ANNUAL ENVIRONMENTAL PROTECTION AND ENHANCEMENT PROGRAM

CANATUAN PROJECT

TVI RESOURCE DEVELOPMENT (PHILS) INC.

ANNUAL REPORT YEAR 2009
REVISION 0

ANNUAL ENVIRONMENTAL PROTECTION AND ENHANCEMENT PROGRAM
CANATUAN PROJECT
TVI RESOURCE DEVELOPMENT PHILIPPINES INC.

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1.0 INTRODUCTION

1.1 Background

This report represents the **Year 2009 Annual Environmental Protection and Enhancement Program** report (AEPEP) for the Canatuan Mining Project undertaken by TVI Resource Development Phils., Inc. (TVI). The activities, programs and data acquisition completed in Year 2008 are presented and discussed within this report. Planned and programmed activities for Year 2009 are also included and discussed. This report follows the format identified in MGB Form No. 16-3.

The information presented in this report is based on the updated Environmental Protection and Enhancement Plan (EPEP) previously submitted to the DENR-MGB and the Final Mine Reclamation and Decommissioning Plan (FMRDP) also previously submitted. The updated EPEP focuses on the second phase of the TVI Canatuan Mining Project known as the Sulphide Phase Project.

The TVIRD Canatuan Mining Project is a surface mine currently being developed in two phases. Phase 1 known as the Gossan Phase consists of mining and processing a gold and silver orebody located near the ground surface. Phase 2 known as the Sulphide Phase consists of mining and processing a copper and zinc orebody located below the gossan orebody.

The Gossan Phase operations began in July 2004 and ended in April 2008 after nearly four years of mining and processing activities. The Sulphide Phase operations began in November 2008 and is anticipated to continue for 5-½ years until Year 2014.

Despite the changes in the schedule of project implementation, the Project conditions and development programs as well as the environmental protection programs identified in the 1998 EPEP remain the same. Some programs were modified to incorporate knowledge and research gained from the Gossan Phase operations.

An **Annual Environmental Protection And Enhancement Program** (AEPEP) was prepared for each of the Years 2003 through 2008 and submitted to the DENR-MGB. Activities completed in each year were presented and activities planned for the subsequent year were discussed.

1.0 INTRODUCTION

The **Year 2009 Annual Environmental Protection And Enhancement Program** presented herein discusses the activities completed in Year 2008 and activities planned for Year 2009. Year 2009 marks the full operation of the Sulphide Phase operations and continuation of Progressive Rehabilitation activities initiated in Year 2008. A **Final Mine Rehabilitation and Decommissioning Plan (FMRDP)** has been prepared and was submitted to the MGB under separate cover in January 2008. This program will become an integral part of the 2009 AEPEP and future AEPEP through the end of the mining operations.

An **Environmental Performance Report and Management Plan (EPRMP)** has also been completed and submitted to the Environmental Management Bureau Central Office in Year 2008. The document was prepared as a compliance requirement for a request in the amendment of some conditions in the current ECC due to changes in the Sulphide Phase Project operations. Additional feasibility studies completed for the Sulphide Phase in Years 2003 to Year 2007 identified some changes in the Project parameters. Most notable is an increase in the available ore reserve and mill production rate. This has resulted in the need for increased tailings storage capacity and increased production rates affecting conditions No. 8 and No. 15 of the Project's Environmental Compliance Certificate (ECC). Mitigating measures and management plans in line with the project changes have been incorporated in the EPRMP report and will also serve as basis for additional programs under the EPEP and AEPEP documents.

1.2 Significant Changes For Year 2009 AEPEP

The primary change in the Year 2009 AEPEP activities versus the Year 2008 Program are associated with the initiation of the Sulphide Phase of the Project.

Features and activities associated with the Year 2009 activities consist of the following:

- Construction of Stage 2 of the Sulphide Tailings Dam and Impoundment.
- Decommissioning of the Gossan Mill Plant.
- End of tailings discharge at Gossan Tailings Dam.
- Construction of a permanent spillway for the Gossan Tailings Dam.

- Construction of a permanent spillway for the Lower Tailings Dam.
- Construction of the Sulphide Mill and Processing Facilities. (Some equipment used during the Gossan Phase were refurbished and reused for the Sulphide Mill Plant).
- Rehabilitation of Ambaan Area adjacent to the Gossan Tailings Dam.
- Construction of an Overburden Stockpile Area at the Lower Phase I area.
- Vertical Expansion of the Mine Pit to Expose the Sulphide Ore.
- Construction of Additional Onsite Haul Roads for Operations.
- Improvement of the Road from the Mine to the Santa Maria Port in Siocon.
- Construction of concentrate storage warehouse in Santa Maria Port in Siocon.

Several new or expanded environmental management programs will be initiated in Year 2009 in response to the Sulphide operations. These will include the following:

- Passive and Active Water Treatment Studies for Potential Acid Mine Drainage Control.
- Establishment of Additional Water Quality Monitoring Stations.
- Establishment of Additional Hydrologic Monitoring Stations for Stream Flow and Sediment Yield.
- Strengthen sediment control measures.
- Implementation of a more expansive Environmental Management System.
- Initiation of the Progressive Rehabilitation program as outlined in the Final Mine Rehabilitation and Decommissioning Plan.

Details of the new Project features and the environmental programs identified above are discussed in subsequent sections of this report.

2.0 PROJECT INFORMATION

2.1 Project Name

Canatuan Mining Project

2.2 Project Location

Sitio Canatuan, Barangay Tabayo

Municipality of Siocon

Zamboanga del Norte

2.3 Company Office

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Mr. Fidel Bontao

Pollution Control Officer, Canatuan Project

Sitio Canatuan, Barangay Tabayo

Municipality of Siocon

Zamboanga del Norte

3.0 PROJECT DESCRIPTION

3.1 Project Details

3.1.1 General

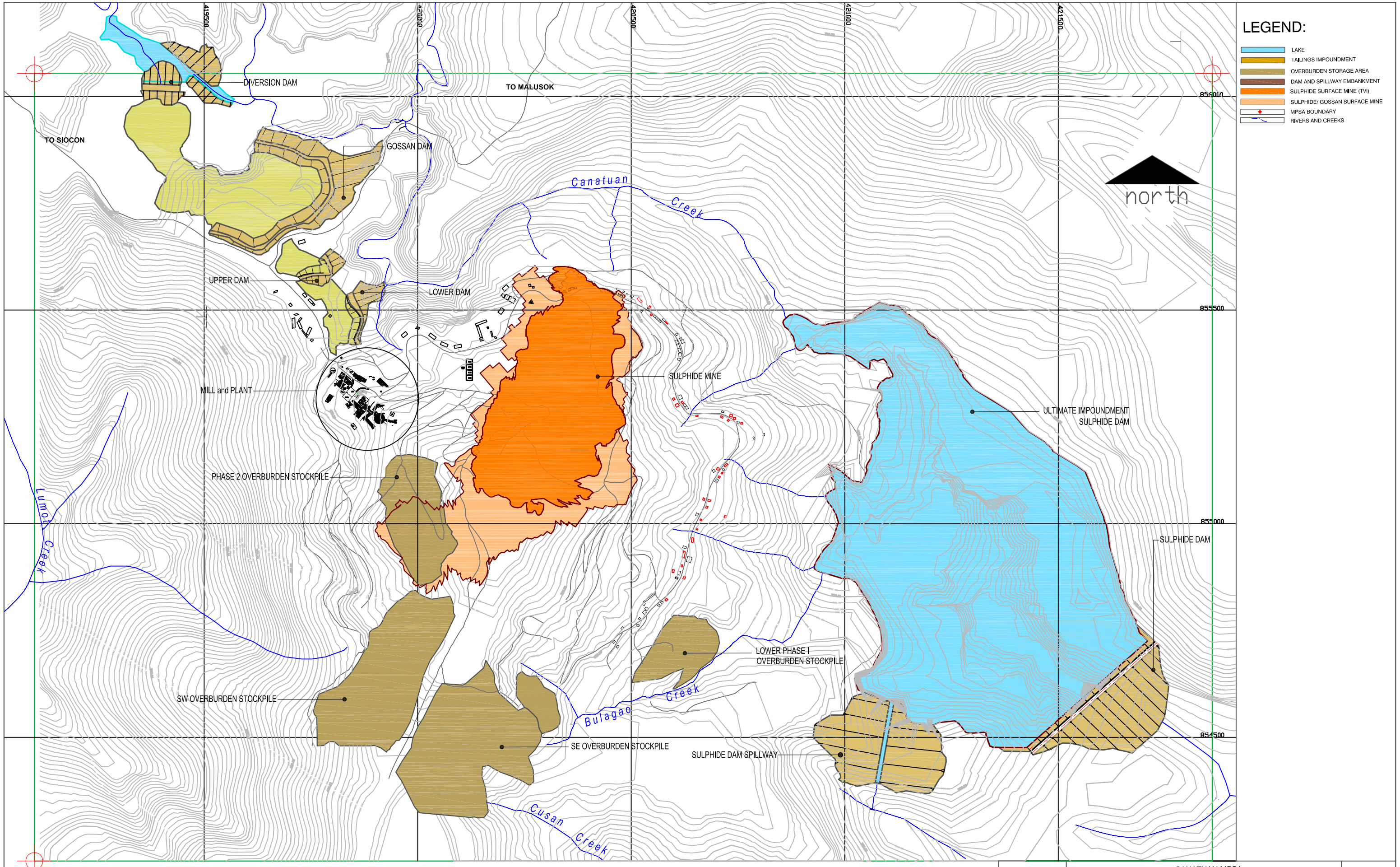
The Project area (**Figure 3.1**) is located east of Siocon Town within Barangay Tabayo, and within the central portion of the Province of Zamboanga del Norte. The terrain is hilly and mountainous and ranges in elevation between 300 meters and 550 meters. The climate is tropical with an average annual rainfall of 3,063 mm through Year 2008 and temperatures ranging from 22° C to 31° C.

The property comprises two Exploration Permit Application (EPA) areas totaling 32,400 hectares and three claim blocks totaling approximately 4,755 hectares. These areas are shown on **Figure 3.2** . The main claim block within which the reserves have been delineated covers an area of approximately 508 hectares. This particular area is covered under a **Mineral Production Sharing Agreement** (MPSA) issued on October 23, 1996. TVI has a 100% interest in the property which is subject to a 1% royalty by a former claim owner.

3.1.2 Mining Method

Mining of the Sulphide ore deposit will be the same as surface mining method used during the Gossan Phase. The overall surface mine area will encompass approximately 26 ha. This includes portions of the Gossan Surface Mine which is outside the boundaries of the Sulphide ore reserve and the Sulphide ore reserve underlying the Gossan surface mine.

Mining of the Sulphide ore will require excavation depths ranging from less than 1 m to approximately 60 m. Benching operations practiced during the Gossan operations will continue throughout the Sulphide Phase of mining. Maximum bench wall height is planned to be from 80 to 85 m. This is consistent with the 75 m depth presented in the 1996 EIS. Geotechnical criteria for the walls and benches of the Sulphide surface mine to best maintain pit wall stabilities are shown in **Table 3.1.** A typical cross section of the surface mine for Sulphide Phase is shown on **Figure 3.3.**



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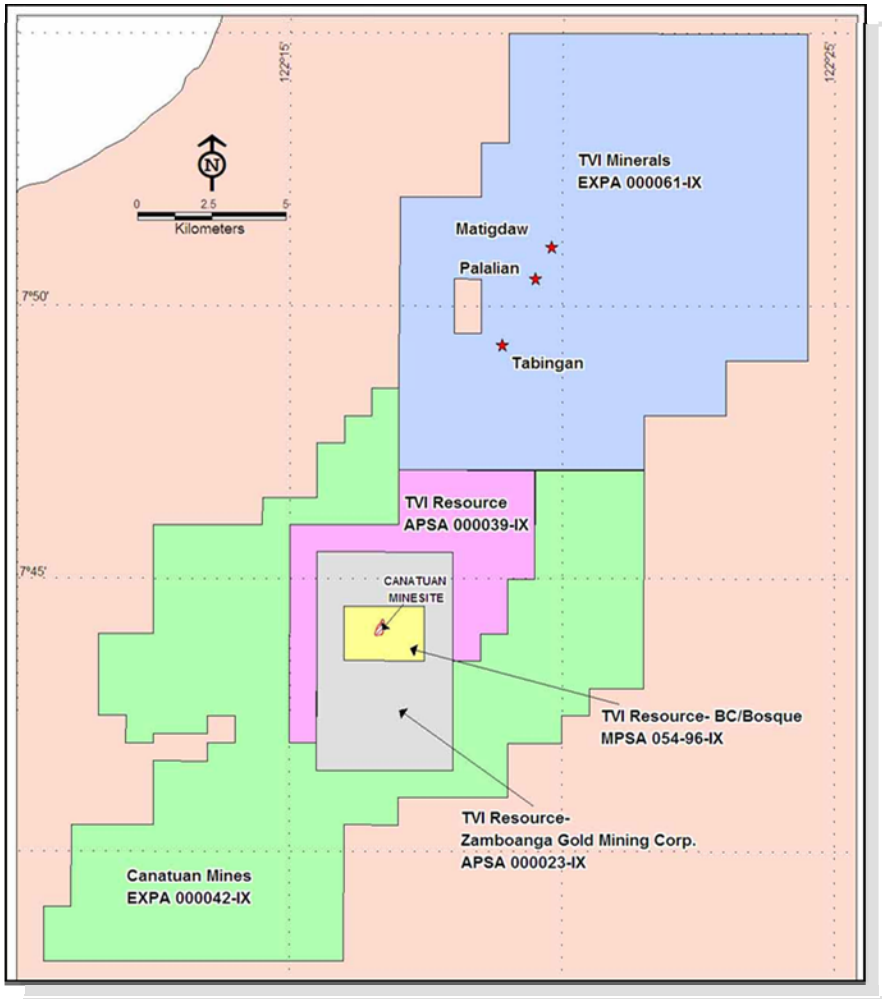
CANATUAN MPSA

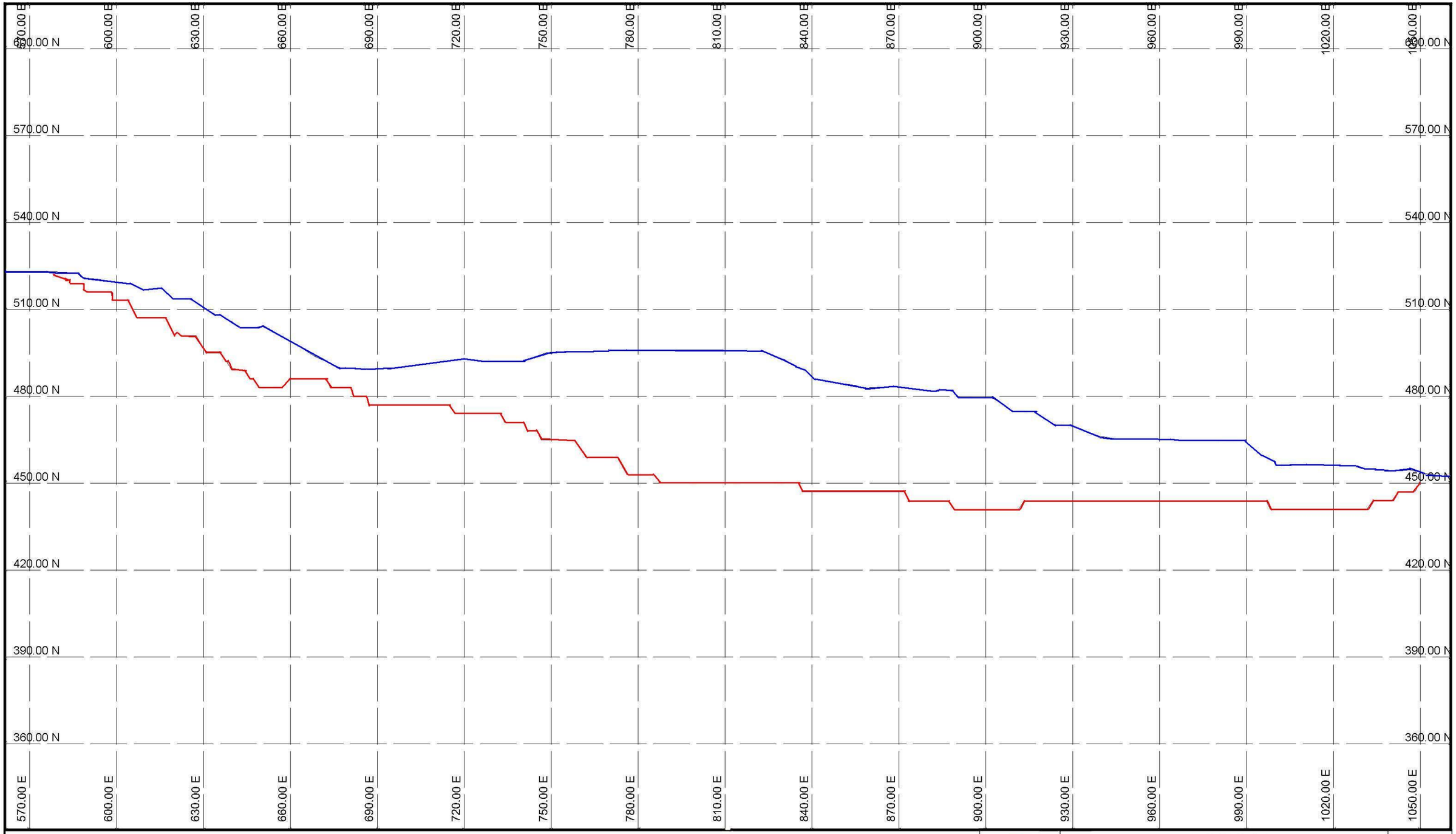
SULPHIDE PHASE PROJECT FEATURES

FIG NO. 3.1

Figure 3.2 – Project Claim Blocks



Source: TVI Resource Development Phils., Inc.



Pit Outline as of January 26, 2009

Final Pit Outline

TVI Resource Devt. (Phils) Inc.

LAST REVISED: FEB 10, 2009

CANATUAN MPSA

SULPHIDE PHASE PROJECT
CROSS SECTION ALONG LINE 420325E

FIG NO.

3.3

3.0 PROJECT DESCRIPTION

Table 3.1 – Recommended Geotechnical Criteria for Sulphide Surface Mine

Geologic Unit	Bench Height	Dry Density (tonnes/m^3)	Inter Ramp Slope Angle	Face Angle	Bench Width
Laterite/Overburden	3m	1.58	30°	63.4°	7.4m
Saprolite	3m	1.93	30°	63.4°	7.4m
Gossan	3m	1.93	30°	63.4°	7.4m
Rubbly Gossan	3m	1.68	30°	63.4°	7.4m
Sulphide	3m	4.25	45°	65°	4.6m
Schist	3m	2.20	45°	65°	4.6m

Source: Knight Piesold, 1996 and Norwest Corporation, 2006

The daily extraction rate for the Sulphide ore will vary depending on the mine plan, weather, equipment availability and ore characteristics. An annual summary is shown on **Table 3.2**. This is based on the updated feasibility studies identifying an ore reserve of approximately 3.1 million tonnes.

Table 3.2 - Summary of Annual Mine Extraction

Year	Total Mined (tonnes)	Sulphide Ore (tonnes)	Average Extraction (tonnes/day)	
			Total	Ore
2008	311,547	140,155	2,533	1,149
2009	1,759,046	669,579	4,819	1,835
2010	1,398,013	622,273	3,830	1,705
2011	1,378,868	261,014	3,778	715
2012	1,494,458	967,080	4,094	2,650
2013	538,730	374,281	4,416	3,068
2014	0	0	0	0
Total	6,880,662	3,034,382		

Notes:

1. *Year 2008 represents 2 months of mill operations, November and December.*
2. *Year 2014 represents 4 months of mill operations, January through April.*
3. *Total Mined represents ore plus waste.*
4. *Source: TVI, 2008*

Mining of the Sulphide ore body will produce overburden waste materials which are divided into two categories: Potentially Acid Generating (PAG) material and Non Acid Generating (NAG) material.

3.0 PROJECT DESCRIPTION

The volume of material within each category is a function of the amount of pyrite within the soil and rock. Estimates of this volume based on drilling and laboratory testing were conducted by Norwest Consulting Engineers in Year 2006. These data were used as input for mine planning and materials movement analysis. The resulting distribution and handling of PAG and NAG material is summarized in **Table 3.3**.

Table 3.3 – PAG and NAG Materials Handling Schedule

Year	Total Waste (tonnes)	PAG (tonnes)	NAG (tonnes)
2008	171,392	99,569	71,823
2009	1,089,466	632,915	456,551
2010	775,740	450,659	325,081
2011	1,117,853	649,406	468,447
2012	527,377	306,375	221,002
2013	164,449	95,535	68,914
2014	0	0	0
Total	3,846,277	2,234,459	1,611,818

Source: Norwest 2006

These materials will be segregated and stored separately. PAG materials will be placed and stored in the Sulphide Tailings Impoundment and/or overburden stockpiles near the Surface Mine. This segregation of PAG is planned for the purpose of control and management of acid water runoff generation and prevention of oxidation of the Sulphide overburden material. The material will be placed within the impoundment and a permanent water cover maintained. Sulphide tailings produced by the mill and processing facility will also be placed within the Sulphide Tailings Impoundment.

The NAG materials will be stripped from the ore body and will be placed within areas previously disturbed as part of the Gossan Phase operations. These materials may be used as soil cover during the rehabilitation of the mined out areas.

Other Overburden Waste stockpile areas used for NAG materials from the Gossan Phase operations are currently under Progressive Rehabilitation.

3.1.3 Mill and Processing Plant

During the Gossan Phase operations, the mill process consisted of crushing, milling and processing of mined ore. A hybrid process consisting of a Merrill-Crowe and Carbon in Leach circuit was used for the recovery of gold and silver. The Sulphide Phase operation will use the same front end crushing and grinding process from the Gossan operation and will use a Flotation Circuit for the recovery of copper and zinc concentrates.

After extraction from the surface mine, the Sulphide ore will be transported to the head of the mill where it will be crushed and conveyed through a milling and grinding circuit. After crushing and grinding the material to the desired feed size, the product will be fed to a copper flotation circuit to produce a copper concentrate and a zinc flotation circuit to produce zinc concentrate.

The flotation circuit will consist of an open circuit rougher and closed circuit cleaner and re-cleaner. The rougher tails will report to the flotation tail thickener while the re-cleaner concentrate will be thickened in a high rate thickener with flocculant. The thickened concentrate slurry will be filtered through a horizontal plate and frame filter press to produce a concentrated filter cake. A flowsheet of this process is shown on **Figure 3.4**. Some tankage, piping and mechanical equipment from the Gossan Processing Plant will be reused however the majority of the processing circuit following the milling circuit will incorporate new equipment.

Chemicals to be used within the plant processes will be the same as those identified in the 1996 EIS. The only exception is the deletion of sodium cyanide and the inclusion of potassium permanganate. Sodium Cyanide was included in the 1996 process but has since been deleted. Potassium Permanganate has been added to the chemicals list. Chemicals and annual quantities to be used as compared to the 1996 plan are shown on **Table 3.4**. The volume of chemicals to be used is less than identified in the 1996 EIS and is representative of an annual mill throughput of 500,000 to 600,000 tonnes.

On site storage facilities will be constructed for the chemicals that will be used for the Sulphide operations. Surface water runoff control and secondary containment will be provided to capture potential spills and separate clean and contaminated surface water runoff.

Figure 3. 4- Sulphide Process Flowsheet

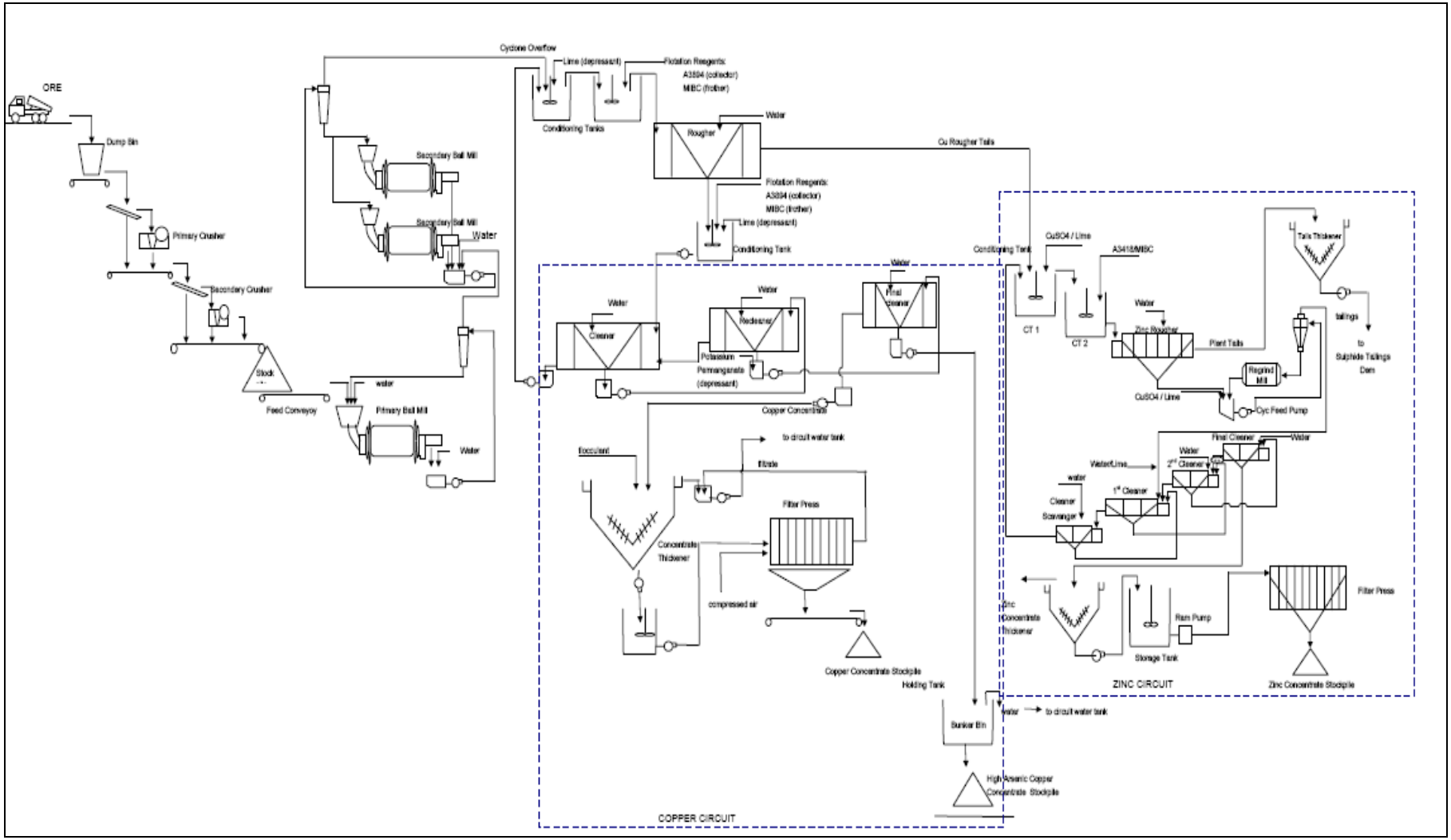


Table 3.4 – Chemical Reagents for Copper Concentrate Processing

No.	Chemical	Form	1996 EIS Estimated Consumption (tonnes/year)	2008 Estimated Consumption (tonnes/year)	*Difference*
1	Sodium Metabisulphite	powder	1,190	300	*Decreased 75%*
2	Zinc Sulphate	powder	268	500	*Increased 87%*
3	Frother (Aero 3894)	liquid	42	25	*Decreased 40%*
4	Copper Sulphate	powder	104	50	*Decreased 52%*
5	Frother (Aero 4037)	liquid	2	15	*Increased 650%*
6	Aerofroth 70 (MIBC)	liquid	105	18	*Decreased 83%*
7	Potassium Permanganate	powder	Not used	15	*Increased 100%*
8	Sodium Cyanide	powder	80	Not used	-
9	Potassium Ferrocyanide	powder	Not used	NA	-
10	*Lime*	*powder*	*1,934*	*1,500*	*Decreased 22%*

Source: TVIRD, 1996 and 2008

3.1.4 Sulphide Tailings Management

A Tailings Dam and Impoundment will be constructed for storage of tailings and PAG materials from the Sulphide Phase operations. This is the same tailings management program as identified in the 1996 EIS and also used during the Gossan Phase of operations.

The dam and impoundment were originally sited on Canatuan Creek within the northwest sector of the MPSA and immediately upstream of the Gossan Tailings Dam and Impoundment. This location and the impoundment characteristics were identified to best match the Sulphide ore reserve projected in 1996. Given the increase in ore reserve, the original site has insufficient storage to contain all the tailings and overburden material in an environmentally sound manner.

Three alternative dam and impoundment sites were identified and evaluated in Years 2006 and 2007. Each site was evaluated with respect to operations parameters, environmental management, social issues, economics, opportunities and constraints of each site, long term environmental management and post mining reclamation and rehabilitation plans. The best site identified is located downstream of the Gossan Tailings Dam, Sulphide Mill and Processing Plant and near the Southwest corner of the MPSA. The selected site was subjected to further engineering and geotechnical studies and evaluations in Year 2007. These studies formed the basis for the preparation of engineering designs and the Engineering Geotechnical and Geohazard Assessment Report (EGGAR) that were submitted to the Region 9 EMB and MGB.

The design of the dam is similar to the existing Gossan Tailings Dam and consists of a zoned earthfill embankment on weathered bedrock. The embankment is constructed as a zoned earthfill structure consisting of a sloping low permeability zone composed of fine-grained materials. Immediately downstream of the low permeability zone is the filter zone consisting of native sands in the area. Outside of the low permeability and filter zones are the random fill zones, which consist primarily of gravels and cobbles located in the immediate vicinity of the Project. The slope of the embankment will be protected by placing rock rip rap materials obtained from local quarries.

Tailings management and ore reserve evaluation indicate the tailings storage will require a dam of between 70 to 80 meters high with a crest length of approximately 300 meters. This is similar in size to the original Sulphide Tailings Dam however the storage capacity is significantly greater. The volume of

tailings to be stored within the impoundment is anticipated to be approximately 3.0 million tonnes. An additional 2.2 million tonnes of overburden material removed as part of the Sulphide ore mining will be placed within the impoundment as well. This will be done as mitigation measure for prevention of acid generation from the unoxidized Sulphide overburden material. An estimated 2.0 million tonnes of watershed sediment will also be deposited within the impoundment.

Final engineering designs and analyses were done assuming a maximum dam height of 85 m. This is consistent with the topography and maximizes the storage volume of the site. This also provides additional operations flexibility in the event tailings densities are less than projected or additional ore is identified and processed.

Design and construction management of the dam is being done by United States based consultants specialized in tailings dam design. The design criteria are based on the Philippine regulations and include analyses and designs for the Maximum Credible Earthquake and Probable Maximum Flood events. Plan view and cross section of the dam are shown in **Figures 3.5 and 3.6**.

The operation philosophy of the dam and impoundment will be a water flow through or run-of-river type structure with an upper level spillway. This is intended to maintain a continuous water cover over the Sulphide tailings and overburden material to prevent oxidation of potentially acid generating materials. This is the same concept for tailings management incorporated within the original tailings management plan and EIS.

3.0 PROJECT DESCRIPTION

Figure 3.5 – Plan View of the Sulphide Dam

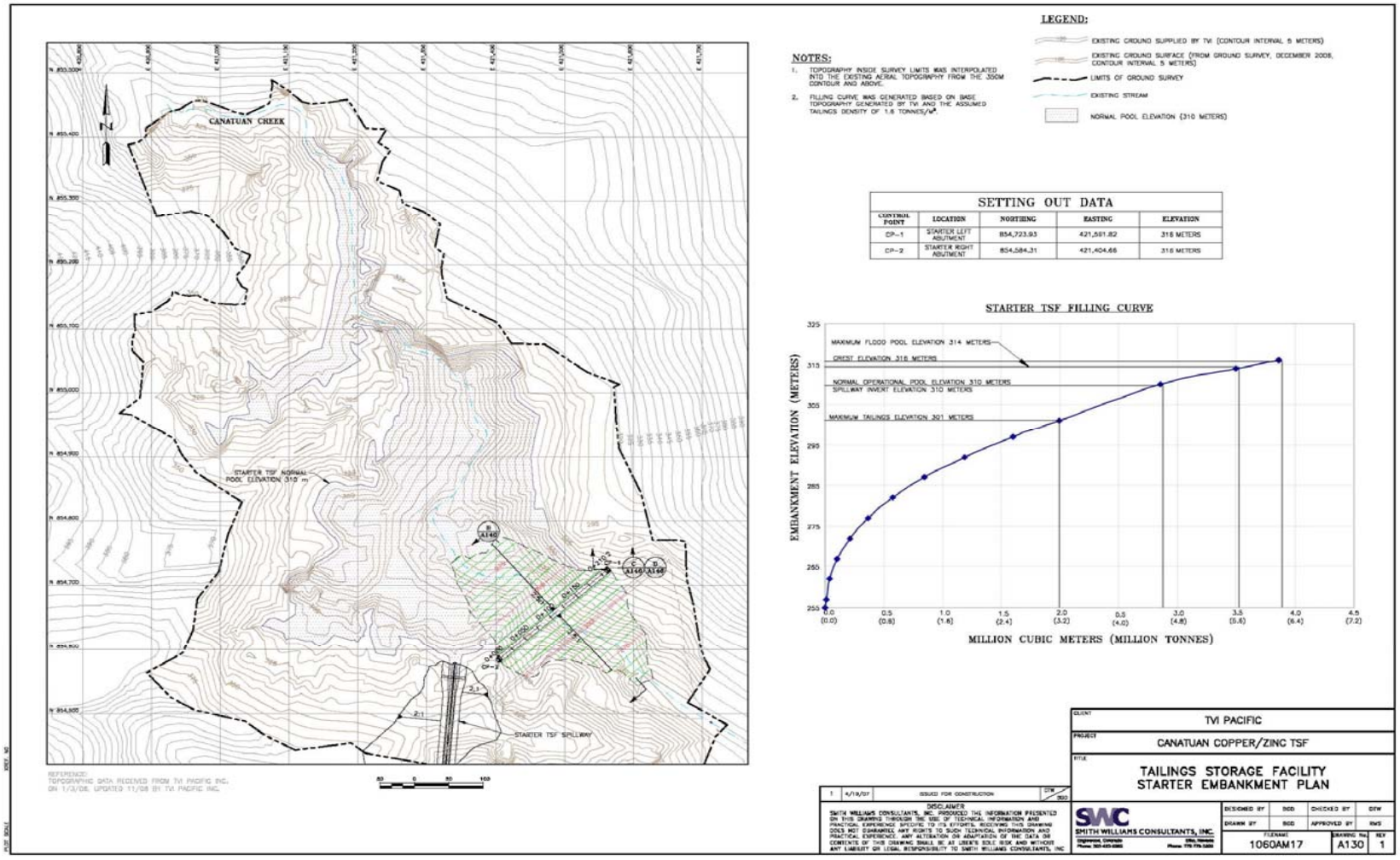
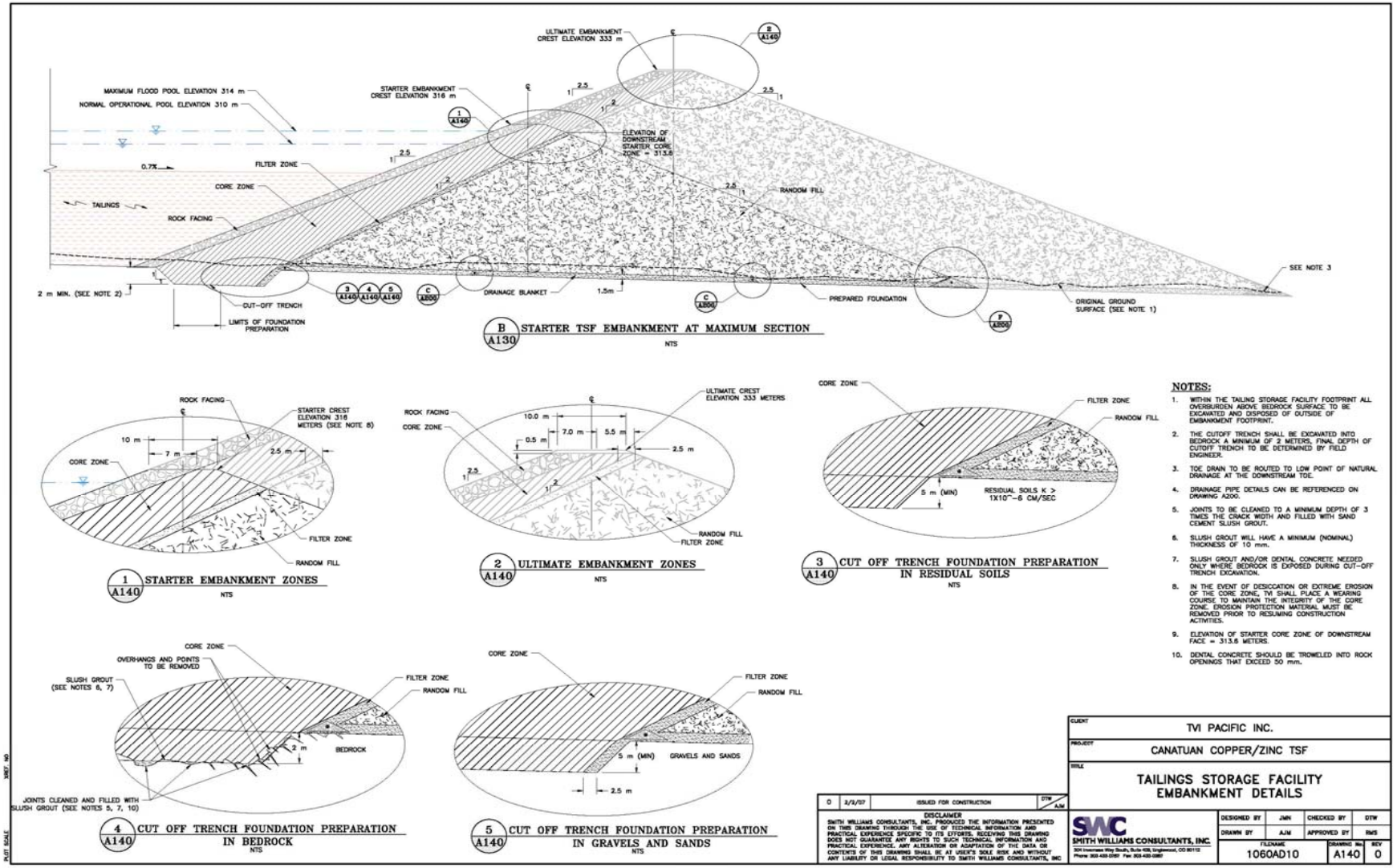


Figure 3.6 – Cross Section View of the Dam



From the standpoint of environmental management, the relocated dam and impoundment will provide a significant sediment capture and storage opportunity for the MPSA. Once constructed, potential water quality impacts associated with erosion within the MPSA and sedimentation downstream of the MPSA will be significantly reduced. Similarly the relocated dam has significantly reduced the forest impacts expected from the original plan.

Existing tailings dam structures used for the Gossan Phase operations (the Gossan Tailings Dam, Upper Tailings Dam and Lower Tailings Dam) will no longer be used for the Sulphide Phase operations and will undergo Progressive Rehabilitation activities during the course of the Sulphide phase operations. Detailed activities associated with the reclamation programs are provided in the Final Mine Rehabilitation and Decommissioning Plan submitted to the DENR-MGB. Yearly progressive rehabilitation activities will likewise be incorporated in this AEPEP document and future updates.

3.1.5 Production

The previous Environmental Impact Study identified the Sulphide ore reserve as 1.5 million tonnes. However, additional metallurgical and geologic studies performed in Years 2006, 2007 and 2008 identified a higher ore reserve that could be mined based on metal prices for copper and zinc. This resulted in an increase in the total reserve and consequently an increase in milling rate from the original 1,200 tonnes per day to 1,850 tonnes per day.

Approximately 160,530 tonnes of copper and zinc concentrate combined are expected to be produced over the 5 ½ year mine life. This is divided into 118,712 tonnes of copper concentrate and 41,818 tonnes of zinc concentrate.

Copper and zinc concentrate production will be divided into three different production campaigns: high copper concentrate only, combination of copper and zinc concentrate production and high zinc concentrate. The high copper concentrate production will cover the period of November 2008 through June 2009. Production of copper and zinc concentrates simultaneously will occur during the periods July 2009 through November 2010 and August 2011 through March 2013. The high zinc concentrate production will occur during the period December 2010 through July 2011 and April 2013 through April

2014. Production schedule summary is provided in **Table 3.5.** The estimated annual production of copper and zinc concentrate is provided in **Table 3.6**. Throughput rates will vary from 250 tonnes per day at startup to 1,850 tonnes per day in Year 2010. The average throughput over the course of the operations will be approximately 1,570 tonnes per day. This represents a 30% increase over the original 1,200 tonnes per day.

Table 3.5 – Annual Mill Feed and Generation of Tailings

Year	Total Mined (tonnes)	Sulphide Ore (tonnes)	Milled Ore	Stockpile Ore (tonnes)	Product Concentrates (tonnes)	Tailings Generated (tonnes)
Year 2008	311,547	140,155	33,567	171,392	1,581	31,986
Year 2009	1,759,046	669,579	488,704	1,089,466	41,095	447,608
Year 2010	1,398,013	622,273	548,510	775,740	42,830	505,679
Year 2011	1,378,868	261,014	567,688	1,117,853	29.763	537,925
Year 2012	1,494,458	967,080	657,153	527,377	18,473	638,680
Year 2013	538,730	374,281	646,331	164,449	20,659	625,692
Year 2014	0	0	184,821	0	6,129	178,692
Total	6,880,662	3,034,382	3,126,794	3,846,278	160,530	2,966,263

Note:
1. Total Mined is ore plus overburden waste materials.
2. Source: TVIRD 2007

Table 3.6 – Annual Copper and Zinc Concentrate Production

Year	Milled Ore (tonnes)	Average Mill Throughput (tonnes/day)	Copper Concentrate (tonnes)	Zinc Concentrate (tonnes)	Total Product Concentrate (tonnes)
2008	33,567	746	1,581	0	1,581
2009	488,704	1,339	38,540	2,555	41,095
2010	548,510	1,503	33,246	9.584	42,830
2011	567,688	1,555	19,040	10,723	29,763
2012	657,153	1,800	13,181	5,292	18,473
2013	646,331	1,771	10,461	10,198	20,659
2014	184,821	506	2,663	3,465	6,129
Total	3,126,794		118,712	41,818	160,530

Source: TVIRD, 2007

3.0 PROJECT DESCRIPTION

3.2 Mineral Resources

3.2.1 Reserves and Resources

Original estimates of the Sulphide ore resource indicated approximately 1.5 million tonnes were available for mining and processing. Feasibility studies completed in May 2006 identified a potential resource of slightly over 3 million tonnes. Although it is a significant increase, the ore body and surface mine horizontal boundaries remain the same as those identified in the 1996 EIS.

3.2.2 Average Grade of Ore

Grades and associated tonnage for copper, zinc, gold and silver in the Sulphide deposit are shown in **Table 3.7.** The copper cutoff grade based on Project optimization studies completed in Year 2007 is approximately 0.25% copper.

Table 3.7 - Mineral Resource Sulphide Deposit

Grade Group	Tonnage	Cu Grade	Zn Grade	Au Grade	Ag Grade
	T	%	%	(grams/tonne)	(grams/tonne)
> 2.00% Cu	606,644	3.28	1.59	1.48	68.70
1.00 – 2.00	826,251	1.42	1.43	0.86	41.10
0.50 – 1.00	930,114	0.72	0.72	0.50	20.82
0.40 – 0.50	257,017	0.45	0.45	0.33	15.54
0.30 – 0.40	276,920	0.35	0.37	0.29	21.83
0.20 – 0.30	244,637	0.25	0.33	0.23	14.25
0.10 – 0.20	346,165	0.14	0.28	0.13	12.40
0.05 – 0.10	273,809	0.08	0.29	0.09	5.26
0.00 – 0.05	26,412	0.01	0.03	0.01	0.33
Total	**3,787,969**	**1.1**	**0.87**	**0.62**	**30.17**

Source: Excerpt from Independent Review and 43-101 Technical report by PJLGeo-Conseil Inc. (Work during 2007, Filed on April 5, 2008)

3.0 PROJECT DESCRIPTION

3.3 Access and Transportation

3.3.1 Road Access

Road access to the Project area by land is year round although the travel time depends on the weather conditions. The primary route to Canatuan is a 45 km route through RT Lim. Access to Siocon town is also available from Canatuan and has been upgraded along the 28 km length of road. Both access roads are open to the public. Completion of the roads and continuous maintenance activities has resulted in the establishment of regular bus service between Siocon and Zamboanga City.

Under normal weather conditions land travel from Canatuan to Zamboanga City is 3 ½ to 4 hours and 2 hours from Canatuan to Siocon.

3.3.2 Air Access

Air access is available by small fixed wing aircraft from Zamboanga City to Siocon and Ipil. Flight time is approximately 40 to 35 minutes. A helipad is located at the mine and is available for helicopter service.

3.3.3 Sea Based Shipping

Product concentrate from the Sulphide Phase operations is intended to be shipped to off-take buyers through the port of Santa Maria in Siocon. The port is located approximately 7.0 km North of Siocon and 34.0 km from Canatuan. It has been upgraded as part of the USAID programs within Mindanao in the past years and Roll-on and Roll-off (RORO) facilities have been provided. The area of the bay and published soundings indicate ships up to 20,000 DWT may be able to navigate the harbor. Plans for improvements and provision of additional facilities such as concentrate storage warehouse are on going as part of the Sulphide Phase operations.

3.4 Power Supply

The estimated power requirement for the Sulphide Phase operations is 53,000 kWh/day. This is about the same as the recently concluded Gossan Phase operations.

3.0 PROJECT DESCRIPTION

The Sulphide Phase operations will be powered by mobile diesel engine generator sets during the start up and early operations period of the Project. Power during the latter period of the Project will be provided by the Zamboanga Electric Cooperative (ZAMSURECO). Connection to the power grid through the ZAMSURECO is currently on going. Once completed the existing generator sets will only be used for standby power.

3.5 Mining Equipment

Equipment related to the mine operations are generally provided by an outside contractor. The company owned equipment is limited and any additional equipment required is leased. A list of equipment owned by TVI and leased from the outside contractor is shown in **Table 3.8.**

Table 3.8 – Major Mining and Operations Equipment

Equipment	Owner	Number of Units
D7 Bulldozer	TVI	1
D4 Bulldozer	TVI	1
Crane	TVI	1
Mini Dump Truck	TVI	1
Skidster, Bobcat	TVI	1
Excavator	Contractor	9
Haul Truck	Contractor	54
Dozer	Contractor	4
Road Grader	Contractor	4
Compactor	Contractor	4
Rock breaker	Contractor	1
Loader	Contractor	4
Lube Truck	Contractor	4
Service Truck	Contractor	4

3.6 Workforce Information

During construction of the Sulphide Phase plant facilities and tailings dam manpower will be sourced from the current labor force of the Gossan Phase Operation. Approximately 100 to 150 construction workers will be used for the decommissioning of Gossan Phase equipment, construction of the Sulphide Mill Plant and construction of the Tailings Dam. During the Sulphide Plant operation, approximately 500 staff and personnel will be needed to operate the Sulphide Mill and Processing Plant as well as administration functions. There will be approximately 90 employees for administration and 450 rank and file including mill personnel. Manpower summary for the Sulphide Phase operations are shown in **Table 3.9.**

Table 3.9 – Manpower Summary for the Sulphide Phase Operations

Department	Number Required	Department	Number Required
Senior Staff	22	Security Force	174
Project Management	3	Civil Engineering Services	19
Mine Operation	29	Environmental/ Permitting	25
Mill Operation	80	Safety	5
Assay Laboratory	25	Finance	5
Mill Maintenance		Human Resource/ Administration	37
Mobile Section	22	Community Development Office	6
Electrical Section	22	Materials Management	14
Mill Maintenance	51	Public Affairs	2

3.7 Operation and Development Schedule

Modifications and construction for the Sulphide Phase Project commenced on May 2008 after the cessation of the Gossan Phase operations. Construction of the Stage 2 of the Sulphide Tailings Dam also continued at this time. Commissioning of the Sulphide Mill Plant began on November 15.

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

4.1 Land Resources

Impact control strategies for the land resources represent commitments to environmental management of the resources during mining, reclamation, and closure operations. Strategies and mitigation measures have previously been developed with the intent that they be implemented throughout the Project operations. These strategies focus primarily on soil erosion control and rehabilitation of the disturbed lands.

4.1.1 Year 2008 Programs and Activities

Projects and programs completed during Year 2008 include the following:

- Decommissioning of the Gossan Phase operation and the commencement of the Sulphide Phase Project. The Sulphide Mill Plant was constructed primarily with the previous Gossan Mill Plant area. Some of the equipment used during the Gossan Phase operation was refurbished to suit the Sulphide Phase operation. Additional equipment was added and facilities constructed to complete the Plant. This included like filter press, product storage warehouse and chemical reagent storage areas. Plant commissioning for the Sulphide operations began on November 15, 2008.

- Tailings disposal to the Gossan Dam ended in April 2008. Construction of the Gossan Dam Final Spillway was completed in the last quarter of Year 2008. Impounded rain water was released through the spillway to allow the dam to dry up and hasten tailings consolidation. This forms part of the initial Progressive Rehabilitation program for the Gossan Tailings Dam. Samples of water impounded in the Gossan Dam and the other existing tailings Dam structures were sent to a third party laboratory for analysis of heavy metals and free cyanide parameters. The results indicated the water was well within both the effluent discharge standards and the stream water quality standards.

- Eight sediment control ponds were constructed or maintained during the year. These ponds serve as control strategies to mitigate impacts on soil erosion and silt conveyed by surface water during rainfall events.

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

- Reforestation and revegetation continued within and outside the MPSA area during Year 2008. Approximately 26,100 trees were planted within and outside the MPSA. In total, this represents approximately 9 hectares that were placed into active reclamation during Year 2008. In addition to the trees planted, various grasses and shrubs were planted within the MPSA. A map showing the reforestation program during the Years 2004 through 2008 time period is shown on **Figure 4.1**.

- Experimental areas located in the Overburden Waste Stockpile area were established to determine survival of cash crop and diverse species in the type of soil in Canatuan. This is intended for the reforestation and revegetation activities under the Progressive Rehabilitation program. The type of species planted for experimental purposes were based on the result of consultation with different members of the community, the Council of Elders, Subanon Youth , and Siocon Subanon Women's Association, as part of the Final Mine Rehabilitation and Decommissioning process. Species planted in these areas included bamboo, lanzones, star apple, coffee, rambutan, makopa, mango and marang. These variety of trees were likewise introduced in the plant nursery to form part of the regular reforestation activities within the MPSA.

- Rehabilitation of the eroded portion of the Ambaan Area adjacent to the Gossan Dam was completed. Eroded slopes were benched and provided with drainage canals. Fill materials were placed in 0.3 m to 0.5 m lifts and compacted. Approximately 15,000 cubic meters of stabilized materials was placed in the area. The area was subsequently revegetated with grasses, shrubs and interplanted with forest and fruit tree species such as durian and marang.

- The rehabilitation of the eroded portion of the Lower Phase I mining area was completed. This area encompasses approximately 8 hectares. Erosion and soil loss from this area were transported in the Sulphide Tailings Dam which serves as a final sediment control for the upstream Canatuan watershed. Overburden materials from the pre-stripping activities at the Sulphide Mine area were compacted to create 3m to 5 m bench heights. Drainage canals were constructed and vegetation on the benches re-established. Various shrubs and grasses were initially broadcast on the bench slopes and crests. Indigenous tree and fruit species were later interplanted with each other. Silt fences were installed on the lower benches and at the toe line to reduce sedimentation impacts to nearby Bolagao Creek.

N
W E
S

OLD STAFFHOUSE
NEW STAFFHOUSE
SCAA BARRACKS AND GENSET ROOM
MALUSOK GUARDPOST
HELIPAD
TO R.T. LIM

TANUMAN DEMO FARM
300 TREES
520 TREES

CANANTUAN ELEM. SCHOOL

Conc. Mon.20x20x60cm. set 50cm. in the ground, centered with a hole and marked "2/MPSA-0004"

TO SIOCON

DIVERSION DAM
200 SEEDLINGS RUBBER

SSAI AREA

TIMBER LAND
LC MAP No. 2500, DATED 12-18-61

MPSA

Conc. Mon.20x20x60cm. set 50cm. in the ground, centered with a hole and marked "3/MPSA-0004"

UPPER TAILINGS POND
1,700 VETIVER SLIPS

TAILINGS POND
LOWER TAILINGS DAM

AGOLO AREA

MILL AREA

NURSERY

BACK RIDGE

TIMBER LAND
LC MAP No. 2500, DATED 12-18-61

7°43'30"00
854210.94

MPSA
Conc. Mon.20x20x60cm. set 50cm. in the ground, centered with a hole and marked "1/MPSA-0004"

TIMBER LAND
MAP No. 2500, DATED 12-18-61

Conc. Mon.20x20x60cm. set 50cm. in the ground, centered with a hole and marked "4/MPSA-0004"

122°16'00"00
122°17'30"00
419102.8

0 100m 200m 500m 750m
SCALE IN METERS

LEGEND

- PREVIOUS REFORESTATION YEARS 2004 AND 2005
- REFORESTATION PROGRAM YEAR 2006 TO YEAR 2007
- REFORESTATION PROGRAM YEAR 2008
- (A) PLANTING AREA DESIGNATION
- MINE PIT OUTLINE

PLANTING SCHEDULE YEAR 2008			
PLANTING AREA	AREA (ha)	NUMBER PLANTED	SPECIES PLANTED
A	1.0	1,775	MANGIUM
B	0.2	350	RUBBER
	1.4	2,400	MANGIUM
		4,560	VETIVER GRASS
	0.2	300	FRUIT TREES
C	0.2	300	MANGIUM
		60	LANZONES, MAKOPA
		2,000	VETIVER
D	0.5	850	AURI
		575	VETIVER GRASS
E	0.4	600	AURI
	0.1	218	NATO
F		2,100	VETIVER GRASS
	0.1	250	RATTAN
G	0.5	900	AURI
H	0.7	1,218	AURI/MANGIUM
I	0.1	200	MANGGASINORO/NATO/
			BAGTIKAN
J	3.0	5,125	AURI
		60	UAY
K	2.5	4,150	AURI
		2,173	VETIVER GRASS
L	4.0	6,800	AURI/ ACACIA MANGIUM
		30	BAMBOO

REFORESTATION PROGRAM YEARS 2004 THROUGH 2008

FIGURE NO. 4.1

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

- Continued benching, drainage controls and placement of fiber netting at the Southeast and Southwest Stockpile areas. Benched portions of the stockpile areas were broadcast with lime for pH neutralization and to increase the potential for growth of grass seeds and tree saplings. Soil conditioning in these areas is also continuous process.

- Installation of wood barriers, terracing and soil retaining structures like silt fences were completed throughout the disturbed areas. This is intended to minimize soil erosion within steep slope areas and increase the retention of grass seed on the disturbed slopes.

- Continuation of Stage 2 construction of the Sulphide Tailings Dam was initiated July 2008. The dam crest elevation planned for this stage is 292 m and spillway elevation at 289 m. The volume provided by stage 2 includes the amount of watershed provisions for sediment that maybe deposited within the impoundment as well storage of waste materials and tailings through Year 2009 operations.

  In addition to tailings and waste disposal, the dam continues to serve as a final sediment control structure for disturbed areas within the MPSA. Since the operation of the Sulphide Tailings Dam, approximately 223,000 m^3 of sediment from the watershed has been retained.

During Year 2008, approximately 190,000 DMT of ore was removed from the mine pit for the remaining Gossan Phase operations. This is equivalent to 4 months of operation from January 2008 to April 2008. The total volume of tailings impounded in the Gossan Tailings Dam from the Gossan Phase operations is approximately 950,000 m^3.

The commissioning of the Sulphide Phase Project began in November 2008 and involved the extraction of 337,911 tonnes of ore and waste materials from the mine area. This is slightly in exceedance of the planned extraction volume in 2008 of 311, 547 tonnes. This is also less than the 1.8 million annual extraction limit identified in the revised ECC.

An additional area of approximately 4.3 hectares of land within the MPSA was disturbed during Year 2008 operations. This represents the pre-stripping activities and initial mine excavation at the Sulphide Surface Mine clearing of the Sulphide Mill area, on-going construction of the Sulphide Tailings Dam,

disturbance at the Lower Phase I and Upper Lumot Creek watershed. In total, approximately 181 hectares or approximately 35% of the 508 hectare MPSA area has been disturbed. The disturbed area outside the MPSA that is affected by both the Gossan and Sulphide Phases is approximately 26 hectares.

Disturbed areas within the MPSA are distributed into parcels and are shown in **Figure 4.2**. A summary of the disturbed areas from the Gossan Phase and additional disturbance from the Sulphide Phase operation is shown in **Table 4.1**. Photodocumentation of the implemented 2008 Land Management Programs and activities are provided in **Annex B.**

4.1.2 Year 2009 Programs and Goals

Sulphide ore operations began as plant commissioning operations in November, 2008 and will continue in Year 2009 with the production of copper concentrate. Approximately 1,800,000 tonnes of ore and waste materials are expected to be mined and 670,000 tonnes are anticipated to be processed during the year. Overburden waste materials that will be extracted are Non Acid Generating (NAG) and Potentially Acid Generating (PAG). Approximately 42% of the waste materials will be NAG (457,000 tonnes) and 58% is considered PAG (633,000 tonnes). NAG materials will be placed within areas previously disturbed as part of the Gossan Phase operations. The PAG materials will be buried within the NAG overburden stockpiles and impounded in the Sulphide Tailings Dam impoundment to eliminate exposure and acid generation. Mine Plans for Year 1 and Year 2 operations (2008 and 2009) are provided on **Figure 4.3** and **Figure 4.4**.

The features associated with the Sulphide operations are shown on **Figure 3.5**. Estimated production rates for mill processing and overburden disposal during the Sulphide phase of operations are shown in **Table 3.3** and **Table 3.5**.

N
W
E
S

620
520
480
460
380
340
100

857000
856500
856000
855500
855000
854500

418000
419000
419500
420000
420500
421000
421500
422000

OFFSITE – MALUSOK 10.0
EAST MALUSOK CREEK
FRESHWATER SUPPLY SOURCE
MALUSOK AREA
STAFFHOUSE
NEW STAFFHOUSE
SCAA BARRACKS AND GENSET ROOM
MALUSOK GUARDPOST
HELIPAD
MALUSOK ROAD
39 kms. TO R.T. LIM PROPER
HOUSING C
10.0 OFFSITE – MALUSOK ROAD
WEST MALUSOK CREEK
OFFSITE – SKYLINE 5.0
FRESHWATER SUPPLY SOURCE
FRESHWATER SUPPLY SOURCE
OFFSITE – LANDFILL 5.0
PERMANENT SPILLWAY
DIVERSION DAM AND SPILLWAY CREST EL. 455M
UPPER CANATUAN CREEK
F 6.0
28 kms. TO SIOCON PROPER FROM MILL PLANT
O 3.0
PERMANENT SPILLWAY CHANNEL
GOSSAN DAM CREST EL. 442
WASTE LANDFILL
DIVERSION DAM LAKE
GOSSAN TAILINGS DAM
WATER CONTROL DIVERSION DAM
HOUSING
G 2.5
E 12.5
GOSSAN TAILINGS IMPOUNDMENT
WATER TREATMENT PONDS
J 2.0
H 1.5
LOWER TAILINGS IMPOUNDMENT
D 2.5
UPPER TAILINS IMPOUNDMENT
UPPER TAILINGS DAM
LOWER TAILINGS DAM
SMALL SCALE MINING AREA
C 3.5
ADMINISTRATION
CANATUAN CREEK
I 2.0
SULPHIDE ORE MILL
M 26.0
NURSERY
SULPHIDE MINE AREA
GOSSAN ORE MILL
L 72.0
B 2.0
K 3.5
A 4.0
SUBMERGED TAILINGS PERMANENT LAKE
PHASE 2 OVERBURDEN STOCKPILE
EAST OVERBURDEN STOCKPILE
S 23.0
Q 8.0
N 23.5
SULPHIDE TAILINGS DAM
P 3.0
R 12.0
SOUTHWEST OVERBURDEN STOCKPILE
LUMOT CREEK
SOUTHEAST OVERBURDEN STOCKPILE
SPILLWAY
PASSIVE WATER QUALITY CONTROL
MPSA

0 100m 200m 500m 750m
SCALE IN METERS

LEGEND

- ROADS
- DESIGNATION (X) AREA (ha.) (1.0)
- MINE AREA
- EXISTING AND PROPOSED DAMS
- CREEKS/RIVERS
- MPSA BOUNDARY
- TAILINGS SURFACE
- LAKE OR POND
- MINE OVERBURDEN STOCKPILE
- INDUSTRIAL AND RESIDENTIAL FACILITIES
- SMALL SCALE MINING FACILITIES
- PASSIVE WATER TREATMENT FACILITITES

DISTURBED AREA DESIGNATION

A	GOSSAN MILL
B	NURSERY AND FUEL STORAGE
C	LOWER TAILINGS DAM
D	UPPER TAILINGS DAM
E	GOSSAN TAILINGS DAM
F	DIVERSION DAM
G	WORKER HOUSING
H	AMBAAN VILLAGE
I	AGOLO VILLAGE
J	MANHATTAN VILLAGE
K	SULPHIDE MILL
L	SULPHIDE TAILINGS DAM
M	MINE PIT SULPHIDE
N	SE/SW OVERBURDEN STOCKPILE
O	RELOCATION SIOCON ROAD (FUTURE)
P	BACK ROAD STRIP AREA
Q	CANATUAN SSM AREA
R	EAST OVERBURDEN STOCKPILE
S	LUMOT CREEK

TVI

DISTURBED AREAS GOSSAN AND SULPHIDE OPERATIONS

YEAR 2009

FIGURE NO.
4.2

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

Table 4.1 - Disturbed Area Estimates Within and Outside the MPSA Area

Parcel	Land Use	Maximum Disturbed Area (ha)	Adjustment Factor	Adjusted Disturbed Area (ha)	Decommissioning and Reclamation Period		Estimated Annual Disturbance (ha)												
							2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
A	Gossan Mill Plant Area	4.00	0.95	3.80	2008	2015	3.04	0.38	0.38										3.80
B	Nursery/Fuel Storage Area/Warehouse	2.00	1.00	2.00	2014	2015	0.40	0.80	0.80										2.00
C	Lower Tailings Dam and Impoundment	3.50	0.95	3.33	2008	2010		2.49	0.83										3.32
D	Upper Tailings Dam and Impoundment	2.50	0.95	2.38	2008	2010	1.20	0.59	0.59										2.38
E	Gossan Tailings Dam and Impoundment	12.50	0.95	11.88	2008	2010		4.75	7.13										11.88
F	Diversion Dam and Spillway	6.00	0.50	3.00	2008	2009		1.80	1.20										3.00
G	Worker Housing	5.00	0.90	4.50	2007	2015	0.45	1.35	1.35	1.35									4.50
H	Ambaan Village	1.50	0.90	1.35	2008	2009	0.94	0.41											1.35
I	Agolo Housing Area	1.87	0.90	1.68	2015	2015	1.18	0.50											1.68
J	Manhattan Housing Area	3.00	1.00	3.00	2007	2008	0.90	1.50	0.60										3.00
K	*Sulphide Mill Plant Area*	*3.50*	*0.95*	*3.33*	*2014*	*2015*				*2.66*	*0.67*								3.33
L	*Sulphide Tailings Dam and Impoundment*	*82.00*	*0.75*	*61.50*	*2008*	*2015*				*45.00*	*9.00*			*7.50*					61.50
M	*Mine Pit (Gossan and Sulphide)*	*31.00*	*1.00*	*31.00*	*2008*	*2015*	7.20	7.20	3.60	5.00	*4.00*	*4.00*							31.00
N	Southeast/Southwest Overburden Stockpile	23.50	1.00	23.50	2006	2009	4.70	9.40	4.70	4.70									23.50
O	Future Relocation Siocon Road	3.00	0.25	0.75	2008	2009				0.75									0.75
P	Back Road Area	3.00	0.25	0.75	2005	2008		0.38	0.37										0.75
Q	Canatuan Small Scale Mining Area	8.00	0.70	5.60	2008	2015	4.48	1.12											5.60
R	*East Overburden Stockpile (Lower Phase 1)*	*12.00*	*1.00*	*12.00*	*2014*	*2015*					*6.00*	*6.00*							12.00
S	Lumot Creek Watershed Lower Phase 2 Mine	27.30	0.85	23.21	2009	2010					23.21								23.21
Total MPSA Area Only		235.17	0.84	198.54	2005	2015	24.49	32.67	21.55	59.46	42.88	10.00	0.00	7.50	0.00	0.00	0.00	0.00	**198.55**
Annual Gossan Phase Disturbance		79.37	1.43	113.71	2005	2015	24.49	32.67	21.55	11.80	23.21	0.00							**113.72**
Annual Sulphide Phase Disturbance		128.50	0.66	84.83	2014	2015				47.66	19.67	10.00	0.00	7.50	0.00	0.00	0.00	0.00	**84.83**
Cumulative MPSA Disturbance							24.49	57.16	78.71	138.17	181.05	191.05	191.05	198.55	198.55	198.55	198.55	198.55	**198.55**
Offsite Parcels	Malusok Housing Area	10.00	0.85	8.50	2014	2015	2.50	2.50	2.50	1.00									8.50
	Malusok Access Road Strip	10.00	0.85	8.50	2014	2015	4.00	3.00	1.00	0.50									8.50
	Skyline and School Area	5.00	0.95	4.75	2014	2015			2.50	2.25									4.75
	Landfill Area	5.00	0.90	4.50	2014	2015			2.25	2.25									4.50
Total Annual Disturbance Outside MPSA Area Only		30.00	0.88	26.25	2014	2015	6.50	5.50	8.25	6.00									26.25
Cumulative Disturbance Outside MPSA		265.17	0.85	224.79	2005	2015	6.50	12.00	20.25	26.25	26.25	26.25	26.25	26.25	26.25	26.25	26.25	26.25	**26.25**
Total Annual Disturbance Within and Outside MPSA							30.99	38.17	29.80	65.46	42.88	10.00	0.00	7.50	0.00	0.00	0.00	0.00	**224.80**
Total Cumulative Disturbance Within and Outside MPSA							30.99	69.16	98.96	164.42	207.30	217.30	217.30	224.80	224.80	224.80	224.80	224.80	**224.80**

Notes:

1. Based on Land Use Map prepared for the 2007 and 2008 AEPEP and the 2008 FMRDP.
2. Sulphide Tailings Impoundment assumed to remain a pemanent lake. Lake area not subject to reclamation.
3. Maximum Disturbed Area represents the gross area subject to disturbance. It is unlikely the entire area within some Parcels will be disturbed. An Adjustment Factor is included to account for this.
4. Red italics represent specific Sulphide Operations reclamation items.
5. Year 2008 Revisions - (a) Added Parcel S disturbed area. (b) Increased disturbed area of Parcel L in 2011. (c) Extended decommissioning period Parcel A.

TVI Resource Devt. (Phils) Inc.

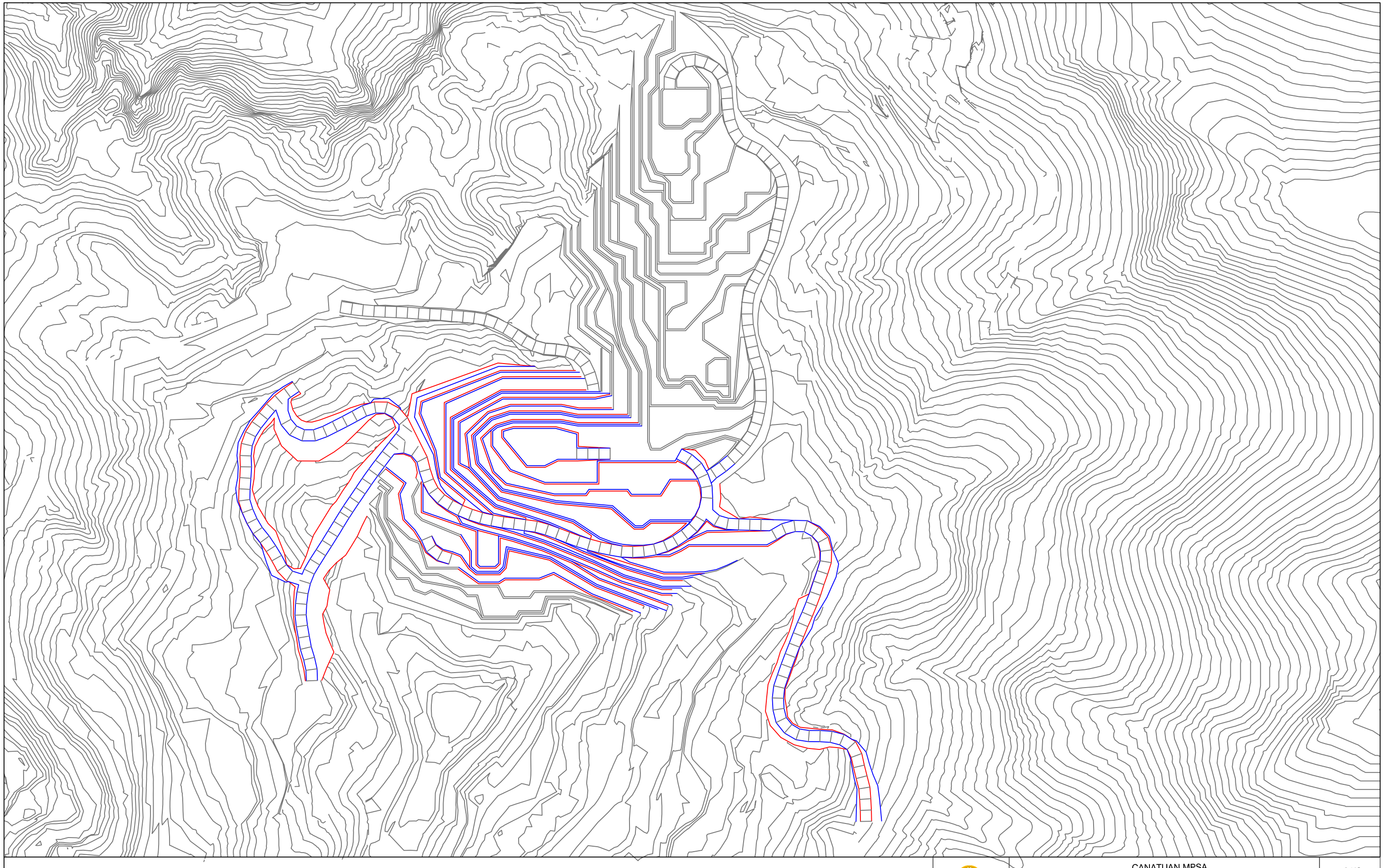
CANATUAN MPSA

SULPHIDE PHASE PROJECT MINE PLAN YEAR 1

FIG NO.

4.3

LAST REVISED: 21 January 2009



TVI Resource Devt. (Phils) Inc.

CANATUAN MPSA

SULPHIDE PHASE PROJECT MINE PLAN YEAR 2

FIG NO.

4.4

LAST REVISED: 21 January 2009

4.1.2.1 Gossan Dam, Upper and Lower Tailings Dam

The Gossan Dam and Impoundment plus the Upper and Lower Tailings Dam Impoundments directly disturb approximately 18 hectares of the Canatuan Creek watershed. These facilities are no longer used for tailings disposal as of the second quarter of Year 2008 (April 2008). Progressive Rehabilitation activities were initiated during the second half of Year 2008. The activities were limited to structural improvements related to the spillways and dam embankments and water management within the impoundments while the tailings consolidate. A more active rehabilitation program will be implemented in Year 2009. Activities will focus on tailings consolidation, and placement of topsoil cover and final spillway construction. Revegetation of the tailings surface will occur in the second half of Year 2009 after top soil placement. A consultation process with the Subanon community is on-going and is focused on identifying what tree species will be planted to sustain the objectives of FMRDP.

4.1.2.2 Southeast Overburden Stockpile

Progressive Rehabilitation of the Southeast and Southwest stockpiles will continue through Year 2009. The Southeast area encompasses approximately 10 to 15 hectares of which nearly 50% has already been subject to Progressive Rehabilitation activities in the previous years. However, additional controls and rehabilitation programs need to be strengthened to reduce the erosion and soil transport to the nearby drainages. Activities will focus on improvements to the slopes and benches, primary drainageways, construction of diversion canals, installation of silt fences and construction of additional sedimentation ponds. Re-establishment of ground cover vegetation, trees and potential agricultural based crops will be conducted after the overburden waste stockpile is stabilized.

In addition to the structural improvements to the Southeast stockpile, a larger sediment pond facility will be constructed downstream. This would essentially be a full valley width structure with significantly greater storage capacity. Although this will impact an additional 3 to 5 hectares of area, the rationale is that this afforded a more positive and longer term protection plan for the downstream drainages.

Overburden material generated from the mine area will be used to construct a wide series of benches downstream of the toe of the Southeast Overburden stockpile. This will act as a control feature to buttress and increase the stability for the existing stockpiles.

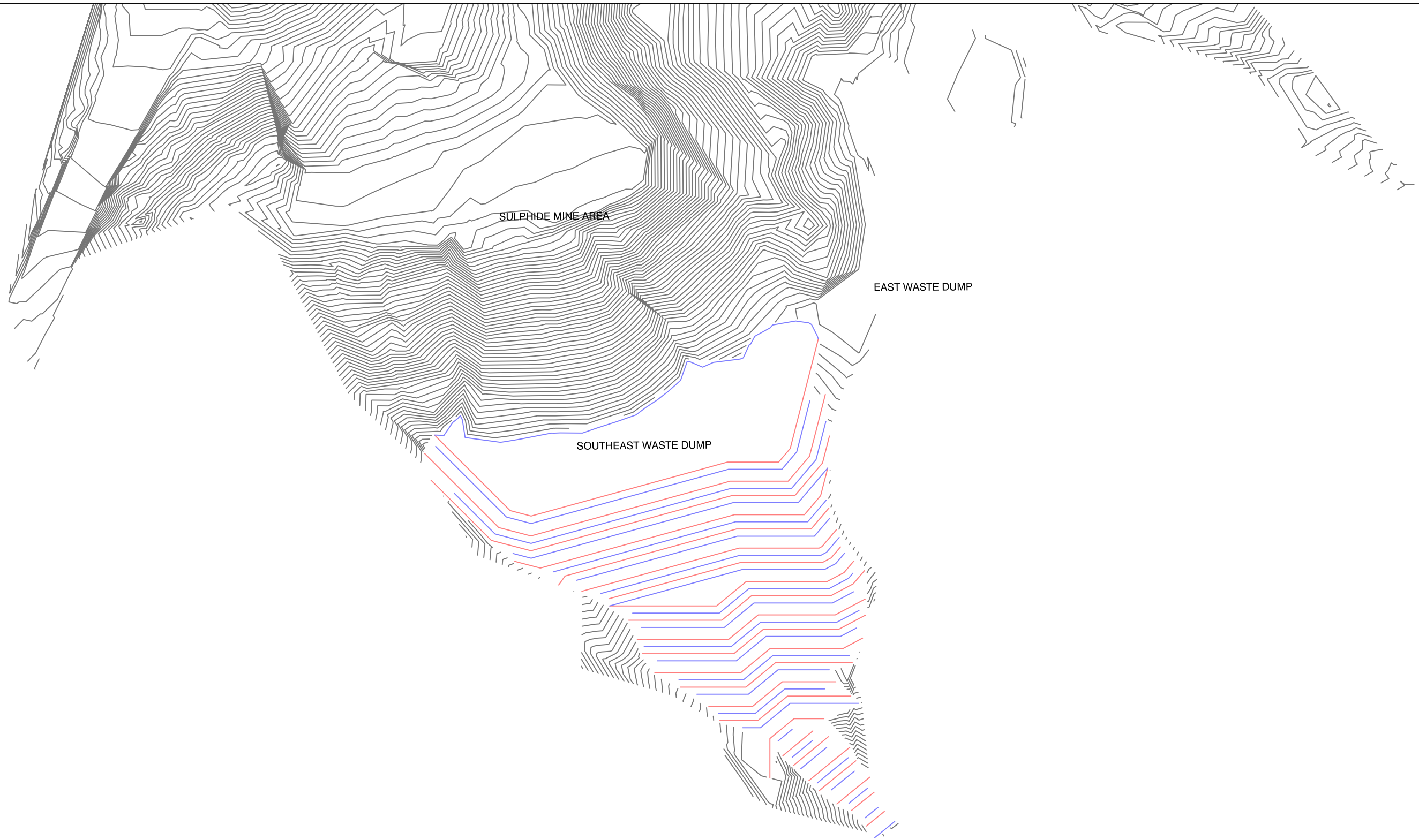
4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

The planned schedule for the rehabilitation of the Southeast Overburden stockpile will begin during the first quarter of Year 2009 and continue throughout the year. **Figure 4.5** illustrates the development plan for the rehabilitation of the Southeast Overburden Stockpile.

4.1.2.3 Southwest Overburden Stockpile

Rehabilitation of the Southwest Overburden Stockpile will be another key activity for Year 2009. The primary objectives will be the protection of the Back Road and the Solonsangan area accessibility and to reduce the erosion and soil transport downstream to the Lumot Creek drainage system. The overall area of activity encompasses approximately 20 to 25 hectares. This includes the Southwest Overburden Stockpile, the Lower Phase 2 mining area which is an extension of the previous Gossan Surface Mine Area and the Back Road. The rehabilitation activities for Year 2009 within this area will focus on the following:

- Benching of steep slopes using 3m to 4 m wide benches and 3m to 5m high benches.
- Re-establishment and/or relocation of primary drainageways within the area. These will be structural improvements to better convey rainfall runoff with reduced erosion potential.
- Construction of additional interception and diversion canals to limit the exposure of the benched areas to surface water runoff.
- Re-establishment of ground cover vegetation, trees and potential agricultural based crops. Soil conditioning with lime and fertilizer application will be a continuous activity prior to ground cover vegetation to promoted higher seedling survival rate.
- Installation of a series of silt fences within the disturbed areas to better trap soil eroded and transported downslope.



TVI Resource Devt. (Phils) Inc.

CANATUAN MPSA

REHABILITATION PLAN FOR SOUTHEAST OVERBURDEN DUMP

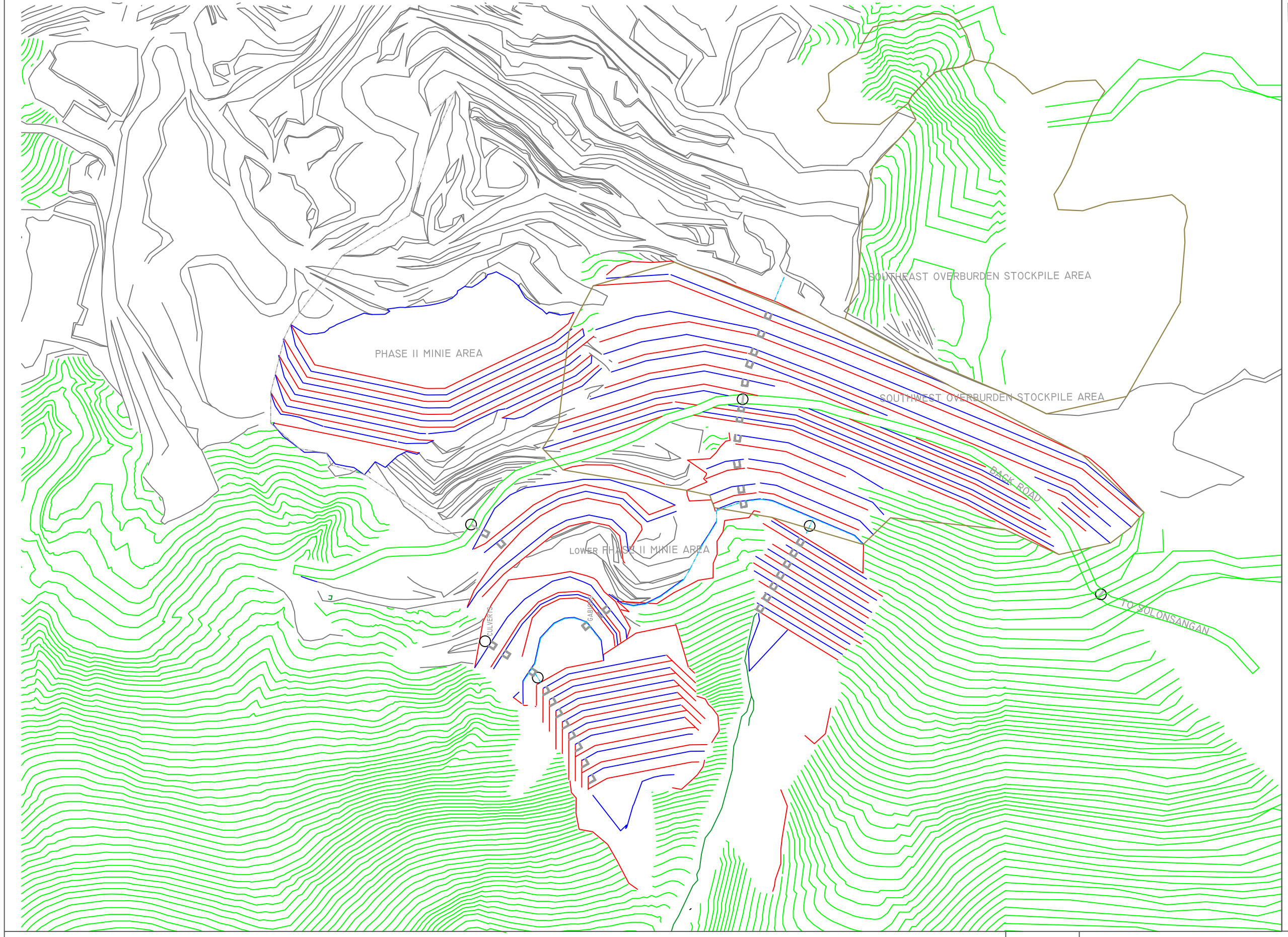
FIG NO.

4.5

LAST REVISED: 21 January 2009

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

Benching activities within the area began in Year 2008 and will continue in Year 2009. Those areas most prone to erosion and stability concerns will be addressed first. This includes the area immediately downstream of the existing Phase 2 sedimentation pond and portions of the lower Southwest Overburden Stockpile toe area. The rehabilitation and development plan of this area is shown on **Figure 4.6**.



LEGEND:

- GABIONS
- CULVERTS

TVI Resource Devt. (Phils) Inc.	CANATUAN MPSA	FIG NO.
	REHABILITATION PLAN FOR SOUTHWEST OVERBURDEN DUMP AND LOWER PHASE II AREA	4.6
LAST REVISED: 21 January 2009		

4.1.2.4 Reforestation and Revegetation Plans

Re-vegetation and reforestation plans for Year 2009 will focus on planting approximately 55,000 trees within and outside the disturbed areas of the MPSA. This includes areas affected by current mining operations and areas identified for Progressive Rehabilitation. Nearly 34.4 hectares of disturbed areas will be under active reclamation and rehabilitation during the year. Various fruit trees and indigenous species will be planted this year in preparation for Final Mine Rehabilitation. A map showing the Year 2009 reforestation plan is shown on **Figure 4.7** and a schedule of reforestation activities is shown in **Table 4.2**. This schedule has been coordinated with the Progressive Rehabilitation Programs as identified in the FMRDP.

4.1.2.5 Sedimentation Control / Neutralization Control Plans

Sediment control plans for Year 2009 will focus on maintenance of sediment ponds that will be strategically located around the Surface Mine and the Overburden Stockpile areas. Drainage and diversion canals and waterways will continue to be constructed and maintained to ensure that water runoff is initially contained in the sediment ponds. This will be developed in accordance with the mine plans. In total, approximately 30 to 40 hectares of the mine, overburden stockpiles and mill areas will be controlled by sediment ponds.

Additional sediment control ponds may be constructed within the year in series with neutralization control ponds. Neutralization ponds will be placed around the mine area to control acid mine drainage. Initial monitoring activities have been conducted in Year 2008 to determine drainage locations where neutralization of acid mine drainage is a priority.

Benching, compaction, placement of abaca nets and silt fences and vegetation planting will continue to reduce potential erosion issues. The initial location of sediment ponds is provided in **Figure 4.8.**

N
W E
S

857000
856500
856000
855500
855000
854500
854000
418000
418500
419000
419500
420000
420500
421000
421500
422000

TANUMAN DEMO FARM
300 TREES
520 TREES

CANANTUAN ELEM. SCHOOL

Conc. Mon.20x20x60cm.
set 50cm. in the ground,
centered with a hole and
marked "2/MPSA-0004"

TO SIOCON

A

DIVERSION DAM
200 SEEDLINGS RUBBER

SSAI AREA

UPPER TAILINGS POND
1,700 VETIVER SLIPS

B

AMBAAN

C

TAILINGS POND
LOWER
TAILINGS DAM

D

ACOLO AREA

MILL
AREA

NURSERY

E

F

G

OLD
STAFFHOUSE

NEW
STAFFHOUSE

SCAA
BARRACKS AND
GENSET ROOM

MALUSOK
GUARDPOST

HELIPAD

TO R.T. LIM

TIMBER LAND
LC MAP No. 2500, DATED 12-18-61

Conc. Mon.20x20x60cm.
set 50cm. in the ground,
centered with a hole and
marked "3/MPSA-0004"

MPSA

J

H

I

TIMBER LAND
LC MAP No. 2500, DATED 12-18-61

7°43'30"00
854210.94

MPSA
Conc. Mon.20x20x60cm.
set 50cm. in the ground,
centered with a hole and
marked "1/MPSA-0004"

122°16'00"00
419102.46

TIMBER LAND
MAP No. 2500, DATED 12-18-61

Conc. Mon.20x20x60cm.
set 50cm. in the ground,
centered with a hole and
marked "4/MPSA-0004"

122°17'30"00

TIMBER LAND
LC MAP No. 2500, DATED 12-18-61

LEGEND

- PREVIOUS REFORESTATION YEARS 2004 AND 2005
- REFORESTATION PROGRAM YEAR 2006 TO YEAR 2007
- REFORESTATION PROGRAM YEAR 2008
- (A) PLANTING AREA DESIGNATION
- MINE PIT OUTLINE

PLANTING DESIGNATION	
PLANTING AREA	DESCRIPTION
A	DIVERSION DAM AREA
B	AMBAAN AREA
C	UPPER TAILINGS DAM
D	LOWER TAILINGS DAMP
E	LOWER PHASE II
F	SOUTHWEST WASTE DUMP
G	SOUTHEAST WASTE DUMP
H	LOWER PHASE I
I	ROAD GOING TO SULPHIDE DAM
J	LANDFILL AREA

0 100m 200m 500m 750m
SCALE IN METERS

TVI

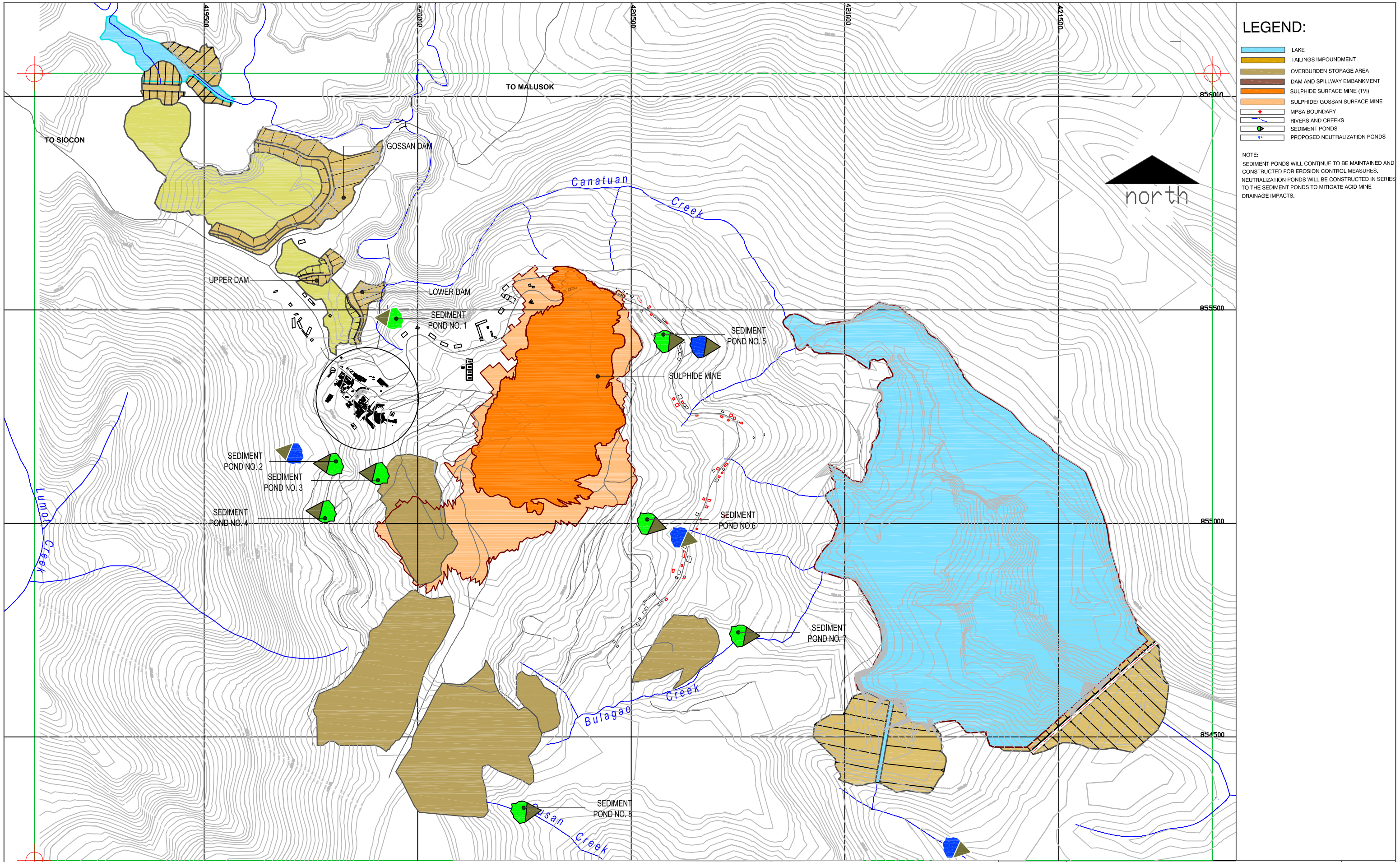
YEAR 2009 REFORESTATION PLAN

FIGURE NO.
4.7

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

Table 4.2 – Reforestation Schedule Year 2009

	Disturbed Area		Schedule												Responsible Person	Area (ha.)	Number of Trees to be Planted	Species
			Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09				
1	Southeast Waste Dump	Plan Rehabilitation													Mines/ CES/Envi	8	12000	Mangium
		Plan Revegetation													Envi			
2	Southwest Waste Dump	Plan Rehabilitation													Mines/ CES/Envi	6	6000	Mangium
		Plan Revegetation													Envi			
3	Lower Phase II	Plan Rehabilitation													Mines/ CES/Envi	12	25000	Mangium, Fruit trees, Wildlings
		Plan Revegetation													Envi			
4	Lower Phase I	Plan Rehabilitation													Envi	3	3000	Mangium, Wildlings
		Plan Revegetation													Envi			
5	Diversion Dam Area	Plan Rehabilitation													Envi	2	2000	Rubber, Fruit trees
		Plan Revegetation													Envi			
6	Ambaan Area (Replanting)	Plan Rehabilitation													Envi	0.5	1,500	Fruit trees
		Plan Revegetation													Envi			
7	Landfill Area	Plan Rehabilitation													Envi	0.4	1000	Mangium
		Plan Revegetation													Envi			
8	Lower Tailings Dam	Plan Rehabilitation													Mines/Envi	0.5	1500	Mangium, Rubber, Fruit trees
		Plan Revegetation													Envi			
9	Upper Tailings Dam	Plan Rehabilitation													Mines/ Envi	0.5	1500	Mangium, Fruit trees
		Plan Revegetation													Envi			
10	Road going to Sulphide Dam	Plan Rehabilitation													CES/ Envi	1.5	2000	Mangium, Auri, Wildlings
		Plan Revegetation													Envi			
															YEAR 2009 TARGET		55,500	



TVI Resource Devt. (Phils) Inc.	CANATUAN MPSA	FIG NO.
	SEDIMENT POND LOCATIONS	4.8
LAST REVISED: 21 January 2009		

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

4.2 Water Resources

Control strategies associated with impacts to the water resources of the area focus on changes to the drainage patterns, changes in water yields of the affected watersheds and potential water quality degradation due to Acid Mine Drainage. Of particular interest are impacts to Canatuan Creek which drains the majority of the Project Area, Lumot Creek and Paduan Creek. Watershed boundaries and hydrologic information associated with each of these waterways relative to the MPSA are shown on **Figure 4.9.** The downstream Litoban and Siocon Rivers are also shown on **Figure 4.9**.

4.2.1 Year 2008 Programs and Activities

4.2.1.1 Watersheds and Water Use

Minimal changes to the water resources of the area have occurred during Year 2008 operations. This is primarily due to the continuation of the construction of the Sulphide Tailings Dam. Watershed boundaries within the MPSA at the end of Year 2008 remain the same as those at the beginning of the year. These are shown on **Figure 4.9** and will remain as indicated throughout the remaining Project life. Each watershed shown is specific to a mine or operations facility and will be evaluated as separate management units for reclamation and closure.

Construction of the diversion canals and sediment ponds as part of the open pit mine operations has not altered the tributary area of the Canatuan Creek watershed. The stream flow response of the basin to rainfall events however has been changed. Removal of the vegetation and exposure of the underlying soil increases the volume of runoff and increases the peak flow rates during rainfall events. This however is mitigated by the sediment ponds which act as retention and detention ponds as well as water quality management features.

Water supply for the Mill and Process Plant during the Gossan Phase operations in Year 2008 was provided by reclaim water pumping from the Gossan Tailings Dam Impoundment and from the Diversion Dam.

N
W
E
S

UPPER CANATUAN CREEK

FRESH WATER SUPPLY

WEST MALUSOK CREEK

POTENTIAL FRESH WATER SUPPLY

EAST MALUSOK CREEK

MALUSOK STAFF AREA

DIVERSION DAM CREST EL. 455m

POTENTIAL DAM SITE

GOSSAN DAM CREST EL. 442m

POTENTIAL DAM SITE

UPPER TAILINGS DAM CREST EL. 445m

LOWER TAILINGS DAM CREST EL. 436m

PROPOSED SULPHIDE MILL PLANT

GOSSAN MILL PLANT

CANATUAN CREEK

SULPHIDE PIT AREA

SUBMERGED TAILINGS-PERMANENT LAKE

GOSSAN MINE AREA

LUMOT CREEK

EAST OVERBURDEN STOCKPILE

SOUTHWEST OVERBURDEN STOCKPILE

SOUTHEAST OVERBURDEN STOCKPILE

SPILLWAY

LOCATION OF PROPOSED SULPHIDE DAM AND IMPOUNDMENT

PASSIVE WATER QUALITY CONTROL

MPSA

A B C D E F G H I J K L M N O P Q R S

LEGEND

- ROADS
- WATERSHED BOUNDARIES
- WATERSHED DESIGNATION
- CONTOURS
- SULPHIDE PIT AREA
- **EXISTING DAMS**
- CREEKS/RIVERS
- PRIMARY WATERCOURSE
- MPSA BOUNDARY
- TAILINGS SURFACE
- LAKE OR POND
- MINE OVERBURDEN STOCKPILE

WATERSHED DESIGNATION	DRAINAGE AREA (ha)
A	24.03
B	30.65
C	68.31
D	112.61
E	21.46
F	16.74
G	12.95
H	1.13
I	3.36
J	54.52
K	140.82
L	23.76
M	75.14
N	19.98
O	130.26
P	25.95
Q	22.78
R	2.25
S	16.11

NOTES

1. THIS DRAWING REPRESENTS THE SULPHIDE MINING OPERATIONS.
2. DRAINAGE AREAS N,O,P,Q,R AND S REPRESENT AREAS WITHIN THE MPSA AND NOT THE TOTAL WATERSHED ARE.

0 100m 200m 500m 750m

SCALE IN METERS

WATERSHED BOUNDARIES

YEAR 2009

FIGURE NO. 4.9

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

Freshwater and process makeup water for the Sulphide Phase operations as well as water supplied to the surrounding communities is also provided by the base flow within Upper Canatuan Creek. Base flows within the Upper Canatuan Creek watershed have been monitored since Year 2004. Streamflow data is collected weekly and was used in the development of a Sulphide Dam Water Balance model. Data collected for Year 2008 is shown in **Table 4.4**. Water use was reduced in the second half of the year due to the end of the Gossan Phase operations in April.

Meteorology Characteristics

A meteorology station is located near the Mill Plant and is maintained by the environmental operations staff. Rainfall data for the Years 1998 through Year 2008 have been recorded and are available. Daily rainfall data for Year 2008 are shown in **Table 4.5**. The mean annual rainfall through Year 2008 is 3,064 mm. Year 2008 had a total recorded rainfall depth of 3,539.35 mm. The wettest month was June (447 mm) and the month of January (151 mm) was the driest.

Daily evaporation data are also available through Year 2008. Data for Year 2008 is shown in **Table 4.6**. The mean annual evaporation for the period Year 2003 through Year 2008 is 1,203 mm. Total annual evaporation for 2008 was 1,175 mm. Compared with the rainfall data for Year 2008, the net annual water balance indicated a positive 2,717 mm of rainfall for the year. This is the highest net rainfall for the Year 2003 through Year 2008 period.

Table 4.3 - Water Quality Baseline Data at Existing Tailings Dam and Impoundment

	LEGAL REQUIREMENTS		POST GOSSAN OPERATIONS				GOSSAN OPERATION			
Location / **Parameter**	DAO 1990-34 Standard	DAO 1990-35 Standard	Upper Tailings Dam	Lower Tailings Dam	Gossan Tailings Dam	Sulphide Tailings Dam	Upper Tailings Dam	Lower Tailings Dam	Gossan Tailings Dam	Sulphide Tailings Dam
unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Mercury	0.002	0.005	<0.0001	<0.0001	<0.0001	<0.0001	0.002	*0.009*	*0.017*	0.003
Arsenic	0.05	0.2	<0.02	<0.02	<0.02	<0.02	0.01	0.01	0.02	0.02
Cadmium	0.01	0.05	<0.002	<0.002	<0.002	<0.002	-	-	-	-
Chromium	0.05	0.1	<0.03	<0.03	<0.03	<0.03	0.005	0.005	0.011	0.005
Copper	-	-	<0.04	0.28	<0.04	0.08	20	19	132	0.2
Iron	-	-	2.7	33	1.4	5.1	3.4	2.7	1.4	3
Lead	0.05	0.2	<0.01	0.07	<0.01	<0.01	0.01	0.01	0.01	0.01
Zinc	-	-	0.04	0.04	0.02	0.03	0.1	0.5	1.4	0.2
Free CN	0.05	0.2	<0.10	<0.10	<0.10	<0.10	-	-	-	-

Note:

1. *Analyzed by CRL Laboratory in Manila on June 21, 2008.*
2. *For Heavy Metals, determination by AAS through TCLP Extraction.*
3. *For Free Cyanide, determination by Titrimetry through TCLP Extraction.*
4. *DAO 1990-35 based on OEI Standards.*
5. *Values in red font are in exceedance of the Surface Water Quality Standard.*
6. *Gossan phase operations data from analysis conducted on August 28, 2007 MMT Water Quality Monitoring.*

Table 4.4 – Upper Canatuan Creek Watershed Monthly Yield Baseflow Stream Weir Year 2008

Month	No. Days	Mean Flow Rate			Total Daily Yield			Total Monthly Yield				Unit Yields/Month		
		gpm	liters/sec	m3/sec	gallons	liters	m3	gallons	ft3	liters	m3	m3/m2	m3/ha	liters/ha
January	31	86.20	5.43	0.005	124,124	469,190	469	3,847,851	514,458	14,544,876	14,545	0.061	606	606,037
February	28	162.93	9.00	0.009	234,615	777,430	777	6,569,232	878,306	21,768,031	21,768	0.091	907	907,001
March	31	162.93	10.26	0.010	234,615	886,846	887	7,273,079	972,411	27,492,238	27,492	0.115	1,146	1,145,510
April	30	188.64	11.88	0.012	271,641	1,026,804	1,027	8,149,237	1,089,553	30,804,116	30,804	0.128	1,284	1,283,505
May	31	183.72	11.57	0.012	264,554	1,000,014	1,000	8,201,172	1,096,497	31,000,429	31,000	0.129	1,292	1,291,685
June	30	210.63	13.27	0.013	303,300	1,146,475	1,146	9,099,007	1,216,537	34,394,248	34,394	0.143	1,433	1,433,094
July	31	166.97	10.52	0.011	240,431	908,830	909	7,453,369	996,515	28,173,736	28,174	0.117	1,174	1,173,906
August	31	193.00	12.16	0.012	277,924	1,050,551	1,051	8,615,632	1,151,910	32,567,088	32,567	0.136	1,357	1,356,962
September	30	201.25	12.68	0.013	289,804	1,095,460	1,095	8,694,130	1,162,405	32,863,812	32,864	0.137	1,369	1,369,325
October	31	175.73	11.07	0.011	253,055	956,550	957	7,844,720	1,048,839	29,653,043	29,653	0.124	1,236	1,235,543
November	30	128.33	8.08	0.008	184,798	698,538	699	5,543,950	741,226	20,956,130	20,956	0.087	873	873,172
December	31	123.77	7.80	0.008	178,222	673,679	674	5,524,883	738,677	20,884,058	20,884	0.087	870	870,169

Note:

1. *Source: TVIRD, 2008*
2. *Total Daily Yield is equal to the mean streamflow multiplied by the time.*
3. *Total Monthly Yield is equal to the Total Daily Yield multiplied by the number of days.*

Table 4.5 – Daily Rainfall Data Canatuan for Year 2008 (mm)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Days	31	29	31	30	31	30	31	31	30	31	30	31
1	15.5	0.0	31.5	5.4	1.5	14.5	19.5	0.0	30.5	5.5	0.0	0.5
2	6.0	0.0	2.5	8.0	11.0	0.0	3.0	0.0	14.5	3.5	2.5	7.5
3	0.0	0.0	0.0	12.5	8.0	0.0	10.5	6.0	0.0	17.5	21.5	3.5
4	1.0	2.5	5.0	22.0	8.5	3.5	0.0	3.0	4.5	15.5	30.0	7.5
5	0.0	36.0	2.0	11.0	0.0	64.0	47.5	2.5	44.0	11.5	21.5	26.0
6	0.0	5.0	0.0	0.0	0.0	25.5	8.5	0.0	4.0	10.0	3.5	14.0
7	2.5	0.0	3.0	21.0	4.5	16.5	0.0	4.0	10.0	2.5	0.0	49.5
8	0.8	0.0	0.0	0.0	11.5	0.0	0.0	6.5	42.0	3.5	0.0	16.0
9	0.0	0.0	19.0	0.0	49.5	9.5	0.0	43.0	1.0	13.5	8.5	4.0
10	9.0	0.0	2.5	25.0	62.5	2.5	6.5	11.0	3.0	6.2	4.5	1.5
11	0.5	4.0	0.0	2.0	90.5	16.5	4.5	2.0	7.5	2.5	1.5	0.0
12	1.0	3.0	2.0	35.0	47.0	0.0	2.0	15.0	2.5	35.0	1.5	2.0
13	49.0	2.0	5.0	20.5	47.0	1.0	0.0	13.5	0.0	5.0	3.5	0.0
14	6.0	0.0	32.5	57.0	23.5	6.5	3.0	0.0	0.0	1.0	34.0	0.0
15	9.0	0.0	17.0	0.0	0.5	49.5	1.0	0.0	0.0	6.5	29.0	0.0
16	0.5	0.0	12.5	0.0	11.5	0.0	14.5	11.5	10.5	0.5	5.0	0.0
17	0.0	2.0	24.5	0.0	0.0	0.0	3.0	31.5	34.5	2.0	0.0	0.0
18	23.5	22.0	0.0	2.5	0.0	3.0	13.5	0.0	10.5	19.5	2.5	0.0
19	21.5	16.0	2.0	1.5	0.0	11.5	1.5	1.0	0.0	0.5	0.0	0.0
20	0.0	32.0	0.5	1.5	0.0	166.0	10.0	5.0	20.0	27.5	30.0	2.5
21	2.0	0.0	16.0	0.0	0.0	19.5	14.0	23.0	10.5	4.5	19.0	12.5
22	2.5	8.5	8.0	1.5	10.5	3.0	2.0	1.0	0.0	11.5	18.0	0.0
23	0.0	0.0	6.0	0.0	0.0	0.0	16.0	33.5	0.0	49.5	1.5	0.0
24	0.0	5.0	0.0	9.5	0.0	1.0	0.0	5.5	0.0	29.0	0.0	14.5
25	0.0	5.0	0.0	0.5	0.0	0.0	9.0	28.5	1.5	15.5	9.5	31.5
26	0.0	14.0	0.0	59.0	0.0	2.0	0.0	4.5	0.0	12.0	0.0	0.0
27	0.0	10.5	11.0	5.5	34.5	1.5	42.0	0.5	0.0	43.0	0.0	10.5
28	0.0	54.0	18.0	1.5	5.5	28.5	6.0	14.5	10.0	3.5	47.5	0.0
29	0.0	28.0	63.0	0.5	0.0	1.0	5.0	3.5	0.0	0.0	0.0	0.0
30	0.0		2.0	0.0	4.5	0.0	0.0	0.0	0.0	20.5	4.0	0.0
31	0.0		0.0		2.5		6.0	0.0		10.5		0.0
Statistics												
Total For Month	150.25	249.50	285.50	302.90	434.50	446.50	248.50	270.00	261.00	388.70	298.50	203.50
Mean Daily	4.85	8.60	9.21	10.10	14.02	14.88	8.02	8.71	8.70	12.54	9.95	6.56
Maximum Day	49.00	54.00	63.00	59.00	90.50	166.00	47.50	43.00	44.00	49.50	47.50	49.50
Minimum Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Monthly Rank	12	9	6	4	2	1	10	7	8	3	5	11
% Of Annual	4%	7%	8%	9%	12%	13%	7%	8%	7%	11%	8%	6%
Cumulative	150.25	399.75	685.25	988.15	1,422.65	1,869.15	2,117.65	2,387.65	2,648.65	3,037.35	3,335.85	3,539.35

Table 4.6 – Daily Evaporation Data Canatuan for Year 2008 (mm)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Days	31	28	31	30	31	30	31	31	30	31	30	31
1	0.0	5.0	6.5	0.5	5.5	4.5	1.5	4.0	3.5	2.5	5.5	5.5
2	5.0	5.0	2.5	3.0	1.5	3.0	2.0	5.0	0.0	6.5	7.0	0.0
3	2.0	5.0	4.0	2.5	5.5	2.0	4.5	4.0	5.0	2.5	1.5	3.5
4	3.0	5.0	1.0	5.0	3.0	3.5	5.0	1.0	0.0	5.5	2.0	0.0
5	5.0	0.0	2.0	6.0	1.5	0.0	4.5	4.5	8.0	1.5	0.0	3.0
6	5.0	0.0	4.0	5.0	1.0	5.5	2.5	5.0	2.0	7.0	6.5	0.0
7	5.0	5.0	1.0	1.0	0.0	1.5	6.0	5.0	2.0	0.5	7.0	0.0
8	0.0	5.0	5.0	5.0	0.0	5.0	5.0	1.0	2.0	1.5	3.0	0.0
9	3.0	6.0	4.0	5.0	1.0	3.5	5.0	0.0	1.0	5.5	3.5	4.0
10	5.0	5.0	4.0	5.0	0.0	2.5	1.5	1.0	3.0	1.5	2.5	4.5
11	0.0	2.0	5.0	5.0	3.5	6.5	2.5	2.0	4.5	0.0	2.5	4.0
12	5.0	1.0	2.0	10.0	1.5	5.0	4.0	5.0	2.5	4.0	6.5	5.0
13	0.0	0.0	5.0	0.0	0.0	3.0	5.0	0.0	5.0	3.0	1.5	3.0
14	5.0	4.0	2.5	0.0	0.0	4.5	3.0	5.0	4.0	4.0	0.0	4.0
15	0.0	4.0	2.0	3.0	0.0	0.0	2.0	5.0	4.0	4.5	0.0	3.0
16	5.0	5.0	2.5	2.0	0.0	5.0	3.5	1.5	5.5	0.0	10.0	5.0
17	5.0	4.0	3.0	5.0	0.0	5.0	6.0	1.5	6.5	4.0	3.0	5.0
18	0.0	0.0	5.0	0.0	0.0	0.0	5.5	5.0	3.5	6.5	4.5	4.0
19	0.0	0.0	7.0	0.0	0.5	4.5	1.5	2.0	5.0	3.5	0.0	3.0
20	5.0	0.0	5.5	1.5	5.5	0.0	5.0	0.0	5.0	2.5	3.0	0.5
21	0.0	4.0	0.0	7.0	2.0	0.0	4.0	6.0	0.5	4.5	3.0	2.5
22	5.0	4.0	1.0	4.5	4.0	0.0	2.0	3.0	5.0	4.5	5.0	5.0
23	5.0	4.0	6.0	5.0	5.0	4.0	1.0	0.0	5.0	1.5	7.5	5.0
24	5.0	0.0	5.0	0.0	6.0	5.0	5.0	5.5	5.0	1.0	4.0	4.5
25	5.0	2.0	5.0	0.5	4.0	5.0	4.0	0.0	1.5	5.5	4.5	0.0
26	5.0	1.0	5.0	0.0	4.5	2.0	5.0	0.0	5.0	2.0	6.0	5.0
27	5.0	4.0	1.0	0.5	0.0	1.5	0.0	7.5	5.0	3.0	7.0	5.5
28	5.0	0.0	0.0	0.0	5.0	3.5	3.0	2.5	2.0	3.5	0.5	3.0
29	5.0	0.0	0.0	5.5	5.0	1.0	2.0	3.5	8.0	3.0	5.0	4.0
30	5.0		2.0	3.0	5.0	4.0	5.0	2.0	5.0	0.0	0.0	5.0
31	5.0		5.0		1.5		4.0	7.0		3.5		4.0
Statistics												
Total For Month	108.00	80.00	103.50	90.50	72.00	90.50	110.50	94.50	114.00	98.50	112.00	100.50
Mean Daily	3.48	2.76	3.34	3.02	2.32	3.02	3.56	3.05	3.80	3.18	3.73	3.24
Maximum Day	5.00	6.00	7.00	10.00	6.00	6.50	6.00	7.50	8.00	7.00	10.00	5.50
Minimum Day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Monthly Rank	4	11	5	9	12	9	3	8	1	7	2	6
% Of Annual	9%	7%	9%	8%	6%	8%	9%	8%	10%	8%	10%	9%
Cumulative	108.00	188.00	291.50	382.00	454.00	544.50	655.00	749.50	863.50	962.00	1,074.00	1,174.50

4.2.1.2 Water Quality Characteristics

Water quality data was collected at 14 locations for different streams and rivers within and around the Project Area during Year 2008. These data were collected by the Multipartite Monitoring Team (MMT) during two sampling events conducted in the months of May and December. The DENR-EMB Regional Office also conducted sampling collection and testing of surface waters located within the MPSA as a verification of the MMT monitoring event conducted in November, 2007.

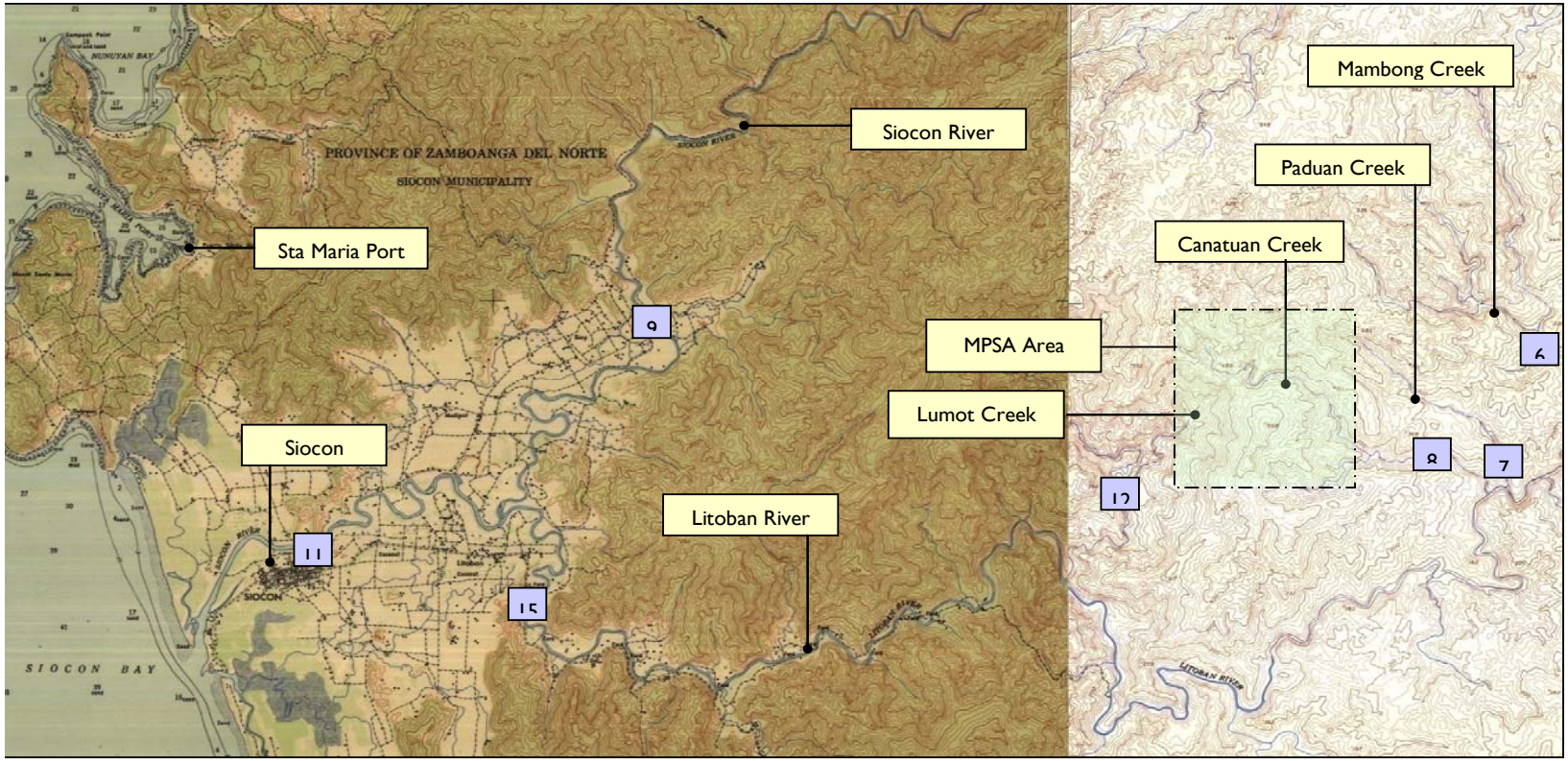
Additional data were also collected for various parameters throughout Year 2008 by TVIRD. These data were collected in support of operations management practices and quality control purpose. Sampling locations included the existing Tailings Dam Impoundments, Canatuan Creek, Lumot Creek, Paduan Creek, Mambong River, Litoban River, Siocon River and three tributaries of Canatuan Creek. The locations of the sampling points are shown on **Figures 4.10** and **4.11.**

During the DENR-EMB Regional IX monitoring event, the presence of free cyanide parameter was tested at the following locations: Upper and Lower Canatuan Creek, Gossan Dam Northridge, Sulphide Dam Spillway, Cussan Creek and the Mixing Zone of Sulphide Dam and Cussan Creek. All stations indicated free cyanide levels below the regulatory standards.

Fourteen stations were monitored during the second and fourth quarter MMT events. Split samples were collected and sent separately to DENR accredited (TVI samples) laboratory and DENR-PETROLAB (DENR samples). Parameters analyzed were Free Cyanide, Total Suspended Solids, Total Dissolved Solids, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Zinc and Mercury.

Results of heavy metals analysis for both laboratories during the second quarter monitoring indicated all sampling locations were within the regulatory standards. Free cyanide analysis indicated values greater than the regulatory standards. Sampling stations that historically had no free cyanide indications and locations outside the influence of the MPSA indicated a positive presence of free cyanide. As such, a resampling was conducted on all the sampling locations for free cyanide parameter. This resulted in concentrations of free cyanide below detection limits.

Figure 4.10 - Regional Water Quality Monitoring Stations



Station	Location
8	Canatuan Creek at Old Bridge
7	Paduan Creek at Litoban River
6	Mambong Creek
12	Lumot Creek

Station	Location
15	Litoban River at Makiang
11	Siocon River at Siocon
9	Siocon River at Pisawak

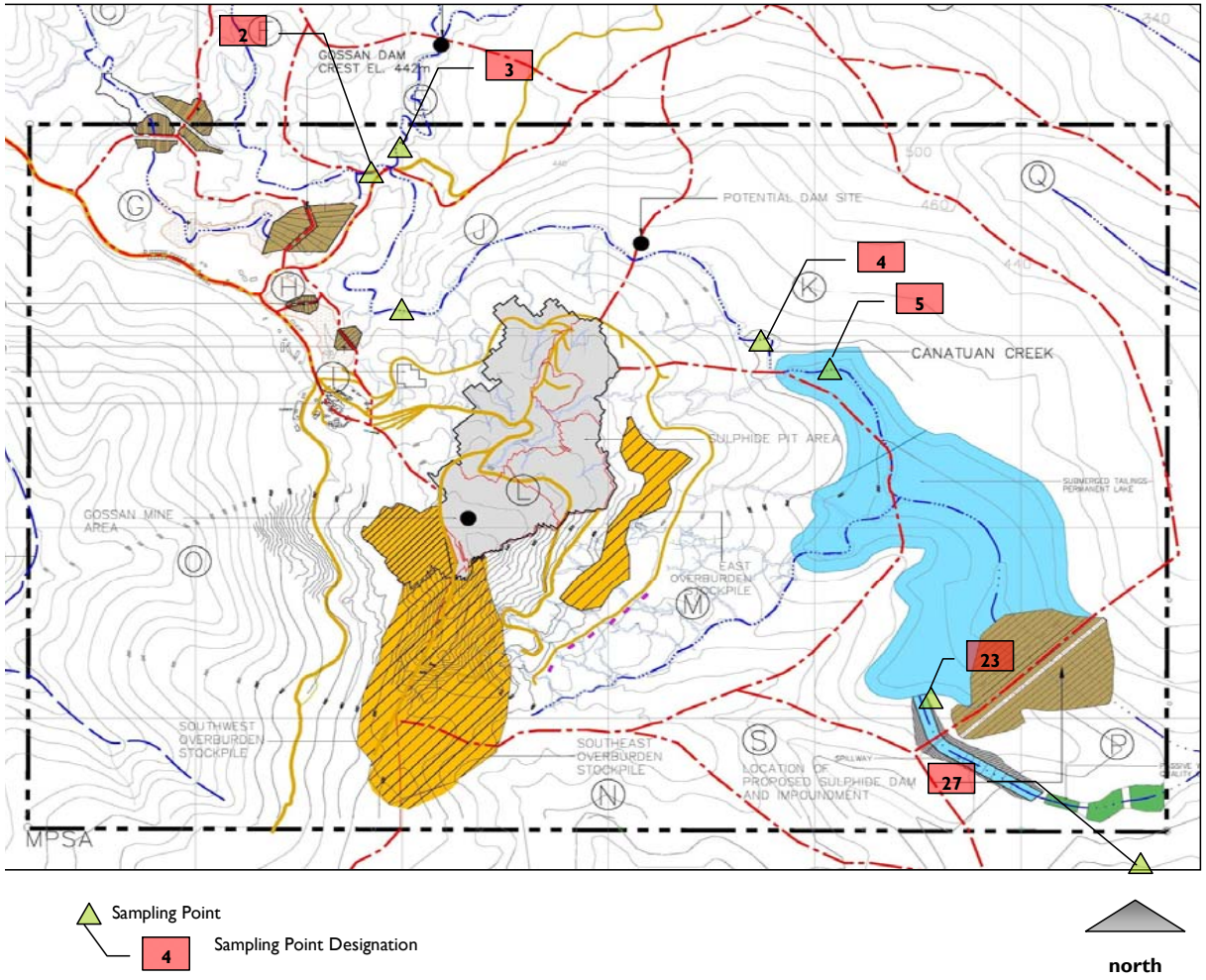
north

Notes:

1. Map Source NAMRIA Siocon and Tupilac Peak 1:50,000
2. Station Designations based on Year 2007 MMT monitoring.
3. See Figure 4.10 for Monitoring Stations within the MPSA
4. Location of Monitoring Station 1

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

Figure 4.11 - MPSA Water Quality Monitoring Stations Year 2008



Station Number	Sample Location
2	Upper Canatuan A
3	Upper Canatuan B
4	Lower Canatuan A
5	Lower Canatuan B
19	QC Sample
23	Sulphide Dam Spillway
25	Sulphide Dam Mixing Zone
27	Cussan Creek

Notes:

1. Sample Points 6,7,9,11,12, and 15 are outside the MPSA. Reference Figure 4.10.

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

Another MMT monitoring and assessment was conducted in December 2008. Water samples were collected in sampling locations similar to the second quarter monitoring.. Result of analysis by the laboratories identified that heavy metals, TSS, TDS and free cyanide concentrations of the water sources were within the regulatory limits. Analysis by DENR-PETROLAB and another DENR accredited laboratory identified the Upper Canatuan Creek A station indicated free cyanide concentrations slightly greater than the regulatory stream standards.

An investigation was conducted to identify probable reason for the single free cyanide contamination. The sampling location was isolated and the potential sources of contamination were analyzed. Samples were collected from these locations and sent out to a third party laboratory for analysis. The result of analysis from this verification identified no free cyanide.

Laboratory test data during the MMT Water Quality Assessment and DENR-EMB Monitoring are provided in **Appendix A**.

4.2.2 Year 2009 Programs and Goals

4.2.2.1 Watersheds and Water Use

The Mining Program for Year 2009 will directly affect the lower portion of the Canatuan Creek watershed. This will be the result of the continued construction of the Sulphide Tailings Dam and Impoundment. Located near the southeast corner of the MPSA, the dam itself will disturb approximately 4.5 hectares. Access and construction roads will disturb an additional 5 to 10 hectares as well as construction of the final spillway. Sulphide tailings and overburden material will be deposited during the year. The resulting impoundment will cover an area of approximately 20 to 30 hectares. In total the Sulphide Tailings Dam and Impoundment will directly impact approximately 25 to 30 hectares.

Another 5 hectares of the Canatuan Creek watershed will be impacted in Year 2009 in associated with the extraction of the sulphide ore from the Surface Mine. Reclamation and closure activities scheduled for the Southeast overburden stockpile during the year will also impact the Canatuan Creek Watershed.

This is expected to be positive and will reduce soil erosion and sediment deposition within the Sulphide Dam Impoundment.

Environmental impacts to the Lumot Creek watershed from exposed disturbed areas during the Gossan Phase operations will be reduced due to the planned Progressive Rehabilitation activities. Rehabilitation of the Southwest Overburden Stockpile and Back Road area, primary source of impact to the Lumot Creek watershed will commence in Year 2009. This will also include the rehabilitation of the previously mined Lower Phase 2 area. The total affected area within the Lumot Creek watershed that will undergo rehabilitation in Year 2009 is estimated to be 23 hectares. This represents less than 1% of the Lumot Creek Watershed.

Both the Canatuan Creek and Lumot Creek watershed boundaries will remain the same as in Year 2008 and no significant changes to watershed yields are anticipated. These boundaries are identified on **Figure 4.9**. More extensive monitoring of these watersheds will be done in Year 2009 to better quantify the hydrologic conditions. Included will be sediment yields, water quality and streamflow. This is to be done in conjunction with the Progressive Rehabilitation programs and in concert with the FMRDP.

Process water requirement for the Mill Plant during the Gossan Phase operations is estimated at 130.0 m^3/ hr. An estimated volume of 89.0 m^3/hr will be recycled within the process while the remaining quantity of 41.0 m^3/ hr will come from fresh water make up. This is nearly the same as used during the Gossan Phase operations. Freshwater make up will continue to be sourced from the Upper Canatuan Creek as will water for community and administration services supply.

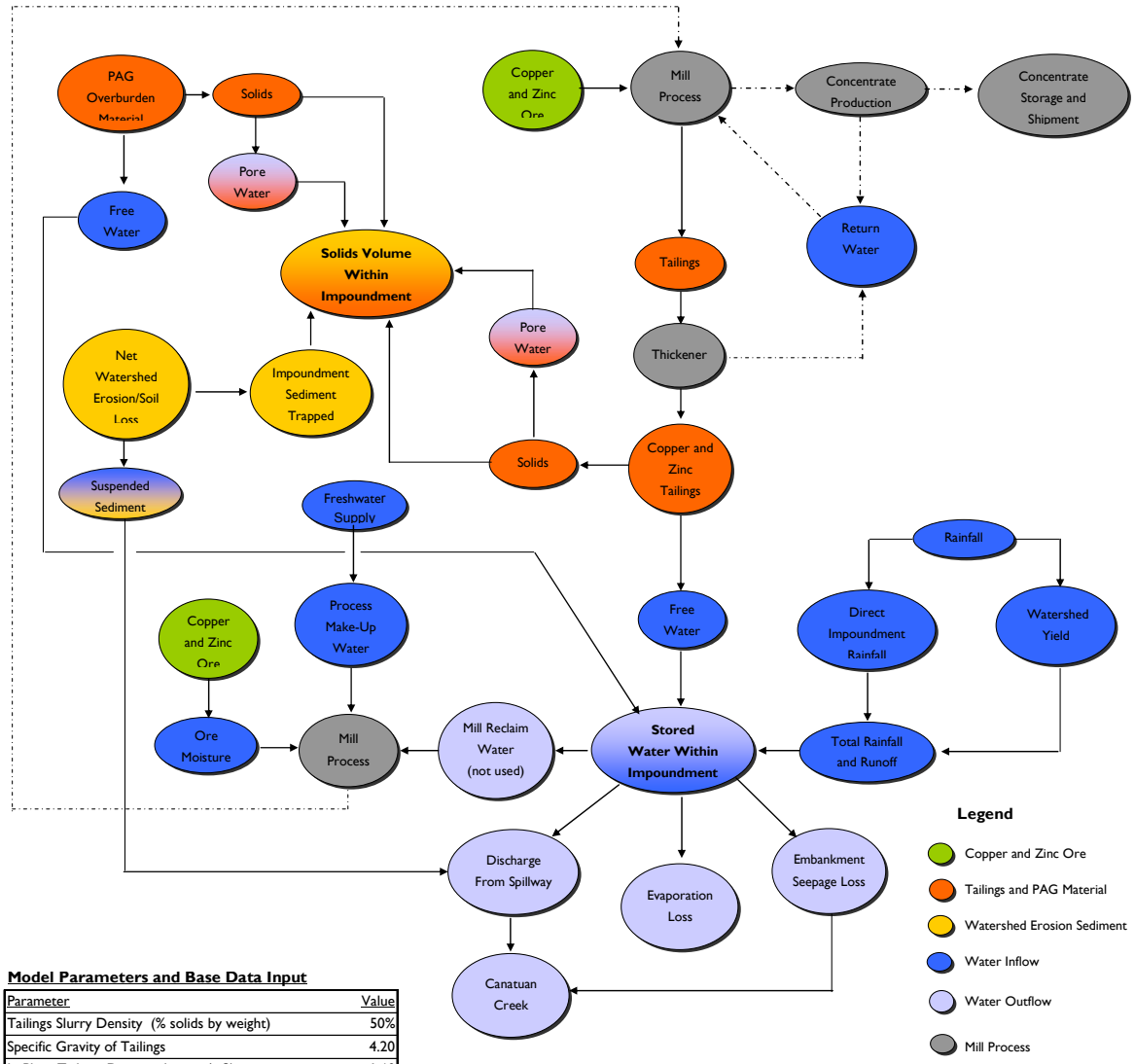
A water and materials balance model was prepared to monitor water levels and materials deposition within the Sulphide Tailings Impoundment. This model also provides a predictive function to ensure continued submergence of the tailings and maintenance of the appropriate water cover and free board. The model parameters and results are shown in **Table 4.7**.

4.2.2.2 Meteorologic Characteristics

Meteorology data will continue to be collected throughout Year 2009. This will include temperature, rainfall, and evaporation. Water balance evaluation and Canatuan Creek data collection baseflow will also continue to be done throughout Year 2009.

Table 4.7 - Sulphide Tailings Impoundment Water and Materials Balance Parameters and Summary Results

Water and Materials Balance Component Diagram



Model Parameters and Base Data Input

Parameter	Value
Tailings Slurry Density (% solids by weight)	50%
Specific Gravity of Tailings	4.20
In Place Tailings Density (tonnes/m3)	1.60
Void Ratio Tailings	0.38
Volume of Tailings In Place (m3)	0.63
Mass of Tailings Solids + Water (tonnes)	2.00
Volume of Water In Tailings (m3)	1.00
Volume of Water In Tailings Voids (m3)	0.24
Free Water Volume from Tailings Slurry (m3)	0.76
Moisture Content of Ore	5.00%
Moisture Content of PAG	15.00%
Specific Gravity of PAG	3.40
In Place PAG Density (tonnes/m3)	1.60
Void Ratio PAG	0.47
Volume of PAG In Place (m3)	0.63
Volume of Water In PAG (m3)	0.29
Volume of Water In PAG Voids (m3)	0.29
Total Watershed Sulphide Dam (ha)	585.50
Impoundment Trap Efficiency (% range)	45% - 91%
In Place Sediment Density (tonnes/m3)	1.28
Monthly Rainfall Data Period (years)	2003 - 2008
Monthly Evaporation Data Period (years)	2003 - 2008

Dam and Impoundment Data

Dam Stage	Crest Elevation (m) Dam	Crest Elevation (m) Spillway	Water Cover Criteria (m)	Solids Storage Volume (m3)	Dam Crest Freeboard (m)
1	273	270	0	167,897	3
2	292	289	4	740,087	3
3	316	310	7	2,237,648	6
4	335	327	10	4,609,137	8

Summary of Water and Materials Balance Modeling

Parameter	Stage 1	Stage 2	Stage 3	Stage 4
Operations Period	Jan 08 - July 08	Aug 08 - Dec 09	Jan 09 - Jul 11	Aug 11 - Apr 04
Solids Deposited (m3)	140,785	712,145	2,017,791	4,159,814
Solids Deposited (tonnes)	180,360	1,007,699	3,130,287	4,159,814
Water Cover (m)	1.4	4.6	9.6	12.4
% Storage Used By Stage	84%	96%	90%	90%
% Storage Used Overall	3%	15%	44%	90%

Note: Above values based on water balance rev 3.1 January 2009

4.2.2.3 Water Quality Characteristics

Erosion control, sedimentation and potential water quality degradation are the primary environmental management concerns for the Year 2009. Erosion and sedimentation will be managed using surface erosion control structures, diversion canals, silt fences and sedimentation ponds. Water quality will be monitored by the MMT on a quarterly schedule. This may be increased to monthly monitoring at the request of TVI or by implementation of revised quality regulations currently under review by the EMB.

Some changes to the water quality monitoring stations are planned for Year 2009 to match the Sulphide Operations. Included among the changes will be the addition of water quality monitoring stations at neutralization ponds that will be constructed around the mine area and overburden stockpiles. A review of the parameters being tested will be made relative to the updated ECC and with respect to monitoring of the internal MPSA watersheds **(Figure 4.8).**

A program for acid mine drainage treatment will be initiated in early Year 2009. This program is intended to support the environmental mitigation measures that will be needed as part of the Sulphide Mining Phase. The program will focus on passive treatment of acid runoff water quality using wetland types of vegetation in conjunction with anaerobic and aerobic treatment pond systems. This will also entail a more extensive water quality monitoring program within and adjacent to the mine area.

A water quality model of the Sulphide Dam and Impoundment was prepared in Year 2008 and 2009 based on the Pilot Testing of the mill process and ore characteristics. The results of this model are shown in **Table 4.8** and indicate compliance with stream water quality standards.

4.3 Noise

Noise impacts are associated with the heavy equipment activity of the mining operations, Mill and Processing Plant operations, and vehicle transportation activities. The primary impact area is limited to the immediate vicinity within and around the Open Pit and the Mill and Processing Plant. Mitigation measures are associated with individual noise protection equipment.

Table 4.8 - Water Quality Modeling Sulphide Tailings Impoundment

Computer Models

Visual Plumes	Simulates single and merging submerged aquatic plumes in arbitrarily stratified ambient flow and buoyant surface disharges. Used to model mixing of the tailings slurry with other material within the impoundment
PHREEQC	Performs a wide variety of low temperature aqueous geochemical calculations based on an ion - association aqueous model. Used to model reaction and mixing calculations. Developed by the United States Geological Survey.
Reservoir Balance	Mass balance model to evaluate stored water volume and released water volume.

Input Parameters

Tailings Discharge	1,350 DMT per day mill rate = 15.2 m3 per hour tailings
Solution Inflow	77.6 m3 per hour at 1,350 DMT per day mill rate
Water Recycle Rate	25 m3 per hour
Dissolved Oxygen	5 mg per L for natural stream inflow (Canatuan Creek)
Meteorology Data	Mean data from Canatuan. Precipitation and Evaporation 1994 - 2007
Stream Flow Data	Monthly watershed yield data from onsite Canatuan Creek Measurements
Tailings Mineralogy	Testing performed by Murray Hill and Intermet 2007
Solution Composition	Testing performed by Murray Hill and Intermet 2007
Canatuan Creek	Water Quality from laboratory testing 1994 - 2008
Dam and Impoundment	Designs from Smith Williams Consulting

Mineralogical Data Ore Bodies

Parameter	Units	Ore Maximum	Ore Minimum	Ore Average	Tails Average
Pyrite	weight %	86.3	26.2	56	56.6
Chalcopyrite	weight %	6	0.3	3.62	0.25
Sphalerite	weight %	2.6	0.2	0.94	0.4
Galena	weight %	nil	nil	nil	nil
Tennantite	weight %	0.8	0.1	0.23	0.18
Covellite	weight %	4.3	0.3	1.02	0.07
Bornite	weight %	0.15	nil	0.02	nil
Chalcocite	weight %	1.7	nil	0.21	0.01
Quartz	weight %	31	10	18	22
Muscovite	weight %	31	8	17.67	19
Chlorite	weight %	2	nil	0.2	0.25
Carbonates	weight %	2	nil	0.3	0.37

Meteorologic and Hydrologic Data

Month	Rainfall (mm)	Evaporation (mm)	Inflow (m3/sec)	Spillway (m3/sec)
January	105.8	129	0.3	0.45
February	74.3	130	0.19	0.23
March	159.3	132	0.12	0.19
April	238.3	129	0.14	0.23
May	284.3	82	0.19	0.35
June	292	60	0.18	0.36
July	276	73	0.21	0.41
August	327.6	77	0.16	0.4
September	301.8	66	0.15	0.39
October	406.3	60	0.28	0.66
November	342.8	84	0.23	0.54
December	187.8	87	0.12	0.5

Tailings Water Quality

Parameter	Units	High Copper Ore	High Zinc Ore
Arsenic	mg/l	0.002	0.002
Cadmium	mg/l	0.358	0.01
Cyanide	mg/l	not used	not used
Lead	mg/l	0.23	0.04
Mercury	mg/l	<0.10	<0.010
Copper	mg/l	0.46	0.08

Source: Murray Hill 2007

Tailings Major Ions Concentrations

Parameter	Units	High Copper Ore	High Zinc Ore
Calcium	mg/l	126	153
Iron	mg/l	0.02	<0.01
Potassium	mg/l	7.9	6.7
Magnesium	mg/l	18.56	8.34
Manganese	mg/l	6.38	0.25
Sodium	mg/l	119	125
Zinc	mg/l	8.87	0.21
Sulfate	mg/l	500	611
Chloride	mg/l	6	5
Bicarbonate	mg/l	136.6	130

Model Results Spillway Discharge

Parameter	Avg (mg/l)	Minimum (mg/l)	Maximum (mg/l)
Arsenic	0.005	0.005	0.005
Cadmium	0.011	0.005	0.032
Chromium	0.01	0.001	0.005
Copper	0.37	0.36	0.39
Iron	1.49	1.48	1.5
Lead	0.006	0.002	0.019
Mercury	0.0005	0.0005	0.0005
Zinc	0.19	0.02	0.73
pH	6.8	6.1	7.2
Sulfate	47.8	33	103

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

4.3.1 Year 2008 Programs and Activities

During Year 2008 the primary noise generators were excavators and trucks within the Open Mine Pit area and truck transport to the Mill and Processing area. This occurred from January to April 2008. Noise generation from May to October at the Mill Plant and Open Mine Pit were limited due to the cessation of Gossan Phase activities. Residents living along the road to Siocon were impacted as part of the Sulphide Tailings Dam construction as a result of sand hauling operations as well as road rehabilitation activities.

Noise monitoring studies were completed in November and December 2006 by Berkman Systems, Inc. The results are detailed in a separate report. The overall result of the study indicated all noise levels were within the ambient noise standards identified within the Philippine Standards.

4.3.2 Year 2009 Programs and Goals

Other than on going mine operations, short term noise impacts will result from continued construction of the Sulphide Tailings Dam and rehabilitation of roads from mine site to Siocon. Noise from the Sulphide Mine operations will be the same as experienced during the Gossan Mine operations. The exception to this will be the need for blasting operations to recover the Sulphide ore. The extent of blasting will depend on the ore material. However, Information, Education and Campaign programs have been prepared for the community for them to be able to understand clearly the method of blasting as well as its impacts. Apprehensions on the blasting practice will be communicated and discussed with the community. Blasting operations protocols have been prepared by the Mines Department and the Safety Department. These are included in **Appendix B**.

Programs and goals for Year 2009 will focus on increased use of personal protective equipment within and around the Mill area and monitoring the employee use of the equipment. This will be implemented by the Safety Department. Additionally a noise monitoring program will be implemented by a Consultant as was done in Year 2006. Noise readings will be taken within and around the Mine and Mill as well as housing and residential areas. This will encompass a 24 hour monitoring program for several days. This monitoring program is scheduled for the second quarter of Year 2009.

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

4.4 Air Quality

Air quality within the area was previously impacted by kaingin practices, wood fires for household use and emissions from small scale mining activities and ore processing. With the exception of wood fires for household use, the other air quality impacts attributed to this source were eliminated during Year 2004.

4.4.1 Year 2008 Programs and Activities

Project related air quality issues during Year 2008 were associated primarily with gasses emitted during the stripping, electro winning and refining operations of the Mill and Processing Plant and power generation at the gensets. Process related emissions ceased with the Gossan Phase operations. Stack emission from the gensets continue to the present until such time as ZAMSURECO has installed a power line from RT Lim to provide electricity to Canatuan. This is expected to be completed in late Year 2009 or Year 2010.

Dust generation during transportation activities and materials handling within the Surface Mine and during the Mill and Processing Plant operations is another air quality impact. Mitigation measures were primarily associated with dust control during dry periods of the year. This was accomplished by continued sprinkling of water on the roads and exposed areas using water trucks.

An ambient and source emissions monitoring program was completed in November and December 2006 by Berkman Systems, Inc. Results of the studies are detailed in a separate report. The overall study reports identified some air quality parameters that exceeded the Philippine Standards. The most prominent of these was Sulfur Dioxide emissions for the boiler operations. Other parameters that exceeded the Standards were particulates. The overall ambient air quality was good.

4.4.2 Year 2009 Programs and Goals

Dust generation is expected to increase during Year 2009 due to full mining operations and the continued constructed of the Sulphide Tailings Dam. The exposed areas will continue to be treated by water sprinkling to minimize dust generation. Emissions from the gensets will be eliminated later in

4.0 STRATEGY TO LIMIT AND CONTROL IMPACTS

Year 2009 once the Zamsureco power line is constructed. Emissions from the Mill and Process Plant are identified and employees assigned are provided with personal protective equipment. This is included as part of the Safety Department activities.

An air quality monitoring program by an outside Consultant will be scheduled for the Year 2009 as was done in the Year 2006. The goals will be to collect both stack samples and ambient air samples for analysis. Workspace samples will also be collected and tested for air quality as well. The sampling and monitoring program will be undertaken during the second quarter of Year 2009.

4.5 Conservation Values

Conservation values focus on three sectors; Nature Issues, Visual Aesthetics and Recreation and Education. Impacts to the first two sectors are unavoidable due to the type of activities associated with mining operations. Mitigation measures are available and have been implemented during the previous operations. Rehabilitation and reclamation practices for disturbed areas are also available and have been implemented as part of the mine revegetation and reforestation programs throughout the operations period.

4.5.1 Nature Issues Year 2008 Programs and Activities

4.5.1.1 Vegetation

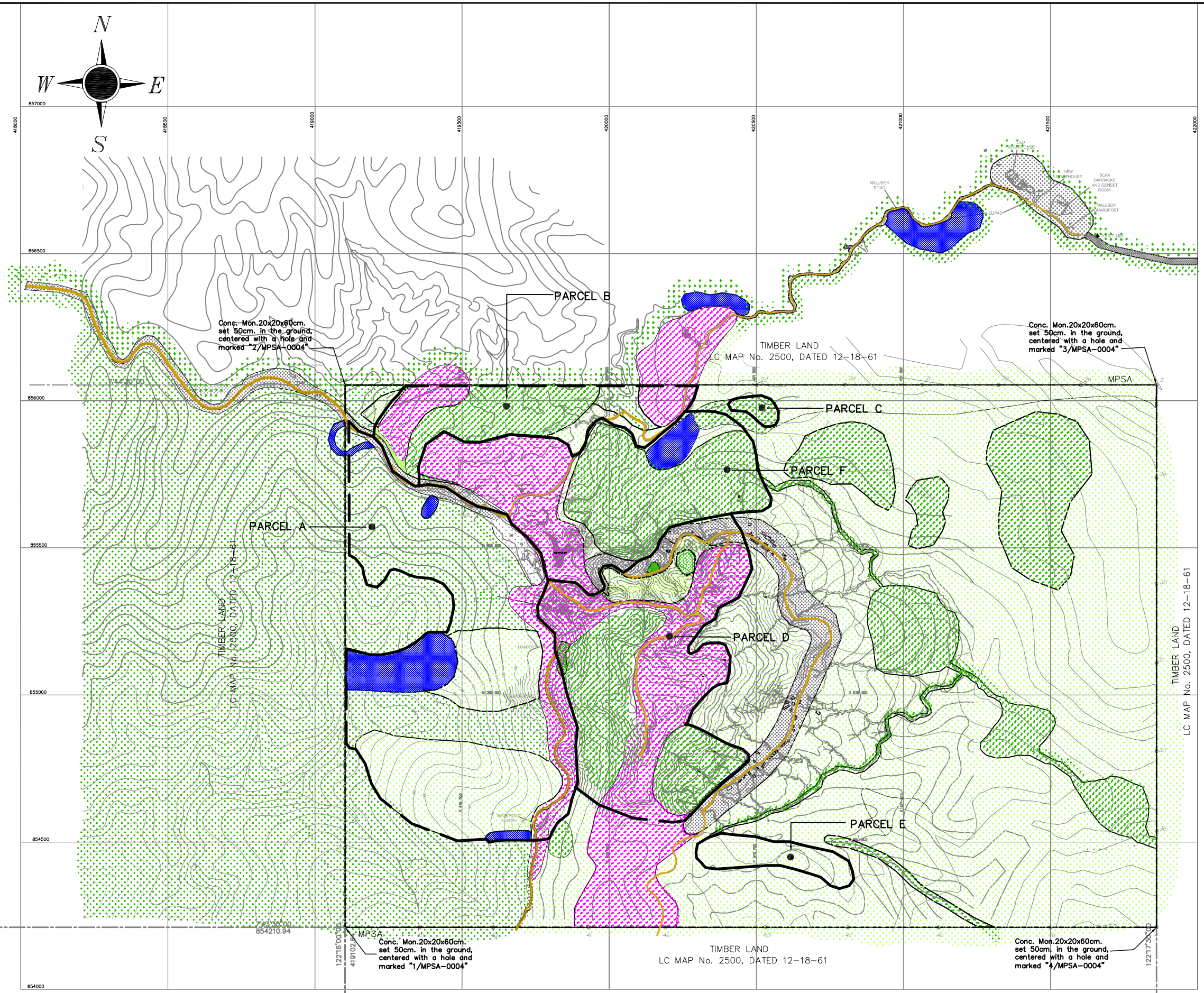
Approximately 10 hectares of existing vegetation was removed or impacted during Year 2008 as part of the mining and related activities and construction of the Sulphide Tailings Dam. The majority of this vegetation consisted of grasses and low level brush with few trees. Approximately 5 ha of the area represented forest conditions which was located at the Sulphide Tailings Dam. This was covered under a Tree Cutting Permit issued by the Forest Management Bureau and monitored by the PENRO and CENRO.

As indicated previously, approximately 26,100 trees were planted during Year 2008. This includes planting areas both inside and outside the MPSA area. The planted species consisted primarily of

mangium, gmelina, auri, rubber and some narra trees. The overall area planted encompassed approximately 9 hectares.

The forest resources map for Year 2008 is shown on **Figure 4.13**. Reforestation activities during the Year were focused on disturbed areas that underwent progressive rehabilitation such as the Ambaan Area, Lower Phase 1 and Southwest Overburden Stockpiles. Areas previously occupied by contractor bunkhouses were likewise vegetated after relocation.

A vegetation survey of the MPSA was conducted in November 2006 by outside consultants. The results of this survey are detailed in a separate report. The overall conclusion of this report is that the plant diversity remains high and consistent with the baseline studies conducted in 1996. Recommendations included protection of the remaining forest patches within the MPSA and



LEGEND

- FORESTED AREAS GOOD FOREST COVER
- CLEARED AREAS, AGRICULTURE LAND POOR FOREST COVER
- RESIDENTIAL AREAS AND TRANSPORTATION CORRIDORS
- KAINGIN AREAS
- MINING AND INFASTRUCTURE
- DENR FOREST AREA PARCELS YEAR 2004
- ROADS

NOTES

1. FOREST LANDUSE BASED ON OCCULAR INSPECTION IN YEARS 2005 AND 2006
2. PARCELS A, B, C, D, E AND F FROM YEAR 2004 FOREST SURVEY BY DENR
3. PARCELS A, B, C, D, E AND F REPRESENTED FORESTED AREAS AS REPORTED BY DENR SURVEY.
4. ALL AREAS OUTSIDE OF DENR PARCELS REPRESENT OPEN OR BRUSH LAND AREAS.

0 100m 200m 500m 750m
SCALE IN METERS

FOREST RESOURCES MAP

FIGURE NO.
4.12

introduction of silviculture techniques within the remaining forest patches. This has been adopted as part of the FMRDP.

4.5.1.2 Wildlife

Wildlife within the area is impacted by the presence of activity from both mining and support services. This has occurred throughout all of Year 2008. Animal poaching however may have been significantly reduced due to security and limited access to the Project Area.

Activities during Year 2008 appear not to have impacted the aquatic ecology of the area from a water quality standpoint. Data collected from the results of the quarterly surface water quality samples at the stream and river monitoring stations indicated levels of metals are generally at or below laboratory detection limits and below the regulatory limits for water quality standards. An aquatic species and sediment monitoring program was conducted in September 2006 by an outside consultant. The results are detailed in a separate report however the overall conclusions indicated there were no impacts to the aquatic systems relative to the heavy metals and cyanide.

Construction activities of the Sulphide Tailings Dam have impacted approximately 1,000 m of Canatuan Creek and several small tributaries within the immediate vicinity of the impoundment. This is an unavoidable impact. The impacted reaches of riverine environment will be filled with tailings and overburden material from the Sulphide operations. This will eventually be replaced by a reservoir and permanent lake encompassing approximately 30 hectares.

Terrestrial wildlife monitoring studies were also completed in November 2006 by an outside consultant. The results of these studies are detailed in separate report. The overall conclusions indicated the area remains very diverse with respect to wildlife species. Several threatened species identified in the baseline studies continue to inhabit the area and have been able to successfully coexist with the mining and operations activities.

4.5.2 Nature Issues Year 2009 Programs and Goals

4.5.2.2 Vegetation

Reforestation activity will continue through Year 2009 and will be directly affected by the start of Progressive Rehabilitation activities. The overall plan is to plant approximately 55,000 trees within and outside the MPSA area. The planting locations will be scattered throughout the MPSA. Approximately 80% of the planting will occur within the disturbed areas that have little or no forest cover or areas subject to Progressive Rehabilitation. The remaining 20% of the planting will be within previous planted areas and those areas with thin forest cover.

The Year 2009 reforestation program will include planting within all six Forest Parcels identified in the DENR June 2004 pre-mining survey. This will include the mine area, overburden stockpile areas and previous kaingin areas. Parcel C will likely not be planted due to the proposed Sulphide Dam construction activity.

Progressive Rehabilitation programs will continue in Year 2009 as described in the Final Mine Rehabilitation and Decommissioning Plan. Revegetation will become a significantly greater activity in Year 2009.

Vegetation and forest resource studies will also be conducted by an outside Consultant as was done in Year 2006. Both field investigations and office analyses will be completed. Further, another DENR forest inventory will be conducted in Year 2009 as a follow up to the inventory conducted in Year 2004.

4.5.2.3 Wildlife

The Surface Mine operations for the Year 2009 are not expected to impact the local waterways and aquatic species since they will be confined within the previous Gossan Phase Surface Mine Units. Construction of the Sulphide Tailings Dam and Impoundment will affect the aquatic habitat of Canatuan Creek. Formation of the impoundment behind the Sulphide Tailings Dam will also permanently alter approximately 1,500 meters of riverine habitat. This is an unavoidable impact. The riverine aquatic habitat will be replaced by a lake aquatic habitat. Mitigation measures for this impact will be

implemented once the tailings impoundment has been fully used and reclamation activities are initiated. Reconstruction of Canatuan Creek and the aquatic habitat will begin at that time. This is anticipated to occur at the end of the mining operations in Years 2013 and 2014.

No additional impacts to terrestrial wildlife due to mining and milling activities are anticipated in Year 2009. The Surface Mine expansion will primarily be vertical with no significant expansion of the horizontal mine limits. Similarly, operation of the new mill plant will not affect wildlife. Wildlife within the area has evacuated the site in the past during the Gossan Phase operations.

Habitat evaluation will also be conducted as part of the terrestrial flora and fauna studies to be completed by an outside Consultant. This work will be similar to that performed in Year 2006.

An aquatic environment sampling and testing program will also be performed by an outside Consultant in Year 2009 similar to that completed in Year 2006. Various aquatic species will be collected from the streams and rivers within and around the Project Area. Tissue analyses of the collected species will be conducted to determine the presence of metals and their concentrations. At the same time, bottom sediment samples will also be collected at the same locations and tested for gradation characteristics and metal concentrations.

4.5.3 Visual Aesthetics Year 2008 Programs and Activities

Some visual impacts have occurred during Year 2008 and are associated with open pit mining activities, expansion of the overburden stockpiles construction of the mill plant, construction of erosion control structures and construction of the Sulphide Tailings Dam. These are unavoidable and will be mitigated in the long term as part of the Progressive Reclamation programs.

4.5.4 Visual Aesthetics Year 2009 Programs and Goals

Continuation of the construction of the Sulphide Tailings Dam as well as the mine pit operation will be the primary visual impacts in Year 2009. These are unavoidable. Some mitigation of the mine pit and Sulphide Dam area will be accomplished through revegetation and reforestation activities.

4.5.5 Recreation and Education Year 2008 Programs and Activities

Recreation and education programs have been established by TVI as part of the Community Relations and Development Office. These have progressed during the past year and have included interaction and education of multiple groups. An open door policy for the mine and operations was initiated in Year 2005 to better educate the local residents, academic organizations and lay people relative to mining operations in general and the TVI Canatuan operations specifically. This has continued throughout Year 2008.

4.5.6 Recreation and Education Year 2009 Programs and Goals

The open door policy will continue throughout Year 2009. Other recreation and education goals have been identified in the Social Management and Development Plan. Details can be found in that document.

4.6 Heritage and Cultural Values

Heritage and cultural values within the Project area focus on the Subanon indigenous peoples. The Subanon are located throughout the Zamboanga peninsula and reside in several villages within the Municipality of Siocon. A Certificate of Ancestral Domain Title (CADT) has been issued to the Subanon community residing within the Canatuan area. The CADT encompasses an area of 8,213 hectares. The 508 hectare MPSA is located entirely within the CADT. As such, current and future activities associated with operations, reclamation and project closure require continuing dialogue between the Subanon and TVI.

4.6.1 Year 2008 Programs and Activities

Development of the second five-year Social Development Management Program (Year 2009 – Year 2013) for the Sulphide Phase Project was completed in Year 2008. This is an extensive document that includes a number of community based projects and programs that resulted from a series of consultation with the primary and secondary impact communities. Preparation of this document was initiated due to the completion of the initial five-year Social Development Management Program for the Gossan Phase operations.

4.6.2 Year 2009 Programs and Goals

One of the primary goals within Year 2009 is the implementation of the SDMP. Another important activity for Year 2009 is the development of the Ancestral Domain Development Sustainable Protection Plan (ADSPP) by SSAI with the assistance of the National Commission of the Indigenious Peoples (NCIP). A series of workshops, Information and Education campaigns are scheduled to be conducted within the year to further develop skills, capabilities and knowledge of the Subanon community. Details of these activities are included in the 5-year SDMP submitted to the DENR-MGB.

5.0 ENVIRONMENTAL MANAGEMENT PLAN

5.1 Monitoring

Monitoring programs serve the need for quantifying the environmental impacts, measuring the effectiveness of mitigation measures and providing a data source of what works and what does not work. Each of the environmental sectors discussed previously have a certain suite of monitoring programs designed to quantify, measure and evaluate. These encompass seven activity sources:

- Land Resources
- Water Resources
- Noise
- Air Quality
- Conservation Values
- Heritage and Cultural Values
- Social Issues

Between 1998 and 2002, little Project activity occurred and little if any monitoring was done. Although limited in scope, activity increased in Year 2003 which resulted in the accomplishment of some activity monitoring. This was focused within the Land Resources, Water Resources and the Conservation Value sectors.

During Year 2004 mining activity increased resulting in an increase in the monitoring activity. An independent monitoring team created by the Mine Rehabilitation Fund Committee (MRFC) was established to oversee the implementation of the environmental and social programs and other commitments of the company. The MRFC is tasked to deputize a Multipartite Monitoring Team (MMT) to serve as monitoring arm. The team is comprised of a MGB representative as the chairman, EMB representative, LGU representative, NGO's representative, IP representative, CENRO, Provincial representative and a TVI representative.

The development activities, environmental strategies and monitoring programs planned and completed in Year 2008 are summarized in **Table 5.1**. Development activities, environmental strategies and monitoring programs planned for Year 2009 are summarized in **Table 5.2**.

5.2 Research

Research programs related to Land Resources, Water Resources and Hydrometeorology were identified in the updated Environmental Performance and Protection Program for the Sulphide Phase. Research topics include the following:

5.2.1 Tailings Rehabilitation and Reclamation

- Topsoil Requirements – Depth and nutrient content.
- Vegetation Species – Fastest growing, highest density, water and nutrient requirements.
- Minerals Uptake – Capacity of different plants to use metals and minerals present within the tailings and overburden materials.
- Monitoring Nursery Requirements – Materials needed, costs, manpower requirements, growing methods.

5.2.2 Water Quality

- Sediment Pond Effectiveness – Measurement of the effective sedimentation and settling rates for different pond configurations, particle sizes and chemical additions.

- Cyanide Degradation – Monitoring and measurement of cyanide degradation within the Gossan Tailings Impoundments due to natural mechanisms such as biological activity and ultraviolet exposure.
- Vegetation Treatment of Acid Mine Drainage – Testing and evaluation of different plant species to treat acid drainage in a passive treatment system.
- Water Balance Monitoring – Modeling of the Gossan and Sulphide Tailings Impoundments with regards to various water balance components and water quality impacts.

Table 5.1 - Summary Of Environmental Strategies And Monitoring Programs Completed For Year 2008

Sector	Component	Purpose	Locations	Sampling Method	Status
Mining and Processing Activities	Sediment Ponds and Passive AMD Water Treatment	Erosion Control Management Water Quality Management Geotechnical Controls	Mine Pit Overburden Stockpiles Mill Area	Water Samples/Testing Sediment Depth Visual Inspection	On Going Operations. Additional sediment ponds constructed. Existing ponds desilted.
	Diversions And Interception Canals	Erosion Control Management Geotechnical Controls Water Quality Management	Mine Pit Overburden Stockpiles Mill Area	Survey Data Visual Inspection	On Going Operations. Construction of roadside canals and drainage controls.
	Tailings Dams	Water Quality Management Dam Stability Storage Capacity Structure Integrity Discharge Quantity/Quality	Upper Tailings Dam Lower Tailings Dam Gossan Tailings Dam Water Control Diversion Dam Sulphide Tailings Dam	Instrumentation Survey Data Visual Inspection Water Samples/Testing Discharge Measurements	Ongoing Monitoring Activities. New peizometers installed. New monitoring hubs set up. Erosion protection completed at the Diversion Dam and Lower Dam. Construction of seepage control systems. Water quality monitoring on-going. Construction of Stage 2 of the Sulphide Tailings Dam.
	Water Supply	Water Quality Discharge	Upper Canatuan Creek Malusok Springs Diversion Dam Tanuman Village	Water Samples/Testing Discharge Measurements	On Going Operations. Conducted Bacteriological testing of potable water sources.
	Meteorology Data	Climate Characteristics Hydrologic Conditions Water Balance	Mill Area	Meterologic Station	On Going Operations. Data Summary for 2008 prepared.
	Streams And Rivers	Water Quality Sediment Quality Aquatic Habitat Hydraulic Characteristics	Canatuan Creek, Lumot Creek, Paduan Creek, Mambong Creek, Litoban River, Siocon River	Water Samples/Testing Sediment Samples/Testing	Water Sampling Completed By MMT. 2 sampling events conducted in Year 2008. EMB verification monitoring also conducted.

Mining and Processing Activities	Open Pit and Overburden Stockpiles	Stability Surface Water Quantity Surface Water Quality Erosion and Soil Loss	Gossan Open Pit Overburden Stockpiles	Survey Data Visual Inspection Water Samples/Testing Sediment Ponds Erosion Controls Revegetation	Completed. No Groundwater. Surface water runoff directed to sediment ponds. pH testing done to monitor acid mine drainage. Sulphide materials segregated and covered to prevent AMD. Benching of stockpiles, placement of surface netting, grasses planting, tree planting.
	Access Roads	Erosion Control Management Stability Drainage Control	Mine Area Mill Area Internal Access	Survey Data Visual Inspection	On Going Operations.
	Water Supply/Tailings Discharge Pipelines	Leaks Uncontrolled Discharges	Water Supply Pipelines Tailings Discharge Pipelines	Survey Data Visual Inspection	On Going Operations Redundant Systems.
Noise	Construction/Mining Equipment Blasting	Adverse Worker Effects Health and Safety Standards Adverse Worker Effects Health and Safety Standards	Mine Pit Mill Area Mine Pit		Minimal blasting activities during the start of Sulphide operations.
Air Quality	Process Plant Emissions	Adverse Worker Effects Health and Safety Standards	Process Plant/Mill Area		Monitoring program postponed to Year 2009.
	Power Supply	Air Emission Standards	Generators		Monitoring program postponed to Year 2009.
	Dust Control	Adverse Worker Effects	Mine Pit Process Plant/Mill Area Access Roads		Monitoring program postponed to Year 2009.
	Nearby Communities	Health Impacts Ambient Quality	Malusok Agolo Village Manhattan Village		Monitoring program postponed to Year 2009.
Conservation Values	Vegetation	Nursery Operations Reclamation Parameters Maintain Wildlife Corridors	Nursery Reclaimed Areas Surrounding MPSA Area	Visual Examination Field Monitoring Program	On Going Operations. Expansion of the Nursery. DENR forest inventory to be conducted in Year 2009.
	Wildlife	Species Monitoring Maintain Wildlife Corridors Identify Threatened Species	Surrounding MPSA Area	Visual Sighting Field Monitoring Program	Terrestrial Fauna survey postponed to Year 2009.
	Aquatic Ecology	Water Quality Impacts Species Monitoring	Canatuan Creek, Lumot Creek, Paduan Creek, Mambong Creek, Litoban River, Siocon River	Visual Examination Live Species Sampling Tissue Sampling	Postponed to Year 2009.

Table 5.2 - Summary Of Environmental Strategies And Monitoring Programs Planned For Year 2009

Sector	Component	Purpose	Locations	Sampling Method	Schedule
Mining and Processing Activities	Sediment Ponds Passive Treatment Ponds *Construct New Ponds*	Erosion Control Management Water Quality Management Structural Integrity	Mine Pit Overburden Stockpiles Mill Area	Water Samples/Testing Sediment Depth Visual Inspection	*As Needed Throughout Year 2009*
	Diversions And Interception Canals *Construct New Canals*	Hydraulic Conditions Structural Integrity Leakage	Mine Pit Overburden Stockpiles Process Plant/Mill Area	Survey Data Visual Inspection	*As Needed Throughout Year 2009*
	Tailings Dam *Close Upper Dam* *Close Lower Dam* *Close Gossan Dam* *Continue Sulphide Dam*	Water Quality Management Dam Stability Storage Capacity Structure Integrity Discharge Quantity/Quality Final Closure/Reclamation	Upper Tailings Dam Lower Tailings Dam Gossan Tailings Dam *Sulphide Tailings Dam*	Instrumentation Survey Data Visual Inspection Water Samples/Testing Discharge Measurements Tailings Relocation	*Monthly Monitoring Year 2009 for All Dams.* *Begin Rehabilitation of Upper, Lower, Gossan Dam.*
	Water Supply *Water Treatment Plant* *Increase Supply*	Water Quality Potable Water Supply Sulphide Mill Requirements	Upper Canatuan Creek Sulphide Tailings Dam Diversion Dam	Water Samples/Testing Discharge Measurements	*On Going Monitoring Monthly.* *RO Plant Operations Continuous*
	Meteorology Data	Climate Characteristics Hydrologic Conditions Water Balance	Upper Dam	Meterologic Station	On Going Daily
	Streams And Rivers *Stations To Be Monitored By The MMT. Add Stations for Sulphide Phase*	Water Quality Sediment Quality Aquatic Habitat Hydraulic Characteristics	Canatuan Creek, Lumot Creek, Paduan Creek, Mambong Creek, Litoban River, Siocon River. *Add 3 or 4 Stations*	Water Samples/Testing Sediment Samples/Testing	On Going Under MGB. Quarterly Sampling MMT. Daily Sampling TVI.
	Open Pit *Begin Sulphide Mining*	Stability Surface Water Quality Surface Water Quantity	Gossan and Sulphide Mine Area	Survey Data Visual Inspection Water Samples/Testing	On Going.
	Access Roads	Erosion Control Management Stability Drainage Control	Mine Area Mill Area Internal Access	Survey Data Visual Inspection	On Going.
	Water Supply/Tailings Discharge Pipelines	Leaks Uncontrolled Discharges	Water Supply Pipelines Tailings Discharge Pipelines	Survey Data Visual Inspection	On Going

Table 5.2 - Summary Of Environmental Strategies And Monitoring Programs Planned For Year 2009

Noise	Construction/Mining Equipment *Monitoring Study*	Adverse Worker Effects Health and Safety Standards Adverse Worker Effects Health and Safety Standards	Mine Pit Mill Area Residential Areas	Portable Monitoring Equip. Portable Monitoring Equip.	 *Continuous PPE monitoring.* No Blasting
Air Quality	Ambient Air Quality	Adverse Worker Effects Health and Safety Standards	Mill Area, Mine Area Residential Areas	Portable Monitoring Equip.	*Third Party Monitoring 3rd Quarter*
	Power Supply *Install Powerline*	Air Emission Standards	Generators	Portable Monitoring Equip. Fixed Monitoring Equip.	*Third Party Monitoring 3rd Quarter*
	Dust Control *Continued Water Application*	Adverse Worker Effects	Mine Area, Mill Area Residential Areas Access Roads	Portable Monitoring Equip. Fixed Monitoring Equip.	*Third Party Monitoring 3rd Quarter*
	Mill Plant Emissions *Monitoring Study*	Health Impacts Ambient Quality	Mill Area Adjacent Areas, Malusok	Portable Monitoring Equip.	*Third Party Monitoring 3rd Quarter*
Conservation Values	Vegetation *Monitoring Study* *DENR (ERDS) Studies*	Nursery Operations Reclamation Parameters Maintain Wildlife Corridors	Nursery Reclaimed Areas Surrounding MPSA Area	Visual Examination Sampling Program Measurement Program	On Going *Third Party Monitoring 3rd Quarter*
	Wildlife *Monitoring Study*	Species Monitoring Maintain Wildlife Corridors Identify Threatened Species	Surrounding MPSA Area	Visual Sighting	*Third Party Monitoring 3rd Quarter*
	Aquatic Ecology *Monitoring Study*	Water Quality Impacts Species Monitoring	Canatuan Creek, Lumot Creek, Paduan Creek, Mambong Creek, Litoban River, Siocon River	Visual Examination Live Species Sampling Tissue Sampling	*Third Party Monitoring 3rd Quarter*

- Watershed Sediment Yield – Monitoring of the watershed sediment production and deposition with the Sulphide Tailings Impoundment.

5.2.3 Meteorologic Monitoring

Meteorologic monitoring will consist of continued data collection at the meteorologic station for rainfall, temperature, and evaporation data. These data will help describe the climate conditions within an area of little information.

5.2.4 Hydrologic Monitoring

Stream flow measurement will be conducted at various locations within the Project area. Data from these stations will be used to characterize the rainfall-runoff relations within the local watersheds. This will be done for both disturbed and undisturbed areas

Work within almost all of these topics was initiated in Year 2004 or prior years. This work will continue throughout Year 2009. Ongoing results and products of these research activities are maintained as separate programs. Data and evaluations are documented as separate reports and are available from the TVI Environmental Department.

5.3 Progressive Rehabilitation

Progressive Rehabilitation will continue and significantly increase in Year 2009. The primary focus will be on the rehabilitation of Upper, Lower and Gossan Tailings Impoundments, the Southeast and Southwest Overburden Stockpiles and the Upper Lumot Creek Watershed. Additional monitoring actions and activities will be introduced. These are summarized in **Table 5.3** for Sulphide Phase operations and through the end of Project Closure (Year 2008 – Year 2019).

5.4 Reporting

Reporting is done by the TVI Environmental Manager or the Pollution Control Officer. The AEPEP will be prepared on a calendar year basis. However, interim reports are prepared on a quarterly basis. These include the Environmental Report, Pollution Control Officers Report, Hazardous Waste Generators Report, Energy Consumption Report and other related reports.

5.0 ENVIRONMENTAL MANAGEMENT PLAN

A Multipartite Monitoring Team (MMT) chaired by the MGB prepares and submits reports on a quarterly basis following each field investigation program. The TVI representative will also submit a report on compliance to the commitment agreed with the MMT and the company on the various concerns and observations noted by the MMT members.

5.5 Land Use and Project Closure

The overall environmental management strategy is to protect and rehabilitate the disturbed areas as much as possible such that the post Project conditions are similar to the pre Project conditions. Over the long term this can be achieved within certain areas of the Project. However, for the most part the terrain, topography and in some cases the vegetation cannot be restored to pre operation conditions. This is due in large part to mining operations. But to some extent, social and political factors will also affect the final land use disposition and Project closure characteristics. Defining a reclamation and closure plan that may be acceptable to all sectors 5 or 6 years from now is difficult at best.

Nonetheless, the recently developed FMRDP presents a base land use plan and development program for post mining closure. Review and revision of this reclamation and closure plan will more than likely be a continuing work in progress. Reclamation programs in the immediate and short term must be developed with respect to the longer term land use and closure plan.

Table 5.3 - Progressive Rehabilitation and Monitoring Schedule

		Sulphide Operations						Final Closure and Decommissioning						
		Progressive Rehabilitation Period						Active Care		Passive Care			Evaluation	
Item	Monitoring Sector / Activity	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Comments
1.0	Surface Water Quality Monitoring												X	Sampling points include pre 2008 locations within and outside the MPSA.
1.1	MPSA Field Testing	monthly	monthly	monthly	monthly	monthly	monthly	monthly	monthly	monthy	monthly	monthly		
1.2	MPSA Laboratory Testing	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly		
1.3	Baseline Control Stations	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	semi annual	semi annual	semi annual		
1.4	Downstream Impact Stations	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	quarterly	semi annual	semi annual	semi annual		
2.0	Potable Water Supply Monitoring													Testing for chlorine residual and bacteria
2.1	MPSA Field Testing	weekly	weekly	weekly	weekly	weekly	weekly	weekly	weekly					
2.2	MPSA Laboratory Testing	monthly	monthly	monthly	monthly	monthly	monthly	monthly	monthly					
3.0	Meteorology and Hydrology Data													Maintenance of the data base for future use by others.
3.1	Rainfall	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily		
3.2	Evaporation	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily		
3.3	Temperature	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily		
3.4	Streamflow Measurements	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily	daily		
4.0	Dam and Overburden Stockpile Monitoring												X	Structural monitoring for stability, erosion and structure performance.
4.1	Piezometers	monthly	monthly	monthly	monthly	monthly	monthly	semi annual	semi annual	semi annual	semi annual	semi annual		
4.2	Movement Hubs	monthly	monthly	monthly	monthly	monthly	monthly	semi annual	semi annual	semi annual	semi annual	semi annual		
4.3	Seepage Flow	daily	daily	daily	daily	daily	daily	monthly	monthly	monthly	monthly	monthly		
4.4	Visual Inspection	monthly	monthly	monthly	monthly	monthly	monthly	semi annual	semi annual	semi annual	semi annual	semi annual		
5.0	Revegetation and Forest Assessment												X	Assess the progress and mortality of revegetation and crops. Identify wildlife activities
5.1	Monitoring Flora	annual	annual	annual	annual	annual	annual	annual	annual					
5.2	Monitoring Fauna	annual	annual	annual	annual	annual	annual	annual	annual					
5.3	Disturbed Area Reclamation Evaluation	monthly	monthly	monthly	monthly	monthly	monthly	monthly	monthly	monthly	monthly	monthly		
5.4	Plantation Crop Evaluation	seasonal	seasonal	seasonal	seasonal	seasonal	seasonal	seasonal	seasonal	seasonal	seasonal	seasonal		
6.0	Aquatic Habitat Monitoring												X	Evaluate short term and long term impacts on the aquatic habitat
6.1	Species Monitoring and Tissue Testing	annual	annual	annual	annual	annual	annual	annual	annual	annual	annual	annual		
6.2	River Sediment Sampling and Testing	annual	annual	annual	annual	annual	annual	annual	annual	annual	annual	annual		
6.3	Habitat Evaluation	annual	annual	annual	annual	annual	annual	annual	annual	annual	annual	annual		
7.0	Air Quality Monitoring													Evaluate operations impacts on air quality.
7.1	Process Air Quality Testing	annual	annual	annual	annual	annual	annual							
7.2	Ambient Air Quality Testing	annual	annual	annual	annual	annual	annual							
8	Infrastructure Monitoring												X	Monitoring general infrastructure and access within the MPSA
8.1	Transportation Corridors	daily	daily	daily	daily	daily	daily	monthly	monthly	semi annual	semi annual	semi annual		
8.2	Utilities (Water and Power)	daily	daily	daily	daily	daily	daily	monthly	monthly	semi annual	semi annual	semi annual		
8.3	Trails and Access Corridors	weekly	weekly	weekly	weekly	weekly	weekly	monthly	monthly	semi annual	semi annual	semi annual		

Notes:

1. Year 2019 represents an evaluation period to determine the effectiveness of the reclamation, rehabilitation and decommissing programs. This will involve the agencies, TVIRD and the stakeholders.

6.0 COST OF ANNUAL ENVIRONMENTAL PLAN

6.1 Elements of the Environmental Programs

During the overall project operations, nine major elements of the mining and processing will be subject to environmental management programs and will be included in the AEPEP. These consist of the following;

- Surface Mine.
- Overburden Stockpiles.
- Tailings Dams and Impoundments.
- Water Supply Systems for Reclaim, Potable and Process Water.
- Processing Plant and Stockpile Areas.
- Solid and Liquid Waste Management Facilities.
- Erosion and Sedimentation Control Facilities and Structures.
- Roads and Utility Corridors.
- Administration Facilities.

6.2 Cost of the AEPEP

Operations over the past 12 months have included many of the above elements with respect to environmental management programs and expenditures. Costs for these programs have been determined and are summarized in **Table 6.1**.

The total expenditures for Year 2008 were Php 61,779,962 versus the original estimated costs for Year 2008 at approximately Php 220,405,000. The Year 2008 planned expenditures included approximately Php 140,000,000 million for Sulphide Tailings Dam construction. Conversations with the MGB have indicated tailings dam costs should not be considered as part of the AEPEP costs. However the Sulphide Tailings Dam has acted as a sediment control feature during Year 2008 and will continue to do so throughout the Project life. This is an integral part of the erosion and sediment control program and a key component to the overall environmental protection plan. Approximately 30% to 35% of the storage volume within the impoundment is allocated to sediment storage. As such, one third of the construction costs have been assigned to the AEPEP cost.

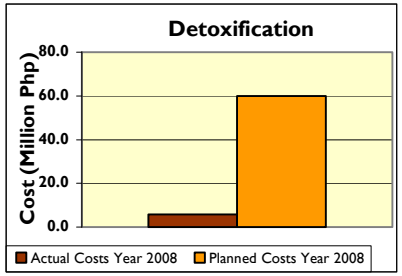
6.0 COST OF ANNUAL ENVIRONMENTAL PLAN

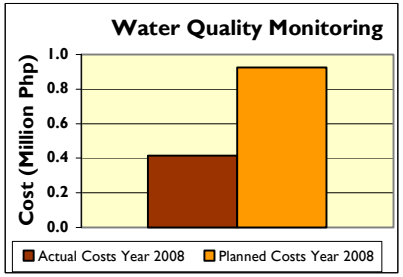
Table 6.1 - Cost Of Environmental Management Programs Year 2008

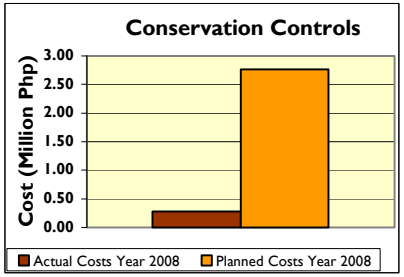
Item/Activity	Actual Costs Year 2008		Planned Costs Year 2008		Comments
	Php	$ US	Php	$ US	
1. Detoxification Process	5,832,746	131,161	60,000,000	1,500,000	Cost for cyanide detoxification for the 1st half of Year 2008 only.
2. Water Quality Sampling and Monitoring	415,572	9,345	925,000	23,125	
3. Erosion Controls and Reclamation	3,131,350	70,415	10,225,000	255,625	Includes rehabilitation of Backroad and construction of gossan dam spillway.
4. Tailings Dam Construction Activities	50,760,543	1,141,456	140,000,000	3,500,000	Cost for Sulphide Tailings Dam construction.
5. Conservation Controls	275,621	6,198	2,765,000	55,300	Postponed annual monitoring activities to Year 2009.
6. Permitting, MRFC Reporting, MMT Monitoring, Education	1,364,130	30,675	6,490,000	129,800	Delay in sulphide project research programs for AMD.
Total Cost with Tailings Management Programs	61,779,962	1,389,250	220,405,000	5,463,850	Actual costs = 28.0% of planned costs.
Total Cost without Tailings Management Programs	11,019,419	247,794	80,405,000	1,963,850	Actual costs = 13.7% of planned costs.

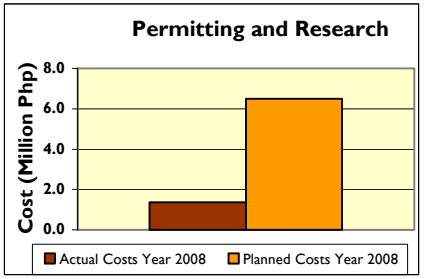
Notes:

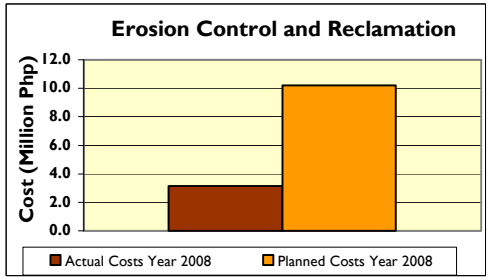
1. An Exchange Rate of Php 44.47 per US$ for Actual Costs of Year 2008.

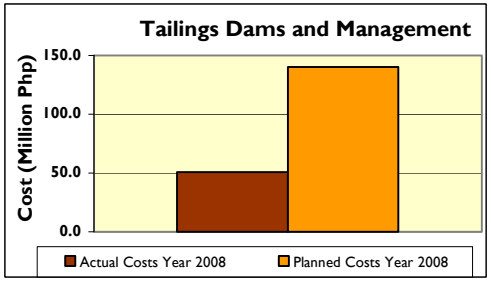


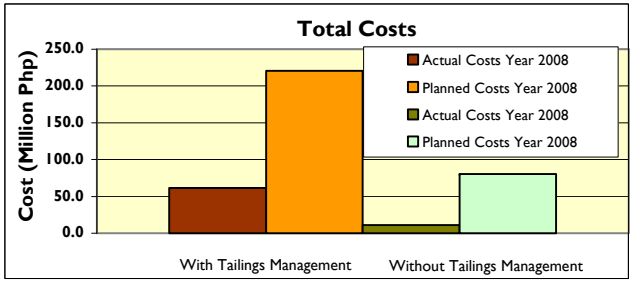












6.0 COST OF ANNUAL ENVIRONMENTAL PLAN

The AEPEP programs planned for Year 2009 have been identified and associated costs estimated. These are shown in **Table 6.2** and indicate a total estimated expenditure of approximately Php 127,391,000. Partial cost of the Sulphide Dam construction is included.

6.3 Cost of Progressive Rehabilitation

Some of the costs identified in **Table 6.2** are also attributed to Progressive Rehabilitation as identified in the FMRDP. These costs are estimated to be approximately Php 63,859,000 with monitoring costs to be approximately Php 3.5 million. Those AEPEP costs attributed to Progressive Rehabilitation are noted in **Table 6.2**.

6.0 COST OF ANNUAL ENVIRONMENTAL PLAN

Table 6.2 – Cost of Environmental Management Programs for Year 2009

Environmental Sector	Item And Activity		Plan Costs Year 2009		Estimated Plan Expenditures (Php)			
			Php	$ US	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr
1. Land	1a	Sediment Pond Construction	403,200	7,754	100,800	100,800	100,800	100,800
Resources	1b	Desilting of Sediment Pond	924,000	17,769	231,000	231,000	231,000	231,000
	1c	Drainage And Diversion Ditch Construction	400,000	7,692	100,000	100,000	100,000	100,000
	1d	Construction of Neutralization Ponds	336,200	6,465	84,050	84,050	84,050	84,050
	1e	DENR Vegetation and Reclamation Studies	612,000	11,769			612,000	
	1f	Solid waste management	700,000	13,462	175,000	175,000	175,000	175,000
	1g	Insfrastructure Monitoring	143,000	2,750	35,750	35,750	35,750	35,750
	1h	Dam and Overburden Stockpile Monitoring	134,000	2,577	33,500	33,500	33,500	33,500
		Estimated Cost Sector 1	3,652,400	70,238	760,100	760,100	1,372,100	760,100
2. Water	2a	Sulphide Tailings Dam construction	50,000,000	961,538	12,500,000	12,500,000	12,500,000	12,500,000
Resources	2b	Cyanide Destruction	80,000	1,538	20,000	20,000	20,000	20,000
	2c	Water Quality Equipment	100,000	1,923		100,000		
	2d	Water Quality Sampling And Testing (Inhous	574,000	11,038	143,500	143,500	143,500	143,500
	2e	Acid Mine Drainage Control	2,929,500	56,337	732,375	732,375	732,375	732,375
	2f	Bacteriological testing of Potable water suppl	281,000	5,404	70,250	70,250	70,250	70,250
	2g	Metereology and Hydrology Monitoring	176,000	3,385	44,000	44,000	44,000	44,000
	2h	Chorination/ Reverse Osmosis	471,000	9,058	106,500	106,500	151,500	106,500
		Estimated Cost Sector 2	54,611,500	1,050,221	13,616,625	13,716,625	13,661,625	13,616,625
3. Conservation	3a	Nursery Operations	120,000	2,308	30,000	30,000	30,000	30,000
Values	3b	Aquatic Habitat and Sediment Sampling	749,000	14,404			749,000	
	3c	Vegetation and Wildlife Habitat Studies	200,000	3,846			200,000	
		Estimated Cost Sector 3	1,069,000	20,558	30,000	30,000	979,000	30,000
4. Noise Control	4a	Hearing Protection For Workers	80,000	1,538	20,000	20,000	20,000	20,000
	4b	Site Noise Level Studies	298,000	5,731			298,000	
		Estimated Cost Sector 4	378,000	7,269	20,000	20,000	318,000	20,000
5. Air Quality	5a	Air Quality Monitoring Studies	500,000	9,615			500,000	
Management	5b	Dust Supression Activity	1,100,000	21,154	500,000	200,000	200,000	200,000
		Estimated Cost Sector 5	1,600,000	30,769	500,000	200,000	700,000	200,000
6. Permitting	6a	MRFC Meetings and Expenses	251,600	4,838	62,900	62,900	62,900	62,900
And Education	6b	MMT Monitoring and Expenses	424,000	8,154	106,000	106,000	106,000	106,000
	6c	Education and Information Campaign	80,000	1,538	20,000	20,000	20,000	20,000
	6d	Permitting Fees	364,650	7,013	64,200	104,500	75,100	120,850
	6e	Research Programs	1,000,000	19,231	500,000		500,000	
	6f	Training	100,000	1,923	40,000	20,000	20,000	20,000
		Estimated Cost Sector 6	2,220,250	42,697	793,100	313,400	784,000	329,750

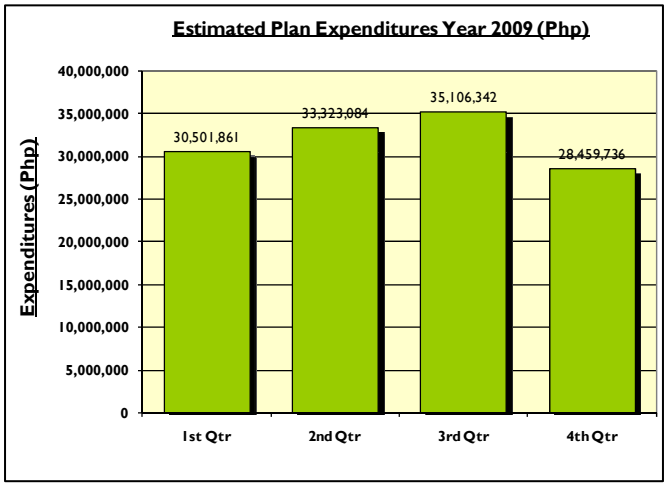
6.0 COST OF ANNUAL ENVIRONMENTAL PLAN

Table 6.2 – Cost of Environmental Management Programs for Year 2009

7. Progressive	7a	Gossan Mill Plant	7,720,364	148,469	1,930,091	1,930,091	1,930,091	1,930,091
Rehabilitation	7b	Nursery/ Fuel Storage Area/ Warehouse	33,075	636	33,075			
	7c	Lower Tailings Impoundment	897,341	17,257	448,671	448,671		
	7d	Upper Tailings Impoundment	601,292	11,563		300,646	300,646	
	7e	Gossan Tailings Impoundment	5,925,882	113,959		1,975,294	1,975,294	1,975,294
	7f	Diversion Dam Spillway	2,244,864	43,170			1,122,432	1,122,432
	7g	Employee Housing	200,432	3,854		200,432		
	7h	Ambaan Village	66,703	1,283	66,703			
	7i	Manhattan Housing Area	749,700	14,417		749,700		
	7j	Sulphide Tailings Dam Impoundment	10,303,140	198,137	2,575,785	2,575,785	2,575,785	2,575,785
	7k	Mine Area	11,916,924	229,172	2,979,231	2,979,231	2,979,231	2,979,231
	7l	Southwest/ Southeast Overburden Stockpile	6,089,535	117,106	2,029,845	2,029,845	2,029,845	
	7m	Backroad Area	340,342	6,545	340,342			
	7n	Canatuan Small Scale mining area	714,971	13,749		714,971		
	7o	East overburden stockpile (Lower Phase 1)	4,373,595	84,108	1,457,865	1,457,865	1,457,865	
	7q	Lumot Creek Watershed	11,161,000	214,635	2,790,250	2,790,250	2,790,250	2,790,250
	7r	Offsite Disturbed areas	520,712	10,014	130,178	130,178	130,178	130,178
		Estimated Cost Sector 6	63,859,872	1,228,074	14,782,036	18,282,959	17,291,617	13,503,261
Total Estimated Cost Of Enviromental Management Programs			**127,391,022**	**1,221,753**	**30,501,861**	**33,323,084**	**35,106,342**	**28,459,736**

Notes:

1. *Exchange rate of Php 52 per US$ for Year 2009.*
2. *Costs for Community Development includes as part of the Social Development and Management Plan.*



Summary of Table 6.1 Costs For Year 2009

Item	Cost (Php)
1. Detoxification Process	80,000
2. Water Quality Sampling and Monitoring	674,000
3. Erosion Controls and Reclamation	69,464,772
4. Tailings Dam Construction Activities	50,000,000
5. Conservation Controls	3,047,000
6. Permitting, MRFC Reporting, Education, Research	2,220,250
7. Solid Waste Management/ Chlorination/ Monitoring	1,905,000
Total With Tailings Dams and Management	127,391,022
Total Without Tailings Dams and Management	77,391,022

7.0 CERTIFICATION

7.1 Certification

This is to certify that the data and information presented in this Annual Environmental Protection And Enhancement Program (APEP) are true to the best of our knowledge and that an objective and thorough assessment and program preparation was undertaken in accordance with the dictates of reasonable and sound judgment.

Should any information come to our attention that would make this AEPEP inaccurate it will be brought to the attention of the appropriate Philippine government agencies.

Proponent : TVI Resource Development Phils. Inc.

_____ _____

Jay Nelson **Date**
Vice President, Environment and Civil Works

_____ _____

Fidel J. Bontao **Date**
Pollution Control Officer

ANNUAL ENVIRONMENTAL PROTECTION AND ENHANCEMENT PROGRAM

APPENDIX A WATER QUALITY SAMPLING RESULTS YEAR 2008

CANATUAN PROJECT

TVI RESOURCE DEVELOPMENT(PHILS) INC.

ANNUAL REPORT YEAR 2009
REVISION 0

Table A.1- MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 2** **Upper Canatuan Creek A**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			6	8.5		2.0	
Total Dissolved Solids	TDS				86	71		184	
Cyanide	CN	0.05	<0.0018	*0.39*		*0.54*	<0.01	*0.15*	*0.300*
Arsenic	As	0.05			<0.01	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			<0.003	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			<0.04	<0.05		<0.04	<0.05
Iron	Fe	na			1.3	0.79		1.40	1.43
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			<0.02	<0.05		<0.01	<0.05
Mercury	Hg	0.002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
3. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
4. Conducted resampling last June 5 for cyanide analysis.
5. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
6. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.2 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 3** **Upper Canatuan Creek B**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			<1	<5		2.5	
Total Dissolved Solids	TDS				26	81		69	
Cyanide	CN	0.05	<0.0018	0.02		*0.31*	<0.01	<0.01	<0.01
Arsenic	As	0.05			0.04	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			<0.003	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			<0.04	<0.05		<0.04	<0.05
Iron	Fe	na			0.24	0.21		0.26	0.25
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			<0.02	<0.05		<0.01	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
3. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide sample for 3rd quarter MMT analyzed by SGS Laboratory.
4. Conducted resampling last June 5 for cyanide analysis.
5. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
6. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.3 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 4** **Lower Canatuan Creek A**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			41.0	25.5		11.0	
Total Dissolved Solids	TDS				85	60		159	
Cyanide	CN	0.05	<0.0018	0.06		*0.26*	*0.03*	0.04	<0.01
Arsenic	As	0.05			0.04	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			<0.003	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			<0.04	<0.05		0.2	0.240
Iron	Fe	na			0.78	0.85		0.75	0.43
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.04	0.07		0.07	0.060
Mercury	Hg	0,002			<0.00045	<0.001		0.0007	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
3. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
4. Conducted resampling last June 5 for cyanide analysis.
5. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
6. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.4 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 5** **Lower Canatuan Creek B**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			24.0	<5		138.0	
Total Dissolved Solids	TDS				72	63		87	
Cyanide	CN	0.05	<0.0018	0.03		*0.21*	<0.01	<0.01	<0.01
Arsenic	As	0.05			0.04	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			<0.003	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.08	<0.05
Copper	Cu	na			0.24	0.29		<0.04	<0.05
Iron	Fe	na			0.62	0.57		4.30	1.11
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.05	0.08		0.03	0.060
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
3. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
4. Conducted resampling last June 5 for cyanide analysis.
5. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
6. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.5 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 6** **Mambong Creek**

Parameter		Sample Date / Limit	EMB R9 5/5/08 not sampled		05/28/08 not sampled		06/16/08 Resampling	12/1/08-12/4/08 TVI	DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase						5.0	
Total Dissolved Solids	TDS							65	
Cyanide	CN	0.05					<0.01	<0.01	<0.01
Arsenic	As	0.05						<0.02	<0.05
Cadmium	Ca	0.01						<0.002	<0.01
Chromium	Cr	0.05						<0.004	<0.05
Copper	Cu	na						<0.04	<0.05
Iron	Fe	na						0.32	0.10
Lead	Pb	0.05						<0.01	<0.05
Zinc	Zn	na						<0.01	<0.05
Mercury	Hg	0,002						<0.0001	<0.001
BOD		5.00							

Notes:

1. Included this sampling station for the Cyanide analysis resampling.
2. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.6 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 7** **Lituban River at Paduan**

Parameter		Sample Date Limit	EMB R9 5/5/08 not sampled		05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			2.0	<5		170.0	
Total Dissolved Solids	TDS				75	86		82	
Cyanide	CN	0.05				*0.2*	<0.01	<0.01	<0.01
Arsenic	As	0.05			<0.03	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			<0.003	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.08	<0.05
Copper	Cu	na			<0.04	<0.05		<0.04	<0.05
Iron	Fe	na			0.77	0.31		1.00	2.17
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			<0.02	0.09		<0.01	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
3. Conducted resampling last June 5 for cyanide analysis.
4. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
5. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.7 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 8** **Canatuan Creek at Old Bridge**

Parameter		Sample Date / Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 not sampled		06/16/08 Resampling	12/1/08-12/4/08 not sampled	
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase							
Total Dissolved Solids	TDS								
Cyanide	CN	0.05	<0.0018	0.03			<0.01		
Arsenic	As	0.05							
Cadmium	Ca	0.01							
Chromium	Cr	0.05							
Copper	Cu	na							
Iron	Fe	na							
Lead	Pb	0.05							
Zinc	Zn	na							
Mercury	Hg	0,002							
BOD		5.00							

Notes:

1. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
2. Included this station during the resampling last June 5 for cyanide analysis.

Table A.8 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 9** **Siocon River at Pisawak Spillway**

Parameter		Sample Date / Limit	EMB R9 5/5/08 not sampled		05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			39.0	30.0		14.0	
Total Dissolved Solids	TDS				97	77		94	
Cyanide	CN	0.05				*0.22*	<0.01	<0.01	<0.01
Arsenic	As	0.05			0.03	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			<0.003	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			<0.04	<0.05		<0.04	<0.05
Iron	Fe	na			2.2	0.55		0.61	0.32
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.19	<0.05		<0.01	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
3. Conducted resampling last June 5 for cyanide analysis.
4. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
5. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.9 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 11** **Siocon River**

Parameter		Sample Date Limit	EMB R9 5/5/08 not sampled		05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			212	143		190.0	
Total Dissolved Solids	TDS				104	81		94	
Cyanide	CN	0.05				*0.19*	<0.01	<0.01	<0.01
Arsenic	As	0.05			<0.01	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			0.004	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			0.35	<0.05		<0.04	<0.05
Iron	Fe	na			8.9	2.46		1.30	2.27
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.03	<0.05		<0.01	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
3. Conducted resampling last June 5 for cyanide analysis.
4. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
5. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A-1 MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 12** **Lumot Creek**

Parameter		Sample Date Limit	EMB R9 5/5/08 not sampled		05/28/08 not sampled			12/1/08-12/4/08 TVI	DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase						672.0	
Total Dissolved Solids	TDS							121	
Cyanide	CN	0.05						<0.01	<0.01
Arsenic	As	0.05						<0.02	<0.05
Cadmium	Ca	0.01						<0.002	<0.01
Chromium	Cr	0.05						<0.04	<0.05
Copper	Cu	na						<0.04	<0.05
Iron	Fe	na						5.00	1.42
Lead	Pb	0.05						<0.01	<0.05
Zinc	Zn	na						0.04	0.050
Mercury	Hg	0,002						<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
3. Conducted resampling last June 5 for cyanide analysis.
4. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
5. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table D.1 MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 14** **Canatuan Creek at Midpoint**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 not sampled		12/1/08-12/4/08 not sampled	
pH	Field	**6.5-8.5**						
Conductivity	Field	**na**						
Turbidity	Field	**na**						
Dissolved Oxygen	Field	5						
Temperature	Field	< 3 deg rise						
Salinity	Field	**na**						
Total Suspended Solids	TSS	30% increase						
Total Dissolved Solids	TDS							
Cyanide	CN	0.05	<0.0018	*0.14*				
Arsenic	As	0.05						
Cadmium	Ca	0.01						
Chromium	Cr	0.05						
Copper	Cu	na						
Iron	Fe	na						
Lead	Pb	0.05						
Zinc	Zn	na						
Mercury	Hg	0,002						
BOD		5.00						

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.

Table A.12 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 15** **Lituban River at Makiang**

Parameter		Sample Date Limit	EMB R9 5/5/08 not sampled		05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			148	87.0		253.0	
Total Dissolved Solids	TDS				86	1385		78	
Cyanide	CN	0.05				*0.15*	<0.01	<0.01	<0.01
Arsenic	As	0.05			<0.01	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			0.003	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			<0.04	<0.05		<0.04	<0.05
Iron	Fe	na			4	1.66		4.40	1.33
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.03	<0.05		0.02	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. Conducted resampling last June 5 for cyanide analysis.
3. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
4. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table D.X-1 MMT Water Quality Sampling and Testing Summary Year 2008 — Sample Point 19 — Blank Sample

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase							
Total Dissolved Solids	TDS								
Cyanide	CN	0.05	-	0.03		<0.01	<0.01	<0.01	<0.01
Arsenic	As	0.05			<0.01	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			0.006	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			<0.04	<0.05		<0.04	<0.05
Iron	Fe	na			0.09	<0.05		<0.08	0.09
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			<0.02	<0.05		<0.01	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. Conducted resampling last June 5 for cyanide analysis.
3. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
4. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A.14 - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 23** **Sulphide Dam spillway**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			13.0	24.5		4.0	
Total Dissolved Solids	TDS				65	62		149	
Cyanide	CN	0.05	<0.001	*0.13*		*0.18*	<0.01	0.02	<0.01
Arsenic	As	0.05			0.04	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			0.005	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.004	<0.05
Copper	Cu	na			0.21	0.08		0.08	0.080
Iron	Fe	na			1.5	0.5		0.22	0.08
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.03	0.05		<0.01	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		0.001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
3. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
4. Conducted resampling last June 5 for cyanide analysis.
5. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
6. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table D.X - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 25** **Mixing Zone of Cusan Creek and Sulphide Dam**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			7	88		322.0	
Total Dissolved Solids	TDS				75	752		132	
Cyanide	CN	0.05	<0.0018	0.05		*0.18*	<0.01	0.01	<0.01
Arsenic	As	0.05			<0.01	<0.05		0.03	<0.05
Cadmium	Ca	0.01			0.004	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.04	<0.05
Copper	Cu	na			0.19	0.15		0.06	0.070
Iron	Fe	na			6.3	0.66		5.90	1,11
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.05	0.05		0.04	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		0.0008	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
3. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
4. Conducted resampling last June 5 for cyanide analysis.
5. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
6. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table A-1 MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 27** **Cusan Creek**

Parameter		Sample Date Limit	EMB R9 5/5/08 Davao	EMB R9 5/5/08 Fast Lab	05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling	12/1/08-12/4/08 TVI	12/1/08-12/4/08 DENR
pH	Field	**6.5-8.5**							
Conductivity	Field	**na**							
Turbidity	Field	**na**							
Dissolved Oxygen	Field	5							
Temperature	Field	< 3 deg rise							
Salinity	Field	**na**							
Total Suspended Solids	TSS	30% increase			540	346		102.0	
Total Dissolved Solids	TDS				98	866		66	
Cyanide	CN	0.05	<0.0018	0.04		*0.31*	<0.01	<0.01	<0.01
Arsenic	As	0.05			<0.01	<0.05		<0.02	<0.05
Cadmium	Ca	0.01			0.007	<0.01		<0.002	<0.01
Chromium	Cr	0.05			<0.05	<0.05		<0.02	<0.05
Copper	Cu	na			0.07	<0.05		<0.04	<0.05
Iron	Fe	na			8.3	0.71		4.80	0.28
Lead	Pb	0.05			<0.01	<0.05		<0.01	<0.05
Zinc	Zn	na			0.05	<0.05		0.02	<0.05
Mercury	Hg	0,002			<0.00045	<0.001		<0.0001	<0.001
BOD		5.00							

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. EMB Region 9 conducted water quality monitoring of previous MMT (11/2007). Samples of EMB sent to Immaculate Conception Laboratory in Davao. Split samples for TVI sent to Fast Lab subcontracted to SGS.
3. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
4. Conducted resampling last June 5 for cyanide analysis.
5. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.
6. 4th quarter MMT was conducted in December 2008. TVI samples were analyzed by CRL Laboratories. DENR samples were analyzed by PETROLAB and SGS for mercury and free cyanide.

Table D.X - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 30** **Ambaan Seepage**

Parameter		Sample Date Limit	EMB R9 5/5/08 not sampled		05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling
pH	Field	**6.5-8.5**					
Conductivity	Field	**na**					
Turbidity	Field	**na**					
Dissolved Oxygen	Field	5					
Temperature	Field	< 3 deg rise					
Salinity	Field	**na**					
Total Suspended Solids	TSS	30% increase			144	15	
Total Dissolved Solids	TDS				57	635	
Cyanide	CN	0.05				*1.24*	<0.01
Arsenic	As	0.05			<0.01	<0.05	
Cadmium	Ca	0.01			0.005	<0.01	
Chromium	Cr	0.05			<0.05	<0.05	
Copper	Cu	na			0.07	0.06	
Iron	Fe	na			0.28	0.16	
Lead	Pb	0.05			<0.01	<0.05	
Zinc	Zn	na			<0.02	0.08	
Mercury	Hg	0,002			<0.00045	<0.001	
BOD		5.00					

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
3. Conducted resampling last June 5 for cyanide analysis.
4. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.

Table D.X.8A - MMT Water Quality Sampling and Testing Summary Year 2008 **Sample Point 32** **Nursery Drainage (Upper Lumot Creek)**

Parameter		Sample Date Limit	EMB R9 5/5/08 not sampled		05/28/08 TVI	05/28/08 DENR	06/16/08 Resampling
pH	Field	**6.5-8.5**					
Conductivity	Field	**na**					
Turbidity	Field	**na**					
Dissolved Oxygen	Field	5					
Temperature	Field	< 3 deg rise					
Salinity	Field	**na**					
Total Suspended Solids	TSS	30% increase			3	78	
Total Dissolved Solids	TDS				58	680	
Cyanide	CN	0.05				*0.29*	<0.01
Arsenic	As	0.05			0.04	<0.05	
Cadmium	Ca	0.01			0.005	<0.01	
Chromium	Cr	0.05			<0.05	<0.05	
Copper	Cu	na			<0.04	<0.05	
Iron	Fe	na			0.76	0.17	
Lead	Pb	0.05			<0.01	<0.05	
Zinc	Zn	na			<0.02	<0.05	
Mercury	Hg	0,002			<0.00045	<0.001	
BOD		5.00					

Notes:

1. Values in italics and blue represent concentrations above the standard limit with reference to DAO 34: Water Quality Criteria for Class B Surface Waters.
2. DENR laboratory testing performed at DENR laboratory in Manila. Cyanide analysis for MMT conducted by SGS Laboratory in Manila.
3. Conducted resampling last June 5 for cyanide analysis.
4. TVI laboratory testing performed by outside private testing laboratory F.A.S.T. Laboratories.

ANNUAL ENVIRONMENTAL PROTECTION AND ENHANCEMENT PROGRAM

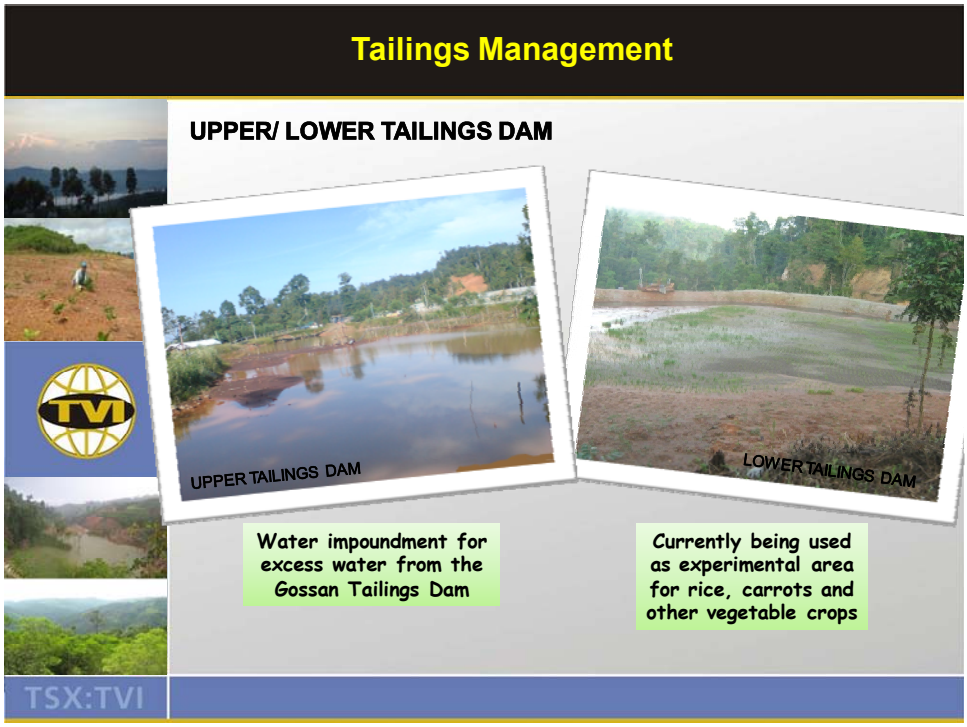
APPENDIX B PHOTODOCUMENTATION OF LAND MANAGEMENT PROGRAMS YEAR 2008

CANATUAN PROJECT

TVI RESOURCE DEVELOPMENT (PHILS) INC.

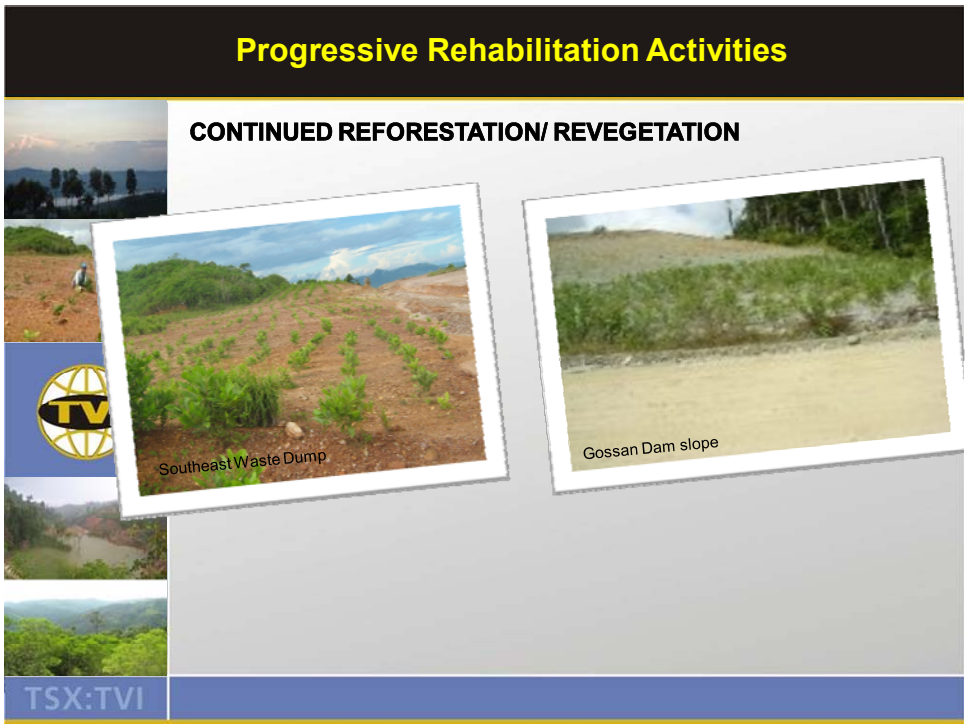
ANNUAL REPORT YEAR 2009
REVISION 0


Tailings Management
GOSSAN TAILINGS DAM
Construction of the Gossan Dam Spillway from October to December 2008
TSX:TVI


Tailings Management
UPPER/ LOWER TAILINGS DAM
UPPER TAILINGS DAM
LOWER TAILINGS DAM
Water impoundment for excess water from the Gossan Tailings Dam
Currently being used as experimental area for rice, carrots and other vegetable crops
TSX:TVI


Progressive Rehabilitation Activities
REHABILITATION OF SOUTH LEVEE/
AMBAAN AREA
After
Completed in July 2008
Revegetated with grass, tree
and fruit species
TSX:TVI


Progressive Rehabilitation Activities
REHABILITATION OF LOWER PHASE 1 MINE AREA
Silt fence
TSX:TVI


Progressive Rehabilitation Activities
CONTINUED REFORESTATION/ REVEGETATION
Southeast Waste Dump
Gossan Dam slope
TSX:TVI


Progressive Rehabilitation Activities
FINAL MINE CLOSURE CONSULTATION
Subanon Council of Elders
April 15 and 20, 2008
CADT Beneficiaries
June 7, 2008
SSWAI & SYO
September 18, 2008
TSX:TVI

ANNUAL ENVIRONMENTAL PROTECTION AND ENHANCEMENT PROGRAM

APPENDIX C BLASTING PROCEDURES

CANATUAN PROJECT

TVI RESOURCE DEVELOPMENT (PHILS) INC.

ANNUAL REPORT YEAR 2009
REVISION 0

TVIRD BLASTING PROCEDURES

1. Prepare blasting and blast guard notification one (1) day prior to blasting schedule.
2. Conduct sounding of the drill holes prior to charging of explosives, re-drill holes if necessary.
3. A quick briefing is made among the blast controller. Blast firer/s, blast guards and safety engineer/inspector before proceeding to their respective post.
4. Holes are now loaded with the required explosive charges and connections (except connection to the blasting igniter cord).
5. Cover the blast area with safety nets.
6. Once the connection is ready, a one (1) minute long signal/siren is sounded. All equipment and civilians are called to clear the area 200 meters and 300 meters away respectively from the blast area.
7. Blast controller calls each blast guard for "ALL CLEAR SIGNAL" from their area of responsibility.
8. One clear, blast controller advice blast firer to connect the igniter cord to the lay-out.
9. Three (3) short warning signals shall be sounded to signify that the blast will be fired soon.
10. Blast crew begins radio silence for one (1) minute.
11. Blast controller advises blast firer/s to fire the blast.
12. After the blast, blast controller and blast firer shall inspect the blast area to determine any misfire prior to giving the "ALL CLLEAR" signal.
13. Blast controller gives "ALL CLEAR" signal if no misfire occurred.

BLAST WITH MISFIRE

- If an unlikely misfire occurs, blast controller advises blast guards to remain in place while blast firer attempt to re-fire the misfired connection.
- If misfire can be re-fired, blast firer to reconnect the wiring/s
- Follow Procedure #5 to 13
- If the misfire is not successfully re-fired, the "ALL CLEAR" signal should be given
- Barricade the area around the misfire for later disposition.