV at 20 % Discount Rate)

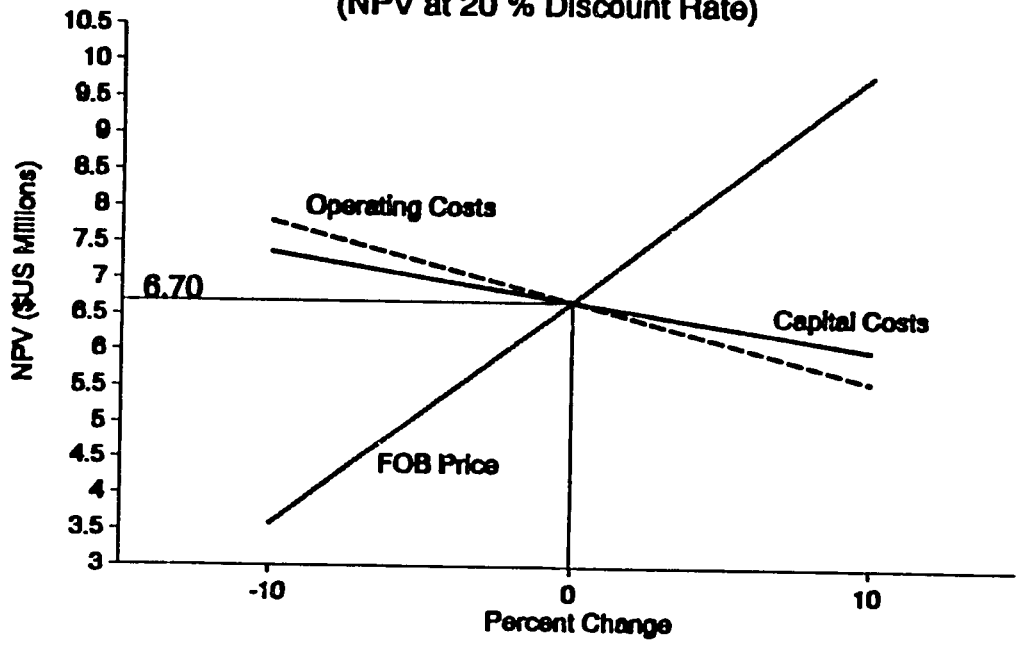

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TABLE 6-6
Hypothetical Copper Scenario
Bagacay Mine
03-Sep-92

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
PHYSICAL PARAMETERS												
Tonnes Waste	210	280	280	280	280	280	280	280	280	280	280	280
Tonnes Ore	210	280	280	280	280	280	280	280	280	280	280	280
Total Tonnes Material Mined	420	560	560	560	560	560	560	560	560	560	560	560
Pyrite												
Ore Grade (%S)	35.0%	35.0%										
Tonnes Conc Produced	142	189										
Copper												
Ore Grade			4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Recovery			70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%	70.0%
Concentrate Grade			17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%	17.0%
Tonnes Concentrate Produced			46	46	46	46	46	46	46	46	46	46
TRANSPORT COSTS (MILL TO PIER):												
Tonnes Transported	142	189	46	46	46	46	46	46	46	46	46	46
Cost per Tonne	$6.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00	$4.00
Transport Cost	852	756	184	184	184	184	184	184	184	184	184	184
FREIGHT, SMELTING AND REFINING:												
Tonnes Concentrate	0	0	46	46	46	46	46	46	46	46	46	46
Cost per Tonne	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135	$135
FSR Cost	0	0	6,226	6,226	6,226	6,226	6,226	6,226	6,226	6,226	6,226	6,226
REVENUE CALCULATION:												
Pyrite												
Tonnes Concentrate	142	189										
Conc Price (US$/Tonne FOB)	$42.16	$42.16										
Transport Cost	852	756										
Net Pyrite Revenue	5,135	7,212										
Copper												
Tonnes Concentrate			46	46	46	46	46	46	46	46	46	46
Conc Price (US$/Tonne)			$375	$375	$375	$375	$375	$375	$375	$375	$375	$375
Less Transport Cost			184	184	184	184	184	184	184	184	184	184
Less FSR Cost			6,226	6,226	6,226	6,226	6,226	6,226	6,226	6,226	6,226	6,226
Net Copper Revenue			10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884
Total Net Revenue	5,135	7,212	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884
CAPITAL COSTS												
Working capital	1,065	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,572	
Increase in Working Capital	65	507										(1,572)
Capital Expenditures	4,750	750	750	750	750	750	750	750	750	750	750	750

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TABLE 6-6
Hypothetical Copper Scenario
Bagacay Mine
03-Sep-92

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
OPERATING COSTS:												
Mine ($/tonne material)	$1.25	$1.25	$1.25	$1.25	$1.25	$1.25	$1.25	$1.25	$1.25	$1.25	$1.25	$1.25
Total Mine	525	700	700	700	700	700	700	700	700	700	700	700
Mill ($/tonne ore)	$9.75	$6.50	$6.50	$6.50	$6.50	$6.50	$6.50	$6.50	$6.50	$6.50	$6.50	$6.50
Total Mill	2,048	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820	1,820
Exploration/Development	300	700										
S,G&A	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Operating Cost	3,873	4,220	3,520	3,520	3,520	3,520	3,520	3,520	3,520	3,520	3,520	3,520
CASH FLOW FROM LINE ITEMS												
CASH INFLOWS:												
Total Net Revenue	5,135	7,212	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884	10,884
CASH OUTFLOWS:												
Capital Expenditure	4,750	750	750	750	750	750	750	750	750	750	750	750
Operating Costs	3,873	4,220	3,520	3,520	3,520	3,520	3,520	3,520	3,520	3,520	3,520	3,520
Working Capital Increase	65	507	0	0	0	0	0	0	0	0	0	(1,572)
Excise Tax (3% of Total Revenue)	154	216	327	327	327	327	327	327	327	327	327	327
TOTAL CASH OUTFLOW	8,842	5,693	4,597	4,597	4,597	4,597	4,597	4,597	4,597	4,597	4,597	3,025
PRE TAX CASH FLOW	(3,707)	1,519	6,287	6,287	6,287	6,287	6,287	6,287	6,287	6,287	6,287	7,859
Cumulative												
INCOME TAX CALCULATIONS												
Pre Tax Cash Flow	(3,707)	1,519	6,287	6,287	6,287	6,287	6,287	6,287	6,287	6,287	6,287	7,859
Add Back: Capital Expenditure	4,750	750	750	750	750	750	750	750	750	750	750	750
Increase in Working Cap	65	507	0	0	0	0	0	0	0	0	0	(1,572)
Operating Cash Flow	1,108	2,776	7,037	7,037	7,037	7,037	7,037	7,037	7,037	7,037	7,037	7,037
Income Tax (20% effective rate)	222	555	1,407	1,407	1,407	1,407	1,407	1,407	1,407	1,407	1,407	1,407
AFTER TAX CASH FLOW	(3,928)	984	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	6,452
Cumulative												
PRE TAX NET PRESENT VALUE												
NPV at 15%	(3,223)	(2,075)	2,059	5,654	8,780	11,498	13,862	15,917	17,704	19,258	20,610	22,079
NPV at 20%	(3,089)	(2,034)	1,604	4,636	7,163	9,269	11,023	12,485	13,704	14,719	15,566	16,447
NPV at 25%	(2,965)	(1,993)	1,226	3,801	5,861	7,509	6,828	9,883	10,727	11,402	11,942	12,482
AFTER TAX NET PRESENT VALUE												
NPV at 15%	(3,416)	(2,687)	521	3,311	5,737	7,847	9,682	11,277	12,664	13,870	14,919	16,125
NPV at 20%	(3,274)	(2,604)	219	2,573	4,534	6,168	7,530	8,665	9,611	10,399	11,055	11,779
NPV at 25%	(3,143)	(2,526)	(28)	1,971	3,570	4,849	5,873	6,692	7,346	7,870	8,290	8,733

NB - This represents a hypothetical scenario only. As of this date no reserves have been developed to support these projections.

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Ore and waste tonnes are those used in the previous pyrite scenario.

Pyrite ore grade and concentrate production are those used previously.

An average copper grade of four percent was assumed for the new hypothetical ore body. Metallurgical recovery of 70 percent and concentrate grade of 17 percent copper are similar to values achieved in the last five years of Marinduque production and have, therefore, been incorporated here.

Transportation costs from the mill to the pier are the same as previously used.

Pyrite revenue calculations are the same as in the above case. Copper revenue is based on a copper price of US$ 1.00 per pound. Freight, smelting and refining are estimated to be $135 per tonne of concentrate.

Capital and operating costs are the same as before with the exception that US$ 1 million has been spent in the first two years for exploration and development. This figure is probably the minimum necessary.

Using the above assumptions the pre-tax NPV varies from US$22.1 million (15% discount rate) to US$12.5 million (25% discount rate). Annual cash flows of US$4.8 million are projected. It must be remembered that these projections are currently hypothetical and based on assumptions of what might be found and not on any known reserve. The project is very sensitive to changes in ore grade and, as such, economic projections could change substantially. A level of risk is a part of any exploration program and there is no guarantee of success. The permissive geologic environment should, however, encourage investors to take that risk.