

各 論

第Ⅱ部 坑 道 調 查

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第1章 坑道調査

1-1 調査概要

1984年度坑道調査は、1983年度坑道調査に引続き、N坑ではクロスカットー2及びボーリング室の掘さく、S坑では直進坑の延長、クロスカットー1・2及びボーリング室の掘さくを実施した。坑道の掘さく長、仕様、調査期間、作業形態などは次のとおりである。

(1) 坑道仕様

坑道坑口標高：

N坑； 4,689.37 m

S坑； 4,570.14 m

有効断面： 2.6 m × 2.5 m

坑道勾配： 1/100 - 1/200

(2) 掘さく長

坑名	掘さく長		掘さく方向
	計画	実績	
N坑クロスカットー2	175 m	175.0 m	250°
S坑直進坑	212 m	212.0 m	330°
S坑直進坑	39 m	39.1 m	320°
S坑直進坑	30 m	30.0 m	250°
S坑直進坑	65 m	65.0 m	330°
S坑クロスカットー1	140 m	141.0 m	250°
S坑クロスカットー2	85 m	86.2 m	250°
計	746 m	748.3 m	

(3) 調査期間

現地調査期間は、A.II-1に示すとおり、1984年5月7日より1985年6月21日までの411日間であった。

坑道掘さく開始は、N坑が1984年6月27日、S坑は1984年6月7日である。

(4) 作業形態

原則として、道路修復、維持修理及び仮設工事は8時間/方、1方/日とし、坑道掘さくは8時間/方、3方/日とした。

(5) 作業人員

坑道掘さくに要した人員は道路工事、仮設工事を含め次のとおりである。

日本人技術者	2名/日
ペルー人技術者	6名/日
掘さく作業員	47名/日
坑外作業員（機械修理工，火薬・倉庫係，発電機係，コンプレッサー運転員）	13名/日
道路維持補修員	10～5名/日
自動車運転手	3名/日
炊事夫	4名/日
警備員	10名/日

(6) 坑道地質調査

坑道地質調査は，岩質，地質構造，鉱化の状況，断層による転位などの解明に特に配慮し，縮尺1:200で実施した。分析・解析作業の内容とその件数は次のとおりである。

- | | |
|--------------------------|------|
| (I) 鉱石部の分析 (Ag・Cu・Pb・Zn) | 100件 |
| (II) 鉱石研磨片顕微鏡観察 | 10件 |
| (III) X線回折分析 | 5件 |

1-2 道路修復維持修理

本年度はオヨン (Oyon)，パンパウアイ (Pampahuay)，イスカイクルス (Iscaycruz) 間の既設道路を修復して使用した。特に1984年3月上旬より下旬にかけての豪雨のため，オヨーンパンパウアイ9.5kmの区間で2箇所，及びパンパウアイ以遠約6.5km，計3箇所で道路の崩壊があり，ブルドーザー (D7-17A) と人力により修復した。パンパウアイーキャンプ間 (1.4km)，及び道路分岐ーリンベ南間 (9km) も路面，側壁などの損傷も著しく，同じくブルドーザーと人力により修復した。パンパウアイーキャンプ間並びにリンベ南間は常時労務者を確保し，必要に応じて人力により道路維持修理を行った。

1-3 仮設工事

宿舍，N坑・S坑坑口付近にある仮設建家は既設建家を補修して使用した。

N坑，S坑の掘さくに伴う発生研処理のため，N坑，S坑各々の坑口付近に研捨棧橋を設置した。

N坑，S坑坑道ともに換気用として扇風機 (日立プロペラフワン170 m³/分，80 mmAQ，3.7 kW) を，N坑坑道に4台，S坑坑道に6台設置した。

既設の地中式爆薬庫及び加工品庫外周の有刺鉄線破損箇所を修復した。

使用した主要機械，設備及び建家をA.II-5に示す。

1-4 掘さく工事

掘さく工事に従事した技術者、人員構成、及び作業時間は次のとおりである。

(1) 技術者名

N坑：古 宿 誠 一

Rene Chicori Orozco

Alejandro Victorio

Melecio Tolentino

S坑：塚 中 邦 彦

Luis Manrique

Enrique Bustamante

Ignacio Bustamante

(2) 人員構成

人員構成は、N坑、S坑とも各々、日本人技術者1名、ペルー人技術者3名、作業員30名、計34名。その内、掘さく作業は原則として、1方当り技術者1名、作業員10名にて1日3方で施工した。

(3) 作業時間

1の方 7時00分 - 15時00分

2の方 15時00分 - 23時00分

3の方 23時00分 - 7時00分

1-5 N坑掘さく工事

1984年度開始点を0mとし距離を表示した。

(1) N坑クロスカット-2

0m-63.3m：3.8mまでは、進行方向に直交する岩目の多い珪岩、4.2mまでは頁岩・粘土質頁岩互層、63.3mまでは苦灰岩で、岩盤軟弱部が多く、19.8m以後後留掘さくを行った。合計支保数は30基である。

63.3m-100.5m：9.8mまで苦灰岩・頁岩互層で無支保で掘さくした。9.8m-100.5mは、粘土質頁岩で2基の支保を施工した。

100.5m-127.1m：黄鉄鉱帯で、109.8m-122.8mは岩目が多く、支保11基を施工した。

127.1m-144.3m：黄鉄鉱及び軟弱な苦灰岩で計17基の支保を施工した。

144.3m-165.3m：石灰岩・頁岩互層で無支保で掘さくした。

165.3m-175m：168.3mまで引続き石灰岩・頁岩互層で、岩目が多く後留掘さくとなった。168.3m-170.8mは赤鉄鉱入りの破碎帯となり、170.8m以後粘土質頁岩層で湧水も加わり、丸太(φ10cm~15cm)を天盤に打込む差矢工法を余儀なくされ、著しく工程が低下した。支保の合計は14基である。

(2) ボーリング室

直進坑道の坑口から310m及び510.8m地点計2箇所ではボーリング室を掘さくした。

510.8m地点のボーリング室は岩目の多い岩盤で、天盤全面を15kg/mレールと板材で支保をした。

(3) 既存坑道の保坑

坑口から25.2mの間(昭和57年度掘さく坑道)で7基、クロスカッター1(昭和58年度掘さく坑道)開始点から38m-40.5m間で3基計10基の支保を施工した。

N坑の支保は合計84基となり、実掘さく1日当り進行は1.533m(合ボーリング室)にとどまった。なお、発破跡ガスの迅速な除去のため坑道換気用扇風機(3.7kW, 170m³/分)4台設置し使用した。

1-6 S坑掘さく状況

(1) S坑直進坑(A)

1984年度開始点(坑口より600m地点)を0mとし距離を表示した。

0m-86.1m：掘さく方向に平行する岩目の多い軟弱な泥灰岩を主とし、7.7m付近で掘さく方向左側より珪岩が出現した。

本区間では、三つ枠支保52基、片枠支保7基、打柱3本後留支保を施工した。

86.1m-159.6m：珪岩中を比較的順調に掘さくした。

159.6m-251.1m：159.6mから坑道左側より再び軟弱な泥灰岩が出現し、170m付近で全面泥灰岩となり、留付掘さくを行った。175m以深は天盤中央部に岩目の発達が著

しく湧水（5ℓ/分）を伴ったため、差矢工法を実施した。215m以深では盤圧が増加したため、掘さくは難行した。本区間で合計104基の支保を施工した。

(2) S坑直進坑(B)

235mより方向を250°に変え30m掘さくし、引続き方向を330°にもどし、65m掘さくした。本項の距離表示は前項235m地点を0mとした。

0m-5.0m：岩目の多い泥灰岩中を留付掘さくし、4基の支保を施工した。

5.0m-35.6m：苦灰岩・砂岩・泥灰岩互層で、31.5m付近の天盤から湧水（約20ℓ/分、pH=3）があったが、掘さく作業は順調であった。

35.6m-39.4m：硬い苦灰岩であったが、坑道に平行な岩目があり、4基の後留支保を行った。

39.4m-50.0m：苦灰岩中を無支保で掘さくした。

50.0m-67.3m：坑道に平行する岩目の多い苦灰岩中を掘さくし、12基の後留支保を施行した。

67.3m-95.0m：苦灰岩・石灰岩互層中を95.0mまで掘さくしたが、切羽引立左側に空洞があり（巾1.2m、高さ、深さ、奥行きは落石湧水で測定不可能）、多量の酸性水（2,500ℓ/分、pH=2）が湧出した。掘さく継続を試みたが、危険なので、95.0mで直進坑掘さくを終了した。

(3) S坑クロスカット-1

0m-50.0m：砂岩・苦灰岩・泥灰岩中で、岩目が掘さく方向に直角しており、掘さく作業は順調に推移した。支保は2基のみであった。49m付近で酸性水の湧水（600ℓ/分、pH=1~2）に遭遇し、50mで一時作業中断（9月27日~10月7日）を余儀なくされた。

50.0m-100.0m：50mから晶洞の多い黄鉄鉱が連続した。53m-55mで新たに1,200ℓ/分（pH=1）の湧水が加わったため、掘さく作業は再度中断した。湧水量は1,200ℓ/分（pH=1~2）であったが、湧水箇所が天盤より踏前に移動したので、掘さく作業を再開した。湧水箇所は掘さくに伴い移動し、湧水量は900ℓ/分~1,600

ℓ/分 (pH=1~2) の範囲で変動した。湧水は酸性水のため、軌条・鉄管の腐蝕が著しく、軌条・鉄管の修理・取替えを余儀なくされた。8m-100mは赤鉄鉱と白色変質岩の互層となり、9基の支保を施工した。

100.0m-120.8m : 111.5mまでは石灰岩・頁岩・苦灰岩互層を無支保で掘さくした。120.8mまでは軟弱な苦灰岩で、後留で支保9基を施工した。

120.8m-141.0m : 130.0mまでの黄鉄鉱帯、141.0mまでの石灰岩は無支保で掘さくした。

(4) S坑クロスカット-2

直進坑(B)の89.2m地点を基点とした。

0m-18.1m : 6mまで石灰岩、その後7.5mまで黄鉄鉱が続き掘さく作業は順調であった。7.5mから鉱体 (Zn・Pb) に入り、14.6m地点で激しい湧水 (1,200ℓ/分, pH=3) に遭遇した。湧水圧が大きく、穿孔困難、装薬不可能な状態となり、作業を中断した。3日後湧水量900ℓ/分に減水したが、出水圧は低下しないため、切羽面を拭出し出水を分散させることより水圧を低下させることが出来た。その後15.0mまで湧水が続いたが、鉱体内を18.1mまで掘さくした。

18.1m-48.9m : 18.1mより粘土質苦灰岩となり48.9mまで続いた。26.6mで踏前より湧水 (1,100ℓ/分, pH=3) があり、掘さくは差矢工法 (差矢丸太φ10cm~15cm) となった。掘さくの進行に伴い湧水は30ℓ/分に減じた。その後後留掘さくとなり、合計33基の支保を施工した。

48.9m-60.8m : 51.8mまで苦灰岩、以後石灰岩となり無支保で掘さくした。

60.8m-65.0m : 60m付近から鉱体 (Pb・Zn・Py) が出現、65m付近まで続いた。この区間は岩目が多かったので後留掘さくを行った。

65.0m-78.2m : 76.3mまで黄鉄鉱が続き、76.3m以後は苦灰岩となった。この間無支保掘さくを行った。

(5) S坑クロスカッター3

0 m～8.0 m：主として苦灰岩であり，無支保で掘さくした。

(6) ボーリング室

直進坑道上坑口から500 m及び700 m 2地点でボーリング室を掘さくした。700 m地点のボーリング室は，岩目が多くボーリング室内の天盤を15 kg/mレールと板材で支保をした。

(7) 既存坑道の保坑

既存直進坑道の坑口から478.3 m～496.3 m区間で5基の支保を追加施工した。

S坑掘さく能率は実掘さく日数1日当り1.959 m（含ボーリング室）であり，支保は三つ枠239基，片枠7基，打柱3箇所であった。発破跡ガスの除去及び換気用として扇風機（3.7 kW，170 m³/分）6台を設置・使用した。湧水が強酸性（pH=1～3）のため，軌條，鉄管の腐蝕が著しく頻繁に取替，修理を行った。

第2章 坑道の地質及び鉱化作用

2-1 N坑クロスカット-2

N坑クロスカット-2の掘進長は175mで、直進坑460m地点よりWSW方向へ向った。

坑道の地質は、開始点より49mまでが、優白質、塊状、緻密、堅硬な珩岩を主とするChimu層である。92mまでが灰色珩質砂岩・苦灰岩・泥岩・泥灰岩より成るChimu層漸移帯である。走向はN15°-25°W、傾斜は75°-80°Eである。20m付近、38m付近、85m付近に層面系断層があり、これは硬質岩に接する泥質岩・苦灰岩などの軟質岩中に発達している。57m付近にはNE系断層を認めた。

92mから170mまでがSanta層である。98m-126m間、136m-140m間が黄鉄鉱で、産状として、塊状のもの、粘土質で軟弱なもの、石英質のもの、晶洞に富むものなど差異が認められる。黄鉄鉱中には、黄銅鉱・輝銅鉱などの銅鉱物が局部的に濃集しており、1m長サンプリング品位でCu5%台に達する部分(NN-112)がある。126m-136m間は苦灰岩及び粘土質変質岩であるが、閃亜鉛鉱を鉱染しており、120m-127m間、両側壁8サンプルの平均値は次のとおりである。

	間隔(m)	サンプル数	Ag(g/t)	Cu%	Pb%	Zn%
北側壁	7	4	34	1.11	0.44	5.18
南側壁	7	4	29	0.62	0.17	0.79
平均	7	8	32	0.89	0.31	2.98

140m以深は頁岩薄層を挟む石灰岩である。126m付近、163m付近に層面系断層を認めた。170mに赤鉄鉱を充填する断層が出現し、この断層を境に著しく破砕された頁岩となるCarhuaz層に達した。

2-2 S坑直進坑(A)

S坑の本年度掘削開始点は、坑口より600m地点である。掘進方向はN30°W、本年度掘進長は251mで、本直進坑の累計は851mである。

坑道の地質は、600mより680mまでが泥灰岩・泥岩・苦灰岩・砂岩互層、770mまでが珩岩、以後851mまでが泥灰岩・泥岩である。地層の走向は、坑道方向にほとんど平行しており、N20°-30°W、傾斜75°-85°Eを示す。

珩岩は優白色・珩質・緻密・堅硬である。泥灰岩・泥岩は淡灰色・軟弱で塊状を呈する。

820m付近には珩質ホルダーが認められた。

苦灰岩は黒灰色で粒状を呈し、軟弱である。このタイプの苦灰岩は、Fe>Mgの組成を有す

るアンケライト (ankerite) を主とすると推察される。珪岩以外は岩盤軟弱で悪く、全面留付となっている。特に軟質岩が珪岩に接する部分は、層面系断層を伴い、岩質劣悪である。

2-3 S坑直進坑(B)

S坑直進坑(A)の835m地点よりWSW方向に約30m、次にNNW方向に65m、合計95m掘進してクロスカットー2予定位置に達した。

本坑道の32mまでは、砂岩・泥灰岩・泥岩・苦灰岩互層でChimu層漸移帯である。32m地点(カーブ位置)で、N20°W方向の層面系断層を境にSanta層に入った。Santa層は、石灰岩より変質した淡灰色・緻密な苦灰岩より成る。このタイプの苦灰岩は、Mn>Mgの組成を有するクトナホライト(kutnahorite)を主とすると推定される。

94m地点に、WNW-ESE系、傾斜45°-55°Sの顕著な断層が出現し、本断層の奥で大規模な空洞に遭遇した。断層付近には閃亜鉛鉱が鉱染している。

2-4 S坑クロスカットー1

S坑直進坑700m地点より、WSW方向、掘進長141mである。開始点より46mまでが、砂岩・泥灰岩・泥岩・苦灰岩互層のChimu層漸移帯である。46mで層面系断層を境にSanta層に入り、100mまでが塊状黄鉄鉱、120mまでが苦灰岩及び石灰岩、130mまでが黄鉄鉱、130m以深が頁岩薄層を挟む未鉱化石灰岩である。129m付近の黄鉄鉱中に閃亜鉛鉱の鉱染を認めた。Santa層の走向は略N20°W、傾斜は70°-75°Eである。

2-5 S坑クロスカットー2

S坑直進坑(B)の88m地点より西方へ向い、掘進長は79mである。3m付近より、苦灰岩・菱鉄鉱中の方鉛鉱・閃亜鉛鉱・鉛鉄鉱となり、6m-15m間は閃亜鉛鉱を主とする高品位塊状Zn鉱石であり、15m-21m間は黄鉄鉱質の高品位Pb・Zn鉱石である。21mより42mまでは、粘土質・ドロマイト質の破碎帯である。

60m-67m間は、黄鉄鉱の多い角礫質のZn鉱石部である。以後黄鉄鉱が続き、76mから苦灰岩となった。東方へのクロスカットはS坑直進坑(B)の85m地点より8mである。

本坑道で捕捉した鉱石部の両側壁1m長連続チャンネル・サンプリングの分析結果は次のとおりである(PLII-4-6参照)。

	深度(m)	間隔(m)	サンプル数	Ag(g/t)	Cu(%)	Pb(%)	Zn(%)
D ₇ 右側壁(北側)	3-21	18	18	161	0.16	4.25	29.80
左側壁(南側)	5-19	13	13	210	0.16	3.28	30.54
平均		15	31	182	0.16	3.84	30.11

	深度(m)	間隔(m)	サンプル数	Ag(g/t)	Cu%	Pb%	Zn%
U。右側壁(北側)	60-67	7	7	15	0.06	2.84	8.64
左側壁(南側)	61-66	5	5	33	0.10	2.47	13.97
平均		6	12	26	0.08	2.63	11.75

上記D₇鉱体は、ほぼ同位置でDDH-5により捕捉されており、DDH-5によれば本鉱体の水平巾は1.9 m、Ag 163 g/t、Cu 0.14%、Pb 2.92%、Zn 27.15%である。坑道による確認結果は、規模・品位ともボーリングの結果を上廻っている。

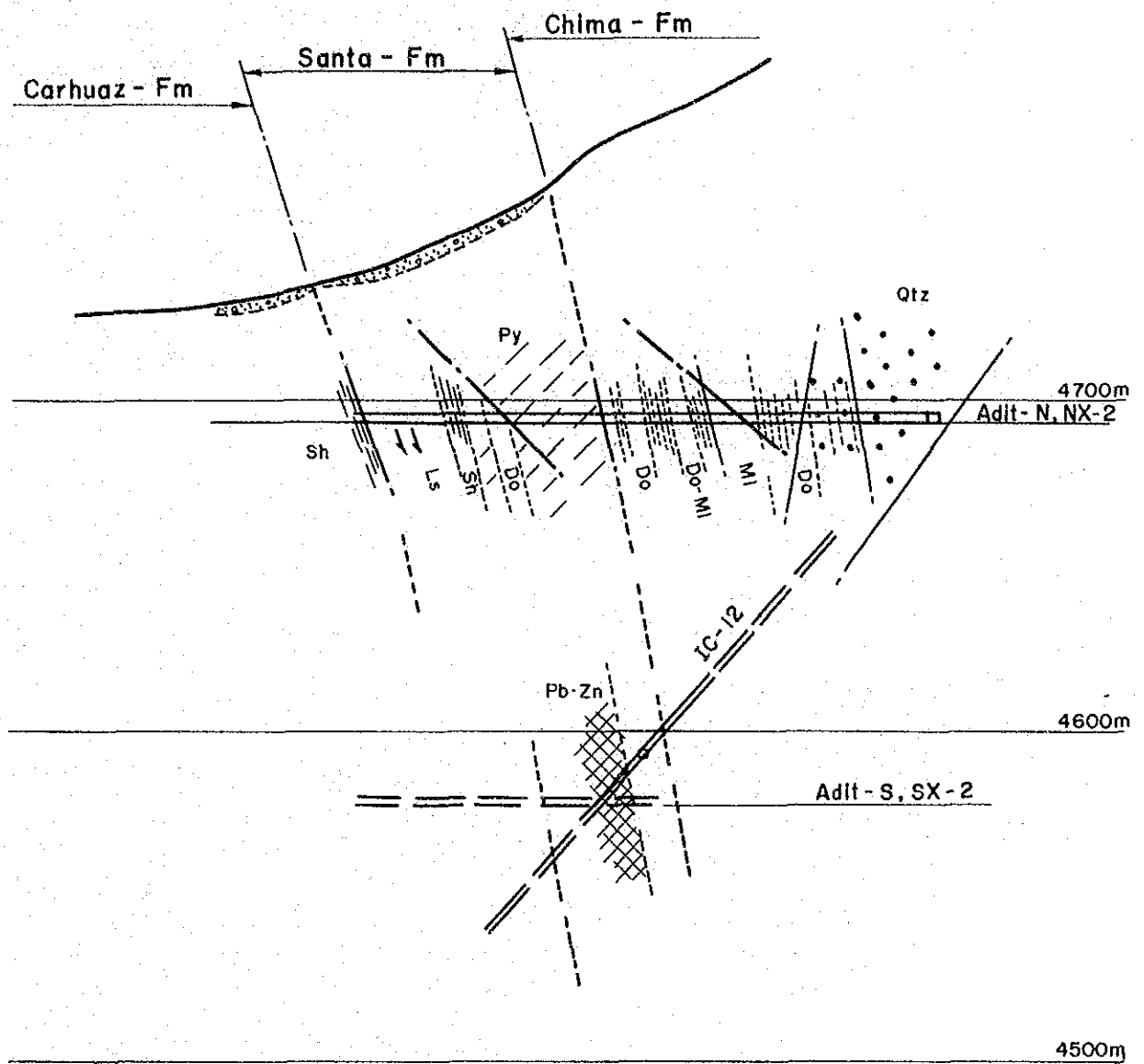


Fig. II - 1 Geological Section for Crosscut, NX-2

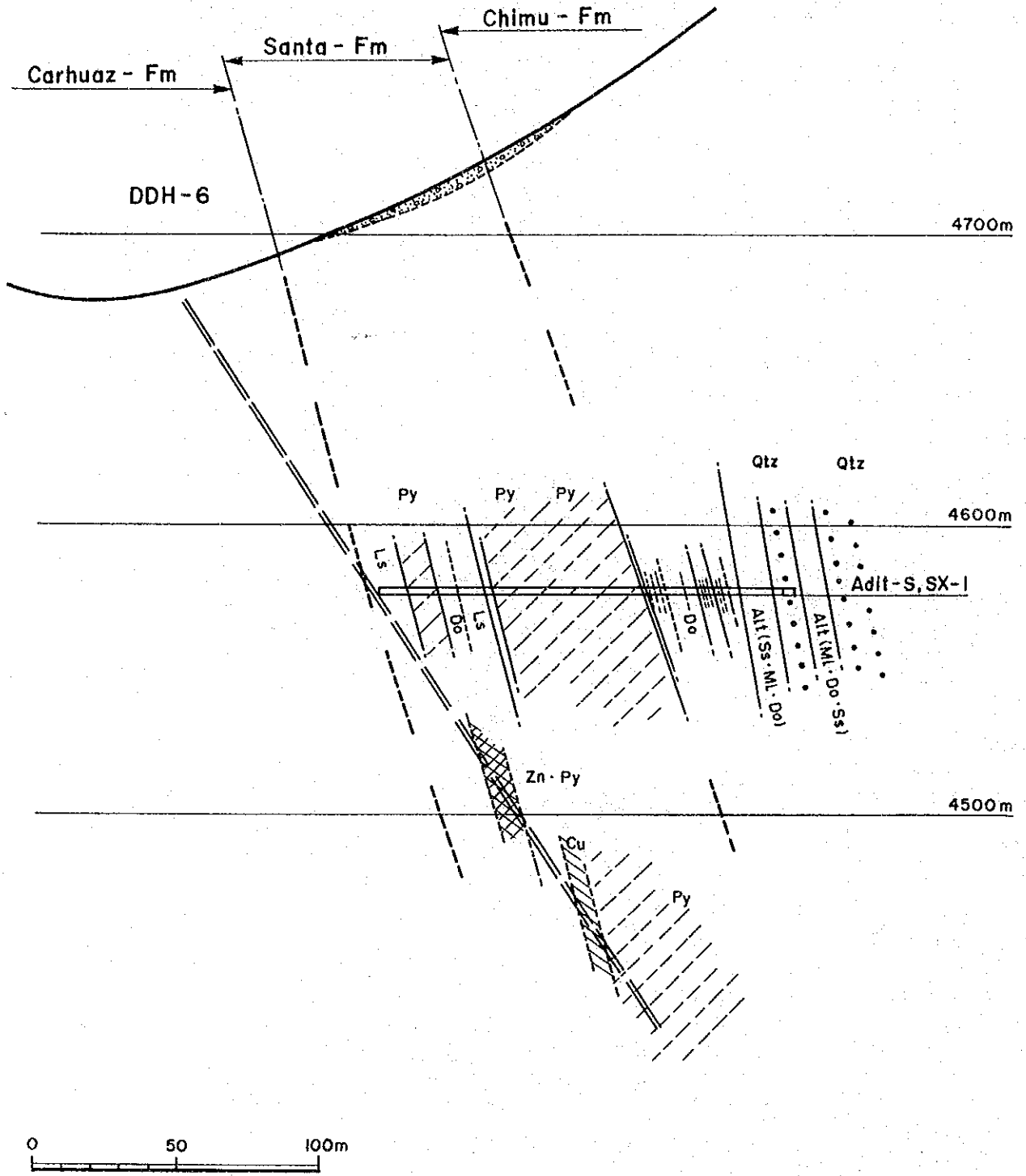
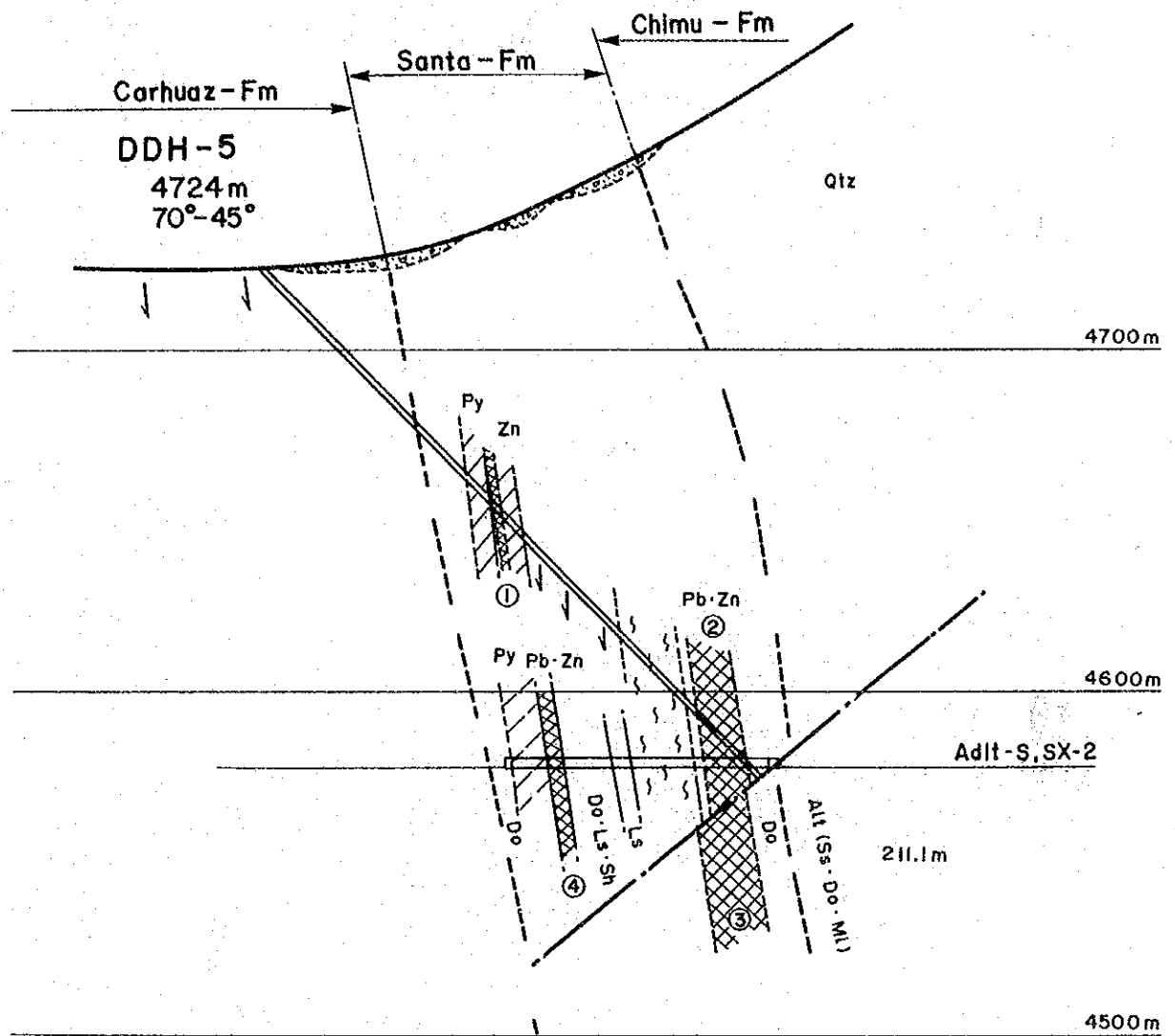


Fig. II - 2 Geological Section for Crosscut, SX-1



	Depth (m-m)	Length (m)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)	
DDH-5	95.6-101.7	6.1	35	1.10	2.89	15.22	①
↙	181.10-204.0	23.0	163	0.14	2.97	27.15	②
SX-2	3.0-21.0	15.0	182	0.16	3.80	30.10	③
↘	58.0-65.0	6.0	26	0.08	2.63	11.75	④

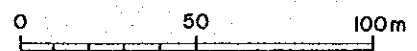


Fig. II-3 Geological Section for DDH-5 and SX-2

APPENDICES
PART I
DATA OF DRILLING

LIST OF APPENDICES

- A. I-1 List of the Used Equipment for Drilling
- A. I-2 Articles of Consumption and Drilling Parts
- A. I-3 Preparation and Removal Records
- A. I-4 Operation Results of Drill Hole, IC-10
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- A. I-14 Summarized Operational Data of Each Drill Hole
- A. I-15 Working Time of Each Drill Hole
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- A. I-17 Specifications of Diamond Bits

A. I-1 List of the Equipment for Drilling

Item	Model	Quantity	Capacity, Type, and Specification
Rod Holder	RH-85	1	Hand Type
Drill Rods	HQ-WL	40	3.00 m/PC
"	"	2	1.50 m/PC
"	NQ-WL	100	3.00 m/PC
"	"	2	1.50 m/PC
"	BQ-WL	100	3.00 m/PC
"	"	2	1.50 m/PC
"	"	5	3.00 m/PC
Casing Pipes	112mm	4	1.00 m/PC
"	"	2	0.50 m/PC
"	"	20	3.00 m/PC
"	"	5	1.00 m/PC
"	"	4	0.50 m/PC
"	NW	70	3.00 m/PC
"	"	5	1.00 m/PC
"	"	2	0.50 m/PC
"	BW	90	3.00 m/PC
"	"	10	1.00 m/PC
"	"	2	0.50 m/PC

Item	Model	Quantity	Capacity, Type, and Specification
Drilling Machine	TCM-3C	1	Capacity NQ 510m, BQ 660m Inner Diameter of Spindle 93mm Weight (except engine) 2,300kg
"	TCM-5A	1	Capacity NQ 510m, BQ 660m Inner Diameter of Spindle 93mm Weight (except engine) 2,300kg
Pump	NAS-3C	1	Piston ϕ 75mm Capacity 130, 72, 39, 22 l/min Pressure 26 ~ 40 kg/cm ²
"	NAS-3B	1	Piston ϕ 75mm Capacity 130, 72, 39, 22 l/min Pressure 26 ~ 40 kg/cm ²
"	NS-303	1	Piston ϕ 25mm Capacity 25 ~ 41 l/min Pressure 35 kg/cm ²
Engine for Drilling machine	F5L-912	1	Diesel Engine 1,800 rpm/6.5PS
Engine for pump	ZI-90L	1	Diesel Engine 1,800 rpm/20PS
"	NS-130C	1	Diesel Engine 1,800 rpm/9.5PS
"	NS-65C	1	Diesel Engine 1,800 rpm/5.5PS
Electric Motor for Drilling Machine	NV180M4	1	Electric Motor 1,750 rpm/30HP
Electric Motor for Drilling Pump	NV132N4	1	Electric Motor 1,745 rpm/12HP
Electric Motor for Mud Mixer	NV100LA4	1	Electric Motor 1,730 rpm/3.6HP
Generator	SAR #76	1	11.5kW, 1,800 rpm/220V, 60Hz
Generator	TS-3.5S	2	8.5kW, 1,800 rpm/220V, 60Hz
Generator	YSC-3.5	2	3.5kVA, 220V, 60Hz
Engine for Generator	NS-65C	2	Diesel Engine 1,800 rpm/5.5PS
Mud Mixer	MCE-200A	1	Volume 200l, 800 ~ 1000 rpm/min
Submersible Pump	KTV-2ZL	1	2.2kW, 3P, 220V, 60Hz, 0.6 m ³ /min
Transformer	60KVA	4	50kVA, 3P, 3,300V/210V

A. I-2 Articles of Consumption and Drilling Parts

(1)

Item	Specification	Unit	Quantity									
			IC-10	IC-11	IC-12	IC-13	IC-14	IC-15	IC-16	IC-17	IC-18	IC-19
Light oil		ℓ	2,760	7,365	6,110	7,796	3,618	13,904	9,010	3,216	9,084	6,676
Gasoline		ℓ	200	180	145	161	86	216	240	128	320	517
Mobil oil #30		ℓ	100	85	40	60	10	60	85	40	55	75
" #90		ℓ	30	20	10	20	3	25	30	10	40	30
Hydraulic oil #10		ℓ	-	30	22	30	5	25	35	-	50	45
Grease		kg	-	-	-	-	-	-	-	-	-	-
Cutting Oil		ℓ	-	120	75	100	35	90	90	-	-	120
Bentonite	50 kg/Bag	Bag	105	146	130	144	92	157	125	80	231	265
Libonite		kg	110	118	109	135	71	134	76	94	196	178
Tel-cellose		kg	24	26	26	26	15	28	18	27	45	37
Tel-stop		kg	130	-	-	-	-	-	-	167	140	-
Speeder-P		ℓ	65	-	-	-	-	-	-	50	55	-
Cement	40 kg/Bag	Bag	10	12	21	18	10	9	8	8	12	22
Diamond shoe	PC	Pc	-	-	-	-	-	-	-	-	1	-
" "	HW	"	1	1	1	2	1	1	1	1	5	-
" "	NW	"	1	1	2	2	2	1	2	3	6	1
" "	BW	"	-	2	-	-	-	1	1	-	2	1
Diamond bit	PQ	Pc	-	-	-	-	-	-	-	-	-	-
" "	116mm	"	1	-	2	3	1	1	1	1	-	-
" "	101mm	"	-	1	-	-	-	-	-	-	-	-
" "	HQ	"	5	8	5	5	6	6	3	1	2	19
" "	NQ	"	3	3	6	9	4	3	4	5	9	4
" "	BQ	"	-	4	-	-	-	3	4	-	3	4
Diamond shell	PQ	Pc	-	-	-	-	-	-	-	-	-	-
" "	116mm	"	1	-	1	1	1	1	1	1	-	-
" "	101mm	"	-	1	-	-	-	-	-	-	-	-
" "	HQ	"	2	2	1	1	1	3	1	1	1	4
" "	NQ	"	2	1	3	2	2	2	1	2	3	2
" "	BQ	"	-	2	-	-	-	2	2	-	1	2
Single Core tube	114mm x 0.5m	set	-	-	-	-	-	-	1	-	-	-
" "	99mm x 0.5m	"	-	1	-	-	-	-	-	-	-	-

(2)

Item	Specification	Unit	Quantity										
			IC-10	IC-11	IC-12	IC-13	IC-14	IC-15	IC-16	IC-17	IC-18	IC-19	
Wire line core barrel	HQ x 1.5m	set	-	-	-	-	-	-	-	1	-	-	1
" "	NQ x 1.5m	"	-	-	-	-	1	-	-	-	-	-	1
" "	BQ x 1.5m	"	-	-	-	-	-	1	-	-	-	-	-
Inner tube assembly	HQ x 1.5m	set	-	-	-	-	-	-	-	-	-	-	1
" "	NQ x 1.5m	"	-	-	-	-	-	-	-	-	-	-	1
" "	BQ x 1.5m	"	-	-	-	-	-	-	-	-	-	-	1
Outer tube	HQ x 1.5m	Pc	-	-	-	-	-	-	1	-	-	-	-
" "	NQ x 1.5m	"	-	-	-	-	1	-	-	-	-	-	-
" "	BQ x 1.5m	"	-	-	-	-	-	-	1	-	-	-	-
Inner tube	HQ x 1.5m	Pc	-	-	-	-	-	-	1	-	-	-	-
" "	NQ x 1.5m	"	-	-	-	-	1	-	-	-	-	-	-
" "	BQ x 1.5m	"	-	-	-	-	-	-	1	-	-	-	-
Guide Pipe	HQ	Pc	-	-	1	-	-	-	-	-	-	-	2
" "	NQ	"	-	-	1	-	-	-	-	-	-	-	2
" "	BQ	"	-	-	-	-	-	-	1	-	-	-	-
Guide coupling	HQ	Pc	-	-	1	-	-	-	-	-	-	-	2
" "	NQ	"	-	-	1	-	-	-	-	-	-	-	2
" "	BQ	"	-	-	-	-	-	-	1	-	-	-	-
Core lifter case	HQ	Pc	-	-	-	-	-	-	2	-	2	-	4
" "	NQ	"	-	-	2	-	2	-	-	-	-	-	2
" "	BQ	"	-	1	-	-	-	2	2	-	2	-	2
Core lifter	HQ	Pc	-	-	-	-	-	-	4	-	-	-	8
" "	NQ	"	-	-	2	-	4	-	-	-	-	-	4
" "	BQ	"	-	2	-	-	-	4	4	-	4	-	4
Water swivel Packing		Pc	-	-	3	-	-	6	-	-	6	-	-
Water swivel spindle		"	-	-	1	-	-	1	-	-	1	-	-
Suction hose	50mm x 3.0m	"	-	-	-	1	-	-	-	-	-	-	1
Piston rod		"	-	-	-	-	-	-	4	-	4	-	4
Valve steel ball	38.1mm	"	-	-	8	-	-	-	-	-	8	-	8
V-Packing		"	-	-	8	-	-	-	-	-	8	-	8
V-belt	TGM-3C	set	-	-	1	-	-	1	-	-	1	-	-
" "	NAS-3C x 2T-90L	"	-	-	1	-	-	1	-	-	1	-	-
" "	NAS-3B	"	-	-	1	-	-	1	-	-	1	-	-
" "	MCE-200A	"	-	-	1	-	-	1	-	-	1	-	-
" "	YSG-3.5xNS-65C	"	-	-	1	-	-	1	-	-	1	-	-

(3)

Item	Specification	Unit	Quantity									
			IC-10	IC-11	IC-12	IC-13	IC-14	IC-15	IC-16	IC-17	IC-18	IC-19
Core box	HQ	Pc	26	31	14	9	15	21	6	1	-	23
" "	NQ	"	12	5	36	38	16	8	14	34	29	8
" "	BQ	"	-	8	-	-	-	10	9	-	5	8
Wire	#10	kg	8	10	10	9	15	12	7	10	8	5
"	#12	"	4	3	2	3	5	2	3	4	2	2
Nail		"	2	4	4	3	5	3	4	2	3	4
Wire rope	6mm x 450m	Roll	-	1	-	-	1	-	-	-	-	-
" "	12mm x 30m	"	-	-	-	-	-	1	-	-	1	1
Manila rope	18mm x 30m	"	-	-	-	1	-	-	-	-	2	1
Vinyl rope	8mm x 100m	"	1	-	-	-	-	-	-	-	1	1
Rag		kg	10	5	5	5	15	5	10	5	10	15

A. I-3 Preparation and Removal Records

Item	Hole No.	IC-10		IC-11		IC-12		IC-13		IC-14		IC-15		IC-16		IC-17		IC-18		IC-19	
		Days	Man-shifts	Days	Man-shifts	Days	Man-shifts	Days	Man-shifts	Days	Man-shifts	Days	Man-shifts	Days	Man-shifts	Days	Man-shifts	Days	Man-shifts	Days	Man-shifts
Preparation and removal	In	31st May. '84		2nd Aug. '84		24th Sep. '84		3rd Sep. '84		7th Nov. '84		19th Nov. '84		12th Oct. '84		19th Jun. '84		7th Jul. '84		4th Nov. '84	
		5th Jun. '84		14th Aug. '84		29th Sep. '84		8th Sep. '84		11th Nov. '84		22nd Nov. '84		19th Oct. '84		25th Jun. '84		9th Jul. '84		26th Nov. '85	
	Out	16th Jun. '84		1st Sep. '84		9th Oct. '84		23rd Sep. '84		17th Nov. '84		11th Dec. '84		5th Nov. '84		5th Jul. '84		12th Aug. '84		4th Feb. '85	
		18th Jun. '84		2nd Sep. '84		11th Oct. '84		23rd Sep. '84		18th Nov. '84		15th Dec. '84		6th Nov. '84		6th Jul. '84		13th Aug. '84		5th Feb. '85	
Preparation	Access road	1	16	-	-	-	-	-	-	-	-	-	-	-	1	16	1	16	9	72	
	Haulage	2	32	8.5	136	3	48	2	32	3.5	56	-	6	96	2	32	1.5	24	5	40	
	Installation	2	32	3	48	3	48	2	32	1.5	24	3.5	56	2	32	2	32	1	16	4.5	48
	Water pipe	0.5	8	1	16	-	-	1	16	-	-	-	-	-	2	32	-	-	-	-	-
	Test run, etc.	0.5	8	0.5	8	-	-	1	16	-	-	-	-	-	-	-	-	-	-	4	32
	Total	6	96	13	208	6	96	6	96	5	80	3.5	56	8	128	7	112	3.5	56	22.5	192
	Dismantling	1	16	1	16	1.5	24	1	16	1	16	1	16	1	16	1.5	24	2	32	0.5	10
Removal	Pipe removal	1	16	1	16	1	16	-	-	0.5	8	2	32	1.5	24	1	16	-	-	1.5	32
	Haulage	1	16	-	-	-	-	-	-	-	-	2	32	-	-	-	-	-	-	-	-
	Road reir-statement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Total	3	48	2	32	2.5	40	1	16	1.5	24	5	80	2.5	40	2.5	40	2	32	2	42
Grand Total	9	144	15	240	8.5	136	7	112	6.5	104	8.5	136	10.5	168	9.5	152	5.5	88	24.5	234	

A. I-4 Operation Results of Drill Hole, IC-10

Working Period	Period			Number of Days	Actual Working Days	Day Off	Total Number of Workers	
	Preparation	31th May. '84 ~ 5th Jun. '84			6	6	-	96
	Drilling	6th Jun. '84 ~ 15th Jun. '84			10	10	-	160
	Removing	16th Jun. '84 ~ 18th Jun. '84			3	3	-	48
	Total	31th May. '84 ~ 18th Jun. '84			19	19	-	304
Drilling Length	Planned Length	180.00 m	Overburden	6.20 m	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	146.45 m	Depth of Hole	Section	Total	
	Length Drilled	180.30 m	Core Recovery	81.2 %	0 ~ 100 m	92.8 %	92.8 %	
Working Time					100 ~ 180.30m	67.0 %	81.2 %	
	Drilling	114°30'	43.4 %	31.8 %	m	%	%	
	Hoisting & Lowering Rod	30°00'	11.4 %	8.3 %	m	%	%	
	Hoisting & Lowering I.T.	56°00'	21.2 %	15.6 %	m	%	%	
	Miscellaneous	63°30'	24.0 %	17.6 %	Efficiency of Drilling			
	Repairing	-	- %	- %	180.30 m/Working Period		9.5 m/day	
	Others	-	- %	- %	180.30 m/Working Days		9.5 m/day	
	Total	264°00'	100 %	73.3 %	180.30 m/Drilling Period		18.0 m/day	
	Removing	Preparation	24°00'	-	6.7 %	180.30 m/Net Drilling Days		18.0 m/day
		Moving	72°00'	-	20.0 %	Total workers/ 180.30 m		1.68 Man/m
G. Total	360°00'	-	100 %	Total Drilling Workers/ 180.30 m		0.88 Man/m		
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length	%	Recovery of Casing Pipe				
	HW 6.00 m	3.3 %		100 %	Hoisting & Lowering Rod 15 Times	Hoisting & Lowering I.T. 135 Times		
	NW 101.00 m	56.0 %		100 %	Remarks			
	m	%		%	G : Grand I.T.: Inner Tube			

A. I-5 Operation Results of Drill Hole, IC-11

Working Period	Period		Number of Days	Actual Working Days	Day Off	Total Number of Workers		
	Preparation	2th Aug. '84 ~ 14th Aug. '84		13	13	-	208	
	Drilling	15th Aug. '84 ~ 31th Aug. '84		17	17	-	272	
	Removing	1st Sep. '84 ~ 2th Sep. '84		2	2	-	32	
	Total	2th Aug. '84 ~ 2th Sep. '84		32	32	-	512	
Drilling Length	Planned Length	220.00 m	Over-burden	- m	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	178.80 m	Depth of Hole	Section	Total	
	Length Drilled	221.10 m	Core Recovery	80.9 %	0 ~ 100 m	98.1 %	98.1 %	
Working Time	Drilling	145°00'	33.6 %	25.3 %	100 ~ 200 m	62.8 %	81.8 %	
	Hoisting & Lowering Rod	56°30'	13.0 %	9.9 %	200 ~ 221.10 m	73.8 %	80.9 %	
	Hoisting & Lowering I.T.	92°30'	21.4 %	16.2 %	m	%	%	
	Miscellaneous	120°00'	27.8 %	21.0 %	m	%	%	
	Repairing	12°00'	2.8 %	2.1 %	Efficiency of Drilling			
	Others	6°00'	1.4 %	1.0 %	221.10 m/Working Period		6.91 m/day	
	Total	432°00'	100 %	75.5 %	221.10 m/Working Days		6.91 m/day	
	Removing	Preparation	80°00'	-	14.0 %	221.10 m/Drilling Period		13.01 m/day
		Moving	60°00'	-	10.5 %	221.10 m/Net Drilling Days		13.01 m/day
	G. Total	572°00'	-	100 %	Total workers/ 221.10 m		2.32 Man/m	
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length	%	Recovery of Casing Pipe	Total Drilling Workers/ 221.10 m		1.23 Man/m	
	HW 1.50 m	0.7 %	100 %	Hoisting & Lowering Rod 37 Times		Hoisting & Lowering I.T. 225 Times		
	NW 111.40 m	50.4 %	100 %	Remarks				
	BW 194.80 m	88.1 %	100 %	G : Grand I.T.: Inner Tube				

A. I-6 Operation Results of Drill Hole, IC-12

Working Period	Period		Number of Days	Actual Working Days	Day Off	Total Number of Workers		
	Preparation	24th Sep. '84 ~ 29th Sep. '84		6	6	-	96	
	Drilling	30th Sep. '84 ~ 9th Oct. '84		9.5	9.5	-	152	
	Removing	9th Oct. '84 ~ 11th Oct. '84		2.5	2.5	-	40	
	Total	24th Sep. '84 ~ 11th Oct. '84		18	18	-	288	
Drilling Length	Planned Length	200.00 m	Overburden	- m	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	215.80 m	Depth of Hole	Section	Total	
	Length Drilled	220.60 m	Core Recovery	97.8 %	0 ~ 100 m	99.0 %	99.0 %	
Working Time					100 ~ 200 m	96.3 %	97.7 %	
	Drilling	115°00'	46.7 %	34.4 %	200 ~ 220.60m	100 %	97.8 %	
	Hoisting & Lowering Rod	29°30'	12.0 %	8.8 %	m	%	%	
	Hoisting & Lowering I.T.	62°30'	25.4 %	18.7 %	m	%	%	
	Miscellaneous	39°00'	- %	11.7 %	Efficiency of Drilling			
	Repairing	-	- %	- %	220.60 m/Working Period	12.25 m/day		
	Others	-	- %	- %	220.60 m/Working Days	12.25 m/day		
	Total	246°00'	100 %	73.6 %	220.60 m/Drilling Period	23.22 m/day		
	Removing	Preparation	51°00'	-	15.3 %	220.60 m/Net Drilling Days	23.22 m/day	
		Moving	37°00'	-	11.1 %	Total workers/ 220.60 m	1.31 Man/m	
G. Total	334°00'	-	100 %	Total Drilling Workers/ 220.60 m 0.69 Man/m				
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length %	Recovery of Casing Pipe		Hoisting & Lowering Rod 34 Times			
	HW 2.50 m	1.1 %	100 %		Hoisting & Lowering I.T. 232 Times			
	NW 60.50 m	27.4 %	100 %		Remarks			
	m	%	%		G : Grand I.T.: Inner Tube			

A. I-7 Operation Results of Drill Hole, IC-13

Working Period	Period		Number of Days	Actual Working Days	Day Off	Total Number of Workers		
	Preparation	3th Sep. '84 ~ 8th Sep. '84		6	6	-	96	
Drilling	9th Sep. '84 ~ 22th Sep. '84		14	14	-	224		
Removing	23th Sep. '84 ~ 23th Sep. '84		1	1	-	16		
Total	3th Sep. '84 ~ 23th Sep. '84		21	21	-	336		
Drilling Length	Planned Length	m 220.00	Over-burden	m -	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	m 213.10	Depth of Hole	Section	Total	
	Length Drilled	m 240.60	Core Recovery	% 88.6	0 ~ 100 m	78.3 %	78.3 %	
Working Time	Drilling	118°00'	35.8 %	29.1 %	100 ~ 200 m	99.3 %	90.1 %	
	Hoisting & Lowering Rod	46°30'	14.1 %	11.5 %	200 ~ 240.60 m	90.1 %	88.6 %	
	Hoisting & Lowering I.T.	91°30'	27.7 %	22.5 %	m	%	%	
	Miscellaneous	68°00'	20.6 %	16.7 %	m	%	%	
	Repairing	6°00'	1.8 %	1.5 %	Efficiency of Drilling			
	Others	-	- %	- %	240.60 m/Working Period		11.45 m/day	
	Total	330°00'	100 %	81.3 %	240.60 m/Working Days		11.45 m/day	
	Removing	Preparation	41°00'	-	10.1 %	240.60 m/Drilling Period		17.18 m/day
		Moving	35°00'	-	8.6 %	240.60 m/Net Drilling Days		17.18 m/day
	G. Total	406°00'	-	100 %	Total workers/ 240.60 m		1.39 Man/m	
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length	%	Recovery of Casing Pipe	Total Drilling Workers/ 240.60 m			
	HW 30.00 m	12.5 %	50 %	Hoisting & Lowering Rod 39 Times		Hoisting & Lowering I.T. 219 Times		
	NW 81.50 m	33.9 %	100 %	Remarks				
	m	%	%	G : Grand I.T. : Inner Tube				

A. I-8 Operation Results of Drill Hole, IC-14

Working Period	Period			Number of Days	Actual Working Days	Day Off	Total Number of Workers	
	Preparation	7th Nov. '84 ~ 11th Nov. '84			5	5	-	80
	Drilling	12th Nov. '84 ~ 17th Nov. '84			5.5	5.5	-	88
	Removing	17th Nov. '84 ~ 18th Nov. '84			1.5	1.5	-	24
	Total	7th Nov. '84 ~ 18th Nov. '84			12	12	-	192
Drilling Length	Planned Length	140.00 m	Overburden	m	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	126.20 m	Depth of Hole	Section	Total	
	Length Drilled	140.20 m	Core Recovery	90.0 %	0 ~ 100 m	89.8 %	89.8 %	
					100 ~ 140.20 m	90.5 %	90.0 %	
Working Time	Drilling	61°00'	42.4 %	31.4 %	m	%	%	
	Hoisting & Lowering Rod	21°00'	14.6 %	10.8 %	m	%	%	
	Hoisting & Lowering I.T.	28°30'	19.8 %	14.7 %	m	%	%	
	Miscellaneous	33°30'	23.2 %	17.3 %	Efficiency of Drilling			
	Repairing	-	- %	- %	140.20 m/Working Period		11.68 m/day	
	Others	-	- %	- %	140.20 m/Working Days		11.68 m/day	
	Total	144°00'	100 %	74.2 %	140.20 m/Drilling Period		25.50 m/day	
	Removing	Preparation	40°00'	-	20.6 %	140.20 m/Net Drilling Days		25.50 m/day
		Moving	10°00'	-	5.2 %	Total workers/ 140.20 m		1.37 Man/m
	G. Total	194°00'	-	100 %	Total Drilling Workers/ 140.20 m		0.63 Man/m	
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length	%	Recovery of Casing Pipe	Hoisting & Lowering Rod 28 Times			
	HW 1.50 m	1.1 %	100 %	Hoisting & Lowering I.T. 166 Times				
	NW 69.00 m	49.2 %	100 %	Remarks				
	m	%	%	G : Grand I.T.: Inner Tube				

A. I-9 Operation Results of Drill Hole, IC-15

Working Period	Period				Number of Days	Actual Working Days	Day Off	Total Number of Workers	
	Preparation	19th Nov. '84 ~ 22th Nov. '84				3.5	3.5	-	56
	Drilling	22th Nov. '84 ~ 10th Dec. '84				18.5	18.5	-	296
	Removing	11th Dec. '84 ~ 15th Dec. '84				5	5	-	80
	Total	19th Nov. '84 ~ 15th Dec. '84				27	27	-	432
Drilling Length	Planned Length	m	Over-burden	m	Core Recovery for each 100 m section				
	Increase or Decrease in Length	m	Core Length	m	Depth of Hole	Section	Total		
	Length Drilled	m	Core Recovery	%	0 ~ 100 m	91.3 %	91.3 %		
					100 ~ 180.40m	95.8 %	95.8 %		
Working Time	Drilling	118°00'	23.7 %	19.9 %	m	%	%		
	Hoisting & Lowering Rod	49°30'	9.9 %	8.3 %	m	%	%		
	Hoisting & Lowering I.T.	132°30'	26.6 %	22.3 %	m	%	%		
	Miscellaneous	192°00'	38.6 %	32.3 %	Efficiency of Drilling				
	Repairing	6°00'	1.2 %	1.0 %	180.40 m/Working Period		6.68 m/day		
	Others	-	- %	%	180.40 m/Working Days		6.68 m/day		
	Total	498°00'	100 %	83.8 %	180.40 m/Drilling Period		9.75 m/day		
	Removing	Preparation	30°00'	-	5.1 %	180.40 m/Net Drilling Days		9.75 m/day	
		Moving	66°00'	-	11.1 %	Total workers/ 180.40 m		2.39 Man/m	
	G. Total	594°00'	-	100 %	Total Drilling Workers/ 180.40m		1.64 Man/m		
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length	%	Recovery of Casing Pipe	Hoisting & Lowering Rod 39 Times		Hoisting & Lowering I.T. 296 Times		
	HW 2.00 m	1.1 %	100 %	Remarks					
	NW 87.50 m	48.5 %	89.7 %	G : Grand					
	BW 123.00 m	68.2 %	100 %	I.T.: Inner Tube					

A. I-10 Operation Results of Drill Hole, IC-16

Working Period	Period			Number of Days	Actual Working Days	Day Off	Total Number of Workers	
	Preparation	12th Oct. '84 ~ 19th Oct. '84			8	8	-	128
	Drilling	20th Oct. '84 ~ 4th Nov. '84			15.5	15.5	-	248
	Removing	5th Nov. '84 ~ 6th Nov. '84			2.5	2.5	-	40
	Total	12th Oct. '84 ~ 6th Nov. '84			26	26	-	416
Drilling Length	Planned Length	160.00 m	Over-burden	- m	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	139.90 m	Depth of Hole	Section	Total	
	Length Drilled	161.00 m	Core Recovery	86.9 %	0 ~ 100 m	87.8 %	87.8 %	
					100 ~ 161 m	85.7 %	86.9 %	
Working Time	Drilling	110°00'	27.0 %	21.7 %	m	%	%	
	Hoisting & Lowering Rod	33°30'	8.2 %	6.6 %	m	%	%	
	Hoisting & Lowering I.T.	125°30'	30.7 %	24.7 %	m	%	%	
	Miscellaneous	139°00'	34.1 %	27.3 %	Efficiency of Drilling			
	Repairing	-	- %	- %	161.00 m/Working Period		6.19 m/day	
	Others	-	- %	- %	161.00 m/Working Days		6.19 m/day	
	Total	408°00'	100 %	80.3 %	161.00 m/Drilling Period		10.39 m/day	
	Removing	Preparation	20°00'	-	3.9 %	161.00 m/Net Drilling Days		10.39 m/day
		Moving	80°00'	-	15.8 %	Total workers/ 161.00 m		2.58 Man/m
	G. Total	508°00'	-	100 %	Total Drilling Workers/ 161.00m		1.54 Man/m	
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length	%	Recovery of Casing Pipe	Hoisting & Lowering Rod 28 Times			
	HW 2.00 m	1.2 %	100 %	Hoisting & Lowering I.T. 198 Times				
	NW 30.00 m	18.6 %	100 %	Remarks				
	BW 109.20 m	67.8 %	100 %	G : Grand I.T.: Inner Tube				

A. I-11 Operation Results of Drill Hole, IC-17

Working Period	Period			Number of Days	Actual Working Days	Day Off	Total Number of Workers	
	Preparation	19th Jun. '84 ~ 25th Jun. '84						
Drilling	26th Jun. '84 ~ 4th Jul. '84			9.5	9.5	-	136	
Removing	5th Jul. '84 ~ 6th Jul. '84			2.5	2.5	-	40	
Total	19th Jun. '84 ~ 6th Jul. '84			19	19	-	288	
Drilling Length	Planned Length	m	Overburden	m	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	m	Depth of Hole	Section	Total	
	Length Drilled	160.20 ^m	Core Recovery	92.0 %	0 ~ 100 m	97.3 %	97.3 %	
Working Time	Drilling	117°00'	51.8 %	37.0 %	100 ~ 160.20m	82.9 %	92.0 %	
	Hoisting & Lowering Rod	22°30'	10.0 %	7.1 %	m	%	%	
	Hoisting & Lowering I.T.	43°00'	19.0 %	13.6 %	m	%	%	
	Miscellaneous	43°30'	19.2 %	13.8 %	Efficiency of Drilling			
	Repairing	-	- %	- %	160.20 m/Working Period		8.4 m/day	
	Others	-	- %	- %	160.20 m/Working Days		8.4 m/day	
	Total	226°00'	100 %	71.5 %	160.20 m/Drilling Period		16.8 m/day	
	Removing	Preparation	20°00'	-	6.3 %	160.20 m/Net Drilling Days		16.8 m/day
		Moving	70°00'	-	22.2 %	Total workers/ 160.20 m		1.79 Man/m
	G. Total	316°00'	-	100 %	Total Drilling Workers/ 160.20 m		0.84 Man/m	
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length	%	Recovery of Casing Pipe				
	HW 1.50 m	0.9 %		100 %	Hoisting & Lowering Rod	12 Times	Hoisting & Lowering I.T. 129 Times	
	NW 30.00 m	18.7 %		100 %	Remarks			
	m	%		%	G : Grand I.T.: Inner Tube			

A. 1-12 Operation Results of Drill Hole, IC-18

Working Period	Period		Number of Days	Actual Working Days	Day Off	Total Number of Workers		
	Preparation	7th Jul. '84 ~ 9th Jul. '84		3.5	3.5	-	56	
Drilling	10th Jul. '84 ~ 11th Aug. '84		32.5	26.5	6	424		
Removing	12th Aug. '84 ~ 13th Aug. '84		2	2	-	32		
Total	7th Jul. '84 ~ 13th Aug. '84		38	32	6	512		
Drilling Length	Planned Length	200.00 m	Overburden	-	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	162.90	Depth of Hole	Section		
	Length Drilled	200.50 m	Core Recovery	81.2 %	0 ~ 100 m	79.0 %	Total 79.0 %	
				100 ~ 200.50 m	83.6 %	81.2 %		
Working Time	Drilling	106°00'	21.4 %	18.9 %	m	%	%	
	Hoisting & Lowering Rod	38°00'	7.7 %	6.8 %	m	%	%	
	Hoisting & Lowering I.T.	62°00'	12.5 %	11.1 %	m	%	%	
	Miscellaneous	70°00'	14.0 %	12.5 %	Efficiency of Drilling			
	Repairing	220°00'	44.4 %	39.3 %	200.50 m/Working Period		5.27 m/day	
	Others	-	- %	- %	200.50 m/Working Days		6.26 m/day	
	Total	496°00'	100 %	88.6 %	200.50 m/Drilling Period		6.16 m/day	
	Removing	Preparation	22°00'	-	3.9 %	200.50 m/Net Drilling Days		7.56 m/day
		Moving	42°00'	-	7.5 %	Total workers/ 200.50 m		2.55 Man/m
	G. Total	560°00'	-	100 %	Total Drilling Workers/ 200.50 m			2.11 Man/m
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length	%	Recovery of Casing Pipe	Hoisting & Lowering Rod 42 Times		Hoisting & Lowering I.T. 296 Times	
	PW 4.50 m	2.2 %	100 %	Remarks				
	HW 69.00 m	34.4 %	100 %	G : Grand				
	NW 149.50 m	74.5 %	68 %	I.T.: Inner Tube				
BW 164.90	82.2 %	100 %						

A. I-13 Operation Results of Drill Hole, IC-19

Working Period	Period			Number of Days	Actual Working Days	Day Off	Total Number of Workers	
	Preparation	4th Nov. '84 ~ 26th Nov. '84						
Drilling	26th Nov. '84 ~ 3th Feb. '85			69.5	32.5	37	852	
Removing	4th Feb. '85 ~ 5th Feb. '85			2	2	-	42	
Total	4th Nov. '84 ~ 5th Feb. '85			94	57	37	1,086	
Drilling Length	Planned Length	200.00 m	Over-burden	- m	Core Recovery for each 100 m section			
	Increase or Decrease in Length	m	Core Length	152.40 m	Depth of Hole	Section	Total	
	Length Drilled	203.60 m	Core Recovery	74.9 %	0 ~ 100 m	94.8 %	94.8 %	
					100 ~ 203.60m	54.8 %	74.9 %	
Working Time	Drilling	195°30'	30.4 %	25.4 %	m	%	%	
	Hoisting & Lowering Rod	52°30'	8.2 %	6.8 %	m	%	%	
	Hoisting & Lowering I.T.	106°30'	16.6 %	13.9 %	m	%	%	
	Miscellaneous	108°30'	16.8 %	14.1 %	Efficiency of Drilling			
	Repairing	180°00'	28.0 %	23.4 %	203.60 m/Working Period		2.17 m/day	
	Others	-	%	- %	203.60 m/Working Days		3.57 m/day	
	Total	643°00'	100 %	83.6 %	203.60 m/Drilling Period		2.93 m/day	
	Removing	Preparation	80°00'	-	10.4 %	203.60 m/Net Drilling Days		6.26 m/day
		Moving	46°00'	-	6.0 %	Total workers/ 203.60 m		5.33 Man/m
	G. Total	769°00'	-	100 %	Total Drilling Workers/ 203.60 m		4.18 Man/m	
Casing Pipe Inserted	Pipe Size & Meterage	Inserted Length Drilling Length %	Recovery of Casing Pipe		Hoisting & Lowering Rod 48 Times		Hoisting & Lowering I.T. 287 Times	
	NW 121.50 m	59.7 %	88.9 %		Remarks G : Grand I.T.: Inner Tube			
	BW 145.00 m	71.2 %	82.8 %					
	m	%	%					

A. I-14 Summarized Operational Data of Each Drill Hole

Drill hole No.	Type of machine	Drilling period	Drilling length	Core		No. of drilling shift			Drilling speed		Remarks
				Length	Recovery	Drilling	Casing etc.	Total	*	**	
IC-10	TGM-3C	6th Jun. '84 -15th Jun. '84	180.30 ^m	146.45 ^m	81.2%	35	17	52	5.15	3.47	
IC-11	TGM-5A	15th Aug. '84 -31st Aug. '84	221.10	178.80	80.9	34	14	48	6.50	4.61	
IC-12	TGM-5A	30th Sep. '84 -9th Oct. '84	220.60	215.80	97.8	36	47	83	6.13	2.66	
IC-13	TGM-5A	9th Sep. '84 -22th Sep. '84	240.60	213.10	88.6	57	29	86	4.22	2.80	
IC-14	TGM-5A	12th Nov. '84 -17th Nov. '84	140.20	126.20	90.0	43	20	63	3.26	2.23	
IC-15	TGM-5A	22th Nov. '84 -10th Dec. '84	180.40	168.30	93.3	36	15	51	5.01	3.54	
IC-16	TGM-5A	20th Oct. '84 -4th Nov. '84	161.00	139.90	86.9	57	18	75	2.82	2.15	
IC-17	TGM-3C	26th Jun. '84 -4th Jul. '84	160.20	147.50	92.0	21	9	30	7.63	5.34	
IC-18	TGM-3C	10th Jul. '84 -11th Aug. '84	200.50	162.90	81.2	71	24	95	2.82	2.11	
IC-19	TGM-5A	25th Nov. '84 -3th Feb. '85	203.60	152.40	74.9	68	100	168	2.99	1.21	
Total			1908.50	1651.35	86.5	458	293	751	4.17	2.54	

* Drilled per one shift covering net drilling operations.

** Drilled per one shift covering total works conducted.

A. I-15 Working Time of Each Drill Hole

Drill hole No.	Drilling	Hoisting & lowering rod & I.T.		Miscellaneous				Repairs	Others	Moving operation	Total
		Rod	Inner tube	Casing insertion	Hole reaming	Others					
IC-10	114°30'	30°00'	56°00'	24°00'	-	39°30'	-	-	96°00'	360°00'	
IC-11	145°00'	56°30'	92°30'	24°00'	18°00'	78°00'	12°00'	6°00'	140°00'	572°00'	
IC-12	115°00'	29°30'	62°30'	1°00'	-	38°00'	-	-	88°00'	334°00'	
IC-13	118°00'	46°30'	91°30'	12°00'	30°00'	26°00'	6°00'	-	76°00'	406°00'	
IC-14	61°00'	21°00'	28°30'	11°00'	-	22°30'	-	-	50°00'	194°00'	
IC-15	118°00'	49°30'	132°30'	12°00'	-	180°00'	6°00'	-	96°00'	594°00'	
IC-16	110°00'	33°30'	125°30'	12°00'	-	127°00'	-	-	100°00'	508°00'	
IC-17	117°00'	22°30'	43°00'	8°00'	-	35°30'	-	-	90°00'	316°00'	
IC-18	106°00'	38°00'	62°00'	9°00'	58°00'	3°00'	220°00'	-	64°00'	560°00'	
IC-19	195°30'	52°30'	106°30'	24°00'	-	84°30'	180°00'	-	126°00'	769°00'	
Total	1,200°00'	379°30'	800°30'	137°00'	106°00'	634°00'	424°00'	6°00'	926°00'	4,613°00'	
					877°00'						

A. I-16 Drilling Meterage of Diamond Bits

(1)

Item	Size	Type	Bit No.	Drilling meterage by drill hole. Unite meter										Total			
				IC-10	IC-11	IC-12	IC-13	IC-14	IC-15	IC-16	IC-17	IC-18	IC-19				
Bit	PC	PC	J10057										(4.50) ^m		-		
			Total	-	-	-	-	-	-	-	-	-	-	(4.50)	-	-	
	116mm	116mm	C-2940	6.00												6.00	
			C-2941			1.20											1.20
			C-2942			1.30											1.30
			C-2943				0.60										0.60
			C-2944				0.40										0.40
			C-2945				0.50										0.50
			C-2946					1.50									1.50
			C-2947						2.00								2.00
			C-2948								2.00						2.00
			C-2949									1.70					1.70
	Total			6.00	-	2.50	1.50	1.50	2.00	2.00	2.00	1.70	-	-	17.20		
	101mm	101mm	P-1020		0.50											0.50	
			Total	-	0.50	-	-	-	-	-	-	-	-	-	-	0.50	
	HX	HQ-WL	S-300	19.40												19.40	
			S-301	18.10												18.10	
			S-302	19.80												19.80	
			S-303	20.10												20.10	
			S-304	15.60												15.60	
			S-305		14.70											14.70	
			S-306		16.40											16.40	
			S-307		11.20											11.20	
			S-308		10.80											10.80	
			S-309		12.10											12.10	
			S-310		13.30											13.30	
			S-311		15.10											15.10	
			S-312		17.30											17.30	
			S-313			7.40										7.40	
			S-314			8.50										8.50	
			S-315			10.20										10.20	
			S-316			8.40										8.40	
			S-317			11.70										11.70	
			S-318				5.60									5.60	
S-319						5.90									5.90		
S-320						4.80									4.80		
S-321						6.20									6.20		
S-322						6.00									6.00		
S-323									7.60						7.60		
S-324									6.90						6.90		
S-325									8.10						8.10		
S-326									10.20						10.20		
S-327									9.30						9.30		
S-328									10.40						10.40		
S-329										10.20					10.20		
S-330								11.30					11.30				
S-331								14.60					14.60				
S-332								15.10					15.10				
S-333								12.30					12.30				
S-334								10.40					10.40				
S-335									7.40				7.40				
S-336									7.00				7.00				
S-337									7.70				7.70				
S-338										2.10			2.10				
S-339											0.70		0.70				
S-340											0.80		0.80				
S-341												9.40	9.40				
S-342												9.30	9.30				
S-343												10.10	10.10				
S-344												10.60	10.60				
S-345												12.20	12.20				

Item	Size	Type	Bit No.	Drilling meterage by drill hole. Unite meter									Total			
				IC-10	IC-11	IC-12	IC-13	IC-14	IC-15	IC-16	IC-17	IC-18		IC-19		
Bit	HX	HQ-WL	S-346										11.10	11.10		
			S-347											12.30	12.30	
			S-348											11.10	11.10	
			S-349											12.00	12.00	
			S-350											12.50	12.50	
			S-351											11.20	11.20	
			S-352											9.40	9.40	
			S-353											8.70	8.70	
			S-354											10.10	10.10	
			S-355											9.60	9.60	
			S-356											10.80	10.80	
			S-357											11.90	11.90	
			S-358											12.10	12.10	
			S-359											12.25	12.25	
				Total	93.00	110.90	46.20	28.50	52.50	73.90	22.10	2.10	1.50	206.65	637.35	
		NX	NQ-WL	N-500	25.60										25.60	
				N-501	27.80											27.80
				N-502	27.90											27.90
				N-503			13.20									13.20
				N-504			12.60									12.60
				N-505			13.30									13.30
				N-506				30.30								30.30
				N-507				28.10								28.10
				N-508				27.20								27.20
				N-509				28.30								28.30
				N-510				26.40								26.40
				N-511				31.60								31.60
				N-512					24.50							24.50
				N-513					24.10							24.10
				N-514					24.60							24.60
				N-515					22.30							22.30
				N-516					22.40							22.40
				N-517					23.00							23.00
	N-518							23.70							23.70	
	N-519							22.40							22.40	
	N-520							23.60							23.60	
	N-521						20.60						20.60			
	N-522						20.10						20.10			
	N-523						22.60						22.60			
	N-524						22.90						22.90			
	N-525							15.20					15.20			
	N-526							16.10					16.10			
	N-527							14.80					14.80			
	N-528								21.30				21.30			
	N-529								22.60				22.60			
	N-530								21.80				21.80			
	N-531								19.40				19.40			
	N-532									30.40			30.40			
	N-533									30.60			30.60			
	N-534									32.10			32.10			
	N-535									31.80			31.80			
	N-536									31.50			31.50			
	N-537										19.40		19.40			
	N-538										18.60		18.60			
	N-539										17.20		17.20			
	N-540										18.10		18.10			
	N-541										17.80		17.80			
	N-542										18.20		18.20			
	N-543										16.60		16.60			
	N-544										17.40		17.40			
	N-545										20.10		20.10			

(3)

Item	Size	Type	Bit No.	Drilling meterage by drill hole. Unite meter									Total				
				IC-10	IC-11	IC-12	IC-13	IC-14	IC-15	IC-16	IC-17	IC-18		IC-19			
Bit	NX	NQ-WL	N-546											11.30	11.30		
			N-547												11.40	11.40	
			N-548													11.10	11.10
			N-549													10.35	10.35
				Total	81.30	39.10	71.90	210.60	86.20	46.10	85.10	156.40	163.40	44.15	1084.25		
		BX	BQ-WL	Y-600		17.80										17.80	
	Y-601				16.90												16.90
	Y-602				17.60												17.60
	Y-603				18.30												18.30
	Y-604										20.10						20.10
	Y-605										19.70						19.70
	Y-606										18.60						18.60
	Y-607											13.40					13.40
	Y-608											12.80					12.80
	Y-609											13.00					13.00
	Y-610											12.60					12.60
	Y-611													12.10			12.10
	Y-612													11.60			11.60
	Y-613													11.90			11.90
	Y-614														14.60		14.60
	Y-615														15.10		15.10
	Y-616														14.10		14.10
	Y-617												12.65		12.65		
			Total	-	70.60	-	-	-	58.40	51.80	-	35.60	56.45	272.85			

A. I-17 Specifications of Diamond Bits

Size	Type	Carats per bit	Matrix	Stones per carat	Water way	Number	Remark
PC	PC	45	Z	1/30	6	J10057	Reset
		42	X	1/30	6	C-2940	Reset
		42	X	1/30	6	C-2941	"
		42	Z	1/30	6	C-2942	"
		42	Z	1/30	6	C-2943	"
		42	Z	1/30	6	C-2944	"
		42	Z	1/30	6	C-2945	"
		42	Z	1/30	6	C-2946	"
		42	Z	1/30	6	C-2947	"
		42	ZZ	1/30	6	C-2948	"
		42	ZZ	1/30	6	C-2949	"
101mm	101mm	40	Z	1/30	6	P-1020	Reset
		40	X	1/30	6	S-300	Reset
		40	X	1/30	6	S-301	"
		40	X	1/30	6	S-302	"
		40	X	1/30	6	S-303	"
		40	Z	1/30	6	S-304	"
		40	Z	1/30	6	S-305	"
		40	Z	1/30	6	S-306	"
		40	Z	1/30	6	S-307	"
		40	Z	1/30	6	S-308	"
		40	Z	1/30	6	S-309	"
		41	C	1/30	6	S-310	"
		41	C	1/30	6	S-311	"
		41	C	1/30	6	S-312	"
		35	H-9	35 mesh	6	S-313	"
		35	H-9	35 mesh	6	S-314	"
		35	H-9	35 mesh	6	S-315	"
		35	H-9	35 mesh	6	S-316	"
		35	H-9	35 mesh	6	S-317	"
		35	H-9	35 mesh	6	S-318	"
		35	H-9	35 mesh	6	S-319	"
		50	J-7	40 mesh	6	S-320	"
		50	J-7	40 mesh	6	S-321	"
		50	J-7	40 mesh	6	S-322	"
		45	A-65	40 mesh	6	S-323	"
		45	A-65	40 mesh	6	S-324	"
		45	A-65	40 mesh	6	S-325	"
		45	A-65	40 mesh	6	S-326	"
		45	A-65	40 mesh	6	S-327	"
		45	A-65	40 mesh	6	S-328	"
		45	A-65	40 mesh	6	S-329	"
		45	A-65	40 mesh	6	S-330	"
		45	A-65	40 mesh	6	S-331	"
		45	A-65	40 mesh	6	S-332	"
		45	A-75	40 mesh	6	S-333	"
		45	A-75	40 mesh	6	S-334	"
		45	A-75	40 mesh	6	S-335	"
		45	A-75	40 mesh	6	S-336	"
		45	A-75	40 mesh	6	S-337	"
		45	A-75	40 mesh	6	S-338	"
		45	A-75	40 mesh	6	S-339	"
		45	A-75	40 mesh	6	S-340	"
		45	A-75	40 mesh	6	S-341	"
		45	A-75	40 mesh	6	S-342	"
		45	A-75	40 mesh	6	S-343	"
		45	A-75	40 mesh	6	S-344	"
		45	A-75	40 mesh	6	S-345	"
		45	A-75	40 mesh	6	S-346	"
		45	A-75	40 mesh	6	S-347	"
		45	A-75	40 mesh	6	S-348	"
		45	A-75	40 mesh	6	S-349	"
		45	A-85	40 mesh	6	S-350	"
		45	A-85	40 mesh	6	S-351	"
		45	A-85	40 mesh	6	S-352	"
		45	A-85	40 mesh	6	S-353	"
		45	A-85	40 mesh	6	S-354	"
		45	A-85	40 mesh	6	S-355	"
		45	A-85	40 mesh	6	S-356	"
		45	A-85	40 mesh	6	S-357	"
		45	A-85	40 mesh	6	S-358	"
		45	A-85	40 mesh	6	S-359	"

Size	Type	Carats per bit	Matrix	Stones per carat	Water way	Number	Remark
		30	Y	1/30	4	N-500	Reset
		30	Y	1/30	4	N-501	"
		30	Y	1/30	4	N-502	"
		30	Y	1/30	4	N-503	"
		30	Y	1/30	4	N-504	"
		30	Y	1/30	4	N-505	"
		30	Y	1/30	4	N-506	"
		30	Y	1/30	4	N-507	"
		30	Y	1/30	4	N-508	"
		30	Y	1/30	4	N-509	"
		30	Z	1/30	4	N-510	"
		30	Z	1/30	4	N-511	"
		30	Z	1/30	4	N-512	"
		30	Z	1/30	4	N-513	"
		30	Z	1/30	4	N-514	"
		30	Z	1/30	4	N-515	"
		30	Z	1/30	4	N-516	"
		30	Z	1/30	4	N-517	"
		30	Z	1/30	4	N-518	"
		24	J-7	35 mesh	4	N-519	"
		24	J-7	35 mesh	4	N-520	"
		24	J-7	35 mesh	4	N-521	"
		24	J-7	35 mesh	4	N-522	"
		35	H-9	40 mesh	4	N-523	"
		35	H-9	40 mesh	4	N-524	"
		35	H-9	40 mesh	4	N-525	"
		35	H-9	40 mesh	4	N-526	"
		35	H-9	40 mesh	4	N-527	"
		35	A-65	40 mesh	4	N-528	"
		35	A-65	40 mesh	4	N-529	"
		35	A-65	40 mesh	4	N-530	"
		35	A-65	40 mesh	4	N-531	"
		35	A-65	40 mesh	4	N-532	"
		35	A-65	40 mesh	4	N-533	"
		35	A-65	40 mesh	4	N-534	"
		35	A-65	40 mesh	4	N-535	"
		35	A-65	40 mesh	4	N-536	"
		35	A-65	40 mesh	4	N-537	"
		35	A-75	40 mesh	4	N-538	"
		35	A-75	40 mesh	4	N-539	"
		35	A-75	40 mesh	4	N-540	"
		35	A-75	40 mesh	4	N-541	"
		35	A-75	40 mesh	4	N-542	"
		35	A-75	40 mesh	4	N-543	"
		35	A-75	40 mesh	4	N-544	"
		35	A-75	40 mesh	4	N-545	"
		35	A-75	40 mesh	4	N-546	"
		35	A-75	40 mesh	4	N-547	"
		35	A-75	40 mesh	4	N-548	"
		35	A-75	40 mesh	4	N-549	"
		20	Z	1/30	4	Y-600	Reset
		20	Z	1/30	4	Y-601	"
		20	Z	1/30	4	Y-602	"
		20	Z	1/30	4	Y-603	"
		20	Z	1/30	4	Y-604	"
		20	Z	1/30	4	Y-605	"
		20	Z	1/30	4	Y-606	"
		20	Z	1/30	4	Y-607	"
		20	Z	1/30	4	Y-608	"
		20	Z	1/30	4	Y-609	"
		16	H-9	35 mesh	4	Y-610	"
		16	H-9	35 mesh	4	Y-611	"
		16	H-9	35 mesh	4	Y-612	"
		23	A-75	40 mesh	4	Y-613	"
		23	A-75	40 mesh	4	Y-614	"
		23	A-75	40 mesh	4	Y-615	"
		23	A-75	40 mesh	4	Y-616	"
		23	A-75	40 mesh	4	Y-617	"

APPENDICES
PART II
DATA OF TUNNELLING

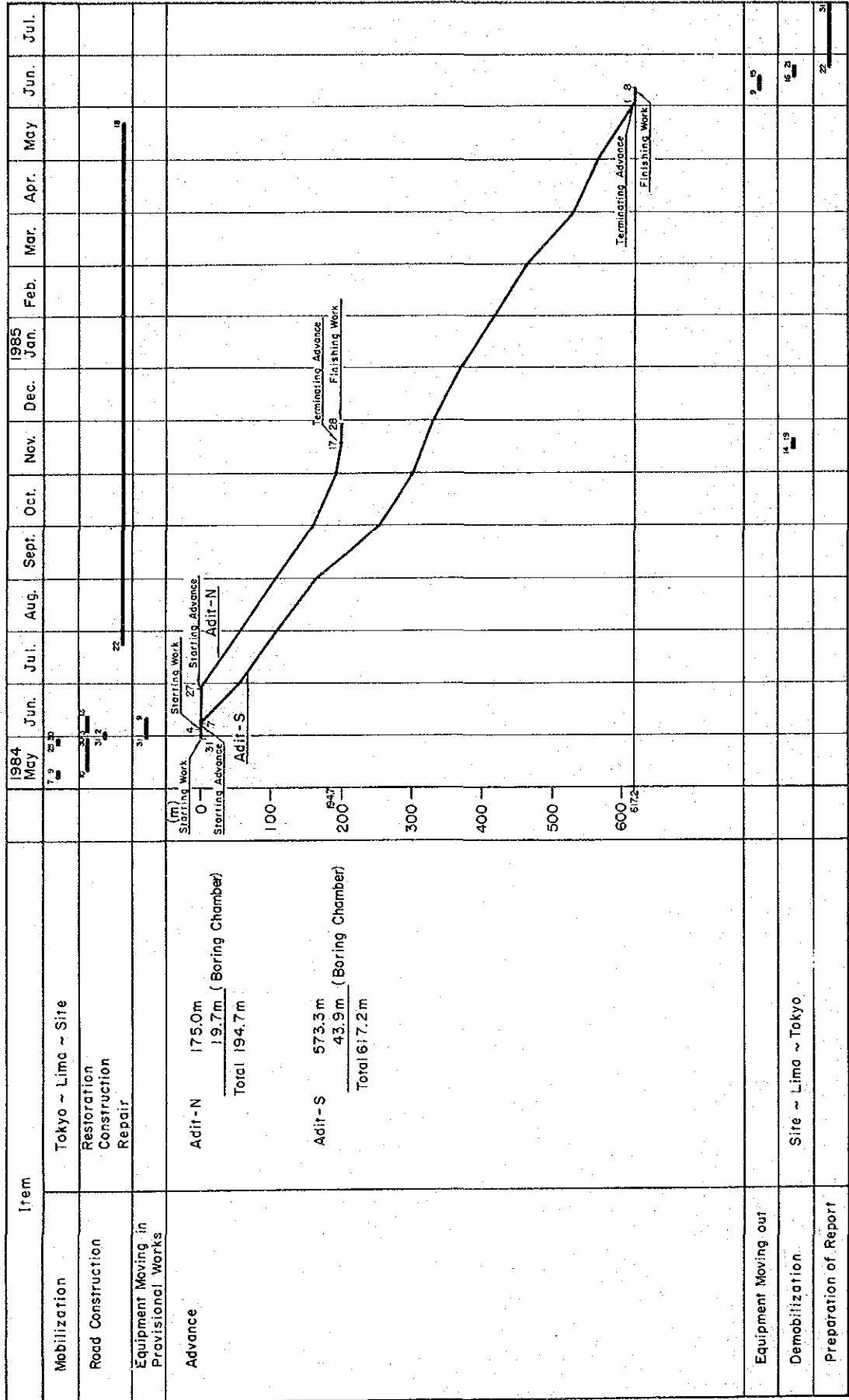
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A. II - I Actual Progress of Investigation

Item	1984							1985							
	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.
1 Mobilization (Tokyo ~ Lima ~ Site)	7 9 25 30 □ □														
2 Road Construction Restoration Construction Repair	10 30 3 13 □ □ □ □ 3 1 2 □ □	22											18		
3 Equipment Moving in Provisional Works (with housing)	3 1 9 □ □														
4 Advance Adit-N 175.00 m Adit-S 573.30 m	4 3 1 □ □						28						8		
5 Equipment Moving out													9 15	□	
6 Demobilization (Site ~ Lima ~ Tokyo)							14 19							16 21	□
7 Preparation of Report														22	31

A. II-2 Record of Progress



A. II-3 Details of Employed Days for Advance

Adit Name	Moving in Moving out	Period of Advancing Work						Details of Working Period		Principal Accessory Works					
		Camping (Date)	No. of Days	Advance (Date)	No. of Days	Boring Chamber (Date)	No. of Days	Total Days	Work- ing Days	Suspend- ed Days	Construc- tion Re- pair of Road (Date)	No. of Days	Moving in Provision (Date)	No. of Days	Total No. of Days
	Accessory Works (Date) 31, May 84 9, Jun. 84														
Adit-N		25, Jun. 84 26, Jun. 84	2	10, Jul. 84 28, Nov. 84	131	27, Jun. 84 14, Jul. 84 31, Jul. 84 25, Aug. 84	12 13	158	151	7			4, Jun. 84 23, Jun. 84	20	20
Adit-S		6, Jun. 84 6, Jun. 84	1	17, Jun. 84 8, Jun. 85	339	7, Jun. 84 23, Jun. 84 27, Sept. 84 27, Oct. 84	14 14	368	357	11			31, May 84 5, Jun. 84	6	6
	Moving out 9, Jun. 85 15, Jun. 85													7	7
Total No. of Days			3		470		53	526	508	18		168		43	211

Note: No. of days of each term signifies the No. of days in working term.

A. II-4 Summary of Performance

Adit Name	Moving in Moving out	No. of Working Shift		No. of Man-shift		No. of Hours for Each Work								
		No. of Shift of Advance	Total No. of Shift	Engineer (man-shift)	Worker (man-shift)	Advance (hrs.)	Support (hrs.)	Besides Advance (hrs.)	Sub-Total (hrs.)	Camping Break up (hrs.)	Equipment Moving out (hrs.)	Others (hrs.)	Total (hrs.)	
(Accessory Works)	Road Restor.	28	28	28	376	280	-	-	280	-	-	-	-	280
	" Constr.	3	3	3	51	30	-	-	30	-	-	-	-	30
	" Repair	137	137	89	631	1,096	-	-	1,096	-	-	-	-	1,096
	Provision	10	10	13	54	-	-	-	-	-	80	-	-	80
Adit-N		383	426	593	3,704	2,129	937	248	3,314	32	8	54	3,408	
Adit-S		958	1,035	1,421	11,662.5	5,589	2,259	760	8,608	-	-	8	8,616	
	Equipment Moving out	7	7	21	112	-	-	-	-	-	56	-	56	
Total		1,526	1,646	2,168	16,590.5	9,124	3,196	1,008	13,328	32	144	62	13,566	

Note: Provisional works contain equipment moving in and camping etc.

A. II-5 List of the Equipment-used and Provisional Construction for Tunnelling

Name of Equipment	Type and Specification	No., Q'ty	Remarks
Compressor	ATLAS COPCO XA 350 Vod	2	1 for N, 1 for S.
Loader	ATLAS COPCO LM 36	1	for N.
	ATLAS COPCO LM 56	1	for S.
	JOY HL 20	1	for S.
Drifter	ATLAS COPCO BBC-16W	6	3 for N, 3 for S.
Tub	Side Dump Type, Manual Handling 1.0 m ³	10	4 for N, 6 for S.
Bit Grinder	ATLAS COPCO LSD-61	1	
Generator	YAMMER YSG-35N	1	
	CATERPILLAR SR-4 90 KVA	1	1 for S.
	CATERPILLAR SR-4 55 KVA	1	1 for N.
Ventilator	HITACHI ϕ 500 m/m 3.7 KW 170 m ³ /min	10	4 for N, 6 for S.
Bulldozer	CATERPILLAR D7-17A	1	
Vehicle	TOYOTA LAND CRUISER FJ-55	1	
	TOYOTA LAND CRUISER FJ-45	1	
	TOYOTA LAND CRUISER FJ-40	1	
House	Storied House, Galvanized Iron 13 m ²	2	Generator. 1 for N, 1 for S.
	Storied House, Galvanized Iron 50 m ²	1	Camp House.
	Storied House, Galvanized Iron 94 m ²	1	Camp House.
	Storied House, Galvanized Iron 80 m ²	1	Kitchen, Dining Room.
	Storied House, Galvanized Iron 190 m ²	1	Camp House. Office.
	Storied House, Galvanized Iron 18 m ²	1	Warehouse.
	Storied House, Galvanized Iron 18 m ²	2	Compressor Chamber 1 for N, 1 for S.
	Storied House, Galvanized Iron 18 m ²	2	Fuel Storage 1 for N, 1 for S.
Powder Magazine	Subterranean Type Powder Magazine	1	
	Subterranean Type Blasting Supplies	1	

A. II-6 Summary of Drift Heading, Adit-N

Date of Starting Work		4, June, 1984						
Date of Starting Advance		27, June, 1984						
Date of Terminating Advance		17, November, 1984						
Date of Finishing Work		28, November, 1984						
		Until 17, Nov. 1984			Until 28, Nov. 1984			Remarks
		No. of Days	Per cent (%)		No. of Days	Per cent (%)		
Working Days	Advance	(days) 127	80.9	76.0	(days) 127	76.5	71.3	
	Housing	2	1.3	1.2	2	1.2	1.1	
	Others	28	17.8	16.8	37	22.3	20.8	
Sub-Total		157	100.0	94.0	166	100.0	93.2	
Suspended Days		10	-	6.0	12	-	6.8	
Total		167	-	100.0	178	-	100.0	
		Perforation		Preparation of Advance, Housing	Accessory Other Works		Remarks	
		(men)		(men)	(men)			
Worker Staff	Interior	525		6	62		1 man=8 hrs/shift	
	Surface	-		-	-			
Worker	Interior	2,761		12	150			
	Surface	767.5		3	10.5			
Sub-Total	Interior	3,286		18	212			
	Surface	767.5		3	10.5			
Total		4,053.5		21	222.5		G. Total 4,297 men	
		Until 17, Nov. 1984			Until 28, Nov. 1984			Remarks
		175.0m	*194.7m		175.0m	*194.7m		
Advance m per 1 working day		(m) 1.115	(m) 1.240	(m) 1.054	(m) 1.173			
Advance m per 1 actual working day		1.378	1.533	1.378	1.533			
Advance m per 1 necessary worker		1.048	1.166	0.983	1.094			
Advance m per 1 necessary worker		0.041	0.046	0.041	0.045			
No. of Support		84 sets						
Timbering Length (%)		83.1 m (47.5%)						

* Included with Boring chamber.

A. II-7 Summary of Drift Heading, Adit-S

Date of Starting Work		31, May, 1984						
Date of Starting Advance		7, June, 1984						
Date of Terminating Advance		1, June, 1985						
Date of Finishing Work		8, June, 1985						
		Until 1, June, 1985			Until 8, June, 1985			Remarks
		No. of Days	Per cent (%)		No. of Days	Per cent (%)		
Working Days	Advance	(days) 315	91.8	85.8	(days) 315	90.0	84.2	
	Housing	1	0.3	0.3	1	0.3	0.3	
	Others	27	7.9	7.4	34	9.7	9.1	
Sub-Total		343	100.0	93.5	350	100.0	93.6	
Suspended Days		24	-	6.5	24	-	6.4	
Total		367	-	100.0	374	-	100.0	
		Perforation		Preparation of Advance, Housing	Accessory Other Works		Remarks	
		(men)		(men)	(men)			
Staff	Interior	1,380		3	38		1 man=8 hrs/shift	
	Surface	-		-	-		*Included guardmen	
Worker	Interior	8,031		20	230		G. Total 13,083.5 men	
	Surface	2,084		3	*1,294.5			
Sub-Total	Interior	9,411		23	268			
	Surface	2,084		3	1,294.5			
Total		11,495		26	1,562.5			
		Until 1, June, 1985		Until 8, June, 1985		Remarks		
		573.3m	*617.2m	573.3m	*617.2m			
Advance m per 1 working day		(m) 1.671	(m) 1.799	(m) 1.638	(m) 1.763			
Advance m per 1 actual working day		1.820	1.959	1.820	1.959			
Advance m per 1 necessary day		1.562	1.682	1.533	1.650			
Advance m per 1 necessary worker		0.045	0.047	0.044	0.047			
No. of Support		239 sets						
Timbering Length (%)		255.3m (44.5%)						

* Included with Boring chamber

A. II-8 Summary of Material Consumption

Name	Specification	Q'ty	Remarks
Petroleum		233,968 ℓ	
Gasoline		18,470 ℓ	
Drifter Oil		1,050 ℓ	
Engine Oil		2,681 ℓ	
Compressor Oil		5,977 ℓ	
Grease		447 kg	
Dynamite	DINASOL 7/8" x 7"	13,899.26 kg	
Detonator	FAMESA No. 8	29,684 nos	
Fuse	FAMESA	211,709 ft	
Insert Bit	COROMANT 22 m/m Hex. Gauge 38 m/m, L 1.8m	682 nos	
Carbide		4,342 kg	
Timbering Wood		136,769 m ³	
Board		58,662 m ³	
Sleeper		1,349 nos	
Supports		323 sets	

Note: Includes road construction etc.

A. II-9 Details of Material Consumption

Name	Specification	Q'ty		Remarks
		Adit-N	Adit-S	
Petroleum		63,550 ℓ	167,018 ℓ	
Gasoline		5,730 ℓ	12,440 ℓ	
Drifter Oil		281 ℓ	769 ℓ	
Engine Oil		801 ℓ	1,880 ℓ	
Compressor Oil		1,710 ℓ	4,267 ℓ	
Grease		124 kg	323 kg	
Dynamite	7/8" x 7"	3,144.02 kg	10,703.84 kg	
Detonator	FAMESA No. 8	6,728 nos	22,806 nos	
Fuse	FAMESA	48,215 ft	163,002 ft	
Insert Bit	COROMANT 22 m/m Hex. Gauge 38 m/m, L 1.8m	153 nos	529 nos	
Carbide		1,177 kg	3,157 kg	
Timbering Wood		33,206 m ³	102,800 m ³	
Board	ø0.10m x 3.0m ø0.20m x 3.0m	14,148 m ³	44,154 m ³	
Sleeper	0.2m x 0.05m x 1.8m 0.10m x 0.15m x 1.2m	329 nos	1,020 nos	
Supports		84 sets	239 sets	

A. II-10 Surveying Results, Adit-N

(1) Main Tunnel

(1)

Survey Point	Direction	Horizontal Distance (m)	Coordinate (m)		Elevation (m)
			Longitude	Latitude	
N1	-	-	310,357.32	8,809,084.56	4,689.37
N1 -N2	111°40'03"	20.329	310,376.21	8,809,077.06	4,689.73
N2 -N3	112°31'41"	33.641	310,407.28	8,809,064.17	4,690.29
N3 -N4	112°38'18"	22.963	310,428.47	8,809,055.33	4,690.49
N4 -N5	112°29'21"	22.632	310,449.38	8,809,046.68	4,690.54
N5 -N6	128°31'16"	10.849	310,457.87	8,809,039.92	4,690.62
N6 -N7	158°21'26"	4.961	310,459.70	8,809,035.31	4,690.74
N7 -N8	163°59'46"	6.526	310,461.50	8,809,029.04	4,690.84
N8 -N9	150°25'56"	23.839	310,473.26	8,809,008.30	4,691.00
N9 -N10	150°29'21"	21.000	310,483.60	8,808,990.03	4,691.28
N10-N11	150°26'51"	26.255	310,496.56	8,808,967.19	4,691.58
N11-N12	150°24'01"	37.265	310,514.96	8,808,934.79	4,691.72
N12-N13	150°18'26"	23.576	310,526.64	8,808,914.31	4,691.72
N13-N14	150°14'46"	31.690	310,542.37	8,808,886.79	4,692.08
N14-N15	150°14'46"	24.488	310,554.52	8,808,865.54	4,692.23
N15-N16	150°19'36"	29.836	310,569.29	8,808,839.61	4,692.39
N16-N17	150°16'21"	22.620	310,580.50	8,808,819.97	4,692.49
N17-N18	150°16'21"	25.642	310,593.22	8,808,797.70	4,692.61
N18-N19	150°11'56"	30.309	310,608.28	8,808,771.40	4,692.80
N19-N20	150°02'46"	38.273	310,628.37	8,808,736.55	4,693.09
N20-N21	149°58'36"	28,736	310,641.76	8,808,713.37	4,693.26
N21-F		25.400			

(2)

(2) Crosscut - 1

Survey Point	Direction	Horizontal Distance (m)	Coordinate (m)		Elevation (m)
			Longitude	Latitude	
N15			310,554.52	8,808,865.54	4,692.23
N15-CN4	238°31'56"	23.816	310,534.21	8,808,853.10	4,692.31
CN4-CN5	238°33'06"	24.249	310,513.51	8,808,840.45	4,692.56
CN5-CN6	238°27'41"	35.339	310,483.40	8,808,821.97	4,693.02
CN6-CN7	238°14'31"	31.479	310,456.63	8,808,805.40	4,693.41
CN7-CN8	238°12'51"	31.427	310,429.92	8,808,788.85	4,693.90
CN8-F		6.300			

(3) Crosscut - 2

Survey Point	Direction	Horizontal Distance (m)	Coordinate (m)		Elevation (m)
			Longitude	Latitude	
N20			310,628.37	8,808,736.55	4,693.09
N20-NN1	240°14'06"	41.352	310,592.47	8,808,716.02	4,693.45
NN1-NN2	241°06'36"	36.717	310,560.33	8,808,698.28	4,693.78
NN2-NN3	241°04'46"	34.134	310,530.45	8,808,681.77	4,694.00
NN3-NN4	241°06'26"	22.200	310,511.01	8,808,671.05	4,694.66
NN4-F		42.000			

A. II-11 Surveying Result, Adit-S

(1) Main Tunnel

(1)

Survey Point	Direction	Horizontal Distance (m)	Coordinate (m)		Elevation (m)
			Longitude	Latitude	
S1			310,967.55	8,807,861.50	4,570.14
S1 -S2	0°30'14"	20.501	310,967.730	8,807,882.00	4,570.20
S2 -S3	2°03'59"	31.665	310,968.87	8,807,913.64	4,570.44
S3 -S4	2°01'24"	24.790	310,969.75	8,807,938.42	4,570.76
S4 -S5	1°46'14"	19.767	310,970.36	8,807,958.18	4,570.91
S5 -S6	0°10'24"	33.714	310,970.46	8,807,991.89	4,571.21
S6 -S7	358°24'09"	8.223	310,970.23	8,808,000.11	4,571.33
S7 -S8	328°57'32"	26.228	310,956.71	8,808,022.58	4,571.57
S8 -S9	328°36'22"	21.505	310,945.50	8,808,040.94	4,571.85
S9 -S10	331°22'42"	29.499	310,931.37	8,808,066.83	4,572.24
S10-S11	332°19'52"	29.813	310,917.53	8,808,093.24	4,572.40
S11-S12	331°31'02"	23.435	310,906.35	8,808,113.84	4,572.50
S12-S13	331°27'12"	26.428	310,893.72	8,808,137.05	4,572.71
S13-S14	331°18'52"	35.267	310,876.80	8,808,167.99	4,573.23
S14-S15	331°20'12"	35.945	310,859.56	8,808,199.53	4,573.56
S15-S16	330°50'12"	38.066	310,841.01	8,808,232.77	4,573.59
S16-S17	330°41'47"	30.635	310,826.01	8,808,259.49	4,573.72
S17-S18	330°26'37"	38.355	310,807.09	8,808,292.85	4,574.21
S18-S19	331°04'42"	35.358	310,789.99	8,808,323.80	4,574.28
S19-S20	331°34'42"	31.299	310,775.09	8,808,351.32	4,574.44
S20-S21	331°21'07"	45.191	310,753.43	8,808,390.98	4,574.53
S21-S22	331°25'57"	34.741	310,736.82	8,808,421.49	4,574.81
S22-S23	331°25'27"	37.725	310,718.77	8,808,454.62	4,575.34
S23-S24	331°15'27"	25.051	310,706.72	8,808,476.59	4,575.62
S24-SX-0	331°17'37"	16.304	310,698.91	8,808,490.86	4,575.73
SX-0-S25	331°19'07"	22.188	310,688.26	8,808,510.32	4,575.84
S25-S26	331°19'37"	39.371	310,669.37	8,808,544.87	4,576.78
S26-S27	331°19'37"	28.50	310,655.70	8,808,569.87	4,577.19
S27-S28	332°39'37"	26.15	310,643.69	8,808,593.10	4,577.63
S28-S29A	319°09'37"	21.85	310,629.40	8,808,609.63	4,577.81
S29A-S30	251°26'	21.60	310,608.92	8,808,602.75	4,578.08
S30-S31	264°31'	7.90	310,601.06	8,808,602.00	4,578.22
S31-S32	298°31'	4.50	310,597.11	8,808,604.15	4,578.31
S32-S33	331°26'	23.21	310,586.01	8,808,624.53	4,578.46
S33-S34	331°26'	26.95	310,573.12	8,808,648.20	4,578.85
S34-S34A	331°26'	3.25	310,571.57	8,808,651.05	4,578.89
S34A-F		6.70			
S28-S29A			310,629.40	8,808,609.63	4,577.81
F		15.0			

(2)

(2) Crosscut - 1

Survey Point	Direction	Horizontal Distance (m)	Coordinate (m)		Elevation (m)
			Longitude	Latitude	
S-24-SX-0			310,698.91	8,808,490.86	4,575.73
SX-0-SX-1	251°11'07"	37.269	310,663.63	8,808,478.38	4,576.49
SX-1-SX-2	251°10'10"	36.950	310,628.66	8,808,466.91	4,577.83
SX-2-SX-3	251°10'10"	39.450	310,591.32	8,808,454.18	4,578.54
SX-3-F		29.331			

(3) Crosscut - 2

Survey Point	Direction	Horizontal Distance (m)	Coordinate (m)		Elevation (m)
			Longitude	Latitude	
S34-S34A			310,571.57	8,808,651.05	4,578.89
S34A-S2S	281°26'	10.75	310,561.03	8,808,653.18	4,579.14
S2S-S3S	251°26'	22.10	310,540.08	8,808,646.14	4,579.62
S3S-S4S	251°26'	29.92	310,511.72	8,808,636.61	4,579.67
S4S-F		18.10			
S33-S34			310,573.12	8,808,648.20	4,578.85
F		9.70			

APPENDICES
PART III
GEOLOGICAL DATA

LIST OF APPENDICES

- A. III-1 Assay Results
- A. III-2 Summary of Microscopic Observation
- A. III-3 Microscopic Observation of Polished Sections
- A. III-4 Microphotograph
- A. III-5 Summary of X-Ray Diffraction Analysis
- A. III-6 X-Ray Diffraction Chart

A. III-1 Assay Results (1) Drilling Core

(1)

No.	Sample No.	Depth (m)	Length (m)	Rock Type	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Note
401	IC-10-087	86.8- 88.0	1.2	Cu	0.01	0.01	0.32	12	
402	IC-10-093	92.5- 93.8	1.3	Py	0.01	0.07	0.21	30	
403	IC-10-147	145.1-149.3	4.2	Sid	0.15	0.22	1.00	10	
404	IC-10-150	149.3-151.7	2.4	Do	0.02	0.05	0.60	4	
405	IC-10-153	151.7-153.5	1.8	Hm	0.96	0.02	0.16	5	
406	IC-10-156	153.9-158.6	4.7	Cu	0.08	0.07	0.11	6	
407	IC-10-162	161.6-163.3	1.7	Hm	1.09	0.05	0.16	8	
408	IC-10-164	163.3-165.4	2.1	Cu	0.14	0.02	0.20	10	
409	IC-10-170	168.6-170.6	2.0	Hm	0.02	0.03	0.18	4	
410	IC-10-172	170.6-172.6	2.0	Hm	0.02	0.07	0.36	3	
411	IC-10-174	172.6-174.6	2.0	Hm	1.57	0.02	0.07	8	
412	IC-10-176	174.6-177.5	2.9	Sh	0.03	0.02	0.35	5	
413	IC-10-178	177.5-180.3	2.8	Do	0.01	1.42	0.70	38	
414	IC-11-107	105.5-107.2	1.7	Do	0.01	0.06	0.88	45	
415	IC-11-108	107.2-108.4	1.2	Ore	0.01	3.60	6.80	20	
416	IC-11-109	108.4-109.6	1.2	Ore	0.03	4.00	6.40	31	
417	IC-11-110	109.6-111.5	1.9	Ore	0.15	7.60	11.20	62	
418	IC-11-112	111.5-113.4	1.9	Ore	0.01	3.20	7.30	35	
419	IC-11-114	113.4-115.4	2.0	Ore	0.01	3.40	7.20	38	
420	IC-11-116	115.4-116.4	1.0	Ore	0.04	4.10	37.7	35	*
421	IC-11-117	116.4-117.4	1.0	Ore	0.03	3.60	32.2	44	*
422	IC-11-118	117.4-118.4	1.0	Ore	0.09	0.64	46.5	74	*
423	IC-11-119	118.4-119.4	1.0	Ore	0.00	0.98	29.8	34	
424	IC-11-120	119.4-120.4	1.0	Ore	0.02	0.45	21.0	27	
425	IC-11-121	120.4-121.4	1.0	Ore	0.05	0.43	34.9	38	*
426	IC-11-122	121.4-122.4	1.0	Ore	0.06	1.28	47.1	61	*
427	IC-11-123	122.4-123.4	1.0	Ore	0.06	0.42	51.8	59	*
428	IC-11-124	123.4-124.5	1.1	Ore	0.06	0.63	50.4	51	*
429	IC-11-125	124.5-125.6	1.1	Ore	0.03	2.46	15.0	25	
430	IC-11-126	125.6-126.8	1.2	Ore	0.04	4.00	12.6	26	
431	IC-11-129	128.3-130.2	1.9	Ore	0.03	3.90	10.0	23	
432	IC-11-131	130.2-132.0	1.8	Ore	0.04	3.60	24.0	25	
433	IC-11-133	132.0-133.9	1.9	Ore	0.06	4.80	29.6	27	
434	IC-11-135	133.9-138.8	4.9	Ald	0.10	0.20	5.90	19	
435	IC-11-140	138.8-146.5	7.7	Sid	0.05	0.98	6.30	5	
436	IC-11-158	156.6-160.7	4.1	Do	0.00	0.08	0.77	4	
437	IC-11-162	160.7-164.8	4.1	Do	0.05	0.75	4.15	4	
438	IC-11-166	164.8-166.7	1.9	Ore	0.03	6.10	29.50	41	
439	IC-11-167	166.7-167.7	1.0	Ore	0.01	0.24	0.80	9	
440	IC-11-172	169.2-173.3	4.1	Py	0.01	0.09	2.35	6	
441	IC-11-176	173.3-177.4	4.1	Py	0.00	0.10	2.00	7	
442	IC-12-145	144.3-145.5	1.2	Ore	0.02	0.35	15.0	15	
443	IC-12-146	145.5-146.5	1.0	Ore	0.05	0.15	3.6	2	
444	IC-12-147	146.5-147.5	1.0	Ore	0.01	3.45	18.0	82	
445	IC-12-148	147.5-148.5	1.0	Ore	0.02	7.90	20.6	55	
446	IC-12-149	148.5-149.5	1.0	Ore	0.03	1.65	8.2	86	
447	IC-12-150	149.5-150.5	1.0	Ore	0.02	1.08	12.2	20	*
448	IC-12-151	150.5-151.5	1.0	Ore	0.01	1.26	8.0	22	
449	IC-12-152	151.5-152.5	1.0	Ore	0.01	1.62	3.9	27	
450	IC-12-153	152.5-153.5	1.0	Ore	0.01	2.55	9.0	44	

(2)

No.	Sample No.	Depth (m)	Length (m)	Rock Type	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Note
451	IC-12-154	153.5-154.5	1.0	Ore	0.01	1.90	4.5	38	
452	IC-12-155	154.5-155.5	1.0	Ore	0.01	1.26	4.8	30	
453	IC-12-156	155.5-156.5	1.0	Ore	0.00	0.77	5.4	41	
454	IC-12-157	156.5-157.5	1.0	Ore	0.00	1.20	3.9	22	
455	IC-12-158	157.5-158.5	1.0	Ore	0.01	1.88	1.0	23	
456	IC-12-159	158.5-159.5	1.0	Ore	0.00	1.50	4.6	19	
457	IC-12-160	159.5-160.5	1.0	Ore	0.01	2.12	6.3	22	
458	IC-12-161	160.5-161.5	1.0	Ore	0.01	5.50	12.0	133	
459	IC-12-162	161.5-162.5	1.0	Ore	0.01	12.40	37.3	709	*
460	IC-12-163	162.5-163.5	1.0	Ore	0.04	4.70	40.6	182	*
461	IC-12-164	163.5-164.5	1.0	Ore	0.09	2.40	39.6	156	*
462	IC-12-165	164.5-165.5	1.0	Ore	0.62	0.12	46.1	73	*
463	IC-12-166	165.5-166.5	1.0	Ore	1.78	0.03	54.1	104	*
464	IC-12-167	166.5-167.5	1.0	Ore	1.98	0.07	49.0	131	*
465	IC-12-168	167.5-168.5	1.0	Ore	0.69	0.08	40.4	158	*
466	IC-12-169	168.5-169.5	1.0	Ore	1.04	0.06	56.3	172	*
467	IC-12-170	169.5-170.5	1.0	Ore	0.08	0.07	52.0	136	*
468	IC-12-171	170.5-171.5	1.0	Ore	0.15	0.17	49.0	79	*
469	IC-12-172	171.5-172.5	1.0	Ore	0.03	13.50	31.8	64	*
470	IC-12-173	172.5-173.5	1.0	Ore	0.02	3.00	43.5	67	*
471	IC-12-174	173.5-174.5	1.0	Ore	0.06	1.75	41.8	83	*
472	IC-12-175	174.5-175.5	1.0	Ore	0.18	6.80	45.7	22	*
473	IC-12-176	175.5-176.5	1.0	Ore	0.15	1.43	28.8	66	
474	IC-12-177	176.5-177.5	1.0	Ore	0.04	2.98	20.4	45	
475	IC-12-178	177.5-178.5	1.0	Ore	0.03	4.00	16.8	41	
476	IC-12-179	178.5-179.5	1.0	Ore	0.03	2.60	34.9	36	*
477	IC-12-180	179.5-180.5	1.0	Ore	0.06	4.25	28.6	52	*
478	IC-12-182	180.5-182.3	1.8	Do	0.04	0.28	6.0	4	
479	IC-12-183	182.3-183.5	1.2	Ore	0.07	4.45	27.0	7	
480	IC-12-184	183.5-184.5	1.0	Sh	0.00	0.01	0.6	7	
481	IC-12-185	184.5-185.5	1.0	Sh	0.02	0.12	9.0	20	
482	IC-12-190	189.0-190.6	1.6	Ald	0.08	0.05	10.5	20	
483	IC-12-206	204.2-206.5	2.3	Po	0.01	0.24	1.18	30	
484	IC-12-208	206.5-208.8	2.3	Po	0.04	0.06	1.00	30	
485	IC-12-217	216.3-218.5	2.2	Py	0.01	0.06	0.18	40	
486	IC-13-166	165.5-170.5	5.0	Py	0.06	0.02	0.19	30	
487	IC-13-171	170.5-175.5	5.0	Py	0.24	0.03	0.26	50	
488	IC-13-229	227.2-229.0	1.8	Py	0.04	0.00	0.05	10	
489	IC-13-231	230.6-231.9	1.3	Hm	0.25	0.00	0.47	30	
490	IC-14-037	86.6- 38.4	1.8	Ss	0.05	0.02	4.60	2	*
491	IC-14-047	45.0- 50.0	5.0	Ald	0.35	0.02	0.03	30	
492	IC-14-052	50.0- 55.0	5.0	Py	0.01	0.03	0.48	50	
493	IC-14-057	55.0- 60.0	5.0	Py	0.05	0.02	0.17	44	
494	IC-14-062	60.0- 65.0	5.0	Py	0.08	0.02	0.09	30	
495	IC-14-067	65.0- 70.0	5.0	Py	0.09	0.01	0.04	28	
496	IC-14-072	70.0- 75.0	5.0	Py	0.02	0.01	0.05	41	
497	IC-14-077	75.0- 80.0	5.0	Py	0.63	0.06	0.08	63	
498	IC-14-082	80.0- 85.0	5.0	Py	0.48	0.02	0.04	40	
499	IC-14-087	85.0- 90.0	5.0	Py	0.14	0.04	0.32	70	
500	IC-14-092	90.0- 95.0	5.0	Py	0.50	0.01	0.08	40	

(3)

No.	Sample No.	Depth (m)	Length (m)	Rock Type	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Note
501	IC-14-097	95.0- 98.2	3.2	Ald	0.35	0.01	0.44	30	
502	IC-14-099	98.2-100.7	2.5	Sh	0.66	0.01	0.80	20	
503	IC-14-101	100.7-102.4	1.7	Ore	0.43	0.02	17.5	30	
504	IC-14-108	107.1-108.3	1.2	Ore	0.02	0.01	8.9	5	*
505	IC-14-109	108.3-110.1	1.8	Sh	0.04	0.04	5.3	12	
506	IC-14-111	110.1-111.9	1.8	Sh	0.12	0.07	16.6	25	
507	IC-14-113	111.9-113.9	2.0	Ald	0.01	0.03	8.6	25	
508	IC-14-115	113.9-115.1	1.2	Ore	0.18	0.07	20.8	40	
509	IC-14-116	115.1-116.4	1.3	Sh	0.14	0.00	10.9	20	
510	IC-14-117	116.4-117.4	1.0	Ore	0.23	0.08	24.7	50	*
511	IC-14-118	117.4-118.4	1.0	Ore	0.19	0.01	24.0	30	*
512	IC-14-119	118.4-119.4	1.0	Ore	0.23	0.07	29.0	30	*
513	IC-14-120	119.4-120.4	1.0	Ore	0.15	0.32	23.0	60	
514	IC-14-121	120.4-121.5	1.1	Ore	0.23	0.87	23.0	50	
515	IC-14-122	121.5-122.6	1.1	Ore	0.35	0.28	24.3	60	*
516	IC-14-123	122.6-123.7	1.1	Ore	0.73	0.07	17.7	40	
517	IC-14-124	123.7-124.8	1.1	Py	3.02	0.05	0.36	80	
518	IC-14-131	130.0-131.6	1.6	Ald	0.06	0.03	2.38	10	
519	IC-14-132	131.6-132.7	1.1	Ore	0.36	0.06	32.8	30	*
520	IC-14-133	132.7-133.8	1.1	Ore	0.19	0.05	29.2	25	
521	IC-15-058	57.9- 59.9	2.0	Cu	0.06	0.01	0.08	6	
522	IC-15-060	59.9- 61.9	2.0	Cu	0.15	0.00	0.15	15	
523	IC-15-062	61.9- 63.9	2.0	Py	0.13	0.01	0.04	15	
524	IC-15-092	90.0- 93.2	3.2	Py	0.13	0.00	0.14	15	
525	IC-15-094	93.2- 97.2	4.0	Hm	0.07	0.01	0.80	15	
526	IC-15-098	97.2- 98.8	1.6	Cu	1.89	0.01	0.81	20	
527	IC-15-100	98.8-100.2	1.4	Cu	0.15	0.01	0.14	50	
528	IC-15-139	138.0-140.9	2.9	Py	0.03	0.21	2.71	18	
529	IC-15-141	140.9-143.8	2.9	Py	0.04	0.24	2.48	20	
530	IC-15-143	143.8-145.0	1.2	Do	0.12	0.02	8.31	20	
531	IC-16-050	50.0- 55.0	5.0	Ald	0.03	0.00	0.04	5	
532	IC-16-055	55.0- 60.0	5.0	Ald	0.64	0.00	0.26	4	
533	IC-16-060	60.0- 65.0	5.0	Ald	0.03	0.01	0.08	4	
534	IC-16-065	65.0- 70.0	5.0	Py	0.05	0.01	0.17	4	
535	IC-16-070	70.0- 75.0	5.0	Py	0.10	0.00	0.00	10	
536	IC-16-075	75.0- 80.0	5.0	Py	0.05	0.00	0.04	5	
537	IC-16-080	80.0- 85.0	5.0	Py	0.06	0.00	0.53	5	
538	IC-16-085	85.0- 91.0	6.0	Py	0.03	0.00	0.16	5	
539	IC-16-092	91.0- 93.0	2.0	Spc	0.11	0.01	0.07	4	
540	IC-16-094	93.0- 95.0	2.0	Spc	0.23	0.01	0.06	4	
541	IC-16-096	95.0- 97.0	2.0	Spc	0.32	0.01	0.15	4	
542	IC-16-098	97.0- 99.0	2.0	Spc	0.67	0.04	0.23	6	
543	IC-16-100	99.0-101.3	2.3	Spc	0.13	0.00	0.04	4	
544	IC-16-102	101.3-104.8	3.5	Py	0.06	0.03	0.13	5	
545	IC-16-130	129.0-130.5	1.5	Ald	0.06	0.01	3.50	5	
546	IC-16-131	130.5-131.8	1.3	Ald	0.05	0.01	9.00	7	
547	IC-16-132	131.8-132.8	1.0	Ald	0.58	0.02	2.75	2	
548	IC-16-133	132.8-133.6	0.8	Ald	0.01	0.04	0.03	7	
549	IC-16-135	133.6-138.5	4.9	Py	0.80	0.13	0.25	30	
550	IC-16-140	138.5-143.4	4.9	Py	0.65	0.19	0.59	20	

(4)

No.	Sample No.	Depth (m)	Length (m)	Rock Type	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Note
551	IC-17-089	88.4- 90.8	2.4	Py	0.34	0.00	0.53	6	
552	IC-17-091	90.8- 92.8	2.0	Hm	1.18	0.01	0.04	10	
553	IC-17-093	92.8- 94.8	2.0	Hm	0.17	0.01	0.04	6	
554	IC-17-095	94.8- 96.8	2.0	Hm	1.02	0.00	0.02	6	
555	IC-17-097	96.8- 98.2	1.4	Mt	1.18	0.00	0.18	15	
556	IC-17-099	98.2- 99.5	1.3	Mt	1.67	0.01	0.10	15	
557	IC-17-104	103.5-104.8	1.3	Mt	0.50	0.01	0.08	8	
558	IC-17-106	105.5-110.5	5.0	Py	0.02	0.01	0.03	5	
559	IC-17-111	110.5-115.5	5.0	Py	0.03	0.03	0.20	4	
560	IC-17-116	115.5-120.5	5.0	Py	0.21	0.01	0.11	6	
561	IC-17-121	120.5-125.5	5.0	Py	0.04	0.01	0.06	5	
562	IC-17-127	127.3-127.7	0.4	Ore	9.00	0.00	38.40	11	*
563	IC-17-132	131.8-133.0	1.2	Py	0.09	0.00	0.80	6	
564	IC-17-133	133.0-134.2	1.2	Py	0.30	0.01	0.56	6	
565	IC-17-140	140.0-141.0	1.0	Ore	0.42	0.00	22.00	8	
566	IC-18-070	70.0- 75.0	5.0	Gos	0.02	0.01	0.06	10	
567	IC-18-075	75.0- 80.0	5.0	Gos	0.08	0.01	0.31	6	
568	IC-18-080	80.0- 85.0	5.0	Gos	0.09	0.01	0.10	8	
569	IC-18-085	85.0- 90.0	5.0	Py	0.06	0.01	0.18	6	
570	IC-18-090	90.0- 95.4	5.4	Py	0.30	0.01	0.12	4	
571	IC-18-096	95.4- 96.9	1.5	Py	0.22	0.00	0.12	4	
572	IC-18-097	96.9- 98.5	1.6	Cu	7.46	0.05	26.66	13	
573	IC-18-099	98.5- 99.9	1.4	Cu	0.95	0.02	27.49	8	
574	IC-18-101	99.9-101.8	1.9	Sk	0.40	0.01	13.00	5	
575	IC-18-102	101.8-102.8	1.0	Py	0.39	0.01	25.50	5	
576	IC-18-103	102.8-103.8	1.0	Ore	3.06	0.02	34.60	14	*
577	IC-18-104	103.8-104.8	1.0	Ore	1.09	0.01	31.60	8	*
578	IC-18-105	104.8-105.8	1.0	Ore	0.46	0.00	29.80	6	*
579	IC-18-106	105.8-106.8	1.0	Ore	0.51	0.01	22.49	10	
580	IC-18-107	106.8-107.8	1.0	Ore	0.32	0.01	20.83	10	
581	IC-18-108	107.8-108.8	1.0	Ore	0.77	0.01	39.00	10	*
582	IC-18-109	108.8-109.8	1.0	Ore	0.78	0.00	32.00	10	*
583	IC-18-110	109.8-110.8	1.0	Ore	0.75	0.00	24.16	10	
584	IC-18-112	110.8-112.4	1.6	Sk	0.24	0.03	5.25	4	
585	IC-18-113	112.4-114.0	1.6	Sk	0.15	0.00	8.00	4	
586	IC-18-115	114.0-115.3	1.3	Sk	0.48	0.01	16.62	7	
587	IC-18-116	115.3-116.4	1.1	Mt	1.71	0.01	1.09	14	
588	IC-18-117	116.4-118.0	1.6	Sk	0.26	0.04	6.00	6	
589	IC-18-119	118.0-119.1	1.1	Ore	0.51	0.01	28.33	13	
590	IC-18-120	119.1-120.2	1.1	Ore	0.36	0.01	11.66	8	
591	IC-18-121	120.2-121.2	1.0	Ore	4.20	0.01	25.83	10	
592	IC-18-122	121.2-122.2	1.0	Ore	1.18	0.00	14.50	4	
593	IC-18-125	124.2-125.5	1.3	Cu	2.44	0.00	17.50	8	
594	IC-18-126	125.5-126.8	1.3	Cu	0.58	0.01	0.22	6	
595	IC-18-131	130.4-131.1	0.7	Py	0.10	0.01	0.05	6	
596	IC-18-132	131.1-132.0	0.9	Sh	1.13	0.01	5.20	10	
597	IC-18-133	132.5-134.5	2.0	Sh	0.08	0.01	0.26	2	
598	IC-18-139	137.7-140.0	2.3	Sh	0.10	0.01	0.07	3	
599	IC-18-141	140.0-142.4	2.4	Sh	0.05	0.01	0.05	5	
600	IC-18-143	142.4-143.3	0.9	Ald	0.07	0.01	0.16	3	

(5)

No.	Sample No.	Depth (m)	Length (m)	Rock Type	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Note
601	IC-19-145	144.0-149.0	5	Gos	0.05	0.3	0.8	38	**
602	IC-19-150	149.0-154.0	5	Ald	0.25	0.1	1.2	10	**
603	IC-19-155	154.0-159.0	5	Ald	1.57	0.1	1.4	10	**
604	IC-19-160	159.0-164.3	5.3	Ald	0.41	0.1	2.2	10	**
605	IC-19-165	164.3-168.7	4.4	Py	0.17	0.1	2.7	10	**
606	IC-19-170	168.7-173.9	5.2	Py	0.12	0.1	0.3	7	**
607	IC-19-175	178.2-179.7	1.5	Py	0.02	0.1	0.2	10	**
608	IC-19-180	179.7-184.0	4.3	Ald	0.06	0.1	0.3	7	**
609	IC-19-185	184.0-187.0	3.0	Ald	0.04	0.0	0.1	10	**
610	IC-19-190	187.0-193.9	6.9	Sh	0.03	0.1	0.2	69	**

Ore: Pb-Zn ore Spc: Specularite
Cu: Cu ore Hm: Hematite
Py: Pyrite Ald: Altered rock
Po: Pyrrhotite Sid: Siderite
Mt: Magnetite Do: Dolomite
 Sh: Shale
 Alt: Alternation
 Sk: Skarn
 Gos: Gossan

Non-mark: All elements were assayed by INGEMMET Lab.

* : Assayed by INGEMMET Lab., but only Zn was assayed by Plenge

** : All elements were assayed by Plenge

A. III-1 Assay Results (2) Tunnelling Sample

(1)

No.	Sample No.	Depth (m)	Length (m)	Rock Type	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Note
701	CN-5-34	80 - 81	1	Py	1.40	0.03	0.07	50	N-CX1
702	CN-5-35	81 - 82	1	Py	0.53	0.01	0.14	13	
703	CN-6-01	82 - 83	1	Py	0.08	0.03	0.12	11	
704	CN-6-03	84 - 85	1	Py	3.06	0.03	0.11	26	
705	CN-6-25	106 - 107	1	Py	0.32	0.01	0.25	11	
706	CN-6-27	108 - 109	1	Py	0.99	0.01	0.05	6	
707	NN-098	98 - 99	1	Py	0.03	0.01	0.08	8	N-CX2
708	NN-100	100 - 101	1	Py	0.03	0.01	0.06	6	
709	NN-102	102 - 103	1	Py	0.10	0.02	0.04	6	
710	NN-104	104 - 105	1	Py	0.13	0.05	0.16	11	
711	NN-108	108 - 109	1	Py	0.24	0.05	0.10	16	
712	NN-112	112 - 113	1	Py	5.63	0.34	0.15	40	
713	NN-116	116 - 117	1	Py	0.19	0.06	0.13	19	
714	NN-120	120 - 121	1	Py	0.56	0.37	1.50	11	
715	NN-122	122 - 123	1	Py	1.38	1.05	1.79	70	
716	NN-124	124 - 125	1	Py	0.67	0.58	9.38	42	
717	NN-126	126 - 127	1	Py	0.67	0.10	9.25	11	
718	NN-128	128 - 129	1	Ald	1.72	0.04	0.30	12	
719	NN-130	130 - 131	1	Ald	0.33	0.33	1.64	13	
720	NN-132	132 - 133	1	Ald	0.03	0.01	0.03	30	
721	NN-134	134 - 135	1	Alt	0.06	0.02	0.03	20	
722	NN-136	136 - 137	1	Alt	0.86	0.02	0.10	20	
723	NN-138	138 - 139	1	Py	0.05	0.01	0.04	7	
724	NN-140	140 - 141	1	Py	0.87	0.01	2.93	6	
725	NN-123S	123 - 124	1	Py	0.07	0.01	0.15	63	
726	NN-125S	125 - 126	1	Py	1.38	0.56	1.93	40	
727	NN-127S	127 - 128	1	Ald	0.09	0.06	0.19	4	
728	NN-129S	129 - 130	1	Ald	0.93	0.05	0.87	10	
729	NN-131S	131 - 132	1	Ald	0.10	0.01	0.13	8	
730	NN-169S	169 - 170	1	Hm	0.65	0.04	0.27	20	
731	SX-052	52.0- 53.0	1	Py	0.16	tr	tr	97	S-CX1**
732	SX-055	54.5- 55.5	1	Py	0.12	nd	tr	19	**
733	SX-057	57.0- 58.0	1	Ald	0.27	nd	0.1	14	**
734	SX-062	62.0- 63.0	1	Py	0.17	tr	0.2	15	**
735	SX-065	64.5- 65.5	1	Py	0.33	tr	tr	13	**
736	SX-067	67.0- 68.0	1	Py	0.08	tr	0.1	24	**
737	SX-070	69.5- 70.5	1	Py	0.09	0.1	0.1	46	**
738	SX-072	72.0- 73.0	1	Py	0.06	tr	0.2	24	**
739	SX-075	74.5- 75.5	1	Py	0.27	tr	tr	7	**
740	SX-077	77.0- 78.0	1	Py	0.14	tr	tr	6	**
741	SX-080	79.5- 80.5	1	Py	0.06	nd	tr	4	**
742	SX-082	82.0- 83.0	1	Py	0.36	tr	tr	6	**
743	SX-085	84.5- 85.5	1	Ald	0.65	nd	tr	13	**
744	SX-087	87.0- 88.0	1	Py	0.01	tr	tr	7	**
745	SX-090	90.0- 91.0	1	Ald	0.01	nd	tr	17	**
746	SX-095	94.5- 95.5	1	Hm	0.03	tr	0.1	66	**
747	SX-099	98.5- 99.5	1	Ald	0.05	tr	0.1	3	**
748	SX-124	124.0-125.0	1	Py	7.00	0.1	0.1	76	**
749	SX-129	129.0-130.0	1	Py	0.04	tr	0.3	21	**
750	SX-131	131.0-132.0	1	Ald	0.04	tr	1.0	4	**

(2)

No.	Sample No.	Depth (m)	Length (m)	Rock Type	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Note
751	SX-134	133.5-134.5	1	Do	0.01	tr	0.5	4	**
752	S34-06	5.4- 6.4	1	Do	0.09	15.6	19.2	143	S-CX2**
753	S34-07	6.4- 7.4	1	Do	0.04	2.3	5.6	26	**
754	S34-08	7.4- 8.4	1	Ore	0.03	5.8	9.1	53	**
755	S34-09	8.4- 9.4	1	Ore	0.08	2.7	41.2	118	**
756	S34-10	9.4- 10.4	1	Ore	0.08	2.2	36.7	121	**
757	S34-11	10.4- 11.4	1	Ore	0.07	4.3	30.2	233	**
758	S2S-01	0.2- 1.2	1	Ore	0.11	0.5	36.3	139	**
759	S2S-02	1.2- 2.2	1	Ore	0.35	0.4	44.3	168	**
760	S2S-03	2.2- 3.2	1	Ore	0.42	0.3	46.9	177	**
761	S2S-04	3.2- 4.2	1	Ore	0.50	0.4	45.5	179	**
762	S2S-05	4.2- 5.2	1	Ore	0.50	0.7	50.8	198	**
763	S2S-06	5.2- 6.2	1	Ore	0.19	1.9	38.8	163	**
764	S2S-07	6.2- 7.2	1	Ore	0.05	6.7	20.0	146	**
765	S2S-08	7.2- 8.2	1	Ore	0.09	7.1	25.1	293	**
766	S2S-09	8.2- 9.2	1	Ore	0.05	9.9	26.9	400	**
767	S2S-10	9.2- 10.2	1	Ore	0.03	7.0	19.9	157	**
768	S2S-11	10.2- 11.2	1	Ore	0.04	5.8	19.4	138	**
769	S2S-12	11.2- 12.2	1	Ore	0.11	2.9	20.5	52	**
770	S2S-13	12.2- 13.2	1	Py	0.11	2.2	4.5	76	**
771	S34-05S	4.4- 5.4	1	Do	0.05	0.7	4.0	34	**
772	S34-06S	5.4- 6.4	1	Do	0.02	0.5	1.8	15	**
773	S34-07S	6.4- 7.4	1	Do	0.04	2.0	4.5	92	**
774	S34-08S	7.4- 8.4	1	Ore	0.04	2.4	27.5	118	**
775	S34-09S	8.4- 9.4	1	Ore	0.06	2.6	6.7	42	**
776	S34-10S	9.4- 10.4	1	Ore	0.16	0.2	34.1	94	**
777	S2S-01S	0.2- 1.2	1	Ore	0.23	0.7	32.2	110	**
778	S2S-02S	1.2- 2.2	1	Ore	0.46	0.2	48.6	161	**
779	S2S-03S	2.2- 3.2	1	Ore	0.57	0.3	51.6	187	**
780	S2S-04S	3.2- 4.2	1	Ore	0.17	0.4	46.3	181	**
781	S2S-05S	4.2- 5.2	L	Ore	0.10	4.1	31.0	174	**
782	S2S-06S	5.2- 6.2	1	Ore	0.04	2.5	8.9	95	**
783	S2S-07S	6.2- 7.2	1	Ore	0.05	9.4	28.4	619	**
784	S2S-08S	7.2- 8.2	1	Ore	0.08	8.3	33.9	651	**
785	S2S-09S	8.2- 9.2	1	Ore	0.06	7.4	30.5	216	**
786	S2S-10S	9.2- 10.2	1	Ore	0.05	4.1	17.3	76	**
787	S2S-11S	10.2- 11.2	1	Py	0.06	1.4	6.3	70	**
788	S2S-12S	11.2- 12.2	1	Py	0.14	2.1	6.6	24	**
789	S3S-29	29.0- 30.0	1	Ore	0.05	0.9	6.2	80	**
790	S3S-30	30.0- 31.0	1	Ore	0.15	6.4	34.8	57	**
791	S3S-31	31.0- 32.0	1	Ore	0.18	0.5	18.1	23	**
792	S3S-32	32.0- 33.0	1	Ore	0.04	5.1	6.0	23	**
793	S3S-33	33.0- 34.0	1	Ore	0.13	3.8	6.0	26	**
794	S3S-34	34.0- 35.0	1	Ore	0.10	0.4	17.4	13	**
795	S3S-35	35.0- 36.0	1	Ore	0.06	0.2	9.3	9	**
796	S3S-30S	29.6- 30.6	1	Ore	0.03	2.3	5.6	11	**
797	S3S-31S	30.6- 31.6	1	Ore	0.04	0.7	3.3	10	**
798	S3S-32S	31.6- 32.6	1	Ore	0.06	0.7	21.9	12	**
799	S3S-33S	32.6- 33.6	1	Ore	0.03	6.0	7.0	22	**
800	S3S-34S	33.6- 34.6	1	Ore	0.14	4.5	5.4	22	**

A. III-1 Assay Results (3) Check Assay

No.	Sample No.	INGEMMET				Huanzala Mine				Plenge			Remarks
		Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)	Ag (g/t)	Fe (%)	Zn (%)	S (%)	
416	IC-11-109	0.03	4.00	6.4	31	0.04	4.8	5.4	32	17.8	5.2	16.6	
421	IC-11-117	0.03	3.60	32.2	44	0.04	3.6	31.8	44	17.4	32.2	31.8	
426	IC-11-122	0.06	1.28	44.4	61	0.07	1.4	47.2	56	12.5	47.1	32.1	
431	IC-11-129	0.03	3.90	10.0	23	0.06	3.5	8.0	24	30.9	7.2	31.8	
441	IC-11-176	0.00	0.10	2.0	7	0.02	0.1	2.2	8	40.4	1.8	41.2	
446	IC-12-149	0.03	1.65	8.2	86	0.04	1.5	7.4	24	32.2	6.7	34.1	
451	IC-12-154	0.01	1.90	4.5	38	0.02	1.5	3.4	32	44.7	2.9	30.1	
456	IC-12-159	0.00	1.50	4.6	19	0.02	1.2	3.4	16	27.5	3.2	18.9	
461	IC-12-164	0.09	2.40	42.0	156	0.09	2.1	40.7	140	5.5	39.6	23.7	
463	IC-12-166	1.78	0.03	66.0	104	1.70	0.1	55.1	100	5.5	54.1	31.0	
466	IC-12-169	1.04	0.06	70.0	172	0.96	0.1	56.2	156	5.4	56.3	31.2	
468	IC-12-171	0.15	0.17	52.0	79	0.15	0.2	49.4	76	6.7	49.0	29.9	
471	IC-12-174	0.06	1.75	39.0	83	0.08	1.9	42.2	76	12.9	41.8	32.8	
476	IC-12-179	0.03	2.60	36.0	36	0.04	2.5	35.6	32	12.7	34.9	27.1	
481	IC-12-185	0.02	0.12	9.0	20	0.05	0.3	7.8	12	17.4	6.6	4.6	
491	IC-14-047	0.35	0.02	0.0	30	0.08	0.1	0.4	9	23.2	0.2	25.5	
501	IC-14-097	0.35	0.01	0.4	30	0.36	0.1	1.1	24	16.2	0.5	5.1	
506	IC-14-111	0.12	0.07	16.6	25	0.13	0.1	15.3	20	11.8	14.4	8.5	
511	IC-14-118	0.19	0.01	30.3	30	0.22	0.1	25.5	40	26.4	24.0	38.0	
516	IC-14-123	0.73	0.07	17.7	40	0.72	0.1	14.5	44	33.6	13.4	42.0	
571	IC-18-096	0.22	0.00	0.1	4	0.23	0.0	0.2	4	32.8	0.3	36.4	
576	IC-18-103	3.06	0.02	42.5	14	3.10	0.0	35.5	12	11.6	34.6	29.1	
581	IC-18-108	0.77	0.01	45.0	10	0.79	0.0	39.1	8	9.0	39.0	26.0	
586	IC-18-115	0.48	0.01	16.6	7	0.48	0.0	15.3	8	25.0	13.4	8.7	
591	IC-18-121	4.20	0.01	25.8	10	4.30	0.0	21.9	8	18.5	21.3	29.1	

A. III-2 Summary of Microscopic Observation

Minerals		Sample No.	Type	Sphalerite	Sphalerite *	Galena	Chalcopyrite	Bornite	Enargite	Tennantite	Chalcoite	Covellite	Gersdorffite	Pyrite	Marcasite	Pyrrhotite	Magnetite	Hematite	Limonite	Remarks
		IC-11-111	Pb-Zn-Py ore	⊙	○	○								○	○	○				Mar replaces Py
		IC-11-120	Zn-Py ore	⊙	○	○	•							⊙		•				
		IC-12-156	Zn-Py-Po ore	○	○	○								○		⊙				Po is massive
		IC-12-162	Pb-Zn ore	⊙	○	○								○		•				
		IC-12-163	Pb-Zn ore	⊙	○	○								○		○				Po is dots in Sp
		IC-12-167	Zn ore	⊙	⊙	○	○						•	○						Gf is with Py
		IC-12-170	Zn ore	⊙	○	○	○							○						
		IC-12-174	Pb-Zn ore	⊙	○	○	•							○						
		IC-12-178	Pb-Zn-Py ore	⊙	○	○								○		○				Po is fgd in Sp
		IC-12-183	Pb-Zn-Py ore	⊙	○	○								○		○				Po is in Gl
		IC-14-115	Zn ore	○	○	○	○										⊙			Mt is anhedral, aggr. and diss.
		IC-14-118	Zn ore	○	○	○	○							○			○	•		
		IC-14-133	Zn-Py ore	○	○	○	○							○						
		IC-15-086	Eng-Py ore				○	○	⊙		○			○						Eng is between gangue m.
		IC-15-100	Cp-Py ore				⊙							○				○	○	Hm is tabular and needle
		IC-17-098	Mt ore				○							○	○		⊙			Banding str.
		IC-17-128	Zn diss ore	○	○	○	○							○						
		IC-18-125	Zn-Py ore	○	○	○	○				○			⊙						
		CN-6-12	Cp-Py ore				⊙							⊙		•				
		NN-105	Cc ore	○	○	○	○	○				○		⊙						Ten is with Cp, in Sp

⊙ abundant ○ common ○ fairly ○ rare * Sphalerite with Chalcopyrite dots

A. III-3 Microscopic Observation of Polished Sections

(1)

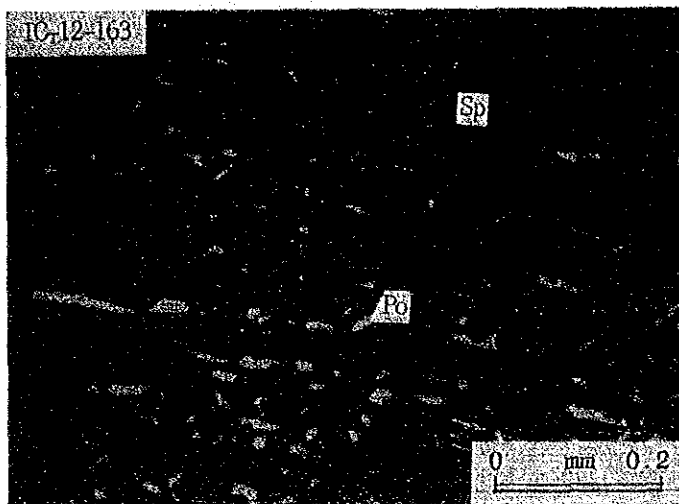
Sample No.	Rock Type	Observation Note
IC-11-111	Pb-Zn-Py ore	Ore minerals are composed of great amount of sphalerite, moderate amount of pyrite, marcasite and galena with minor amount of pyrrhotite. Sphalerite is in massive form, containing small dots of pyrrhotite. Galena is porphyritically distributed around sphalerite in many cases. Pyrite is euhedral ~ anhedral and is in aggregates. Marcasite is seen to have replaced pyrite in parts. Pyrrhotite is found in dots and is contained in sphalerite and pyrite.
IC-11-120	Zn-Py ore	Ore minerals are composed of great amount of pyrite, large amount of sphalerite, small amount of galena and slight amount of chalcopyrite and pyrrhotite. Pyrite is euhedral ~ anhedral and is found in aggregates. Sphalerite is recognized to occur in spaces between pyrite grains, containing slight amount of dots of chalcopyrite and pyrrhotite. Galena is found in sphalerite, along boundaries between sphalerite and pyrite, and in spaces between pyrite grains.
IC-12-156	Zn-Py-Po ore	Ore minerals are composed of great amount of pyrrhotite, moderate amount of sphalerite and pyrite with small amount of galena. Pyrrhotite constitutes matrix. In some cases pyrite is euhedral and is contained in pyrrhotite while in other cases it is found to have filled cracks of pyrrhotite. Sphalerite and galena are found to be in the space between pyrrhotite grains.
IC-12-162	Pb-Zn ore	Ore minerals are composed of great amount of sphalerite, moderate amount of galena and pyrite with slight amount of pyrrhotite. Sphalerite is found in massive form, containing slight amount of dots of pyrrhotite. Pyrite is euhedral ~ anhedral and is found scattered in sphalerite and in gangue minerals although seams of pyrite and found in parts.
IC-12-163	Pb-Zn ore	Ore minerals are composed of great amount of sphalerite and small amount of galena, pyrite and pyrrhotite. Sphalerite is recognized in massive form. Galena is fine grained and is found contained in sphalerite grains. Pyrite is euhedral, fine grained and is observed to be contained in sphalerite. Pyrrhotite has lattice-like exsolution structure (see photograph).
IC-12-167	Zn ore	Ore minerals are composed of great amount of sphalerite, moderate amount of chalcopyrite and pyrite with slight amount of gersdorffite. Sphalerite is recognized in massive form containing chalcopyrite dots. Chalcopyrite has exsolution structure in dots in sphalerite in some cases, while in other cases it is found in cracks of pyrite, along margins of pyrite or in spaces between sphalerite grains. Pyrite is anhedral and is contained in sphalerite. Gersdorffite is several ten um in diameter, and is associated with pyrite contained in sphalerite (see photograph).
IC-12-170	Zn ore	Ore minerals are composed of great amount of sphalerite, small amount of chalcopyrite and pyrite with slight amount of galena. Sphalerite is recognized in massive form containing chalcopyrite dots. Sphalerite has zonal structure according to dots of chalcopyrite. Chalcopyrite is fine grained and is contained in sphalerite in addition to the one found in dots. Pyrite and galena are also fine grained and are contained in sphalerite.
IC-12-174	Pb-Zn ore	Ore minerals are composed of great amount of sphalerite, moderate amount of galena and pyrite with slight amount of chalcopyrite. Sphalerite is in massive form. Pyrite is euhedral to anhedral and is recognized to be in aggregates in sphalerite. Galena is found to be fine grained or porphyritically in sphalerite (see photograph).
IC-12-178	Pb-Zn-Py ore	Ore minerals are composed of great amount of sphalerite, moderate amount of galena and pyrite with slight amount of pyrrhotite. Sphalerite is found in massive form and in network. Pyrite has bird-eye structure in some parts.

Sample No.	Rock Type	Observation Note
IC-12-183	Pb-Zn-Py ore	<p>Ore minerals are composed of great amount of sphalerite, moderate amount of galena and pyrite with small amount of chalcopyrite and pyrrhotite. Sphalerite is found in massive form. Most of galena and chalcopyrite are recognized to be along boundaries between sphalerite and pyrite. Pyrite has bird-eye structure in parts and has been altered in some way. The order of the crystallization is estimated as below (see photograph).</p> <p>Pyrite Sphalerite Galena Chalcopyrite Pyrrhotite</p>
IC-14-115	Zn-Mt ore	<p>Ore minerals are composed of large amount of sphalerite and magnetite with less amount of galena and chalcopyrite. Sphalerite contains dots of chalcopyrite and is distributed porphyritically. Magnetite is euhedral and is found in aggregates or in dissemination. The crystallization of magnetite is estimated to have been prior to that of sphalerite. Galena is fine grained and is contained in sphalerite.</p>
IC-14-118	Zn ore	<p>Ore minerals are composed of large amount of sphalerite, moderate amount of pyrite, small amount of galena and chalcopyrite with slight amount of hematite. Sphalerite is observed to occur porphyritically, containing chalcopyrite dots. Pyrite is euhedral & anhedral and is contained in sphalerite. Magnetite is recognized to be in gangue minerals or in sphalerite. Hematite is columnar and is found to be in sphalerite or along margins of magnetite. Hematite is estimated to have replaced magnetite.</p>
IC-14-133	Zn-Py ore	<p>Ore minerals are composed of large amount of sphalerite, moderate amount of pyrite and small amount of chalcopyrite. Sphalerite is recognized to be distributed porphyritically, containing chalcopyrite dots. Pyrite is euhedral & anhedral and is found to be contained in sphalerite.</p>
IC-15-086	Eng-Py ore	<p>Ore minerals are composed of large amount of enargite, moderate amount of pyrite and small amount of chalcopyrite, chalcocite, bornite and covellite. Enargite is found to have filled spaces between grains. It contains pyrite and is also observed to have replaced pyrite partly. Chalcopyrite, bornite and chalcocite are recognized to be around enargite or in cracks of enargite. Covellite is found to be along margins of chalcopyrite. Covellite is thought to be one of the secondary minerals.</p>
IC-15-100	Cp-Py ore	<p>Ore minerals are composed of large amount of chalcopyrite, moderate amount of pyrite and small amount of hematite and limonite. Chalcopyrite is distributed porphyritically, containing pyrite.</p>
IC-17-098	Mt ore	<p>Ore minerals are composed of great amount of magnetite and small amount of pyrite, chalcopyrite and hematite. Magnetite is found to be in banded structure and anhedral pyrite is recognized along the cracks parallel to the banding. Chalcopyrite is found to be distributed around pyrite and in cracks of magnetite. Hematite is thought to have replaced magnetite. The order of the crystallization is estimated as below.</p> <p>Magnetite Pyrite Chalcopyrite Hematite</p>
IC-17-128	Zn diss ore	<p>Ore minerals are composed of large amount of sphalerite and small amount of chalcopyrite and pyrite. Sphalerite is disseminated in banded form and it contains dots of chalcopyrite. Pyrite is recognized to be distributed around sphalerite and therefore the crystallization of pyrite is thought to have been later than that of sphalerite.</p>
IC-18-125	Zn-Py ore	<p>Ore minerals are composed of large amount of pyrite, moderate amount of sphalerite and small amount of chalcopyrite and chalcocite. Pyrite is euhedral to anhedral and is found in aggregates. Sphalerite is recognized to have occupied spaces between pyrite grains and contains dots of chalcopyrite partly. Chalcocite is found along margins of sphalerite as well as in cracks of sphalerite. Chalcocite is thought to be one of the secondary minerals. In some parts of pyrite and sphalerite, brecciation is recognized.</p>

Sample No.	Rock Type	Observation Note
CN-6-12	Cp-Py ore	Ore minerals are composed of large amount of pyrite, moderate amount of chalcopyrite, and slight amount of pyrrhotite. Pyrite is euhedral or anhedral and is found in aggregates. Spaces between pyrite grains have been filled with chalcopyrite. Pyrrhotite is fine grained though only several grains of pyrrhotite are recognized in pyrite.
NN-105	Cc ore	Ore minerals are composed of large amount of pyrite and small amount of covellite, chalcopyrite, sphalerite and galena. Pyrite is anhedral and is found in dissemination or in aggregates. Partly it is brecciated. Galena is fine grained and is contained in pyrite. Sphalerite is found in and around pyrite. Copper minerals as tennantite, chalcopyrite and covellite are recognized to be distributed around pyrite. Covellite is thought to be one of the secondary minerals. It is noted that, according to the results of qualitative analysis carried out with E.P.M.A., the tennantite found here does contain very little of silver (see photograph).

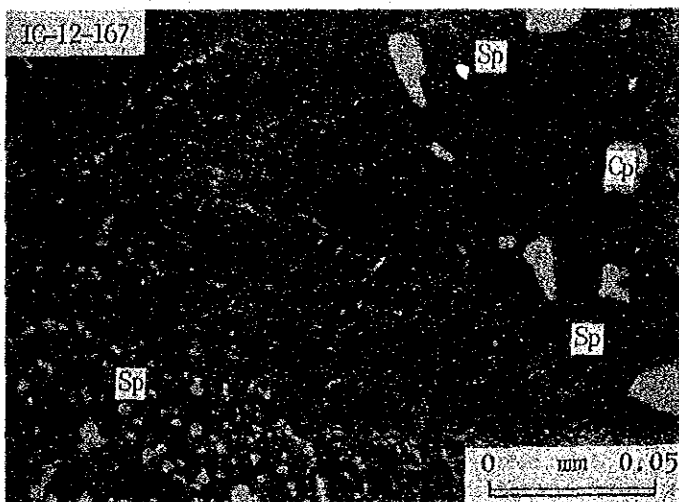
A. III-4 Microphotograph

(1)



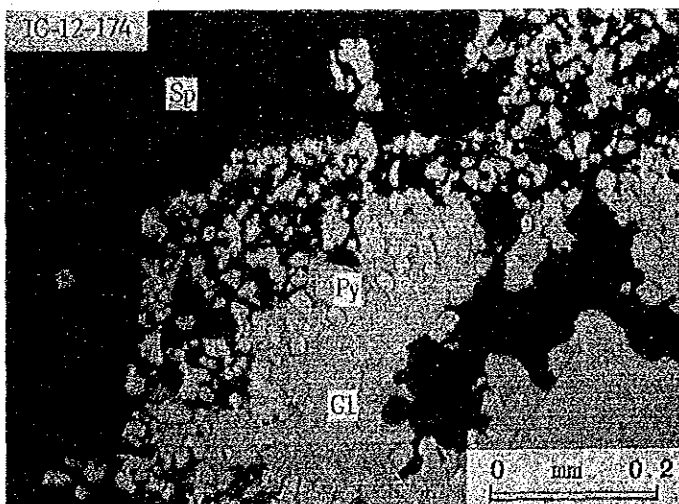
Sample No. IC-12-163
Type of Ore: Pb-Zn Ore

Sp: Sphalerite
Po: Pyrrhotite



Sample No. IC-12-167
Type of Ore: Zn Ore

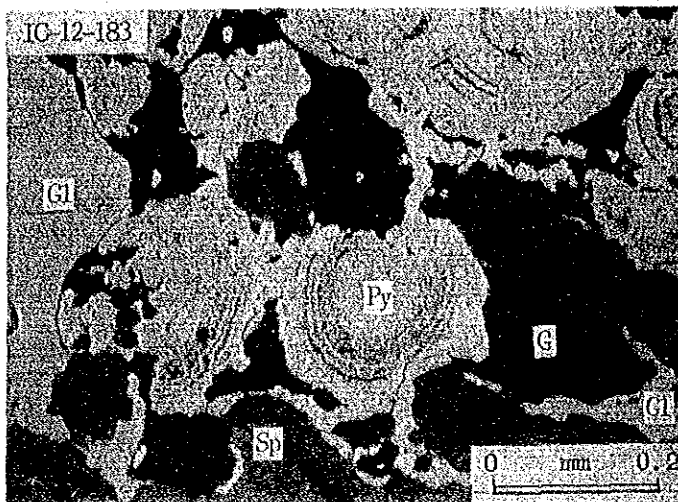
Sp: Sphalerite
Cp: Chalcopyrite



Sample No. IC-12-174
Type of Ore: Pb-Zn Ore

Sp: Sphalerite
Gl: Galena
Py: Pyrite

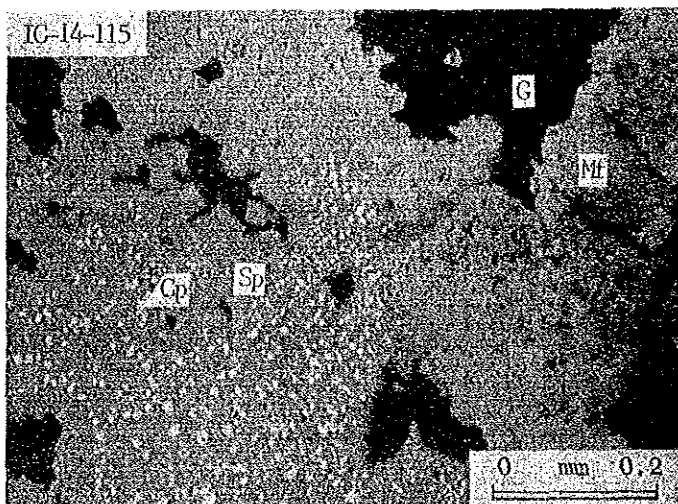
(2)



Sample No. IC-12-183

Type of Ore: Py-Zn-Py Ore

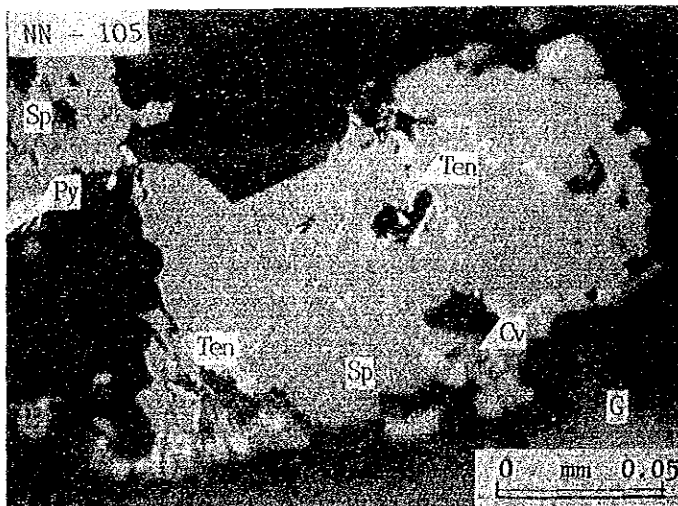
Gl: Galena
Sp: Sphalerite
Py: Pyrite
G: Gangue m.



Sample No. IC-14-115

Type of Ore: Zn-Mt Ore

Sp: Sphalerite
Cp: Chalcopyrite
Mt: Magnetite
G : Gangue m.



Sample No. NN-105

Type of Ore: Cu Ore

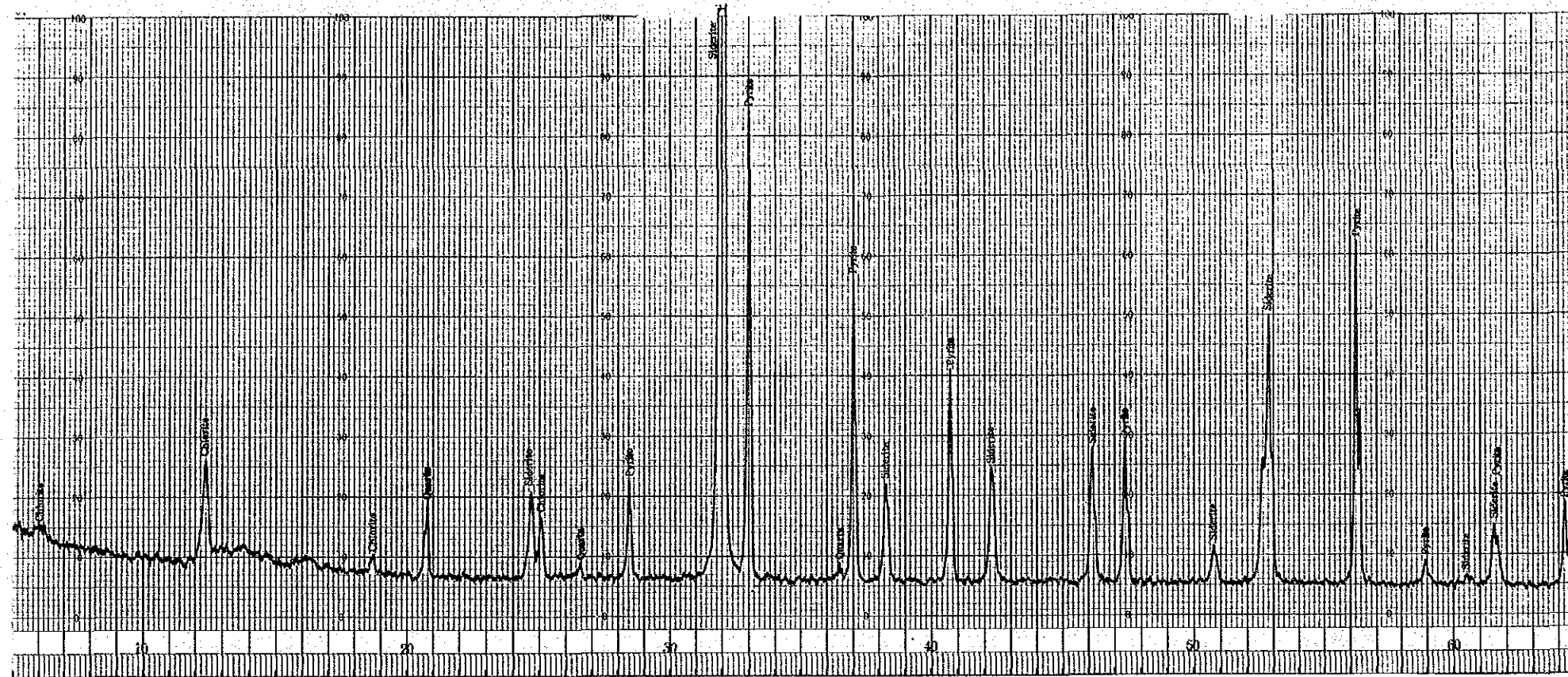
Sp: Sphalerite
Cv: Covellite
Py: Pyrite
Ten: Tennantite
G: Gangue m.

A. III-5 Summary of X-Ray Diffraction Analysis

Mineral		Quartz	Calcite	Siderite	Sericite	Chlorite	Talc	Rutile	Chalcopyrite	Galena	Sphalerite	Pyrite	Magnetite	Amorphous
Sample No.	Type													
IC-12-102	Do	⊙			°			°				°		⊙
IC-12-146	Ald	⊙		•							⊙			
IC-12-163	Zn-ore	°				•					⊙	°		
IC-12-167	Zn-ore	°							○		⊙	°		
IC-12-218	Siderite-Py	•		⊙								⊙		
IC-14-095	Ald	⊙				⊙						°		
IC-14-115	Zn-ore	○				°					⊙		⊙	
IC-18-099	Skarn		•			°					⊙			
NN-125	Zn diss Ald	⊙	°								⊙			
SX-070	Py-clay	⊙			○									

⊙ abundant ○ common ° fairly • rare

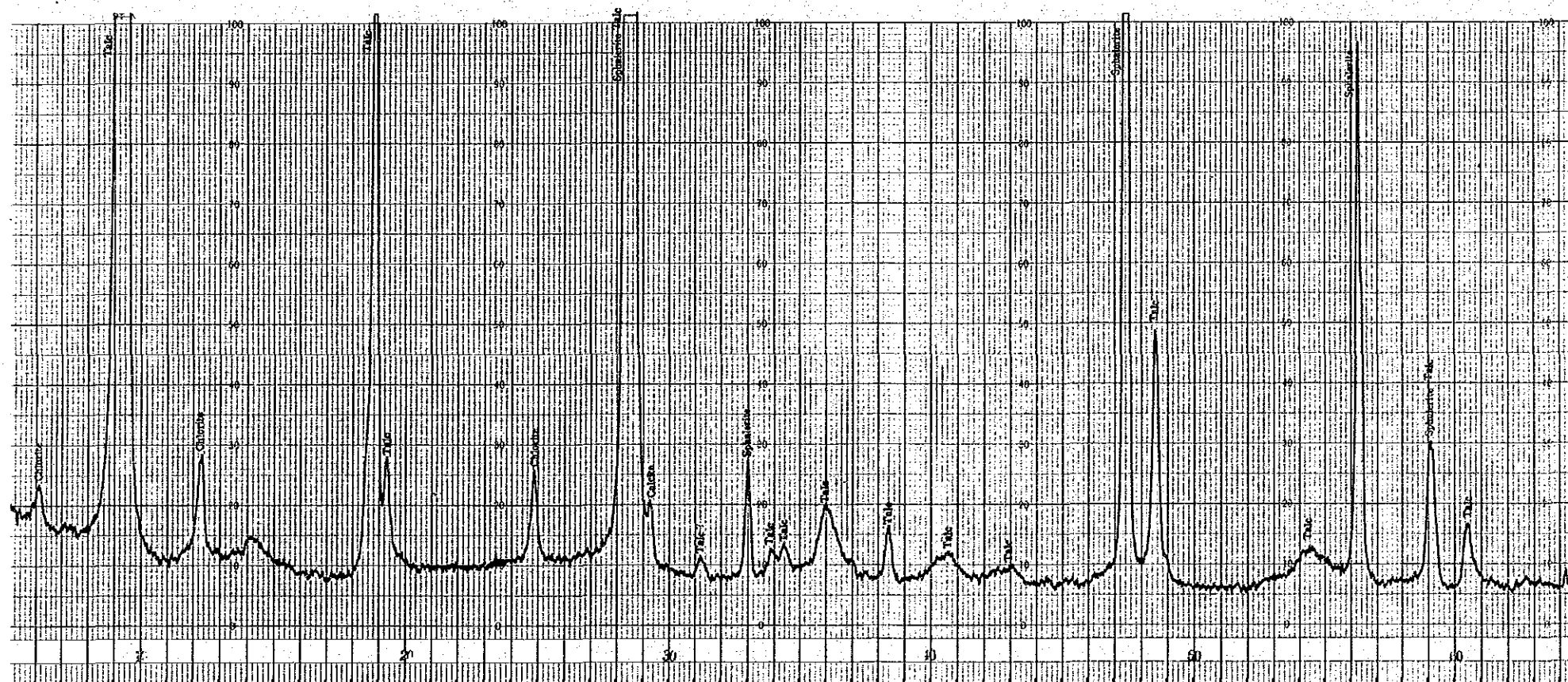
A. III-6 X-Ray Diffraction Chart



Sample No. IC-12-218

Target	Cu
G. Monochro	
Voltage	40 kv
Current	150 mA
Full Scale Range	4000 cps
Time Constant	0.5 sec
Scanning Speed	4 °/min
Chart Speed	4 cm/min
Divergency	1 °
Receiving Slit	0.15 mm
Detector	S.C
Date	3. 1984
Diffractometer	Rotaflex RU-200

MINDECO



Sample No. IC-18-099

Target	Cu
G. Monochro	
Voltage	40 kv
Current	150 mA
Full Scale Range	4000 cps
Time Constant	0.5 sec
Scanning Speed	4 °/min
Chart Speed	4 cm/min
Divergency	1 °
Receiving Slit	0.15 mm
Detector	S.C
Date	3. 1984
Diffractometer	Rotaflex RU-200

MINDECO