パプア・ニューギニア

プラリ河電力開発計画調査報告書

第八巻　水力発電計画—地質柱状図

昭和 52 年 12 月

国際協力事業団

本報告書は、次に示す標題の全八巻より構成されている。

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補　　遺

1．序

本巻には、第５巻の第一部に述べられている全ボーリングコアの柱状図が含まれ、また現在保存されているそれらのコア写真が掲載されている。

2．ボーリング方法とコア柱状図

１９５９年のボーリング孔　これらは、Commonwealth Aluminium Corporation Pty. Ltd.（１９６０）のコンサルティングエンジニアであるSir William Halcrow & Partnersの指導のもとに、George Wimpey & Co.Ltdによりボーリングされ報告された。

これらの報告書はボーリングの方法について次のように述べている。

「一般に地上のボーリング孔は、全長にわたりロータリー方式でダイヤモンド・ビットを使いコアを採取した。また傾斜と方向は地層の法線方向になるようにした。一般には直径２～１／８のコア（ＮＸサイズ）を採取した。しかし水上のボーリングは、垂直とし、種々の方法を組合わせた。礫層はシェルとオーガーボーリングにより削孔され、砂やシルトの層にはウオッシュボーリングが用いられた。基岩に到達後、ボーリング孔はロータリーダイヤモンド・コアーボーリングにより仕上げた。堆積砂礫では、セディメント・チューブから撹乱試料、すなわち戻ってくる洗浄水から集められる試料であるが、かなりの頻度で採取された。」

「Waboの鞍部地域におけるボーリング孔は、Mindrill F2 ボーリング・マシンにより削孔された。この機械は軽量でポータブルであって、ヘリコプターで運搬が可能である。しかしながらＦ２機には欠点がある。すなわち設計上コア直径が小さく、水掘りでなくスクリューによるので、コア採取率は一般に大きなボーリングマシンにより悪い。」

１９５９年のボーリングのコアーは最早入手できない。

本巻に再録した柱状図は、１９６０年のレポートをメートル法に変えたものである。

可能な限りもとの用語を残したが、柱状図形式が相違したので若干の修正が必要であった。

ある深さの節理には図式表示をしたが、適用できる記述はそのままとした。

新しい柱状図の形式には風化も図式表示されるが、異なった命名法が用いられている。もとの柱状図が風化として述べていないか、あるいは「未風化の亀裂」と書いてある場合、岩石は「新鮮」とされた。亀裂や節理が「鉄分を帯びている」とか、「錆びている」とか、「錆色に風化している」場合、岩石は「新鮮であるが褐鉄鉱色の節理を有している」とされた。風化の程度を示すことなく「風化している」という言葉が用いられている場合、一般に、書

き直した柱状図では「中程度」とされた。それは「完全に」あるいは「ひどく」風化した岩石は、一般にコアとして採取されないという仮定に基づくためである。

もとの柱状図は、大体コア軸に対して相対的な角度を与えているので、地質構造を示す方法を若干変更した。垂直ボーリング孔では、水平に対して測定された真の傾斜が与えられる。傾斜孔においては、コア軸に直交する平面に対する見かけの傾斜が与えられる。

1971年のボーリング孔　これらはダイヤモンドを用いたロータリーコアボーリングであり、日本工営により削孔された。コアは見ることができ再柱状化され写真にとられた。

1975－1976のボーリング孔　DD101からDD115は、NMLC三重管コアバレルを用いロータリーダイヤモンド法により削孔された。しかし、付近に多く分布する軟岩の場合には、ダイアモンドビットの代りに硬い面を有する炭化タングステンビットが用いられた。

DD116からDD121までのボーリング孔は、ダイヤモンドボーリングであるが、可搬式Winkieボーリングマシンを用いた小口径のコア（AMLC）である。このマシンは、手動で給水する。コア採取率は、ボーリング設備のせいとボーリングが滑落ずり、あるいは固結度の低い材料の所で行われたため、悪い。

ボーリング孔UG1／1P、2Pおよび4Pは、水上で船の上から削孔された。この場合には、ワイヤ方式のパーカッションドリルが用いられた。孔からは連続的に撹乱試料が採取されたが、これは断続ポンプによった。おおむね3mごとに不撹乱試料の採取と貫入試験が行われた。

柱状図におけるデータはほとんど自明である。

柱状図における破砕は、節理等による自然の破砕を示し、ボーリングによる人工的破砕を示していない。

Waboにおける軟岩は、この点に関して特別な問題をひき起こす。すなわちコアは取り抜いの過程で地層に沿って容易に破壊することと、ある岩種はコアとして採取した後にもエアースレーキングを起こすからである。しかしながら、コアの破壊の度合いは岩塊の強さの指標となるので、破砕の欄に破壊の程度と破壊の原因について適切な注をつけることにより示すこととした。

コアは、大部分なるべく破壊させない柱状図作成の時期まで、湿潤な状態に置かれた。コアのサンプルは、その自然含水状態を岩盤力学的試験まで保つために、プラスチック・チューブに封入された。ボーリング孔L1、L2、R1、R2およびR3のコアは、完全に乾燥してしまったので、エアースレーキングによる破壊がかなり生じた（柱状図再作成前に）。

3. 座標と標高

ボーリング孔の座標と傾斜孔の方向はAustralian Map Grid Zone 55にのっとり、ボーリング孔の首環の標高はNational Height Datumにのっとった。

1959年から1971年のボーリング孔の標高資料は、当初ローカルなWabo基準によっていたが、新しい基準に修正された。

3.1 主ダム

1959年ボーリング孔　1959年ボーリング孔の相対的位置は、Miles（1960）の座標リストから得られた。グリッドの起源は知られていないが、次のデータを用いると新しいコンター平面に、図式的には最良に合致して関係が分る。孔番号BH44とBH46の位置は、現場で発見されその位置が測量された。孔番号BH1、BH2、BH10、BH11およびBH14の概略位置は、コンクリートベースの存在により確かめられたが、その実際の位置は、それから1m以内であろう。

1971年ボーリング孔　孔番号L2、R2およびR3は実際上現場にあり、その位置と標高は1975年に再測量された。L1、L3とR1の位置は、既存の地図と報告書からスケールアップされた（日本工営1975年）。

1975－1976年ボーリング孔　位置は1976年に測量された。

3.2 副ダム

1959年のボーリング孔は、位置が現場には残っていない。しかし、この地域における試掘立坑の大半は識別可能である。ボーリング孔の位置出しは、Miles（1960）により与えられた座標によれば、これら試掘立坑と相対的になされる。地図に示された位置は、3mから4m以内の精度があると信じられる。これら孔の首環の標高は、地図と数メートルのオーダーで違っている。採用された孔口標高は、コンター平面からスケールアップされた。

1975年ボーリング孔の位置出しは、近くの測量杭からコンパス、テープおよびAbneyレベルによりなされた。

4. 参考文献

. COMMONWEALTH ALUMINIUM CORPORATION PTY LTD. (1960). *Report on site investigation for proposed Wabo Dam, Purari River, Papua.* George Wimpey & Co. Limited, Hayes, U. K., December 1960.

. MILES, KEITH R. (1960). Report on further geological investigations, Wabo Dam Project. January 1960.

. NIPPON KOEI CO. LTD. (1975). *The lower basin development of the Purari River - Preliminary Report.* Tokyo, September 1975.

LIST OF DIAMOND DRILL HOLES

HOLE NO.	CO-ORDINATES (m) East	North	SURFACE ELEVATION m	ANGLE FROM HORIZONTAL	BEARING (GRID)	DEPTH m
MAIN DAM AND ASSOCIATED WORKS						
1959 DRILLING (Cores no longer available)						
BH1	285 462	9 226 514	28.5	51°	053°30'	45.72
BH2	415	499	29.5	50°	057°	61.42
BH3	345	485	28.1	50°	058°	60.96
BH4	397	568	55.5	50°	060°	45.71
BH5	476	605	84.4	90°	-	24.99
BH6	354	540	52.8	50°	060°	30.48
BH7	565	351	25.8	50°	045°	46.13
BH8	524	323	29.4	50°	045°	61.26
BH9	423	270	29.4	50°	055°	76.81
BH10	573	309	47.8	50°	053°	15.85
BH11	604	300	61.3	50°	045°	30.63
BH12	727	411	33.4	90°	-	15.24
BH13	768	407	43.8	90°	-	30.48
BH14	521	266	52.1	50°	053°	30.79
BH15	457	225	64.7	50°	055°	46.03
BH16*	374	290	15.6	90°	-	18.29
BH17*	439	324	10.8	90°	-	19.20
BH18*	467	339	12.1	90°	-	36.88
BH19*	505	357	14.3	90°	-	25.30
BH20*	524	371	12.9	90°	-	25.60
BH24*	456	362	8.2	90°	-	39.78
BH25*	424	418	8.2	90°	-	34.44
BH34*	444	403	7.9	90°	-	24.99
BH40	413	495	26.3	27°30'	115°	137.16
BH41	411	491	25.7	20°	199°	42.37
BH42	413	493	25.5	27°	153°	32.11
BH43	511	320	26.6	25°	313°	28.65
BH44	512	321	26.7	36°	000°	30.94
BH45	358	485	28.5	50°	058°	38.71
BH46	512	321	26.7	43°	007°	126.49

* Holes BH16 to BH34 drilled in the river were commenced with shell and auger sampling, then wash drilled to bedrock, and finally rotary core drilled into bedrock.

LIST OF DIAMOND DRILL HOLES - Continued

HOLE NO.	CO-ORDINATES (m) East	North	SURFACE ELEVATION m	ANGLE FROM HORIZONTAL	BEARING (GRID)	DEPTH m
MAIN DAM AND ASSOCIATED WORKS (Continued)						
1971 DRILLING (Cores available and core photographs included)						
L1	285 488	9 226 534	30.1	45°	146°	106.8
L2	465	558	52.0	90°	-	45.4
L3	403	664	97.1	90°	-	31.8
R1	571	355	27.4	45°	324°	106.7
R2	603	300	62.0	90°	-	42.7
R3	617	273	72.8	90°	-	32.4
1975-76 DRILLING (Cores available and core photographs included)						
DD101	285 694.4	9 226 861.8	46.1	45°	064°	100.00
DD102	638.6	835.3	48.0	45°	064°	100.00
DD103	441.4	974.3	151.6	90°	-	150.00
DD104	364.5	780.3	155.5	48°	066°	120.68
DD105	365.7	805.0	156.6	90°	-	70.00
DD106	308.1	519.1	62.2	50°	063°	60.00
DD107	904.6	478.2	37.8	45°	068°	99.50
DD108	781.5	186.8	159.7	90°	-	91.89
DD109	758.1	966.6	54.3	90°	-	60.00
DD110	700.9	941.3	54.4	45°	067°	70.00
DD111	822.9	341.5	76.0	45°	068°	100.00
DD112	398.6	510.1	34.2	90°	-	48.87
DD113	754.8	783.6	30.5	90°	-	60.00
DD114	527.3	215.3	87.7	90°	-	49.41
DD115	834.7	926.4	33.5	90°	-	59.75
DD116	505.8	661.8	66.1	90°	-	20.00
DD117	647.0	714.6	28.3	90°	-	21.70
DD118	613.7	758.6	43.1	90°	-	15.70
DD119	729.8	9 227 093.5	68.8	90°		16.27
DD120	862.4	9 226 913.6	29.6	90°	-	12.80
DD121	947.0	389.7	70.6	90°	-	23.20

LIST OF PERCUSSION DRILL HOLES

HOLE NO.	CO-ORDINATES (m) East	North	SURFACE ELEVATION m	ANGLE FROM HORIZONTAL	BEARING (GRID)	DEPTH m
MAIN DAM AND ASSOCIATED WORKS (Continued)						
1975 DRILLING (no core photographs)						
UG1/1P	285 582.9	9 226 472.7	11.0	90°	-	30.6
UG1/2P	646.0	543.1	11.4	90°	-	25.5
UG1/4P	460.5	400.0	9.2	90°	-	27.2

LIST OF DIAMOND DRILL HOLES

HOLE NO.	CO-ORDINATES (m) East	North	SURFACE ELEVATION m	ANGLE FROM HORIZONTAL	BEARING (GRID)	DEPTH m
SADDLE DAMS						
1959 DRILLING (Cores no longer available)						
BH1	278 256	9 231 379	92	90°	-	15.24
BH2	257	436	82	90°	-	12.19
BH3	248	514	94	90°	-	15.24
BH4	285	612	84	90°	-	12.19
BH5	303	672	96	90°	-	15.24
BH6	319	811	112	90°	-	15.24
BH7	309	876	112	90°	-	15.24
BH8	388	942	103	90°	-	15.24
1975 DRILLING (Cores available and core photographs included)						
DD201	278 245.0	9 231 524.6	95.2	90°	-	30.40
DD202	250.5	460.7	83.9	45°	185°	50.00
DD203	255.4	418.3	84.7	90°	-	25.00
DD204	246.8	276.7	123.5	90°	-	25.00
DD205	336.9	121.7	134.5	45°	000°	25.00
DD206	492.0	230 929.8	122.1	45°	167°	29.74
DD207	607.0	661.2	142.4	90°	-	20.00
DD208	300.1	231 760.8	98.4	45°	203°	50.00
DD209	412.0	232 054.6	122.3	45°	180°	30.00
DD210	576.3	465.4	147.9	45°	225°	50.00
DD211	696.8	580.8	123.4	45°	208°	49.68
DD212	279 109.0	637.4	151.8	45°	212°	30.00
DD213	399.7	733.3	149.7	90°	-	14.96
DD214	280 044.1	844.6	145.8	45°	045°	30.20
DD215	293.0	233 039.9	141.7	90°	-	15.00
DD216	521.3	750.1	144.6	45°	019°	23.89
DD217	543.5	798.2	145.4	45°	017°	25.00
DD218	420.3	234 285.8	138.2	45°	356°	25.40

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 1

DIAMOND DRILL HOLE - GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION Left Abutment

CO-ORDINATES E 285 462 m, N 9 226 514 m, SYSTEM AMG Zone 65

SURFACE ELEVATION 28.5 m

ANGLE FROM HORIZONTAL 51°

DIRECTION 053° 30'

DESCRIPTION OF CORE ROCK TYPE - colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION metres	LOG	CORE LOSS % per run	STRUCTURES JOINTS - spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SHEARS, FAULTS, CRUSHED ZONES.	FRACTURE LOG	CORE LOSS	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
TOPSOIL, clayey and weathered SANDSTONE. NO CORE									
SANDSTONE: Bedded, grey, medium to fine grained. NO CORE									
SANDSTONE: Grey, medium to fine grained, with irregularly interbedded thin bands of blue-grey mudstone.									
MUDSTONE: Thinly bedded, blue-grey with irregularly interbedded thin bands of sandstone, which become increasingly common with depth.									
SANDSTONE: Grey, medium to fine grained with irregularly interbedded thin bands of mudstone, which become increasingly common with depth.							NOT RECORDED	NO LOSS	NOT TESTED
SANDSTONE: Grey, medium to fine grained with irregularly interbedded thin bands of mudstone									
SANDSTONE & MUDSTONE. Irregularly interbedded thin bands of medium to fine grained, grey sandstone and blue-grey mudstone.									
MUDSTONE. Thinly bedded, blue-grey.									
SANDSTONE, grey, medium to fine grained with occasional irregularly interbedded thin bands of mudstone.									
MUDSTONE. Thinly bedded, blue-grey with occasional thin, irregular bands of grey fine grained sandstone. NO CORE									
SANDSTONE & MUDSTONE (as before)									

19 Mar 1969. Water flowing from hole after drill removed.

DRILL

Make Mindrill

Type 20

Driller G. Wimpy Co. Ltd.

Commenced 9 Mar 69

Completed 19 Mar 69

FRACTURE LOG: Natural breaks in core per metre; Equivalent lengths of core pieces in centimetres

EXPLANATION

WEATHERING

CW - Completely weathered

HW - Highly weathered

MW - Moderately weathered

SW - Slightly weathered

FrSt - Fresh, with limonite stained joints

Fr - Fresh

ENGINEERING GEOLOGY BRANCH

Logged

Drawn D.P.

Checked

Sheet 1 of 3

S.M.E.C. Dwg. No. 1429-S3018

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 1

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATIO or LUGEON UNITS
NO CORE Irregularly interbedded thin bands of grey, medium to fine grained sandstone and blue-grey mudstone. Mudstone bands become increasingly common with depth. NO CORE NO CORE		NX	21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44				NOT RECORDED	Some water lost		NOT TESTED

SANDSTONE & MUDSTONE

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429-S3018 /..

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DH 1

PROJECT WABO POWER [illegible]

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING V.W. / H.W. / M.W. / S.W. / F.W. / C.W.	CORE SIZE	RELATIVE DEPTH metres	CORE LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG 0 1 2 3 4 5 6 7 8 9 10	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0 1 2 3 4 5 6 7 8 9 10
SANSTONE & MUDSTONE as above.										
MUDSTONE Sandy, blue-grey.		NX	45				NOT RECORDED	Some water lost.		NOT TESTED
END OF HOLE 45.72m (RL-8.1m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3

Dwg. No. 1429-S3018 /1

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 2

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Left Abutment
CO-ORDINATES E 285 415 m, N 9 226 499 m
SYSTEM AMG Zone 55
SURFACE ELEVATION 29.2 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 057°

DESCRIPTION OF CORE (ROCK TYPE—colour, grain size, texture, mineral composition)	DEGREE OF WEATHERING (CW, HW, MW, SW, Fr)	CORE SIZE	ELEVATION (metres)	DEPTH (metres)	CORE	LOG	CORE LOSS % PER UNIT (0, 33, 66, 99)	STRUCTURES (JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES)	FRACTURE LOG (0, 33, 66, 99)	WATER LEVEL	WATER LOSS	WATER PRESSURE TESTS (LEAKAGE RATES IN LUGEON UNITS) (0, 3, ∞, 33, 66, 99)
Medium to fine grained NO CORE												
SANDSTONE: Grey, medium to fine grained, massive in upper part but with mudstone bands increasing in frequency with depth		NX		1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20				Some limonite stained fissures sub-vertical	NOT RECOVERED	Water commenced rising in hole after 60.96 m	NOT RECORDED	NOT TESTED
MUDSTONE: Blue-grey with sandy and silty parts												
SANDSTONE: Silty, with shelly fossils, grey, argillaceous												
SANDSTONE & MUDSTONE: Thinly interbedded irregular bands, medium to fine grained.												
MUDSTONE: Blue-grey with sandy and silty bands. Shelly fossils and plant remains common. Sand content decreasing with depth.												

DRILL
Make Mindrill
Type F50
Driller S. Wimpey Co Ltd
Commenced 3 Mar 1959
Completed 3 Apr 1959

FRACTURE LOG (0, 33, 66, 99) cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 3
Dwg. No. 1429 - S3019

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 2

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE--colour, grain size, texture mineral composition	DEGREE OF WEATHERING F FR SW PW HW CW	CORE SIZE	ELEVATION DEPTH CASING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS--spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE Blue-grey with sandy and silty bands. Shelly fossils and plant remains common, sand content decreasing with depth.			21 22 23							
Blue-grey with thin bands of medium to fine grained sandstone			24 25							
SANDSTONE Medium to fine grained, argillaceous with occasional thin mudstone bands		C	26							
SANDSTONE & MUDSTONE Thin interbedded, irregular bands, medium to fine grained. Sandstone more prominent		I	27 28 29			← Limonite stained fissure with calcite lining	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
SANDSTONE Massive, medium to fine grained, grey.		NX	30 31 32							
SANDSTONE & MUDSTONE Interbedded, thin irregular bands, medium to fine grained. Mudstone becoming more prominent with depth.			33 34 35 36 37							
SANDSTONE Massive, medium to fine grained with occasional thin mudstone bands.		G	38 39 40 41			← Sub-vertical fissure, calcite lined				
SANDSTONE & MUDSTONE Interbedded, thin irregular bands, medium to fine grained.			42 43 44							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429 - S3019/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 2

PROJECT: WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEPTH	CORE SIZE	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE & MUDSTONE: Interbedded thin, irregular bands, medium to fine grained.	45–53	NX		NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
Sandy bands more frequent.	53–57						
SANDSTONE: Irregularly bedded, argillaceous.	57–60.5						
Massive, medium to fine grained.	60.5–61.42		Unweathered fracture (61)				
END OF HOLE 61.42m (RL-17.6m)	62–68						

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3

Dwg. No. 1429 - 83019/

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 3

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Left Abutment

CO-ORDINATES E 285 345 m
N 9 226 485 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 28.1 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 058°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL/m DEPTH	CORE LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
CLAY: NO CORE			1							
Firm, grey-brown, mottled and timber			2							
NO CORE			3							
MUDSTONE: NO CORE			25 4							
NO CORE			5			Fissured				
			6							
NO CORE			7							
SANDSTONE: Massive, grey, medium to fine grained			8				NOT RECORDED	Water flowing from hole.	NOT RECORDED	NOT TESTED
NO CORE		NX	9			Incipient sub-vertical fractures				
			10							
NO CORE			20							
Grey, argillaceous Fissured?			11			Un-weathered fractures				
NO CORE			12							
Massive, grey, medium to fine grained, grading downwards into fine grained			13							
			14							
NO CORE			15			Unweathered fractures				
			16			← Unweathered fracture				
Grey, medium to fine grained, irregularly interbedded with thin bands of mudstone			17							
Grey, medium to fine grained NO CORE			18			Extensively fractured				
Grey, medium to fine grained with irregularly interbedded thin bands of mudstone NO CORE			19			Vertical un-weathered fracture				
As below			20			Vertical un-weathered fracture				

DRILL
Make Mindrill
Type F50
Driller G. Wimpey Co. Ltd
Commenced 8.4.59
Completed 8.4.59

FRACTURE LOG
cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 3
Dwg. No. 1429-S3020/

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 3

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELEVANT DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE and MUDSTONE: Sandstone is fine grained argillaceous, with occasional thin bands of medium to fine grained.			21			Un-weathered vertical fracture			
MUDSTONE: Sandy, thinly bedded, blue-grey			22						
SANDSTONE Massive, grey, fine grained			23						
MUDSTONE, Sandy thinly bedded, blue-grey, with thin bands of fine grained sandstone			10 24						
SANDSTONE Grey, fine grained			25						
MUDSTONE Sandy, thinly bedded blue-grey									
SANDSTONE Massive, argillaceous grey			26						
MUDSTONE: Slightly sandy, thinly bedded, blue-grey			27						
			28						
			29						
MUDSTONE: Sandy, fairly massive			30 5				NOT RECORDED	NOT RECORDED	NOT TESTED
			31						
			32						
			33						
SANDSTONE: Massive, grey, argillaceous			34			Vertical un-weathered fractures			
Massive, grey, medium to fine grained			35						
Grey, fine grained with thin bands of mudstone			36			Vertical un-weathered fractures			
Massive, grey, argillaceous fine grained			0 37			Vertical unweathered fracture			
Grey, argillaceous fine grained with thin bands of mudstone									
Massive, grey, argillaceous, thinly bedded			38						
SANDSTONE & MUDSTONE: Grey, fine grained sandstone, interbedded with mudstone and sandy mudstone. Generally massive. Thin band of pale mudstone (calcareous?)			39			Vertical unweathered fracture			
			40						
SANDSTONE: Massive, medium to fine grained with occasional thin mudstone bands			41			Vertical fracture, calcite lined			
						Fracture at 60°			
			42			Vertical fractures, calcite lined			
			43 -2			Fracture at 60°			
						Fracture at 45°			
			44						

Marked increase of water flow

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429-S3020/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 3

PROJECT. WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEPTH (metres)	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	GROUNDWATER	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Massive, medium to fine grained with occasional thin mudstone bands	45–58 (Elevation −10 at 50; −15 at 56.5)	Incipient fractures (51.2); Fracture at 45° (53.6); Fracture at 45° (54.6); Extensively fractured (56–57.3)	NOT RECORDED	NOT RECORDED	NOT TESTED
MUDSTONE sandy, blue-grey	58				
SANDSTONE Grey, medium to fine grained with thin, irregular bands of mudstone. Mudstone becoming increasingly prominent with depth.	58–60.96	Vertical fracture (60.6)			
END OF HOLE 60.96m (RL−18.3m)					

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3

Dwg. No. 1429-S3020/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 4

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION Left Abutment

CO-ORDINATES E 285 397 m
N 9 226 568 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 55.5 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 060°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SLW MOD HW CW CORE SIDE	ELEVATN DEPTH CORE SIDE	LOG	CORE LOSS % PER LIFT R 9 5 8	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG n 0 2 4 6 8 10 20	WATER STRIKE CORE LOSS GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.4 n 0 2 4 6 8 10 20
SANDSTONE & MUDSTONE NO CORE Boulders in a matrix of firm, brown, sandy clay.		55 1 2 3						
SANDSTONE Grey, medium to fine-grained with argillaceous bands NO CORE		4 5			Sub-vertical fissures, limonite stained			
NO CORE		6 7 50						
MUDSTONE, sandy, blue-grey		8			Fissure at 75°, limonite stained			
Grey, medium to fine grained with occasional argillaceous bands NO CORE	FR	9 10			Vertical fractures	NOT RECORDED	No water loss	NOT TESTED
Grey, medium to fine grained with numerous thin, argillaceous bands		11 12 13			Vertical fractures		NOT RECORDED	
SANDSTONE Grey, medium to fine grained with occasional argillaceous bands		45 14 15 16 17			Fracture at 80°			
Somewhat finer grained		18 19 20			Incipient vertical fracture Sub-vertical fractures			

DRILL
Make Mindrill
Type F 20
Driller G. Wimpey Co. Ltd
Commenced 20.[illegible].1959
Completed 4.Aug.1959

FRACTURE LOG
n 0 2 4 6 8 10 20 cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn B.P.
Checked
Sheet 1 of 3
Dwg. No. 1429 - S302V

BICH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 4

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE – colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELEVATION / DEPTH (metres)	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS – spacing, attitude, roughness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL (DRILL HOLE)	WATER LEVEL (PIEZOMETER)	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Somewhat finer grained.			40 21 22			← Sub-vertical fractures				
SANDSTONE Grey, medium to fine grained with occasional argillaceous bands			23 24 25 26 35 27			← Sub-vertical fractures		No water loss Complete loss		
SANDSTONE & MUDSTONE Thinly interbedded. Argillaceous bands increasing with depth			28 29 30				NOT RECORDED		NOT RECORDED	NOT TESTED
Sandy, well bedded, blue-grey, becoming less sandy with depth. Some calcareous, shelly fossil bands.		XX	31 32 33 30							
MUDSTONE Blue-grey, with some sandy bands.			34 35 36					No water loss Complete water loss		
Fine grained, argillaceous with occasional mudstone bands			37 38 39 25 40			← Sub-vertical fissure, calcite lined ← Fracture at 60°				
SANDSTONE Massive, grey, medium to fine grained with occasional argillaceous bands.			41 42 43 44			← Sub-vertical fissure, calcite lined		No water loss		

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429 – S9021/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 4.

PROJECT MAHO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING E V S SW MW HW CW	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness openness, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE RECOVERY	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE massive, grey, medium to fine grained with occasional argillaceous bands		NX	45				NOT RECORDED	NIL NOT RECORDED		NOT TESTED
END OF HOLE 45.71m (RL 20.4m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3

Dwg. No. 1429 - S3021/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 5

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Left Abutment

CO-ORDINATES: E 285 476 m, N 9 226 605 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 84·4 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: -

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH (metres)	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
CLAY, brown and weathered rock — NO CORE			1							
Grey, medium to fine grained, massive — NO CORE			2			Some fissures at 45°, limonitic, weathered				
NO CORE						Fissures at 0°, limonitic, weathered				
Grey, argillaceous			3			Irregular bedding planes at 60° irregularly limonitic, weathered				
Grey, medium to fine grained, massive			4			Fissures at 0°, limonite stained and limonite stained sandpipes.				
NO CORE			80							
Grey, medium to fine grained with mudstone band — NO CORE			5			Bedding plane fracture at 45°				
						Bedding at 40°				
Massive, grey, medium to fine grained			6			Some limonitic, weathered open bedding planes and sandpipes.				
			7			Fissure, horizontal, limonitic, weathered				
SANDSTONE: Massive, light grey, medium to fine-grained		EX	8							
			9			3 parallel fractures at 30°				NOT TESTED
			75			Bedding at 45°				
Grey, medium to fine, grained, with frequent thin mudstone bands.			10							
			11			Bedding at 40°				
NO CORE			12							
MUDSTONE and SANDSTONE Interbedded thin bands. The mudstone becoming dominant at depth — NO CORE			13			Bedding at 34°				
MUDSTONE, sandy, Massive, blue-grey			14							
			70							
Grey, medium to fine grained			15							
Weathered zones 75-100cm wide			16			Fractures, surrounded by limonite.				
SANDSTONE			17							
			18			Bedding plane fissure, weathered. Fissure, limonite stained.				
Medium to fine grained with mudstone bands			19			Fractures at 45°, intersected by irregular horizontal fractures, all limonitic, weathered.				
Grey, medium to fine grained			65							
Grey, medium to fine grained with numerous thin mudstone bands			20			As before				

DRILL
Make: MINDRILL
Type: F2
Driller: G. Wimpey Co. Ltd.
Commenced: 25 May 1969
Completed: ... Jun. 1969

FRACTURE LOG: 82 90 95 98 100 cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn: D.P.
Checked
Sheet 1 of 1
Dwg. No. 1429 - S3022/1

ICH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 5

PROJECT WARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELEVANT DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL CHECK	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Grey, medium to fine grained with numerous thin mudstone bands. Apparently sandstone with bands of mudstone. Rock much weathered. Core very broken.			21 22			Bedding at 38° Fracture at 45°, limonitic, weathered, surrounded by limonitic rock zone.			NOT TESTED
SANDSTONE & MUDSTONE Interbedded thin bands of medium to fine grained sandstone and mudstone.			23 24 60			Bedding at 40°			
END OF HOLE 24.99m (RL59.4m)									

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet ... of ...

Dwg. No. 1429 - S3022/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 6

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Left Abutment

CO-ORDINATES E 285 394 m
N 9 226 540 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 52.8 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 060°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RECORD	ELEVATN	DEPTH	CORE LOG	CORE LOSS % PER CUT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE & MUDSTONE, Weathered boulders — NO CORE												
SANDSTONE, Grey, medium to fine grained with argillaceous bands — NO CORE												
MUDSTONE, blue-grey — NO CORE												
SANDSTONE: Massive, grey, medium to fine grained. Becoming slightly argillaceous		NX						Extensive vertical fracturing throughout with limonite staining Poor core recovery and drilling difficulty suggest that strata to 7.42m may not be bedrock, though examination of core does not confirm this view. Incipient vertical fracture Vertical fractures, limonite stained Vertical fracture, unweathered				NOT TESTED
MUDSTONE, Blue-grey												
SANDSTONE: Grey, argillaceous, medium to fine-grained with occasional mudstone bands								Vertical, limonite stained fractures Fracture at 75°, calcite lined Vertical, limonite stained fracture. Fracture at 75°, un-weathered. Sub-vertical fracture, limonite stained. Fracture at 75°, un-weathered. Vertical limonite stained fissure. Fissure at 80°, limonite stained Vertical fracture, unweathered				
MUDSTONE Sandy, blue-grey												
SANDSTONE Grey, medium to fine grained with thin argillaceous bands												
MUDSTONE Sandy, blue-grey												

NOT RECORDED

DRILL
Make MINDRILL
Type F 20
Driller G. Wimpey Co. Ltd.
Commenced
Completed

FRACTURE LOG
EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429 - S3023/1

BCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 6

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING FR SLIGHTLY MOD HIGHLY EXTREMELY SOIL	CORE SIZE	metres ELEVATN / DEPTH / CORING	LOG	CORE LOSS % PER LIFT 0 25 50 75 100	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG 0 10 20 30 40	STANDING WATER LEVEL	GROUNDWATER CHEM. DATA	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0 5 10 20 30 40
Sandy, blue-grey			21			Vertical fracture, un-weathered				
Slightly sandy, fairly massive, blue-grey						Fractures at 75°, un-weathered				
Blue-grey, fairly well bedded			22							
Blue-grey, fairly massive			23			Vertical fracture, un-weathered				
			35			Fracture at 80° un-weathered				
Sandy, blue-grey			24			Fractures at 80° un-weathered				
MUDSTONE		NX	25			Fractured				
Blue-grey, with slightly sandy bands			26							NOT TESTED
			27							
			28							
			29			Vertical fracture, un-weathered				
			30							
			30							
END OF HOLE 30.48m (RL29.5m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet ... of ...

Dwg. No. 1429 - 53023/1

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 7

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Right Abutment

CO-ORDINATES E 285 565 m
N 9 226 351 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 25·8 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 045°

DESCRIPTION OF CORE — ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING (FR SW MW HW CW)	CORE SIZE	ELEVATION (metres)	DEPTH (metres)	LOG	CORE LOSS % PER LIFT	STRUCTURES — JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, infilling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	CEMENTATION LEVEL, DATE	WATER PRESSURE TESTS — LEAKAGE RATES IN LUGEON UNITS
NO CORE SANDSTONE Grey, medium to fine grained with thin mudstone bands.			25	1 2			Sub-vertical fractures, limonite stained				
NO CORE Thinly bedded, blue-grey with occasional, irregular sandstone bands.				3 4 5							
NO CORE			20	6 7 8							
Massive, grey, medium to fine grained, occasional thin mudstone bands, which become more frequent with depth.		NX		9 10 11 12 13 14 15 16 17 18 19 20			Fissuring with limonite staining, calcite lining, usually sub-vertical	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED

SANDSTONE / MUDSTONE

DRILL
Make MINDRILL
Type F20
Driller G.Wimpey Co.Ltd.
Commenced [illegible] 1979
Completed [illegible] 1979

FRACTURE LOG

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 3
Dwg. No. 1429 - S3024/1

ICH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 7

PROJECT ... WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING CSW SW MSW MW CW	CORE SIZE	ELEVATION / DEPTH	CORING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, connecting, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	GROUNDWATER LEVEL (DATE)	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE As above			10 21								
MUDSTONE Blue-grey with thin sandstone bands, which decrease in frequency with depth.			22 23 24								
SANDSTONE Grey, medium to fine grained with thin mudstone bands. The sandstone becomes argillaceous and the mudstone bands more frequent with increasing depth.			25 26 5 27 28 29 30				Vertical and sub-parallel fissures, limonite stained	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
MUDSTONE Very sandy at top, but becoming less sandy and more thinly bedded with depth. Blue-grey.		NX	31 32 33 0 34 35 36 37 38								
SANDSTONE & MUDSTONE Thin, interbedded, irregular bands of argillaceous sandstone and sandy mudstone.			39 -5 40 41				← Some un-weathered fractures				
SANDSTONE Grey, argillaceous, fine grained, changing with depth to thinly bedded, sandy mudstone.			42 43								
MUDSTONE, Sandy, thinly bedded, Blue-grey.			44								

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet ... 2 ... of ... 3 ...

Dwg. No. 1429 - S9024/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 7

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	RUN No.	DEPTH (metres)	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE Sandy, thinly bedded, blue-grey.		NX		45 46				NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
END OF HOLE 46.13m (RL-9.4m)											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3

Dwg. No. 1429 - S3024/3

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 8

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Right Abutment
CO-ORDINATES: E 285 524 m, N 9 226 323 m
SYSTEM: AMG Zone 55
SURFACE ELEVATION: 29·4 m
ANGLE FROM HORIZONTAL: 50°
DIRECTION: 045°

DESCRIPTION OF CORE — ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING / CORE SIZE	ELEVATION / DEPTH (metres)	LOG	CORE LOSS % PER CUT	STRUCTURES — JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS / GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS — LEUGEON UNITS
NO CORE								
Medium to fine grained, grey, weathered boulders of sandstone with mudstone bands in a firm, brown, sandy clay matrix		1 2 3 4						
NO CORE		5						
SANDSTONE: Grey, medium to fine grained with irregular bedded bands of blue-grey mudstone		6 7 8 9			Sub-vertical fissures, showing limonitic weathering and incipient fractures			
NO CORE								
Massive, grey, medium to fine grained	NX	10 11 12 20 13 14 15 16 17 18			Incipient, sub-vertical fractures	NOT RECORDED	COMPLETE LOSS — NO WATER LOSS — NOT RECORDED	NOT TESTED
Becoming finer and silty. Where irregularly bedded thin bands of blue-grey mudstone appear, to become increasingly common with depth.								
MUDSTONE: Thinly bedded, blue-grey, sometimes sandy and/or silty								
SANDSTONE: Grey, medium to fine grained with irregularly and thinly bedded bands of blue-grey mudstone and silty mudstone, unevenly distributed		15 19 20						

DRILL
Make: MINDRILL
Type: F 20
Driller: G. Wimpey Co. Ltd.
Commenced: 3 Mar. 1959
Completed: 3 Mar. 1959

FRACTURE LOG: 200 100 50 20 10 5 2 cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn: D. P.
Checked
Sheet: 1 of 3
Dwg. No. 1429 - 83025 /1

CH1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 8

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	RL ELEVATN	DEPTH CASING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	STANDING WATER LEVEL	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE: Grey, medium to fine grained with irregularly and thinly bedded bands of blue-grey mudstone and silty mudstone, unevenly distributed				21 22 23 24 25			Evidence of tree roots or boring organisms. Sub-Vertical fissure showing limonitic weathering.				
Grey, silty, fine grained			10	26							
Blue-grey with sandy or silty intercalations NO CORE				27 28							
MUDSTONE: Blue-grey with sandy and silty intercalations and some fossiliferous bands			5	29 30 31 32 33 34				NOT RECORDED	NO WATER LOSS	NOT RECORDED	NOT TESTED
SANDSTONE: Grey, medium to fine grained with frequent irregularly bedded bands of mudstone				35			Vertical fissure with calcite infilling.				
Massive, grey, medium to fine grained with pyrites, occasional thin mudstone bands				36							
MUDSTONE: Silty, well-bedded, blue-grey				37			Vertical fissures				
SANDSTONE: grey, medium to fine grained with frequent thin mudstone bands			0	38			Sub-vertical fractures, some limonite stained.				
MUDSTONE: Well bedded, blue-grey, in places sandy and silty				39 40 41 42 43 44							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429 - S3025/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 8

PROJECT. MADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATION DEPTH	LOG	CORE LOSS % PER CUT 0 50 100	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG 0 2 5 10 20 50 100	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.5 1 2 5 10 20 50 100
MUDSTONE Well bedded, blue-grey, in places sandy and silty			45 -5 46 47							
Sandy bands becoming more frequent			48 49							
SANDSTONE Grey, medium to fine grained with frequent bands of blue-grey, sandy and silty mudstone, which become more common with depth.		NX	50 51 -10 52 53 54 55 56 57				NOT RECORDED	NO WATER LOSS	NOT RECORDED	NOT TESTED
Sandy, silty, well bedded, blue-grey			58 -15							
MUDSTONE Well bedded, blue-grey			59 60 61			Incipient sub-vertical fractures				
END OF HOLE 61.26m (RL-17.5m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3

Dwg. No. 1429 - S3025

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WAPDA PROJECT JOINT VENTURE STUDY

HOLE No. BH 9

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WAPDA POWER PROJECT
FEATURE MAIN DAM
LOCATION Right Abutment

CO-ORDINATES E 285 423 m
N 9 226 270 m
SYSTEM AMG Zone 65

SURFACE ELEVATION 294 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 055°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING (FR, SW, MW, HW, CW)	CORE SIZE	metres ELEVATION / DEPTH	CORE LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE RECOVERED	GROUNDWATER LEVEL OF	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
CLAY, brown and weathered SANDSTONE — NO CORE			1							
MUDSTONE: Well bedded, blue-grey			2–5			Some sub-vertical fractures				
SANDSTONE: Medium to fine grained, some ironstone seams			25 6			Sub-vertical fractures				
SANDSTONE: Fairly massive, grey, medium to fine grained with sparse thin mudstone bands		NX	7–8			Sub-vertical fractures; Major sub-vertical fissures, limonite stained		NOT RECORDED		NOT TESTED
SANDSTONE: Grey, argillaceous, fine grained, grading downwards into a sandy mudstone			9–12 20			Sub-vertical fissure, limonite stained				
MUDSTONE: Sandy, blue-grey, grading downwards into a well and thinly bedded mudstone			13–16							
SANDSTONE: Grey, argillaceous, fine grained with bands of mudstone and sandy mudstone			17							
SANDSTONE: Massive, grey, fine grained, argillaceous			18 15 19							
MUDSTONE, sandy, blue-grey			20							

DRILL
Make MINDRILL
Type F20
Driller G. Wimpey Co. Ltd.
Commenced 2 Apr 1959
Completed 11 Apr 1959

FRACTURE LOG
cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
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Sheet 1 of 4
Dwg. No. 1429-S3026/1

BCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 9

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION metres	DEPTH metres	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, inclinds, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER PRESSURE TESTS LEAKAGE RATIO IN LUGEON UNITS
MUDSTONE, sandy, blue-grey				21					
SANDSTONE Massive, grey, fine grained, argillaceous				22			← Sub-vertical fracture		
MUDSTONE Sandy, blue-grey				23					
SANDSTONE Grey, fine grained, argillaceous with thin bands of mudstone				24					
MUDSTONE Well bedded, blue-grey with thin bands of fine grained sandstone, which become less frequent with depth			10	25					
SANDSTONE, Massive, grey, medium to fine grained, some shelly fossils				26					
SANDSTONE & MUDSTONE, Interbedded, thin, irregular bands of fine grained sandstone&mudstone				27					
SANDSTONE, grey, medium to fine grained and fine grained sandstone, interbedded with thin, irregular bands of mudstone, Shelly fossil bands				28					
				29					
				30			← Sub-vertical fracture, un-weathered		
SANDSTONE & MUDSTONE Interbedded. Sandstone is fine grained, Prominent shelly fossil zone				31					
			5	32					
Grey, medium to fine grained and fine grained, interbedded with thin bands of mudstone NO CORE				33					
				34			← Sub-vertical fracture, un-weathered		
				35			← Sub-vertical fracture, un-weathered		
				36					
Prominent shelly fossil band NO CORE				37					
				38					
Massive, grey, medium to fine grained, argillaceous SANDSTONE			0	39					
				40			← Sub-vertical fractures, un-weathered		
				41					
				42					
Grey, medium to fine grained with frequent, irregular bands of mudstone				43					
Grey, medium to fine grained, massive				44			← Vertical fissures, unweathered		

NOT RECORDED

NOT RECORDED

NOT RECORDED

NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 9

PROJECT MADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER LAY	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	PIEZOMETER LEVEL	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, Grey, medium to fine grained, massive. NO CORE			45							
SANDSTONE & MUDSTONE irregularly interbedded thin bands			46			Vertical fissures, un-weathered				
SANDSTONE: Massive, grey, medium to fine grained			47							
SANDSTONE: Grey, medium to fine grained, argillaceous			48							
			49							
MUDSTONE: Sandy, blue-grey, with thin bands of sandstone			50			Sub-vertical fissure, un-weathered				
MUDSTONE: Blue-grey NO CORE			51							
SANDSTONE: Massive, grey, medium to fine grained, becoming increasingly argillaceous with depth			10 52			Vertical fracture, un-weathered Sub-vertical fracture un-weathered				
			53							
MUDSTONE, Sandy			54							NOT TESTED
SANDSTONE & MUDSTONE Irregularly interbedded. Sandstone, fine grained with a general decrease in grain size with depth			55							
			56							
NO CORE			57			Vertical to sub-vertical fractures				
			58							
			59			Fracture at 45, calcite lined Vertical to sub-vertical fracture				
			60							
MUDSTONE: Sandy in parts, blue-grey, the sandy parts being quite massive			61			Vertical fractures, un-weathered				
			62			Vertical fractures, un-weathered				
MUDSTONE: Sandy, fairly massive, blue-grey.			63			Fracture at 60°, unweathered				
			64			Fractures at 60°, un-weathered				
MUDSTONE: generally sandy, blue-grey			65							
SANDSTONE, grey, medium to fine grained			66							
MUDSTONE, slightly sandy, blue grey with shelly fossils										
SANDSTONE, massive, grey, medium to fine grained.			67			Sub-vertical fractures, un-weathered				
MUDSTONE, fairly massive, blue-grey, Slightly sandy,			68							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 9

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING Fr SW MW HW CW	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, inclination, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATH IN LUGEON UNITS
SANDSTONE, massive, grey, medium to fine grained with occasional mudstone bands			69			← Extensively fractured at 90° ← Fracture at 60°, un-weathered				
SANDSTONE & MUDSTONE, irregularly interbedded thin bands of fine grained sandstone and sandy mudstone			70			Fractures along boundaries of sand pipes.				
SANDSTONE, massive, grey, medium to fine grained										
SANDSTONE & MUDSTONE irregularly interbedded, predominantly sandy — Quite massive		N.X.	71 72 73 74			Bedding at 5° ← Irregular fracture	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
SANDSTONE: Grey, medium to fine grained and fine grained, with occasional thin bands of mudstone Massive, grey, medium to fine grained			75 76			← Irregular fractures				
END OF HOLE 76.81m (RL-29.4m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 4

Dwg. No. 1429-S3026/4

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. DH 10

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION Right Abutment

CO-ORDINATES E 285 573 m
N 9 226 309 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 47.8 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 051°

DESCRIPTION OF CORE (ROCK TYPE—colour, grain size, texture, mineral composition)	DEGREE OF WEATHERING (L FR SW MW HW CW)	CORE SIZE	RL / DEPTH (metres)	LOG	CORE LOSS % PER LINE	STRUCTURES (JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES)	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS (LEAKAGE RATES IN LUGEON UNITS)
CLAY, firm brown mid			47.8							
SANDSTONE, weathered fragments. NO CORE			1							
MUDSTONE & SANDSTONE, fine grained. NO CORE			2	CLAYS		Fissured				
			3							
			45							
SANDSTONE, medium to fine grained with thin bands of mudstone.			4			Fractures at 60°, un-weathered				
MUDSTONE and SANDSTONE irregularly interbedded thin bands. Sandstone predominant.			5							
SANDSTONE, massive, grey, medium to fine grained. Mudstone band			6			Fractures, un-weathered				
Irregularly bedded, medium to fine grained with occasional thin bands of mudstone.			7							
SANDSTONE: Massive, grey, medium to fine grained.		NX	8							
			9			Vertical fracture showing some limonitic weathering	NOT RECORDED	FULL WATER RETURN	NOT RECORDED	NOT TESTED
			10			Fractures at 45°				
SANDSTONE and MUDSTONE Thinly and irregularly interbedded bands. Sandstone dominant.			40			Fracture at 60°, un-weathered				
			11			Fracture at 75°				
			12			Fracture at 60°, un-weathered				
SANDSTONE Massive, grey, medium to fine grained, becoming finer grained and increasingly argillaceous with depth.			13			Fracture at 75°, un-weathered				
			14							
			15							
END OF HOLE 15.8 m (RL 35.7m)			16							
			17							
			18							
			19							
			20							

DRILL
Make MINDRILL
Type F 20

Driller G. Wimpey Co. Ltd.
Commenced 18 Apr 1969
Completed 20 Apr 1969

FRACTURE LOG

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
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Sheet 1 of 1
Dwg. No. 1429 - 3027

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

HOLE No. BH 11

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION Right Abutment

CO-ORDINATES E 285 604 m, N 9 226 300 m

SYSTEM AMG Zone 55

SURFACE ELEVATION 61.3 m

ANGLE FROM HORIZONTAL 50°

DIRECTION 045°

DESCRIPTION OF CORE (ROCK TYPE—colour, grain size, texture, mineral composition)	DEPTH (metres)	ELEVATION	STRUCTURES (JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES)
CLAY, firm, brown and SANDSTONE and MUDSTONE, weathered fragments NO CORE	0–1		
SANDSTONE and MUDSTONE irregularly interbedded thin bands. Sandstone fine grained and predominant	1–2	60	Some bedding plans show limonite staining
SANDSTONE: Massive, grey, medium to fine grained	2–2.5		Sub-vertical fractures, limonite stained
SANDSTONE: Massive, grey, medium to fine grained, grading downwards into an argillaceous, fine grained sandstone	2.5–4		
MUDSTONE, Sandy, fairly massive, blue-grey	4–5		Vertical fractures, un-weathered
SANDSTONE, grey, medium to fine grained, grading downwards into an argillaceous, fine grained sandstone	5–6		Vertical fractures, calcite lined; sub-vertical fractures, un-weathered
MUDSTONE, sandy, blue-grey	6–6.3		
SANDSTONE & MUDSTONE Irregularly interbedded, fairly massive. Sandstone, fine to medium grained and dominant	6.3–8	55	
SANDSTONE Massive, grey, medium to fine grained	8–10		Vertical fractures, un-weathered
SANDSTONE & MUDSTONE irregularly interbedded, fairly massive. Sandstone medium to fine grained and dominant	10–12		
SANDSTONE: Fairly massive Grey, medium to fine grained, grading downwards into a fine grained, argillaceous sandstone	12–16	50	Vertical fracture, un-weathered (12.3); Vertical fracture, un-weathered (15)
SANDSTONE: Massive, grey, medium to fine grained	16–17.5		Irregular fracture at 60°, un-weathered; Vertical fracture, irregular, limonite stained
SANDSTONE & MUDSTONE Fairly massive, irregularly interbedded. Sandstone medium to fine grained and dominant.	17.5–19		
SANDSTONE, massive, medium to fine grained, with occasional argillaceous bands which become common with depth	19–20		

Core size: NX

FRACTURE LOG: NOT RECORDED

DRILL WATER LOSS: NOT RECORDED

GROUNDWATER LEVEL, DATE: NOT RECORDED

WATER PRESSURE TESTS (LEAKAGE RATES IN LUGEON UNITS): NOT TESTED

DRILL	
Make	MINDRILL
Type	F 20
Driller	G. Wimpey Co. Ltd
Commenced	14 April 1959
Completed	20 April 1959

FRACTURE LOG — EXPLANATION: Natural breaks in core per metre. Equivalent lengths of core pieces in centimetres.

WEATHERING
- CW - Completely weathered
- HW - Highly weathered
- MW - Moderately weathered
- SW - Slightly weathered
- FrSt - Fresh, with Limonite stained joints
- Fr - Fresh

ENGINEERING GEOLOGY B'CH

Logged

Drawn D.P.

Checked

Sheet 1 of 2

Dwg. No. 1429 - S3028/1

RCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 11

PROJECT MARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING L MW MW HW CW CORE SIZE	ELEVATION DEPTH	CASING	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, inclination, smoothness aperture, connecting, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATE IN LUGEON UNITS
SANDSTONE Massive, medium to fine grained with occasional argillaceous bands, which become common with depth		45 21 22 23				← Incipient vertical fracture:, limonite stained				
SANDSTONE & MUDSTONE Thinly and irregularly interbedded, fine grained. The mudstone becoming dominant with depth	XX	24 25								
NO CORE		26				Fractures at 60°, un-weathered	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
MUDSTONE Sandy, massive, blue-grey, becoming less sandy and thinner bedded with depth		27 40 28 29								
Fairly thinly bedded, blue-grey with sandy bands, shelly fossils, and plant remains, including a pod of fossil resin		30								
END OF HOLE 30.63m (RL37.8m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S3028/2

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. DH 12

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Right Abutment
CO-ORDINATES: E 285 727 m, N 9 226 411 m
SYSTEM: AMG Zone 55
SURFACE ELEVATION: 33.4 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: E

DESCRIPTION OF CORE ROCK TYPE--colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW CORE SIZE	ELEVATION DEPTH LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS--spacing, attitude, smoothness aperture, cementing, coating, filling BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
NO CORE NO CORE NO CORE NO CORE Well bedded, badly fretted NO CORE Fairly massive NO CORE MUDSTONE Sandy, blue-grey with bands of mudstone	BX	30 25 20		Bedding at 47° Bedding at 47° Bedding at 50° Bedding at 45° Fracture at 80° Bedding at 45°	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
END OF HOLE 15.24m (RL18.2m)								

DRILL
Make: HINDRILL
Type: F 2
Driller: G. Wrigley Co. Ltd.
Commenced: May 1959
Completed: May 1959

FRACTURE LOG

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FeSt - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn: D.P.
Checked
Sheet 1 of 1
Dwg. No. 1429-S3029

MARCH 1975

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 13

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Right Abutment

CO-ORDINATES: E 285 768 m, N 9 226 407 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 43.8 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION:

DESCRIPTION OF CORE — ROCK TYPE—colour, grain size, texture, mineral composition	STRUCTURES — JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS — LEAKAGE RATES IN LUGEON UNITS
NO CORE					
MUDSTONE: Sandy, blue-grey with bands of mudstone, fairly well bedded	Some fractures at 50°, un-weathered Dip of bedding approximately 45°	NOT RECORDED	FULL WATER RETURN	NOT RECORDED	N.T. TESTED
NO CORE					
Sandy, fairly massive, blue-grey with occasional thin mudstone bands	Bedding at 45°				
SANDSTONE, massive, blue-grey, fine grained, argillaceous with occasional thin bands of sandy mudstone					
NO CORE					
Sandy, fairly massive, blue-grey.					
MUDSTONE: Sandy, blue-grey with frequent bands of mudstone	Bedding approximately at 45°				
NO CORE					

DRILL
Make. HINDRILL
Type F 2
Driller G. Wimpey Co. Ltd.
Commenced 19 May 1959
Completed 22 May 1959

FRACTURE LOG — Natural breaks in core per metre. Equivalent lengths of core pieces in centimetres.

EXPLANATION

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429-S3030 /1

IRCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 13

PROJECT WADO POWER PR (EC)

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, roughness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE: Sandy, blue-grey with frequent bands of mudstone		BY	21			Bedding approx. at 45° ← A "slickensided" surface parallel to bedding				
NO CORE			22							
MUDSTONE: Sandy with mudstone bands, becoming sandier and more massive with depth			23							
			24							
			25							
			26				NOT RECORDED	FULL WATER RETURN	NOT RECORDED	NOT TESTED
SANDSTONE: Grey, fine grained, argillaceous with coarser bands and bands of sandy mudstone and mudstone. Fairly massive throughout		AX	27							
			28							
			29							
			30			← Horizontal fracture, un-weathered.				
END OF HOLE 30.48m (RL 13.3m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429-S3030/

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 14

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Right Abutment

CO-ORDINATES E 285 523 m
N 9 226 266 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 52.1 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 053°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION metres	DEPTH metres	LOG	CORE LOSS % PER LAP	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, dilling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	FREE WATER LEVEL	PIEZOMETRIC LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE & MUDSTONE Fragments in a firm, brown, sandy clay matrix											
NO CORE				1							
NO CORE				2							
			50	3							
				4			Fracture at 60°, un-weathered				
CORE BROKEN							Fissures at 75° limonitic, weathered				
Sandy, massive, blue-grey, plant remains common, and some small shelly fossils				5							
				6							
CORE BADLY BROKEN				7			Vertical fracture, un-weathered				
				8							
CORE BADLY BROKEN				9							
			45								
Slightly sandy in parts, massive, blue-grey				10			Occasional incipient, sub-vertical fractures	NOT RECORDED	FULL WATER RETURN	NOT RECORDED	NOT TESTED
				11							
Sandy, massive, blue-grey. Occasional small shelly fossil bands				12							
				13							
				14							
Massive, grey, medium to fine grained, with occasional thin mudstone bands.				15							
			40	16			Fissure at 60, limonitic weathered Vertical fracture, un-weathered Fissures at 70, limonitic weathered Horizontal fissures, limonitic weathered and vertical fissures, calcite filled Horizontal and subhorizontal fissures, limonite stained. Rock between fissures highly fractured with some sandy clay				
				17							
				18							
				19							
				20							

MUDSTONE

SANDSTONE

NX

DRILL
Make MINDRILL
Type F 20
Driller G. Wimpey Co. Qld.
Commenced 3 June 1959
Completed 5 June 1959

FRACTURE LOG
cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429 - S3031/1

(1976)

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 14

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELATIVE ELEVATION	DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SHEARS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	WATER LEVEL	WATER PRESSURE TESTS LEAKAGE PATH IN LUGEON UNITS
SANDSTONE Massive, grey, medium to fine grained with occasional thin mudstone bands.				21 22 23			Horizontal parallel fractures, partly limonitic weathered				
SANDSTONE & MUDSTONE Massive, grey, medium to fine grained sandstone with thin bands of mudstone			35								
SANDSTONE & MUDSTONE Interbedded thin bands of medium to fine grained sandstone and mudstone				24			← Vertical fracture, un-weathered				
SANDSTONE Massive, argillaceous, fine grained with occasional thin bands of mudstone				25			Incipient vertical fractures				
SANDSTONE & MUDSTONE Interbedded thin bands of fine grained sandstone and mudstone				26				NOT RECORDED	FULL WATER RETURN	NOT RECORDED	NOT TESTED
SANDSTONE Grey, fine grained, argillaceous with occasional mudstone bands, grading to a sandy mudstone, with mudstone bands, downwards. Sparse small shelly fossils				27 28 29 30			← Vertical and sub-vertical fracture, un-weathered. ← Fractures at 60° and vertical fracture, un-weathered ← Fracture at 60° un-weathered.				
END OF HOLE 30.79m (RL28.6m)											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - 83031 /3

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 15

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Right Abutment

CO-ORDINATES: E 285 457 m, N 9 226 225 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 64.7 m
ANGLE FROM HORIZONTAL: 50°
DIRECTION: 055°

DESCRIPTION OF CORE (ROCK TYPE—colour, grain size, texture, mineral composition)	DEGREE OF WEATHERING (FR, SLWR, MWR, HWR, CW)	CORE SIZE	RL OF RESERVATION	DEPTH (metres)	CASING	LOG	CORE LOSS % PER LIFT	STRUCTURES (JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES)	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE & MUDSTONE: NO CORE				1								
Weathered boulders and cobbles in a matrix of soft, sandy clay with pockets of loose, clayey sand				2								
NO CORE				3								
				4								
				5								
NO CORE			60	6								
				7								
				8								
NO CORE												
MUDSTONE: Massive, blue-grey, with occasional bands of sandy mudstone				9								
				10				Sub-vertical fracture, limonitic weathered	NOT RECORDED	90% Water loss		NOT TESTED
				11				Incipient sub-vertical fractures				
				12				Sub-vertical fracture, limonitic weathered				
SANDSTONE: Massive, grey, medium to fine grained			55	13				Fissure at 75°, limonitic weathered				
				14				Hole filled with sand. This presumably flowed into the hole through the gap between casing and rock-head on the night of 9 Oct 1959.				
SANDSTONE & MUDSTONE: Alternating bands of mudstone, sandstone and sandy mudstone				15				Series of sub-vertical fractures, some with slight limonitic weathering		FULL WATER RETURN	NOT RECORDED	
				16				Sub-vertical fractures				
MUDSTONE: Slightly silty and sandy in parts, blue-grey, with occasional thin sandstone bands				17								
				18								
			50	19								
				20				Fractures at 60°				

DRILL
Make: MINDRILL
Type: F 20
Driller: G. Wimpey Co. Ltd.
Commenced: 7 July 1959
Completed: 14 July 1959

FRACTURE LOG

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn: D. P.
Checked

Sheet 1 of 3
Dwg. No. 1429-S3032/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 15

PROJECT WARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE--colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS--spacing, attitude, smoothness, aperture, cementing, coating, filling BEDDING, FOLIATION, VEINS, SEAMS FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE As Above								
SANDSTONE, Massive, grey, fine grained, argillaceous						Irregular, vertical fractures		
MUDSTONE, Sandy, blue-grey						Incipient vertical fracture Fracture at 75°		
SANDSTONE: Grey, fine grained, argillaceous with thin bands of sandy mudstone and mudstone						Fracture at 60°		
			45			Fracture at 75° with parallel incipient fractures		
SANDSTONE: Grey, medium to fine grained with argillaceous bands						Sub-vertical fractures Incipient sub-vertical fractures	NOT RECORDED	NO WATER RETURN NOT RECORDED NOT TESTED
Grey, fine grained, argillaceous								
MUDSTONE: Sandy, blue-grey Slightly sandy in parts, blue-grey			40			Fracture at 60°		
SANDSTONE: Massive, grey, medium to fine grained			35			Vertical fissure with limonitic weathering in upper part		
Grey, medium to fine grained with argillaceous bands, becoming more frequent with depth.								
MUDSTONE: Sandy, well bedded, blue-grey with thin bands of argillaceous sandstone						Vertical fracture		
Slightly sandy in parts, well bedded, blue-grey								

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429 - 33092/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 15

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING L MW SW HW CW	CORE SIZE	RELEVATION / DEPTH (metres)	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES in LUGEON UNITS
MUDSTONE Slightly sandy in parts, well bedded, blue-grey Sandy, blue-grey		NX	45 30 46			Incipient vertical fractures	NOT RECORDED	No water return N.W.P. RECORDED	NOT TESTED
END OF HOLE 46.03m (RL29.4m)									

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3
Dwg. No. 1429 - S3032/3

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 16

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: River Channel

CO-ORDINATES: E 285 374 m, N 9 226 290 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 15.6 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: -

DESCRIPTION OF CORE. ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL/DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES: JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS: LEAKAGE RATES IN LUGEON UNITS
SAND: Dark, medium to coarse grained, loose, micaceous with pockets of clayey and silty sand, fine grained sand and fine gravel			15							
			1				D			
			2				D			
			3				D			
GRAVEL: Compact, medium to coarse sized, in coarse, dark sand matrix, Pebbles well rounded, predominantly limestone			4							
			5							
		8 inch (203mm) Shell and Auger	10				D			
			6							
			7				D			
SILT & SAND: Soft, pale grey, clayey silt with pockets of fine sand			8					NOT RECORDED	NOT RECORDED	NOT TESTED
			9							
			10							
			5							
			11							
			12							
			13							
			14							
			15			Wash drilling				
SANDSTONE: Massive, grey, medium to fine grained with occasional argillaceous bands. Current bedding in sandstone and argillaceous bands			0			Irregular sub-vertical fracture.				
			16			Irregular sub-vertical fracture				
						Fracture at 60°				
			17			Fracture at 60°				
			18							
END OF HOLE 18.29m (RL-2.7m)			19							
			20							

Current bedding 30° to 40°

DRILL: Shell & Auger, MINDRILL
Make: F 50
Type:
Driller: G. Wimpey (S.) Ltd.
Commenced: [illegible] 1959
Completed: [illegible] 1959

FRACTURE LOG: Natural breaks in core per metre; Equivalent lengths of core pieces in centimetres.

D = Disturbed samples taken by shell and auger

EXPLANATION

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged:
Drawn: D.P.
Checked:
Sheet: 1 of 1
Dwg. No. 1429-S3033

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 17

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: River Channel

CO-ORDINATES: E 285 439 m; N 9 226 324 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 10,8 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: -

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	METRES ELEVATION	METRES DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	SEAMS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SAND, Loose, silty, medium to coarse grained, black.			10	1			D				
GRAVEL, Compact, medium size, in a coarse grained, black sand matrix. Well rounded pebbles of sandstone and limestone				2			D				
				3							
				4			D				
SAND, soft, grey, silty, fine grained with pockets of medium grained.				5			D				
				6							
				7			Wash drilling				
				8			D				
				9							
Slightly sandy, fairly massive, blue-grey		NX	10	10			Fractures at 60° slightly limonitic, weathered	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
NO CORE				11			Fractures at 60° Bedding at 43°				
				12							
NO CORE Blue-grey with slightly silty and sandy bands. Well bedded				13			Very soft and badly fractured				
NO CORE				14							
MUDSTONE Slightly sandy, fairly massive, blue-grey.			-5	15							
NO CORE				16							
Well bedded, blue-grey with thin, slightly sandy bands, which emphasise bedding.				17			Bedding at approximately 38°				
NO CORE				18							
				19							
END OF HOLE 19,20m (RL-8,4m)				20							

Shell & Auger, MINDRILL
Make
Type P 50
Driller S.Wimpey Co.Ltd.
Commenced 29 Jun 1959
Completed 8 Jun 1959

FRACTURE LOG
EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.
D = Disturbed samples taken by shell and auger

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 1
Dwg. No. 1429 - S3034

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SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. BH 18

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION River Channel

CO-ORDINATES E 285 467 m
N 9 226 339 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 12.1 m
ANGLE FROM HORIZONTAL 90°
DIRECTION —

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING FR SWW MWW HWW CWW	CORE SIZE	ELEVATION / DEPTH	CORES	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DIRECT WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
GRAVEL, medium to fine sized, well rounded, in a matrix of firm, grey, silty clay.			18 inch (203mm) Shell and auger				D D D D				
SAND and Silt. Soft, grey silt and fine grained sand.							Wash drilling	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
MUDSTONE, sandy, well bedded with thin bands of sandstone, becoming more frequent with depth				NX			Irregular fracture zones with softening of the mudstone in places Bedding at 40°				
MUDSTONE & SANDSTONE Interbedded thin bands. The sandstone bands dominant							Bedding at 40°				
SANDSTONE Massive, medium to fine grained with occasional argillaceous bands							Irregular fracture at 60° Irregular fracture at 60° Incipient fractures at 60° Badly fractured and somewhat argillaceous Bedding at 40° Vertical and sub-vertical fractures				

DRILL
Shell & Auger, MINDRILL
Make
Type F 50
Driller G. Wimpey & Co. Ltd.
Commenced
Completed

FRACTURE LOG
cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.
D = Disturbed samples taken by shell and auger

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429-S3035 /1

RCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BR 18

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW CORE SIZE	RL OR DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEONS UNITS
Massive, medium to fine grained with occasional argillaceous bands		21			Irregular fracture at 60° Vertical and sub-vertical fractures			
		22			Irregular fracture at 60° Fracture at 45°, calcite lined			
		23			Badly fractured Bedding at 40°			
Medium t. fine grained with mudstone bands		24			Irregular fracture, with softening of the mudstone			
Massive, medium to fine grained with occasional argillaceous bands	XT	25						
		26			Irregular fractures terminating in sub-horizontal fracture			
		27						
		28						
		29			Irregular fracture at 45°			
		30			Sub-horizontal fracture	NOT RECORDED	NOT RECORDED	NOT TESTED
		31			Sub-horizontal fracture	BEDDING AT 40°		
		32			Irregular fracture at 45°			
Grey, medium t. fine grained with thin, irregular mudstone bands.		33			Numerous parallel incipient fractures at 45°, cutting across the bedding planes.			
		34						
		35						
Grey, medium t. fine, grained.		36			Fracture at 45° Occasional incipient fractures at 45° cutting across bedding planes			
END OF HOLE 36.88m (RL-24.8m)								

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429-S3035/2

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC-NK WADO PROJECT JOINT VENTURE STUDY

HOLE No. BH 19

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WADO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: River Channel

CO-ORDINATES: E 285 505 m, N 2 226 357 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 14.3 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: —

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING R Fr Sl SW MW HW CW	CORE SIZE	ELEVATION / DEPTH	CORE LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE RECOVERED	CORE RECOVERED UNIT LENGTH	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SAND: Loose, grey, medium grained silty sand with sparse, angular gravel						D				
GRAVEL: Compact, medium to fine gravel in a grey, medium grained sand matrix		3 inch (200 mm) Shell and Auger				D				
SAND: Loose, grey, silty, fine grained with pockets of fine gravel		NX				D Wash drilling	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
MUDSTONE: Sandy, blue-grey with bands of argillaceous, fine grained sandstone						Fracture at 75° Bedding at approx. 45° Vertical fracture				
SANDSTONE, Medium to fine grained										

DRILL: Shell & Auger, MINDRILL
Make:
Type: F 50
Driller: G. Wimpey Co. Ltd.
Commenced:
Completed:

FRACTURE LOG

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.
D = Disturbed samples taken by shell and auger.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn
Checked
Sheet 1 of 2
Dwg. No. 1429 - S3036/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 19

PROJECT ... WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW HW CW	CORE SIZE	ELEVATION DEPTH RECORDING	LOG	WATER LOSS % FOR LIFT 0 50 100	STRUCTURES JOINTS—spacing, attitude, roughness, aperture, opening, coating, filling BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG 0 1 2 3 4 5 6 7 8 9 10	POINT LOADING STRENGTH INDEX	UNCONFINED COMPRESSIVE STRENGTH	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0 1 2 3 4 5 6 7 8 9 10
SANDSTONE MUDSTONE, sandy, blue-grey with bands of argillaceous fine grained sandstone SANDSTONE, Grey, medium to fine grained MUDSTONE & SANDSTONE Interbedded sandy mudstone, argillaceous sandstone						some vertical fractures Fissure at 80° limonite -stained, calcite lined Bedding at 40°				
SANDSTONE Grey, medium to fine grained, somewhat argillaceous in parts Argillaceous Grey, argillacequa, fine grained and medium to fine grained		NX	21 22 23 24 -10 25			Calcareous fossils prominent Vertical fractures	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
END OF HOLE 2 .30m (RL-11.0m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S3036/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 20

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION River channel

CO-ORDINATES E 285 524 m
N 9 226 371 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 12.9 m
ANGLE FROM HORIZONTAL 90°
DIRECTION "

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL/DEPTH (metres)	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE LOSS	CORE RECOVERY	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SAND — Grey, loose, fine grained, silty.			1							
GRAVEL — Compact, medium fine, in medium grained, grey sand matrix.		8" (200mm) shell & auger.	2 3 4			D—				
SAND — Compact, silty, grey, coarse to fine grained with pockets of fine gravel.			5 6 7 8			D— Wash drilling.				
SANDSTONE, medium to fine grained.			9 10							
SANDSTONE, MUDSTONE, interbedded argillaceous, fine grained sandstone and sandy mudstone.			11			←Sub-vertical fracture.				
			12			←Fissure at 55° limonite stained. ←Fissure at 75° limonite stained.	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
		NX	13			Fissure at 55° limonite stained.				
SANDSTONE — Grey, medium to fine grained. Argillaceous bands indicate bedding.			14 15			Fracture zone, limonite stained with partial disintegration of sandstone.				
			16			Fissure at 78° slightly limonite stained.				
			17			Bedding between 45° and 55°.				
			18							
			19 20			Fracture zone, limonite stained with partial disintegration of sandstone.				

DRILL
Shell & Auger,
Make Mindrill
Type F50
Driller G. Wimpy & Co Ltd.
Commenced 29 Jul 1959
Completed 1 Aug. 1959

FRACTURE LOG — cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.
D = Disturbed sample taken by shell and auger.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429 - S3070/1

BECH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DH 20

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE RECOVERY	CORE DISCONTINUITY LOSS, DATE	WATER PRESSURE TESTS LEAKAGE RATES BY LUGEON UNITS
SANDSTONE Grey, medium to fine grained. Argillacious bands indicating bedding. Becoming increasingly finer grained and more argillaceous.		NX	21 22 10 23 24 25		8998	Bedding between 45° and 55°	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
END OF HOLE 25.60m (RL-12.7m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S3070/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

HOLE No. BH 24

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION River Channel

CO-ORDINATES E 285 456 m
N 9 226 362 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 8.2 m
ANGLE FROM HORIZONTAL 90°
DIRECTION —

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	METRES ELEVATION / DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smooth/rough, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER TABLE CASE	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
GRAVEL Coarse to fine grained, compact with cobbles in a coarse, grey sand matrix. Pebbles well rounded, predominantly limestone			1 2 3 4 5				D D D D			
Loose, grey, medium to fine grained with fine gravel.			5 6 7 8 9 10							
SAND Silty, fine grained, loose, grey			10 11 12 13 14 15 16 17 18			WASH DRILLING	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
GRAVEL Compact, coarse to medium grained with occasional cobbles in a firm, grey clay matrix. Pebbles well rounded, predominantly limestone, but basalt, granite, siliceous limestone and jasper also present. NO CORE		NX	-10 19 20							

6 inch Shell and Auger

DRILL
Make Shell & Auger, Mindrill
Type F50

Driller G. Wimpey Co. Ltd,
Commenced 3 Aug 1969
Completed 9 Aug 1969

FRACTURE LOG


EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.
D = Disturbed sample taken by shell and auger.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
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Drawn L.L.
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Sheet 1 of 2
Dwg. No. 1429 - S3024/1

SRCH1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 24

PROJECT. MARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE RUN	RELATIVE DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER PRESSURE TESTS LEAKAGE RATES BY LUGEON UNITS
GRAVEL As above NO CORE			21					
CLAY Firm, grey, silty with sparse medium size gravel NO CORE			22 23 15 24					
SANDSTONE Grey, medium to fine grained to fine argillaceous, becoming increasingly argillaceous with depth			25 26 27 28 20 29			Bedding at 40°		
MUDSTONE Sandy, blue-grey, becoming less sandy with depth			30 31 32 33 25 34 35 36			Bedding at 40° Fractures at 60°	NOT RECORDED	NOT TESTED
Blue-grey with occasional sandy bands.			37 38 30 39			Bedding variable between 40° - 50°		
Blue-grey, fine sandy								
END OF HOLE 39.78m (RL-31.6m)			40					

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S3074/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 25

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION River Channel

CO-ORDINATES E 285 [illegible] m, N 9 226 [illegible] m, SYSTEM AMG Zone 55

SURFACE ELEVATION [illegible] m

ANGLE FROM HORIZONTAL 9

DIRECTION -

DESCRIPTION OF CORE — ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RESERVATN DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES — JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER TABLE LEVEL	PIEZOMETRIC LEVEL, DATE	WATER PRESSURE TESTS — LEUGEON UNITS
GRAVEL: Compact, coarse & fine with cobbles in a sparse, coarse sand matrix. Gravel predominantly limestone			6 inch Shell and Auger			6 INCH DISTURBED SAMPLE	NOT APPLICABLE	NOT RECORDED	NOT RECORDED	NO TESTS
SAND: Loose, grey, fine grained						WASH DRILLING				
SANDSTONE: As bed rock		NX								

DRILL
Make Shell & Auger, Mindrill
Type P50
Driller G. Wimpey Co. Ltd
Commenced 12 Aug 1959
Completed 19 Aug 1959

FRACTURE LOG — cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked

Sheet 1 of 2
Dwg. No. 1429 - S30/5/1

MARCH 1978

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 25

PROJECT ... WADO POWER PROJECT ...

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, inclination, roughness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Grey, argillaceous, medium to fine grained with mudstone bands			21					
			22					
			23					
			24			Bedding approximately at 35°	NOT RECORDED	NOT RECORDED
Grey, argillaceous, fine grained with mudstone bands becoming increasingly argillaceous with depth			25					
			26					
			27					
			28			Prominent fracture zones		
			29					
			30					
MUDSTONE Sandy, blue-grey			31			Bedding approximately at 50° Fracture at 60°		
			32					
			33			Irregular intersecting fractures		
Blue-grey with sandy and shelly bands			34			Bedding at approximately 40°		
END OF HOLE 34.44m (RL-26.2m) NOTE: Core generally much broken due to vibration of 6 inch (152 mm) casing.			35				NOT RECORDED	NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S30/5/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 34

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION River Channel

CO-ORDINATES E 285,444 m
N 9,226,103 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 7.9 m
ANGLE FROM HORIZONTAL 90°
DIRECTION -

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, moisture, mineral composition	DEGREE OF WEATHERING CW HW MW SW Fr	CORE SIZE	RELATIVE DEPTH	LOG	CORE LOSS % PER CENT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
GRAVEL: Compact, fine to coarse sized, with cobbles and coarse grained sand, Gravel predominantly limestone		6 in (152 mm) Shell and Auger	1 2 3 4 5 6 7			BD				
			D 8							
SAND: Loose, fine grained, grey.			9 10 11 12 13 -5 14 15 16 17			Wash drilling	NOT APPLICABLE	NOT RECORDED	NOT RECORDED	NOT TESTED
GRAVEL: Compact, fine to coarse size with cobbles and coarse grained sand. Predominantly limestone		NO CORE	18 -10 19 20							

Drill: Shell and Auger,
Make: Mindrill
Type: F50

Driller
Commenced 21. Aug. 1959
Completed 26. Aug. 1959

FRACTURE LOG — cm

EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.
D = Disturbed sample taken by shell and auger
BD = Bulk disturbed sample

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429 - S3084/1

BCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 34

PROJECT. WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW HW CW	CORE SIZE	ELEVATN metres	DEPTH metres	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
GRAVEL As above NO CORE			-15	21 22 23 24 25			Large mudstone cobble	NOT APPLICABLE	NOT RECORDED	NOT TESTED
END OF HOLE 24.99m (RL-17.1m) NOTE: Drill hole abandoned, because rising river forced barge off hole on 27 Aug. 1959										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S3084/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 40

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Left Abutment

CO-ORDINATES E 285 413 m
N 9 226 495 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 26.3 m
ANGLE FROM HORIZONTAL 27° 30'
DIRECTION 115°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING Fr FrSt SW HW CW	CORE SIZE	RL OR ELEVATN	DEPTH	GRAPHIC LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, massive, grey, medium to coarse grained,	NO CORE										
Interbedded fine grained SANDSTONE and MUDSTONE, with irregular bands of siltstone.											
SANDSTONE, grey, medium to fine grained,											
SANDSTONE and MUDSTONE, interbedded,											
Massive, grey, medium to fine grained,							Sub-vertical fissure, limonite stained				
							Sub-vertical fissures, limonitic, weathered				
Grey, medium to fine grained with frequent argillaceous bands	NO CORE										
SANDSTONE Massive, grey, medium to fine grained, becoming increasingly fine grained and argillaceous with depth	NO CORE	NX					Sub-vertical limonitic, weathered fissure, terminating in limonite coated, weathered bedding plane at 45°	NOT RECORDED	Full water return	NOT RECORDED	NOT TESTED
							Limonitic, weathered fissures at 50°				
SANDSTONE & MUDSTONE Interbedded, Mudstone predominant	NO CORE						Limonitic, weathered fissures at 50°				
							Incipient sub-vertical fracture				
SANDSTONE Grey, medium to fine grained, argillaceous	NO CORE						Badly fractured with limonite and weathering				

DRILL
Make MINDRILL
Type F 20
Driller Wimpey & Co Ltd
Commenced 7th Aug. 1959
Completed 9. Sept. 1959

FRACTURE LOG
0 2 5 10 15 20 cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 6
Dwg. No. 1429-S3090/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 40

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATION DEPTH	LOG	LIFT	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE			21				As above Limonite stained, weathered, sub-vertical fracture Badly fractured with limonite, weathered. Limonite stained, weathered, sub-vertical fractures				
NO CORE			22								
Grey, medium to fine grained, argillaceous			23								
			24								
			15 25								
NO CORE											
Sandstone becomes increasingly argillaceous			26								
			27								
NO CORE			28								
Blue-grey, sandy, with mudstone bands		NX	29								
			30								
NO CORE			31				Bedding at 40°				
MUDSTONE Blue-grey with sandy mudstone bands			32								
NO CORE			33								
			34				Fracture at 75°				
			35								
			10 36				Sub-vertical fracture				
SANDSTONE & MUDSTONE Massive, grey, medium to fine grained, argillaceous			37								
			38								
			39				Bedding at 40° ~ 50° Occasional unweathered fractures, sub-vertical				
			40								
			41								
			42								
			43								
NO CORE			44								

NOT RECORDED

NOT RECORDED

Full water return

NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 6

Dwg. No. 1429-S3090/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 40

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING F S MW HW EW C	CORE SIZE	ELEVATION metres	DEPTH metres	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG 0 1 2 3 4 5 6 7 8 9 10	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.4 1 2 4 6 8 10 20
Bands of medium to coarse grained				45							
				46							
				47							
				48			Bedding at 40° - 55° Occasional unweathered fractures at acute angles				
Massive, grey, medium to fine grained, argillaceous		NX		49							
				50							
				51							
				52							
				53							
				54							
				55							NOT TESTED
				56							
SANDSTONE Well bedded, grey, argillaceous, fine grained			0	57			Bedding at 45°				
				58							
				59			Fracture at 40°				
Massive, grey, medium to coarse grained, argillaceous bands.				60			Compound subvertical fracture.				
				61			Compound subvertical fracture with calcite veining.				
NO CORE				62							
		NX		63							
				64							
NO CORE				65							
SANDSTONE & MUDSTONE Thinly interbedded. Sandstone dominant, grading into a well bedded, grey, argillaceous, fine grained sandstone				66			Intermittent, irregular, parallel fractures.				
				67							
			-5	68							

NOT RECORDED

Full water return

NOT RECORDED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 6

Dwg. No. 1429-S3090/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 40

PROJECT. WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATN metres DEPTH CORING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE & MUDSTONE Thinly interbedded, Sandstone dominant, *grading into a well* bedded, grey, argillaceous, fine grained sandstone NO CORE			69 70 71							
Grey, medium to fine, grained, argillaceous, with mudstone bands coming in with depth NO CORE			72 73 74							
SANDSTONE			75 76 77							
NO CORE			78			Bedding at 45°				
Interbedded, The sandstone becoming dominant with depth.		NX	79 80 81 82 83 84 85 86 87 88 89 90 91 92				NOT RECORDED	Full water return	NOT RECORDED	NOT TESTED
SANDSTONE & MUDSTONE										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 6

Dwg. No. 1429-S3090 /4

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 40

PROJECT. MADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATION metres DEPTH metres	LOG	CORE LOST % PER LIFT 0 25 50 75 100	STRUCTURES JOINTS—spacing, persistence, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG N 0 25 50 75 100	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0 2 5 N 0 25 50 75 100
SANDSTONE & MUDSTONE as above			93			Bedding at 45°				
Massive, grey, medium to fine grained, argillaceous			94 95 96 97 98 99 100 -20 101			Bedding at 42° – 45° Irregular fracture at acute angle				
Grey, medium to fine grained with argillaceous bands			102 103 104			Irregular fractures Bedding at approximately 45°		Full return		NOT TESTED
Grey, medium to fine grained, becoming argillaceous with depth			105 106 107 108 109 110							
NO CORE			111 -25 112 113 114 115 116							

SANDSTONE

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 6

Dwg. No. 1429-S3090/5

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 40

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F FRESH SLIGHTLY WEATHERED MODERATELY WEATHERED EXTREMELY WEATHERED	CORE SIZE	ELEVATN / DEPTH metres	LOG	CORE LOSS % PER LMT 0 25 50 75 100	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG 2 5 10 25 50 100 200	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.5 1 2 5 10 25 50 100 200
SANDSTONE Grey, medium to fine grained, becoming argillaceous with depth			117			Bedding at approximately 45°				
Well bedded, blue-grey, sandy with bands of sandstone			118 119 120 121							
NO CORE			-30							
Well bedded, blue-grey, sandy		AX	122 123 124 125 126			Bedding at 45°				
MUDSTONE			127				NOT RECOVERED	Full water return	NOT RECOVERED	NOT TESTED
			128			Fracture at 70°				
			129			Fracture at 70°				
NO CORE			-35							
Blue-grey, with sandy bands			130 131 132							
NO CORE			133							
			134 135 136							
END OF HOLE 13⅞.16m (RL-3⅞.0)			137							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 6 of 6

Dwg. No. 1429-S3090/6

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 41

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Left Abutment

CO-ORDINATES E 285 411 m
N 9 226 491 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 25.7 m
ANGLE FROM HORIZONTAL 20°
DIRECTION 199°

DESCRIPTION OF CORE — ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING (Fr, FrSt, SW, MW, HW, CW)	CORE SIZE	metres ELEVATN / DEPTH	CORE LOG	CORE LOSS % PER LIFT	STRUCTURES — JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS — LEAKAGE RATES IN LUGEON UNITS
MUDSTONE sandy weathered, limonite coated. NO CORE										
GRAVEL. NO CORE										
MUDSTONE, Sandy. GRAVEL. NO CORE			25							
Blue-grey, sandy, with thin bands of sandstone										
Weathered, [illegible]										
MUDSTONE NO CORE		NX				Bedding at 77°	NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
Core barrel emerged from rock above water level. NX casing pushed ahead from here on river bottom to end of hole at 42.37 m.										
NO CORE										

DRILL
Make MINDRILL
Type F 20
Driller G. Wimpey Co.Ltd
Commenced 17. Sept. 1959
Completed 22. Sept. 1959

FRACTURE LOG — N, 20, 10, 5, 2, 1, cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429 - S3091/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 41

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F HW SW HW MW CW	CORE SIZE	ELEVATN metres DEPTH CORING	LOG	CORE LOSS % PER LNT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	SWELL TEST	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
Clinometer test indicates inclination 20°			21 22 23 24 25 26 27 28				NOT RECORDED	NOT RECORDED	NOT RECORDED	NOT TESTED
NO CORE		NX	29 30 31 15 32 33 34 35 36 37 38 39 40							
Clinometer test indicates inclination 12°			41							
Sample taken by Shell shows black, coarse sand and gravel			42							
END OF HOLE 42.37m (RL11.2m)			43 44							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S3091/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC–NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

HOLE No. BH 42

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Left Abutment

CO-ORDINATES E 285 413 m
N 9 226 493 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 25.5 m
ANGLE FROM HORIZONTAL 27°
DIRECTION 153°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	metres ELEVATION	metres DEPTH	CASING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG N 0.2 0.8 2.0	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.8 2.0
NO CORE												
NO CORE												
NO CORE												
Grey, medium to coarse grained and medium to fine grained SANDSTONE		NX						Bedding at 70° Limonite stained bedding plane fissures	NOT RECOVERED	Fair water return	NOT RECOVERED	NOT TESTED
								Fissure at 75° limonite stained				
NO CORE												
Grey, medium to fine grained, with thinly interbedded bands of mudstone												

DRILL
Make MINDRILL
Type F20
Driller G. Wimpey Co. Ltd
Commenced 24. Sept. 1959
Completed 28. Sept. 1959

FRACTURE LOG
N 0.2 0.8 2.0 cm
100 50 10 5 1 0.5

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P
Checked
Sheet 1 of 2
Dwg. No. 1429-S3092 /1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 42

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING ST FSW SW MW HW CW	CORE SIZE	RELEVATN in Metres BELOW DATUM / DEPTH in Metres BELOW COLLAR	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG N 0 20 40 60 80 100 200	STEEL WATER LEVEL	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.6 1 N 0 20 40 60 80 100 200
Grey, medium to fine grained with thinly interbedded bands of mudstone		NX	21 22 23 24 25			Bedding at 70°	NOT RECORDED	Rod water return	NOT TESTED	NOT TESTED
SANDSTONE Massive, grey, argillaceous, fine grained			26 27 28 29							
NO CORE			30							
Medium to fine grained, argillaceous NO CORE			31							
GRAVEL, coarse, well rounded limestone and volcanic pebbles			32							
END OF HOLE 32.11m (RL10.9m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429-S3092/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 43

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION Right Abutment

CO-ORDINATES E 285 511 m

N 9 226 320 m

SYSTEM AMG Zone 55

SURFACE ELEVATION 26.6 m

ANGLE FROM HORIZONTAL 25°

DIRECTION 313°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING Fr, FrSt, SW, HW, MW, CW; CORE SIZE	metres ELEVATION / DEPTH	CORE	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEONS UNITS
CLAY: Firm, brown, mottled — NO CORE										
MUDSTONE: Blue-grey, sandy — NO CORE						Bedding approximately at 70°. Limonite stained bedding plane fissures				
NO CORE										
SANDSTONE: Massive, grey, medium to fine grained — NO CORE						Limonite stained; Irregular limonite stained fissures	NOT RECORDED	GOOD WATER RETURN		NOT TESTED
SANDSTONE & MUDSTONE: Interbedded — NO CORE						Bedding approximately at 72°		NOT RECORDED		
NO CORE										
SAND: Loose, grey, fine grained silty								COMPLETE WATER LOSS		

DRILL
Make MINDRILL
Type F50
Driller G. Wimpey Co. Ltd.
Commenced 24. Sept. 1959
Completed 28. Sept. 1959

FRACTURE LOG

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429 - S3093/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 43

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	RL/DEPTH metres	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	TOTAL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SAND, loose, grey, fine grained, silty.		NX	21 22 23 24 25 26 27 15 28				NOT RECORDED	COMPLETE WATER LOSS	NOT RECORDED	NOT TESTED
END OF HOLE 28.65m (RL14.5m)						NOTE: Lining tubes were drilled from 17.07 m to 28.65 m and disturbed sample taken by shell. Hole was abandoned, when deviation of hole was too great to insert rods in casing for further sampling or clinometer tests.				

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429 - S3093/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 44

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Right Abutment

CO-ORDINATES E 285 512 m
N 9 226 321 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 26.7 m
ANGLE FROM HORIZONTAL 36°
DIRECTION 000°

DESCRIPTION OF CORE (ROCK TYPE—colour, grain size, texture, mineral composition)	DEGREE OF WEATHERING	CORE SIZE	ELEVATN / DEPTH (metres)	LOG	CORE LOSS % PER CENT	STRUCTURES (JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS; FAULTS, CRUSHED ZONES)	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS (LEAKAGE RATES IN LUGEON UNITS)
MUDSTONE Blue-grey, sandy										
SANDSTONE: Grey, argillaceous, medium to fine grained			1			Limonitic, weathered				
NO CORE			2			← Limonitic fissure at 60°				
MUDSTONE: Blue-grey, sandy			25 3			Bedding at 35°				
NO CORE			4							
			5			Fissure, probably filled with loose silt				
			6							
			7							
			8							
Grey, argillaceous, medium to fine grained. Mudstone bands appear with depth		NX	9				NOT RECORDED	No water loss		NOT TESTED
			10					100% Loss		
			11							
			20 12							
NO CORE			13							
NO CORE			14					No loss		
Massive, grey, medium to fine grained, with occasional thin argillaceous bands			15			← Bedding approximately at 25°				
			16							
			17							
			18							
Grey, medium to fine grained with argillaceous bands			19			← Sub-vertical fracture		100% LOSS		
see below			15 20			← Bedding at 33°				

DRILL
Make MINDRILL
Type F50
Driller G. Wimpey Co. Ltd
Commenced 2. Oct. 1959
Completed 8. Oct. 1959

FRACTURE LOG

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429-S3094/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. 011 44

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F FW SW HW CW	CORE SIZE	ELEVATN / DEPTH (metres)	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Grey, argillaceous, fine grained, with occasional bands of medium to fine grained			21 22 23 24							
MUDSTONE Blue-grey, sandy, with thin bands of fine grained sandstone			24							
Grey, medium to fine grained with argillaceous bands		NX	25			Bedding plane fissures, limonite stained.	NOT RECORDED	100% Water Loss	NOT RECORDED	NOT TESTED
NO CORE			26							
SANDSTONE Irregularly interbedded, fine and medium grained sandstones with occasional bands of mustone			27 28 10 29 30			Irregular sub-vertical fracture				
Massive, grey, medium to fine grained										
END OF HOLE 30.94m (RL8.5m)			31							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429-S3094 / 2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 45

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Left Abutment

CO-ORDINATES E 285 358 m
N 2 226 485 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 28.5 m
ANGLE FROM HORIZONTAL 50°
DIRECTION 058°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR FrSt SW HW CW	CORE SIZE	metres ELEVATN	DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SAND loose, grey fine NO CORE				1							
Massive, grey, medium to fine grained.		NX		2 3 4 25 5 6			Sub-vertical fissures, limonite stained. Sub-vertical fractures.				
Occasional thin argillaceous bands				7 8 9 10							
SANDSTONE Irregularly, thinly bedded, medium to fine grained, with bands of mudstone.				11 20 12 13							
Massive, grey, medium to fine grained				14							
Thinly bedded, grey, argillaceous, fine grained				15 16 17							
SANDSTONE & MUDSTONE Thinly interbedded, fine grained.				15 18							
MUDSTONE Blue-grey with thin bands of sandy mudstone.				19 20							

Artesian water flowing from bore hole on completion of drilling

Full water return

NOT TESTED

DRILL
Make MINDRILL
Type F 20
Driller G. Wimpey Co. Ltd.
Commenced 10. Oct. 1959
Completed 14. Oct. 1959

FRACTURE LOG
cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429-S3095

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 45

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F FW SW EW CW	CORE SIZE	ELEVATION metres DEPTH CORE	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE Blue-grey with thin bands of sandy mudstone			21							
NO CORE										
NO CORE										
MUDSTONE Blue-grey, sandy with bands of mudstone			22 23 24 10 25 26							
NO CORE										
SANDSTONE Massive, grey, medium to fine grained		NX	27 28 29			Sub-vertical fracture				
NO CORE			30 5				NO RECORD	Full water return		NOT TESTED
SANDSTONE & MUDSTONE Thinly interbedded, fine grained sandstone, sandy mudstone and mudstone			31 32 33							
SANDSTONE Grey, medium to fine grained, with bands of coarse grained and thin bands of mudstone			34 35 36			Irregular subvertical, calcite lined fissure.				
			37 0 38			Fractures at 75° Incipient subvertical fracture.				
END OF HOLE 38.71m (RL-1.2m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429-S3095/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 46

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Right Abutment

CO-ORDINATES E 205 512 m
N 9 226 321 m
SYSTEM AMG Zone 55

SURFACE 26.7 m
ELEVATION
ANGLE FROM 43°
HORIZONTAL
DIRECTION 007°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING Fr FrSt SW HW MW CW	CORE SIZE	metres ELEVATN	DEPTH	LOG	CORE LOSS % PER CUT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE—Blue-grey, sandy											
NO CORE											
SANDSTONE Grey, argillaceous, medium to fine grained with thin bands of mudstone				1 2 25 3			Weathered, limonitic				
NO CORE				4							
MUDSTONE Blue-grey, sandy				5							
NO CORE				6 7 8			Fissure, probably filled with loose silt				
Grey, argillaceous, fine grained				9							
Grey, medium to fine grained, with thin bands of mudstone		NX		10 20			Vertical fractures				
NO CORE				11			vertical fractures				
				12 13 14							
NO CORE				15							
SANDSTONE Massive, grey, medium to fine grained, with occasional thin, argillaceous bands				16 17 15 18 19 20							

NOT RECORDED

100% water return after running BX casing

NOT RECORDED

NOT TESTED

DRILL
Make MINDRILL
Type F 50
Driller G. Wimpey Co Ltd
Commenced 11 Oct. 1959
Completed 31 Oct. 1959

FRACTURE LOG
cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged
Drawn D.P.
Checked
Sheet 1 of 6
Dwg. No. 1429-S3096/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 46

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FW SW MW HW CW	CORE SIZE	ELEVATION metres DEPTH metres	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
As above										
NO CORE			21			Vertical fractures				
Massive, grey, argillaceous, fine grained			22							
			23			Vertical fractures				
NO CORE			24			Incipient subvertical fracture				
			10 25							
SANDSTONE Irregularly bedded, fine and medium grained, argillaceous in parts and with thin mudstone bands			26							
			27							
			28							
			29			Incipient vertical fractures				
			30							
			31							
		NX	5 32				NOT RECORDED	100% water return after running 2X casing	NOT RECORDED	NOT TESTED
Massive, blue-grey, sandy			33			Frequent incipient vertical fractures				
			34							
			35							
			36							
			37							
MUDSTONE Blue-grey with sandy bands			38							
			39 0							
			40							
Massive, blue-grey, sandy			41			Incipient vertical fracture				
			42							
Blue-grey, sandy with bands of fine grained sandstone			43							
SANDSTONE as below			44			Fissure at 75°, calcite lined				

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 6

Dwg. No. 1429-S3096/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 46

PROJECT MADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Grey, coarse to fine grained. The finer grained becoming prominent with depth			45 46 -5 47 48 49							
MUDSTONE, sandy, blue-grey with thin bands of fine grained sandstone										
SANDSTONE and MUDSTONE Thinly interbedded, fine grained sandstone, sandy mudstone and mudstone			50 51 52 53 -10 54			Fissure at 75°, calcite lined Fracture at 60°				NOT TESTED
Sandstone becoming prominent		NX	55 56			Fracture at 60°				
SANDSTONE NO CORE Massive, grey, medium to fine grained			57 58 59 60 61 -15 62 63			Compound fractures with limonitic weathering. Fracture at 60°, limonitic, weathered	NOT RECORDED	100% water return after running BX casing		
Massive grey, argillaceous, fine grained becoming increasingly argillaceous with depth			64 65 66 67 68			Sub-vertical fracture Fracture at 60°				

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 6

Dwg. No. 1429-53096/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 46

PROJECT ... WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATN. / DEPTH (metres)	CORE LOG	LOSS	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG N 0.2 0.6 2 6 20 60 100 200	OVAL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.6 2 6 20 60 100 200
SANDSTONE Massive, grey, argillaceous, fine grained, becoming increasingly argillaceous with depth			-20 69 70 71				Fracture at 60°				
MUDSTONE Sandy, blue-grey with thin bands of fine grained sandstone and mudstone			72 73								
SANDSTONE Massive, grey, medium to fine grained			74 75 -25 76 77				Fractures at 60° Fissure at 70°, calcite lined sub-vertical fissure, calcite lined				
Thinly bedded, grey, argillaceous, fine grained, with occasional thin bands of medium grained sandstone and mudstone. Argillaceous bands becoming more frequent with depth.			78 79 80 81 82								
SANDSTONE & MUDSTONE Thinly interbedded, fine grained sandstone, sandy mudstone and medium to fine grained sandstone			83 -30 84 85 86				Bedding at 22°				
Fairly well bedded grey, medium to fine grained sandstone with thin bands of coarse grained sandstone and mudstone			87 88 89				Fracture at 60°				
MUDSTONE Sandy, blue-grey			90 -35 91								

NOT RECORDED

100% water return after running EX casing

NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 6

Dwg. No. 1429-S3096/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 46

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL OR DEPTH FROM DATUM	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, orientation, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE Sandy, blue-grey			93 94 95 96 97			Sub-vertical fracture				
MUDSTONE and SANDSTONE Thinly interbedded, sandy mudstone with medium and fine grained sandstone			40 98 99 100 101 102			Bedding at 27°				
Thinly and irregularly bedded, grey, medium and fine grained, argillaceous		NX	103 104 105 42 106			Bedding variable, approximately at 28°				NOT TESTED
SANDSTONE Grey, argillaceous, fine grained with thin, medium to fine grained bands, grading down into a medium to fine grained sandstone. Some argillaceous streaks			107 108 109 110 111 112 50 113 114 115			Fractures at 70° Bedding variable, approximately at 20° - 25° Vertical fracture				

NOT RECORDED

Total return after running BX casing NOT RECORDED

Full Return

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 6

Dwg. No. 1429-S3096/5

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. BH 46

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELATIVE DEPTH (material)	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE As above			117							
Sandy, massive, blue-grey			118 119 -55 120							
MUDSTONE Massive, blue-grey, dense with occasional sandy bands			121 122 123 124 125 126			Bedding approximately at 25°	NOT RECORDED	Full Water Return	NOT RECORDED	NOT TESTED
END OF HOLE 126.49m (RL-59.6m)			127							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 6 of 6

Dwg. No. 1429-S3096/6

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L1

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE - GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT

FEATURE: MAIN DAM

LOCATION: Left Abutment

CO-ORDINATES: E 285 486 m, N 9 226 534 m

SYSTEM: AMG Zone 55

SURFACE ELEVATION: 30.1 m

ANGLE FROM HORIZONTAL: 45°

DIRECTION: 146°

DESCRIPTION OF CORE ROCK TYPE - colour, grain size, texture, mineral composition.	STRUCTURES JOINTS - spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES.
NO CORE	
SANDSTONE: Medium grained,	Fractures at 65°
NO CORE	
NO CORE	
SANDSTONE: Medium grained, light to mid-grey, mostly massive. A few siltstone bands up to 30mm thick.	Bedding at 70°
NO CORE	

NOT RECORDED

NOT RECORDED

NOT TESTED

DRILL

Make:

Type: EWT-1000

Driller: Nippon Koei Co.

Commenced: 29 Sept. 1971

Completed: 22 Oct. 1971

FRACTURE LOG

Equivalent lengths of core pieces in centimetres.

EXPLANATION

Natural breaks in core per metre.

WEATHERING

CW - Completely weathered

HW - Highly weathered

MW - Moderately weathered

SW - Slightly weathered

Fr(S) - Fresh, with limonite stained joints

Fr - Fresh

ENGINEERING GEOLOGY BRANCH

Logged: G.A. Fronda

Drawn: D.P.

Checked:

Sheet 1 of 5

S.M.E.C. Dwg. No 1429-S3104/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L1

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F SW MW HW CW	CORE SIZE	ELEVATN / DEPTH metres	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL RATE LOG	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Medium grained, light to mid grey, mostly massive. A few silty bands up to 30mm thick.			21 22 23 24			BEDDING at 70°.		NOT RECORDED	NOT RECORDED	NOT TESTED
SANDSTONE Medium to fine grained with many siltstone bands up to 20mm thick and very silty sandstone bands up to 0.4m thick.			25 26 27 28 29 30			Minor air slacking				
SANDSTONE to SILTSTONE SANDSTONE fine grained, SILTSTONE sandy. Mid to dark grey.		NX	31 32 33 34			Partially air slacked, friable. Fractures parallel to bedding at 65°.				
SANDSTONE Fine grained, very silty A few siltstone bands up to 30mm thick.			35 36 37 38 39			Minor air slacking				
Medium to fine grained, mid grey, minor silty bands.			40 41 42			No air slacking				
SANDSTONE and SILTSTONE mid grey.			43 44			Air slacked friable.				

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 5

Dwg. No. 1429-S3104/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L1

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL or RELATIVE DEPTH	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Medium to fine grained. Minor silty bands.			45 46 47 48 49 50 51							
SILTSTONE to SANDSTONE SILTSTONE very sandy, dark grey, SANDSTONE is silty.			52 53 54 55 56 57 58 59 60 61 62 63 64 65 66			CORE REMOVED BY N.K. FOR TESTING. Air slacked throughout, but not broken to disoriented fragments, very friable. CORE REMOVED BY N.K. FOR TESTING.		NOT RECORDED	NOT RECORDED	NOT TESTED
SANDSTONE very silty			67 68			Partially air slacked				

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L1

PROJECT. WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE - colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATN / DEPTH CASING	LOG	CORE LOSS %	STRUCTURES JOINTS - spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Very silty			69			Partially air slacked				
SILTSTONE Sandy, dark grey.		NX	1-20 71 72 73 74 75 76			Air slacked throughout to fragments. Friable.		NOT RECORDED	NOT RECORDED	
NO CORE			1-25 77 78							NOT TESTED
MUDSTONE to SILTSTONE Dark grey		EX	79 80 81 82 83 84			Bedding at 65°				
Dark grey. MUDSTONE is very silty. Sandy bands up to 10mm fairly common.			1-30 85 86 87 88 89 90 91 92			Bedding at 65°				

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L1

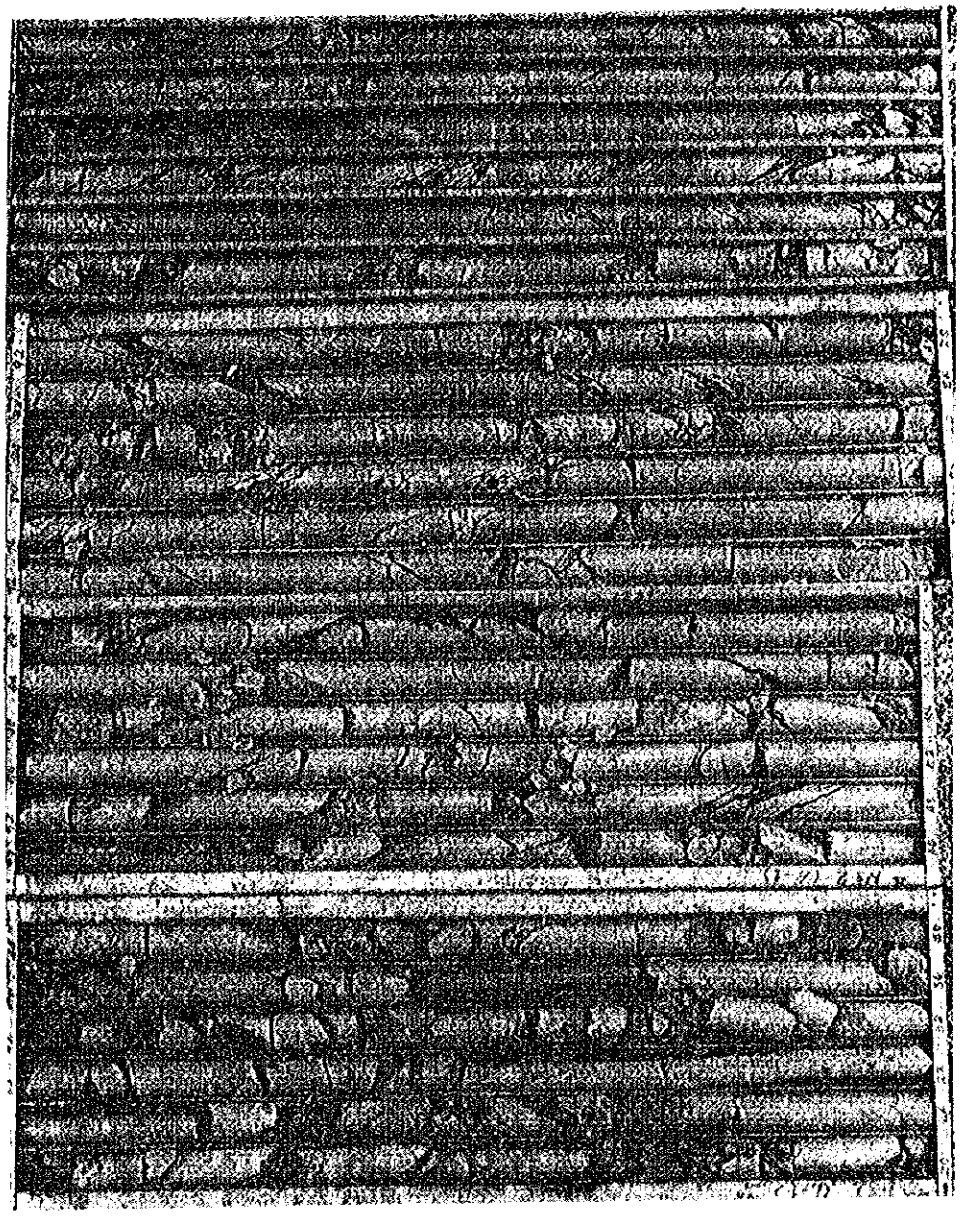
PROJECT. WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATN metres / DEPTH metres	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DIRECTIONAL TEXTURE	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE to SILTSTONE: Dark grey. MUDSTONE is very silty. Sandy bands up to 10mm fairly common			93 94 95 96 92 98			Bedding at 65°				
MUDSTONE dark grey, silty		BX	99			Air slacked to fragments.				NOT TESTED.
NO CORE			100							
SILTSTONE: Dark grey			101 102 103 104 105			Bedding at 65°		NOT RECORDED	NOT RECORDED	
			106							
END OF HOLE 106.8 m (RL45.4)			RL 140 RL 45							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 5

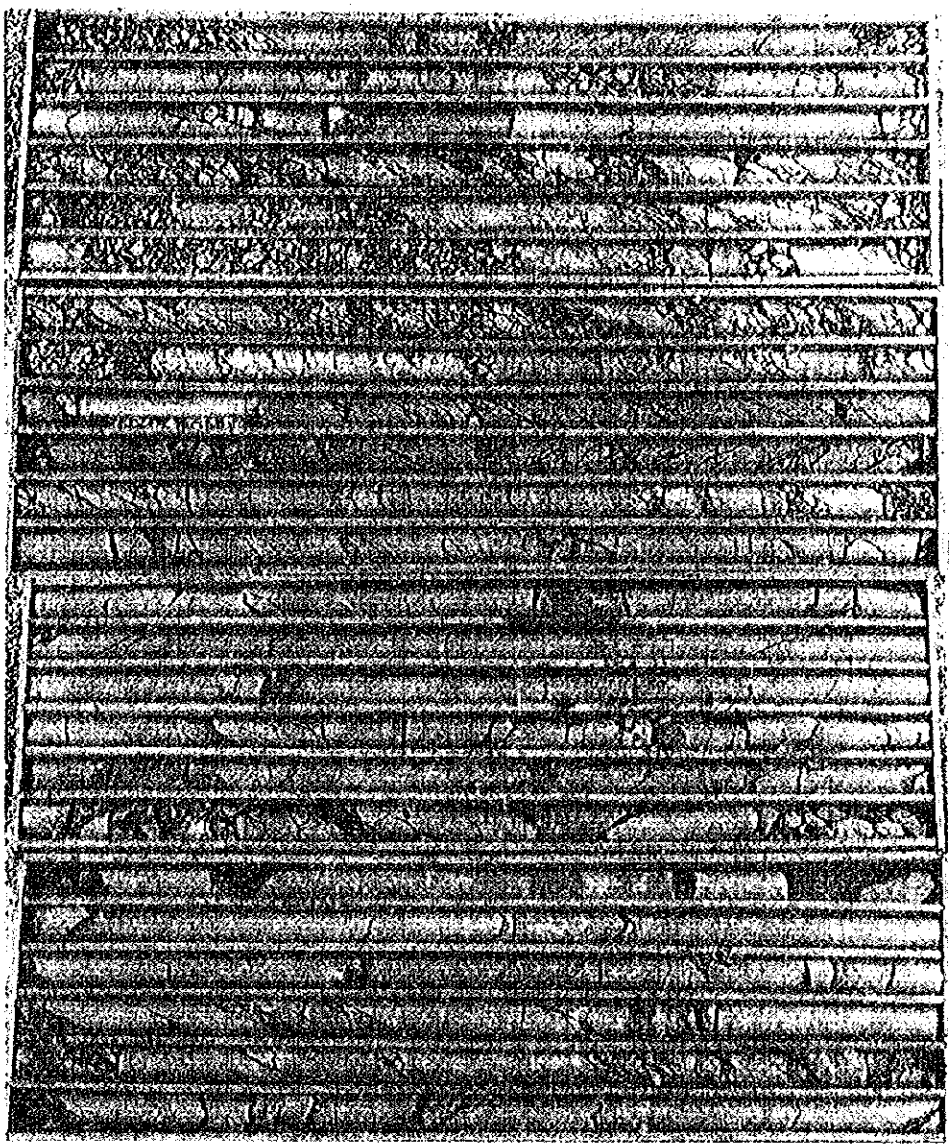
Dwg. No. 1429-S3104/5



DIAMOND DRILL HOLE L1

WABO POWER PROJECT

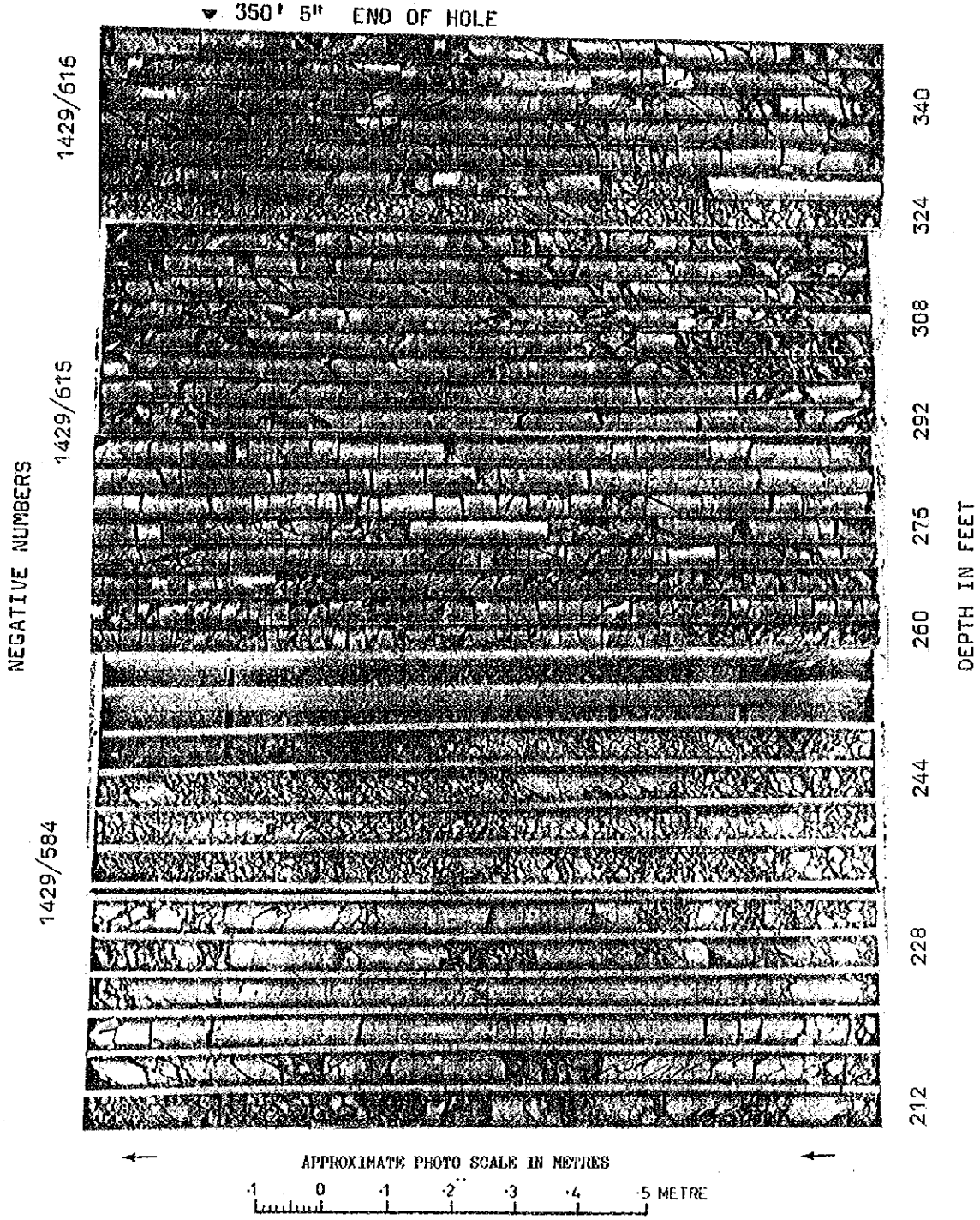
SHEET 1 OF 3



DIAMOND DRILL HOLE L1

WABO POWER PROJECT

SHEET 2 OF 3



DIAMOND DRILL HOLE L1

WABO POWER PROJECT

SHEET 3 OF 3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L2

SMEC-NK WAPO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE - GEOLOGICAL LOG

PROJECT: WAPO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Left Abutment

CO-ORDINATES: E 285 462 m, N 9 226 558 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 52.0 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: –

DESCRIPTION OF CORE ROCK TYPE - colour, grain size, texture, mineral composition.	STRUCTURES JOINTS - spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES.
NO CORE	
SANDSTONE: Light grey, fine grained.	3 joints at 30°, rough surfaces. Rough joints at 20° to 30°. Irregular fractures, some are drilling breaks.
SANDSTONE: Interbedded with thin 10-20mm siltstone beds.	Irregular fractures. Joint at 60°, planar, almost smooth, clean. Joint at 80°, clean, curved, undulating. Rough bedding plane partings at 45°.
Interbedded SANDSTONE and SILTSTONE. Grading into siltstone	Irregular fractures
SANDSTONE: Light grey, fine grained.	Very rough partings, approximately on bedding plane at 40°. Bedding plane partings. Bedding plane partings and irregular fractures. Joint at 70° rough. Rough bedding plane partings at 30 -40°. Joint at 30° approximately perpendicular to bedding, rough, clean. Joint at 70°, very rough.

NOT RECORDED

NOT RECORDED

NOT TESTED

DRILL
Make:
Type: EWT-1000
Driller: Nippon Koei Co.
Commenced: 27 Oct. 1971
Completed: 30 Oct. 1971

FRACTURE LOG: Natural breaks in core per metre. Equivalent lengths of core pieces in centimetres.

EXPLANATION

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
Fr St - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY BRANCH
Logged: B.V. Radford
Drawn: D.P.
Checked:
Sheet 1 of 3
S.M.E.C. Dwg No. 1429-S3105/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L2

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES PE LUGEON UNITS
SANDSTONE — Light grey, fine grained			30			Mainly bedding plane partings at 45°.				
Local increase in siltstone content.						Smooth bedding plane partings along siltstone interbeds.				
SANDSTONE and SILTSTONE, Interbedded. — Thin 5–50mm interbeds			25			Rough, curved vertical fracture				
						Joint near vertical, curved.				
sandstone predominates		NX				SAMPLE REMOVED BY N.K. FOR TESTING.		NOT RECORDED	NOT RECORDED	NOT TESTED
						Bedding plane partings at 40°, rough to undulating				
			20			Joint at 60°, rough, approximately perpendicular to bedding.				
SANDSTONE — Light grey, fine grained with occasional thin siltstone interbeds, mostly less than 10mm thick.										
			15			Joint at 80°, rough.				
						Bedding plane partings at 40°, rough.				
			10			Joint at 80°, very rough, clean				

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429-S3105/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L2

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELATIVE STRENGTH	DEPTH (metres)	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, light grey, fine grained with occasional thin siltstone interbeds, mostly less than 10mm thick			VW	45			Bedding partings at 40°, rough. Joint at 55°, rough, clean, near perpendicular to bedding plane.		NOT RECORDED	NOT RECORDED	NOT TESTED
END OF HOLE 45.4m (RL 6.6m)											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

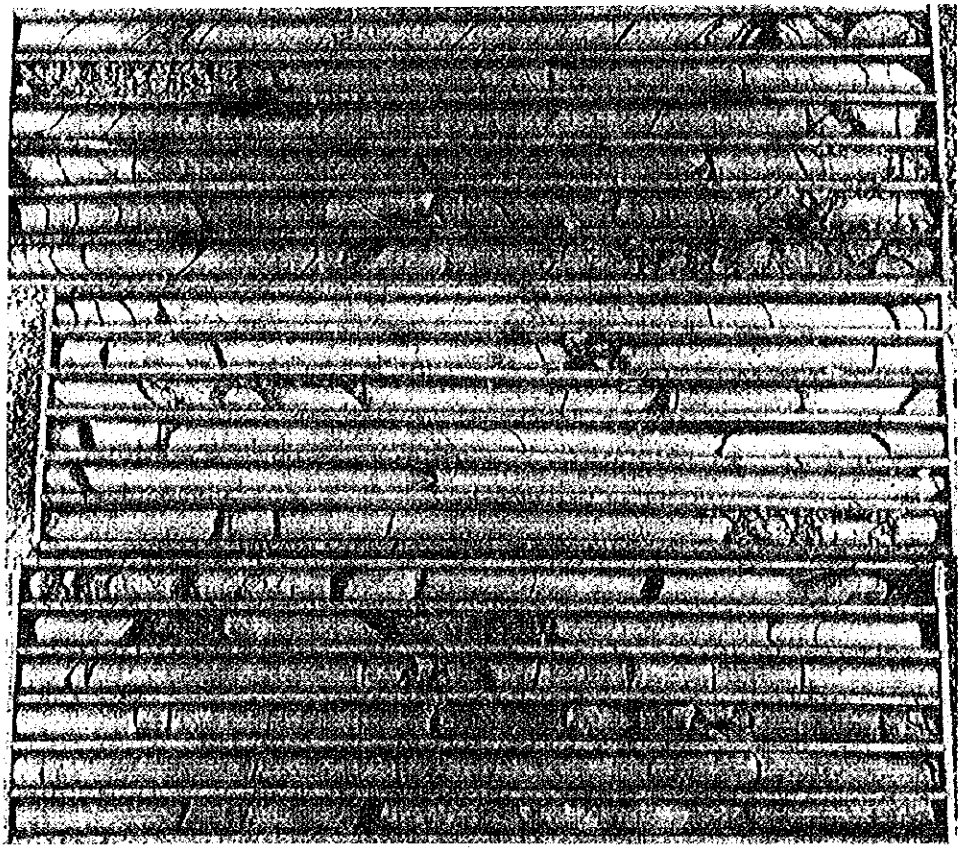
Sheet 3 of 3

Dwg. No. 1429-S3105/3

NEGATIVE NUMBERS

1429/610

1429/609



DEPTH IN FEET

74

58

42

26

10

START OF HOLE

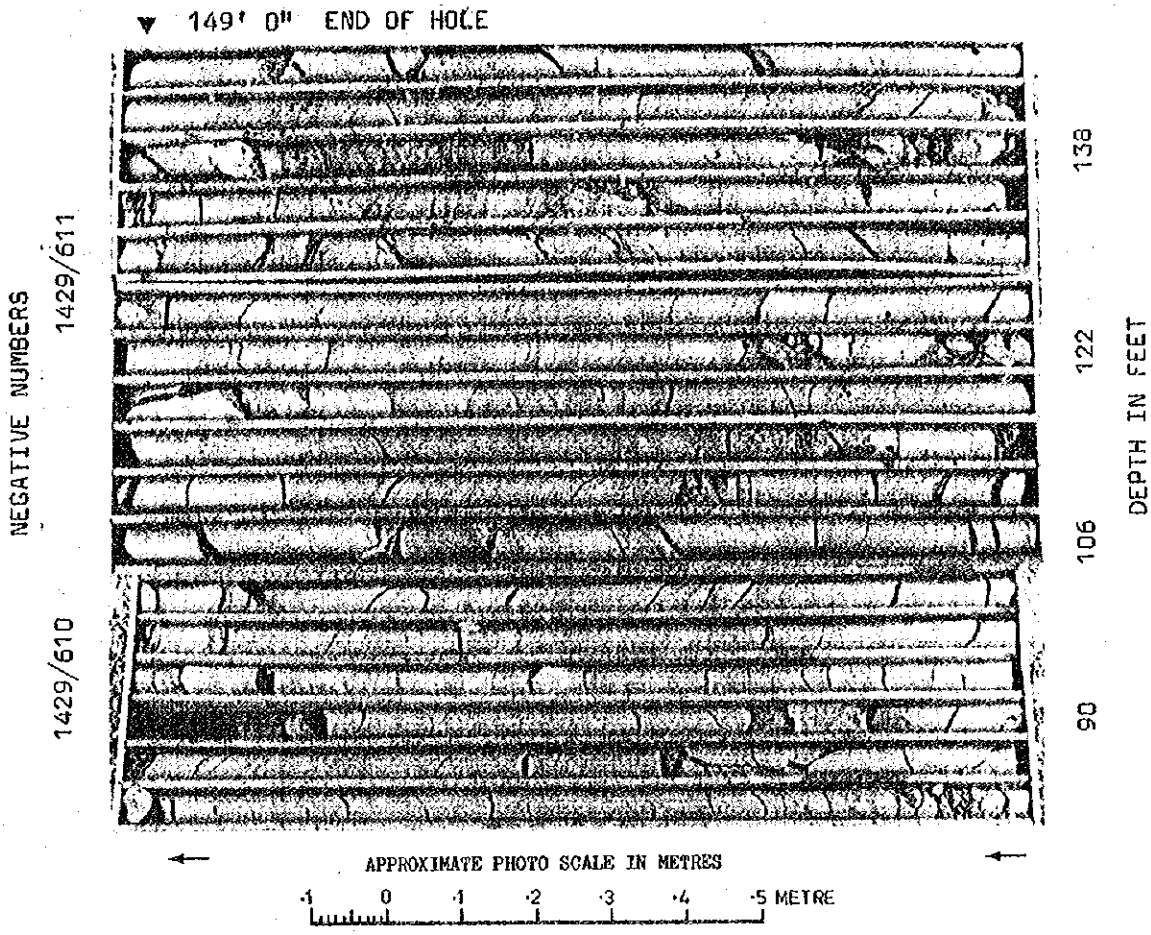
APPROXIMATE PHOTO SCALE IN METRES

·1 0 ·1 ·2 ·3 ·4 ·5 METRE

DIAMOND DRILL HOLE L2

WABO POWER PROJECT

SHEET 1 OF 2



DIAMOND DRILL HOLE L2

WABO POWER PROJECT

SHEET 2 OF 2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L3

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT

FEATURE: MAIN DAM

LOCATION: Left Abutment

CO-ORDINATES: E 285 403 m, N 9 226 664 m, SYSTEM AMG Zone 55

SURFACE ELEVATION: 97.1 m

ANGLE FROM HORIZONTAL: 90°

DIRECTION: –

DESCRIPTION OF CORE ROCK TYPE - colour, grain size, texture, mineral composition.	DEGREE OF WEATHERING	CORE SIZE	CORE LOSS %	STRUCTURES JOINTS - spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES.	FRACTURE LOG	WATER LEVEL	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
NO CORE		NX				NOT RECORDED	NOT TESTED
SANDSTONE, Light grey, fine grained.				Some bedding plane partings			
NO CORE							
SANDSTONE and SILTSTONE Interbedded				Bedding plane partings and air slacking fractures.			
NO CORE							
SANDSTONE Grey, fine grained.				Bedding plane partings at 40° Many irregular air slacking fractures.			
NO CORE							
				Fractures are bedding plane partings at 45°, air slacking cracks and drilling breaks.			

DRILL
Make:
Type: E15
Driller: Nippon Koei Co.
Commenced: 26 Oct. 1971
Completed: 30 Oct. 1971

FRACTURE LOG
cm 0 2 4 6 8 10 cm
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

EXPLANATION

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
Fr(t) - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY BRANCH
Logged: B.V. Radford
Drawn: D.P.
Checked:
Sheet 1 of 2
S.M.E.C. Dwg. No. 1429-S3106

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. L3

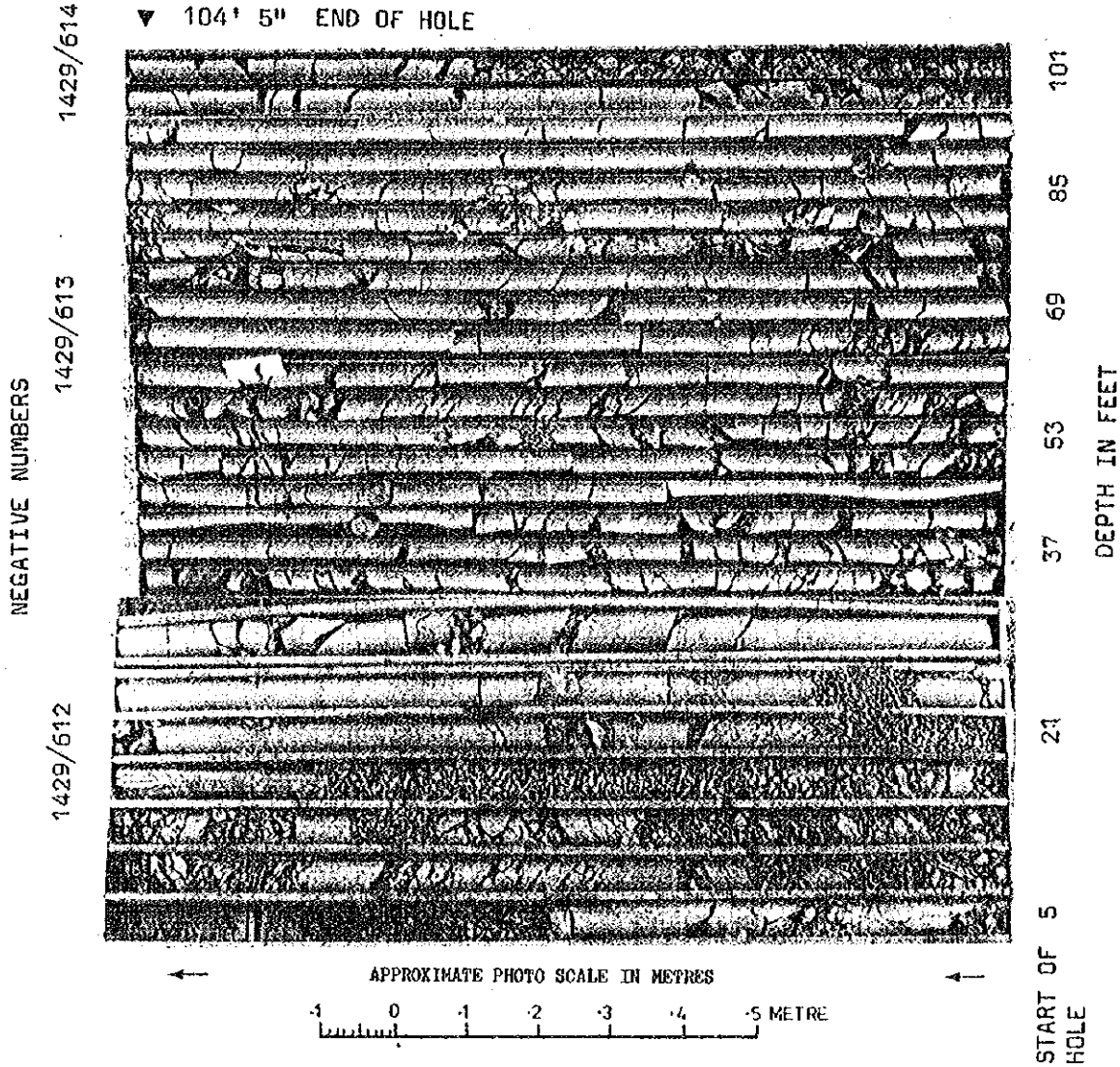
PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SLW MOD HW CW	CORE SIZE	RELEVATN metres DEPTH	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Grey, fine grained.		BX	21 22 23 24 25 26 27 28 29 30 31			Fractures are bedding plane partings at 45°, air slacking cracks and drilling breaks. Fracture near vertical curved, clean Zone of near vertical fractures.		NOT RECORDED	NOT RECORDED	NOT TESTED
END OF HOLE 31.8m (RL65.3m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429-S3106/2



DIAMOND DRILL HOLE L3

WABO POWER PROJECT

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R1

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE - GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT

FEATURE: MAIN DAM

LOCATION: Right Abutment

CO-ORDINATES: E 285 571 m, N 9 226 355 m

SYSTEM: AMG Zone 55

SURFACE ELEVATION: 27.4 m

ANGLE FROM HORIZONTAL: 45°

DIRECTION: 324°

DESCRIPTION OF CORE ROCK TYPE - colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	metres ELEVATION	CORE LOSS %	STRUCTURES JOINTS - spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES.	FRACTURE LOG	DRILL WATER LOSS	WATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
NO CORE			125					NOT RECORDED	
SANDSTONE SILTSTONE-MUDSTONE Very sandy at base. Alternating bands and intercalations of carbonaceous flecks common		NX	120		Broken to fragments Pronounced air slacking			NOT RECORDED	NOT TESTED
NO CORE SANDSTONE Medium grained, light to medium grey. Massive, tough. A few siltstone lenticles.			115		Bedding at 43° Joints mainly at 45° and 60°, mostly limonite stained.				

DRILL

Make:

Type: EWT-1000

Driller: Nippon Koei Co.

Commenced: 30 Aug 1971

Completed: 27 Sept. 1971

FRACTURE LOG

Natural breaks in core per metre.

Equivalent lengths of core pieces in centimetres.

EXPLANATION

WEATHERING

CW - Completely weathered

HW - Highly weathered

MW - Moderately weathered

SW - Slightly weathered

FrSt - Fresh, with limonite stained joints

Fr - Fresh

ENGINEERING GEOLOGY BRANCH

Logged: G.A. Frenda

Drawn: D.P.

Checked:

Sheet 1 of 5

S.M.E.C. Dwg. No. 1429-S3101/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R1

PROJECT MARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F SW MW HW CW CORE SIZE	RELEVATN DEPTH metres	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Medium grained, light to medium grey. Massive, tough. A few siltstone lenticles		21			Bedding at 43°. Joints mainly at 45° and 60°, mostly limonite stained.			
Fine grained, very silty. Carbonaceous and mudstone lenticles common.		22 23 24			Partly air slacked, crumbly. Parts easily along bedding at 50°.			
SILTSTONE Sandy, dark grey, grading to fine grained sandstone in part. Alternating coarser bands common, average 5mm thick		25 26 27 28 29 30			Air slacking common throughout. Soft, crumbly.		NOT RECORDED	NOT TESTED
		31			← SAMPLE REMOVED BY N.K. FOR TESTING.			
Fine grained, very silty, much stronger than above		32 33 34 35			Minor air slacking		NOT RECORDED	
SANDSTONE Medium grained, mid grey relatively strong.		36 37 38 39 40 41 42						
Interbedded SANDSTONE and MUDSTONE. See Below.		43 44			See Below			

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 5

Dwg. No 429-S3101/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R1

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F FSW SW HW MW CW CORE SIZE	metres ELEVATN DEPTH SCALE	LOG	UNITS	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE-MUDSTONE Interbedded, Sandstone mostly fine grained, Beds up to 10mm thick, average 2.5mm, Carbonaceous partings common.		45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68				Average bedding at 45° Core air slacked and now mostly in fragments.		NOT RECORDED	NOT RECORDED	NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 5

Dwg. No. 1429-S3101/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R1

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW HW MW CW	CORE SIZE	ELEVATN / DEPTH metres	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LEVEL	WATER PRESSURE TESTS LEAKAGE RATES OF LUGEON UNITS
SANDSTONE—MUDSTONE Interbedded. Sandstone mostly fine grained. Beds up to 10mm thick, average 2.5m. Carbonaceous partings common.			69 70 71 72 73 74 75 76			Average bedding at 45° Core air slacked and now in fragments.			
NO CORE		NX	77					NOT RECORDED	NOT TESTED
SANDSTONE Fine grained with fewer mudstone lenticles than above but still common			78 79 80 81 82			Core partly to completely air slacked to fragments.			
NO CORE			83						
NO CORE			84 85						
Medium to fine grained. Mudstone lenticles common, average 2mm, fairly strong.		BX	86 87 88 89 90 91 92			Negligible air slacking			

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 5

Dwg. No. 1422-S3101/4

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R1

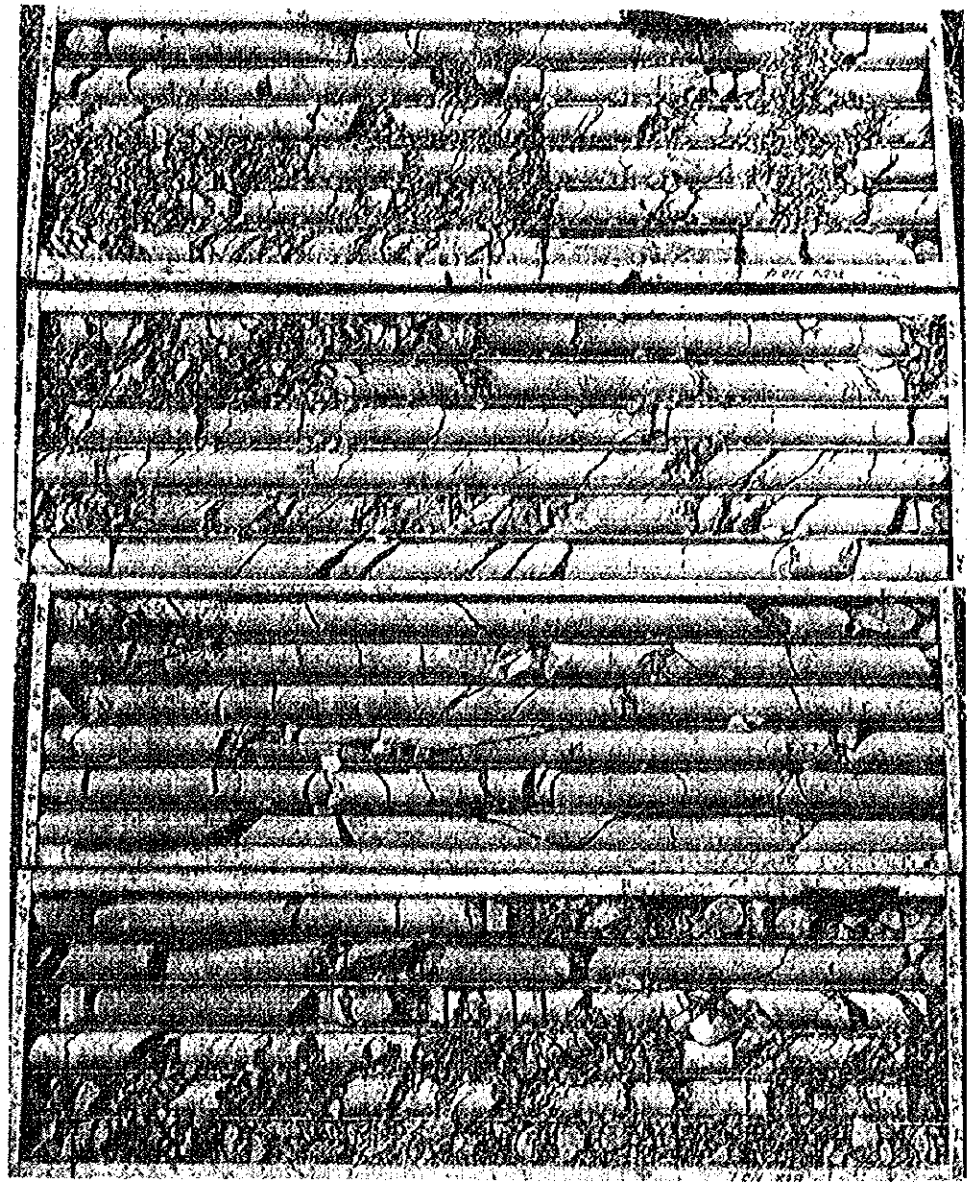
PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	Metres ELEVATION DEPTH	LOG	UNIT	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CHALCOPYRITE	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE Medium to fine grained. Mudstone lenticles common, average 2mm. Relatively strong.			93 94 95 96 97				Negligible air slacking				
SILTSTONE to SANDSTONE Siltstone is sandy, sandstone fine grained. Mudstone lenticles and inclusions common		EX	98 99 100 101 102 103 104 105 106				Core air slacked and broken to fragments throughout.		NOT RECORDED	NOT RECORDED	NOT TESTED
END OF HOLE 106.7m (RL-48.0m)											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 5

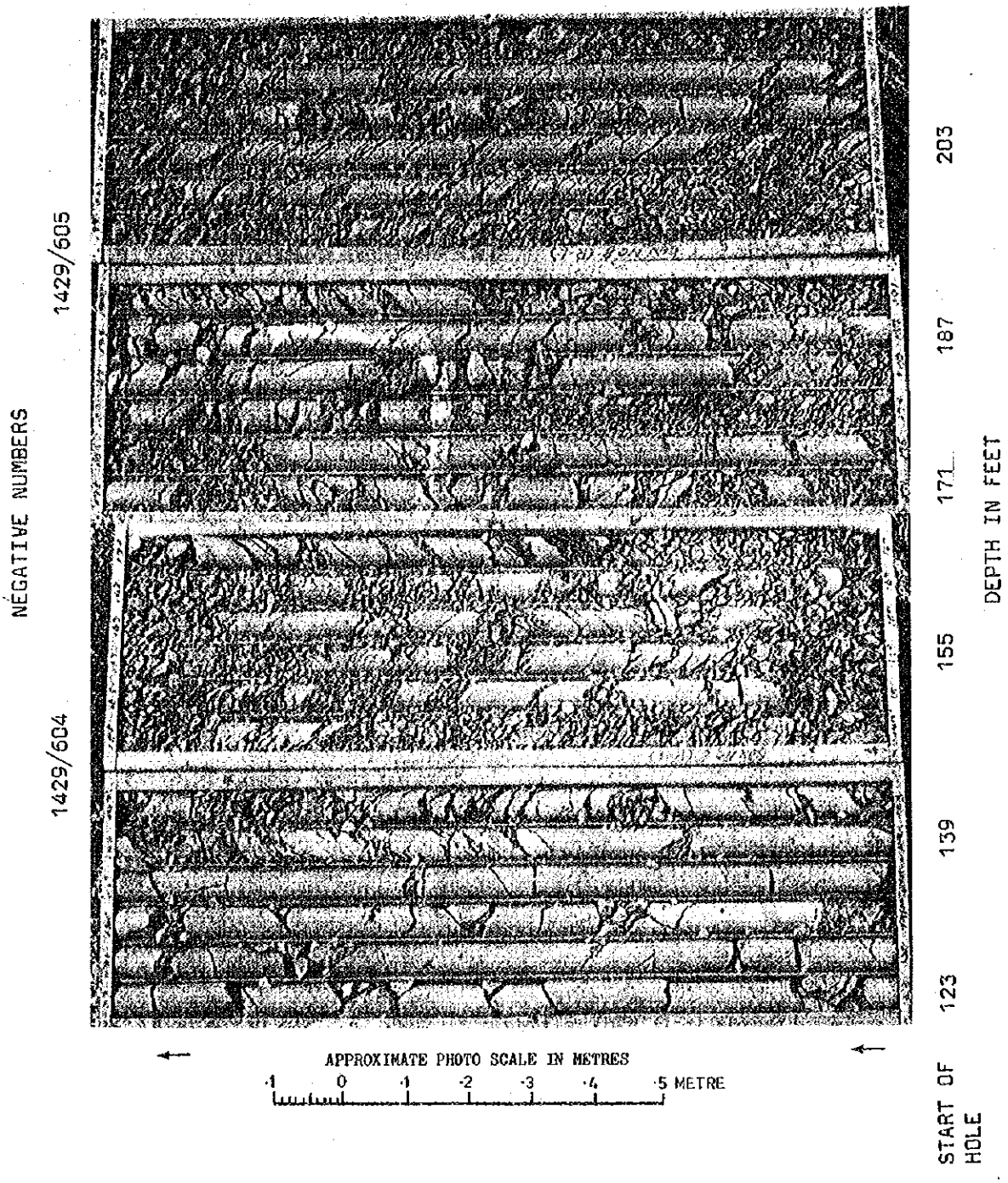
Dwg. No. 1429-S3101/5



DIAMOND DRILL HOLE R1

WABO POWER PROJECT

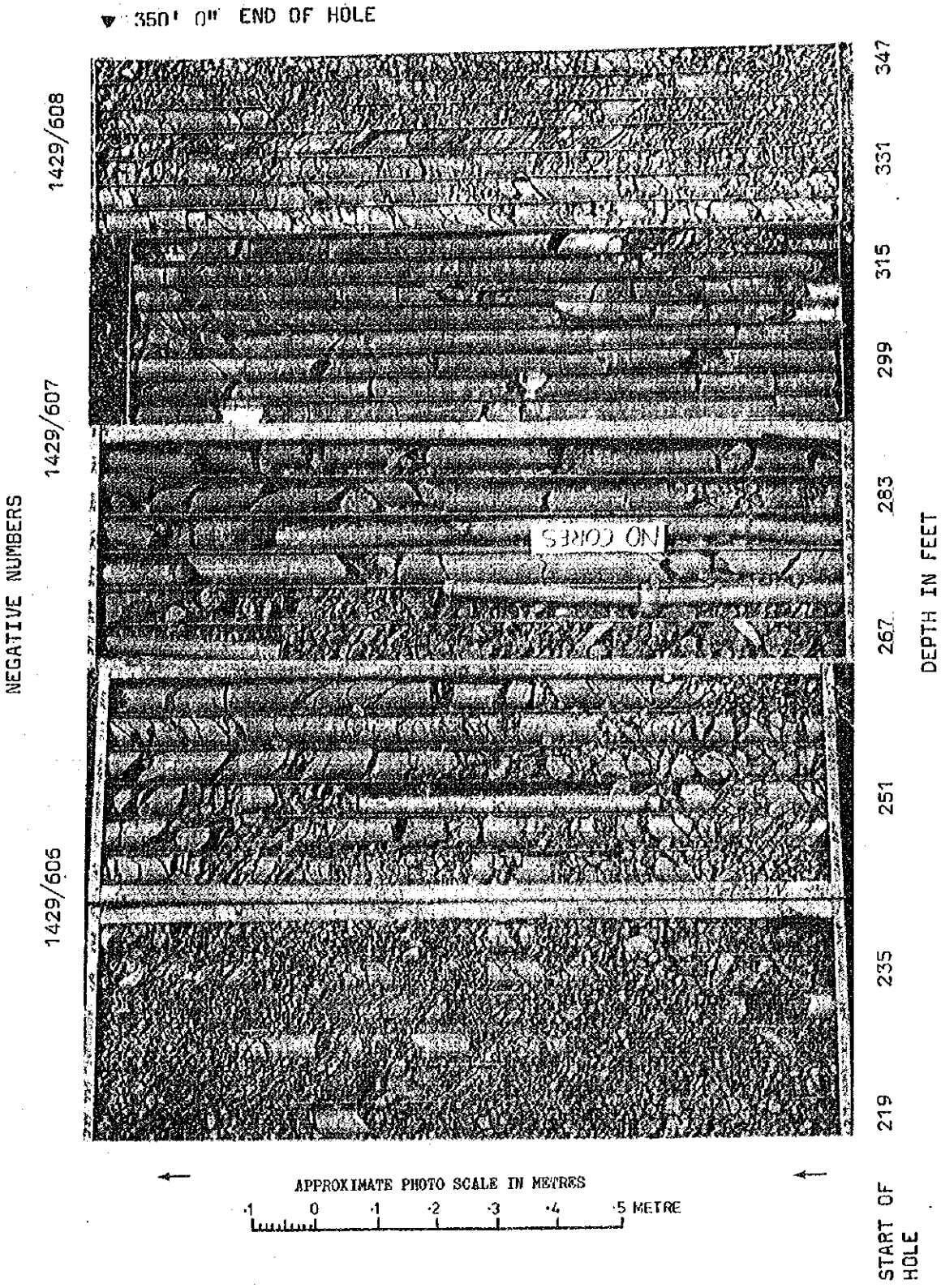
SHEET 1 OF 3



DIAMOND DRILL HOLE R1

WABO POWER PROJECT

SHEET 2 OF 3



DIAMOND DRILL HOLE R1

WABO POWER PROJECT

SHEET 3 OF 3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R2

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Right Abutment

CO-ORDINATES E 285 603 m
N 9 226 300 m

SURFACE ELEVATION 62.00 m
ANGLE FROM HORIZONTAL 90°
DIRECTION —

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	DEPTH (metres)	CASING	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
NO CORE			1								
SILTSTONE Very fine, sandy			2 60 3 4 5 6				Bedding plane partings at 30° to 50°. Air-slacking. SAMPLE REMOVED BY N.K. FOR TESTING.		NOT RECORDED	NOT RECORDED	NOT TESTED
SANDSTONE light grey, fine grained with a little silt.			7 55 8 9 10				Small crushed zone. Broken zone. Bedding plane partings at 40°.				
SILTSTONE Sandy, dark grey to light grey. Sand content increasing.			11				Joint at 60° rough, planar, clean.				
SANDSTONE Light grey, medium to fine grained, slightly friable.			12 50 13 14				Joint at 70° rough, planar, clean. SAMPLE REMOVED BY N.K. FOR TESTING. Bedding plane partings at 30° to 40°.				
SILTSTONE, dark grey, traces of plant fossils in bedding planes.			15				Zone of irregular fractures				
SANDSTONE and SILTSTONE			16				Bedding plane partings at 40° smooth, some are curved.				
SILTSTONE Dark grey. Sand content increases markedly.			17 45				Joint at 60° rough, planar.				
SANDSTONE, silty, very fine grained, light grey.			18				Zone of irregular fractures				
SILTSTONE, sandy, sand content increases with depth.			19 20				Bedding plane partings, rough. Joint at 80° planar, smooth, stepped bedding plane partings.				

DRILL
Make
Type E15
Driller Nippon Koei Co.
Commenced 13 Oct. 1971
Completed 20 Oct. 1971

FRACTURE LOG
cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged B.Y. Radford
Drawn D.P.
Checked
Sheet 1 of 2
Dwg. No. 1429-S3102/1

SCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R2

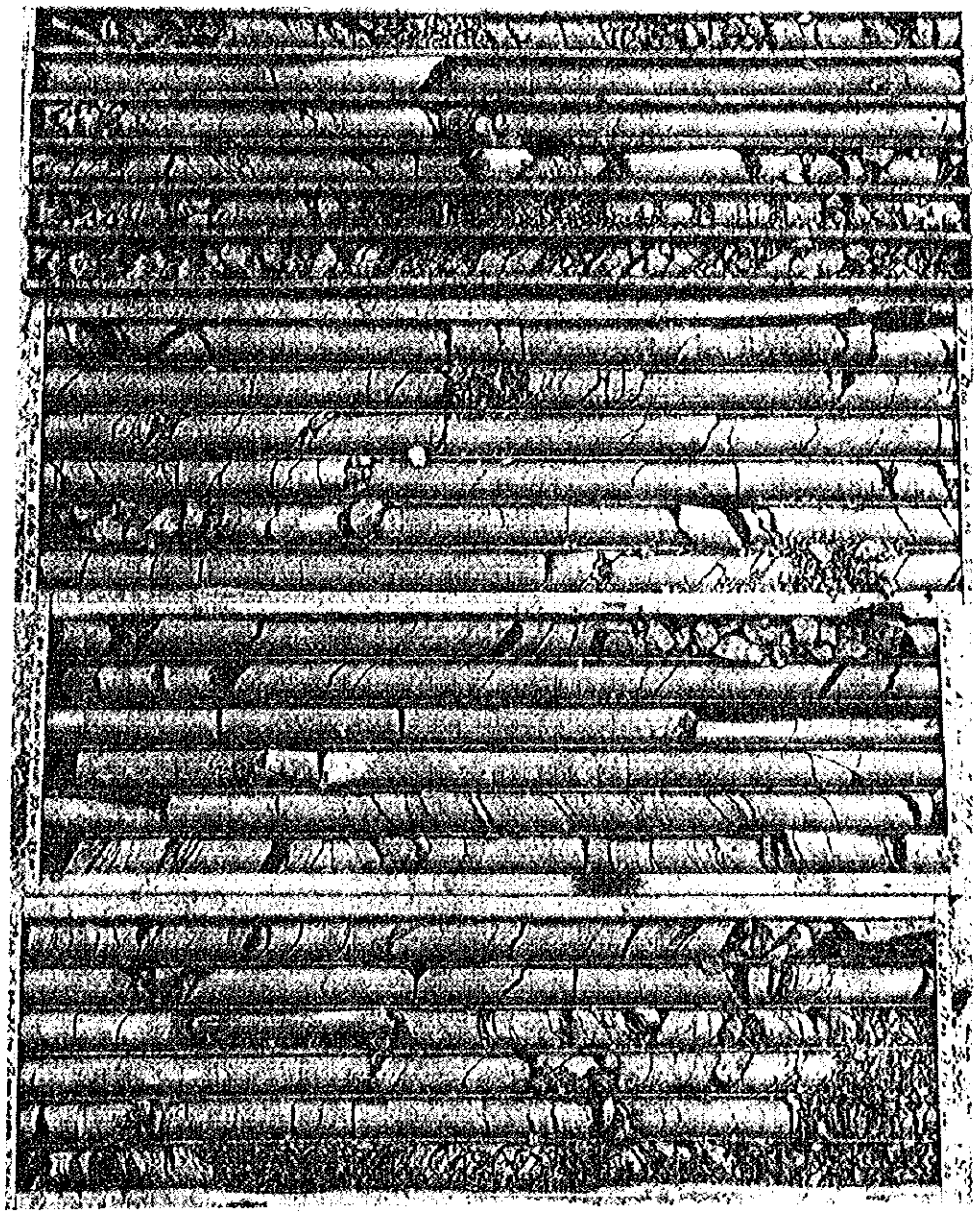
PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION (metres)	DEPTH (Cumec)	LOG	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, crossing, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE Sandy, sand content increases with depth.			40	21 22 23 24			Crushed Zone Bedding plane partings at 40° to 0°. ← Joint at 0° rough, planar, (30° to bedding) Fractures are bedding partings, apart from joint at 0° perpendicular to bedding.				
with some scattered sandstone.											
SANDSTONE and SILTSTONE, Interbedded				25 26			Bedding plane partings and many irregular fractures.				
SANDSTONE Fine to medium grained.		NX	35	27 28 29 30 31			5 joints, 0.25m apart; 2 at 50° and 3 at 80° Bedding plane partings and irregular fractures. ← Joint at 60° rough, curved, clean.		NOT RECORDED	NOT RECORDED	NOT TESTED
SILTSTONE Dark grey			30 25 20	32 33 34 35 36 37 38 39 40 41 42			Some bedding plane partings and many irregular fractures. Air slacking, possibly some faulting or shearing. Core broken into many sub-angular fragments. Intense air-slacking, possibly some faulting or shearing.				
NO CORE											
END OF HOLE AT 42.7m (RL19.3m)				43							

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

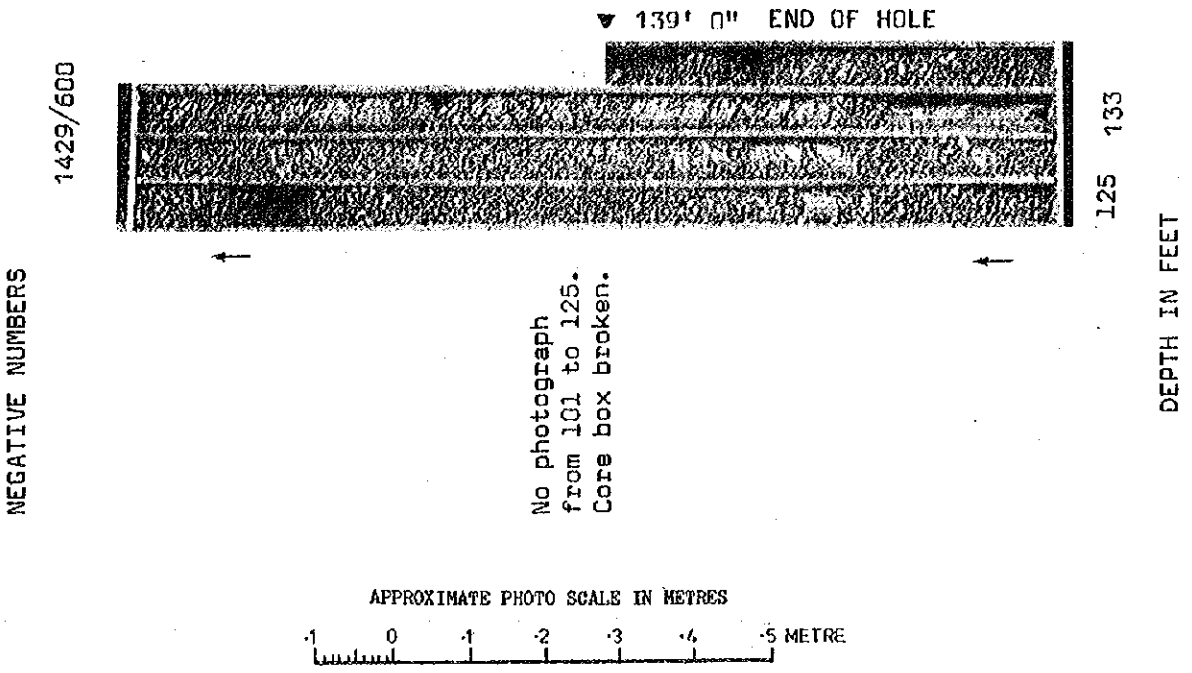
Dwg. No. 1429-S3102/2



DIAMOND DRILL HOLE R2

WABO POWER PROJECT

SHEET 1 OF 2



DIAMOND DRILL HOLE R2

WABO POWER PROJECT

SHEET 2 OF 2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R3

SMEC-NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE - GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Right Abutment

CO-ORDINATES: E 285 617 m, N 9 226 273 m
SYSTEM: AMG Zone 56

SURFACE ELEVATION: 72.8 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: --

DESCRIPTION OF CORE ROCK TYPE - colour, grain size, texture, mineral composition.	DEGREE OF WEATHERING	CORE SIZE	CORE RECOVERY	DEPTH (metres)	LOG	CORE LOSS %	STRUCTURES JOINTS - spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES.	FRACTURE LOG	WATER LEVEL	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
NO CORE				70					NOT RECORDED	NOT TESTED
SILTSTONE Slightly sandy.				65			Intense air slacking. Many angular to sub-angular fragments, average diameter 5mm.		NOT RECORDED	
							SAMPLE REMOVED BY N.K. FOR TESTING.			
				60			Most fractures rough, curved approximately in bedding plane			
SANDSTONE Light grey, fine grained.							Joint at 80° rough, planar.			
							2 Joints at 60° and 70° mutually perpendicular planes. Rough planar, lightly limonite stained.			
SILTSTONE Dark grey				55			Mainly bedding plane partings at 50°, possibly caused by air slacking			

DRILL
Make
Type E 15
Driller Nippon Koei Co.
Commenced 7 Oct. 1971
Completed 11 Oct. 1971

FRACTURE LOG
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

EXPLANATION

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY BRANCH
Logged B.V. Radford
Drawn D.P.
Checked
Sheet 3 of 2
S.M.E.C. Dwg No. 1429-S3103/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. R3

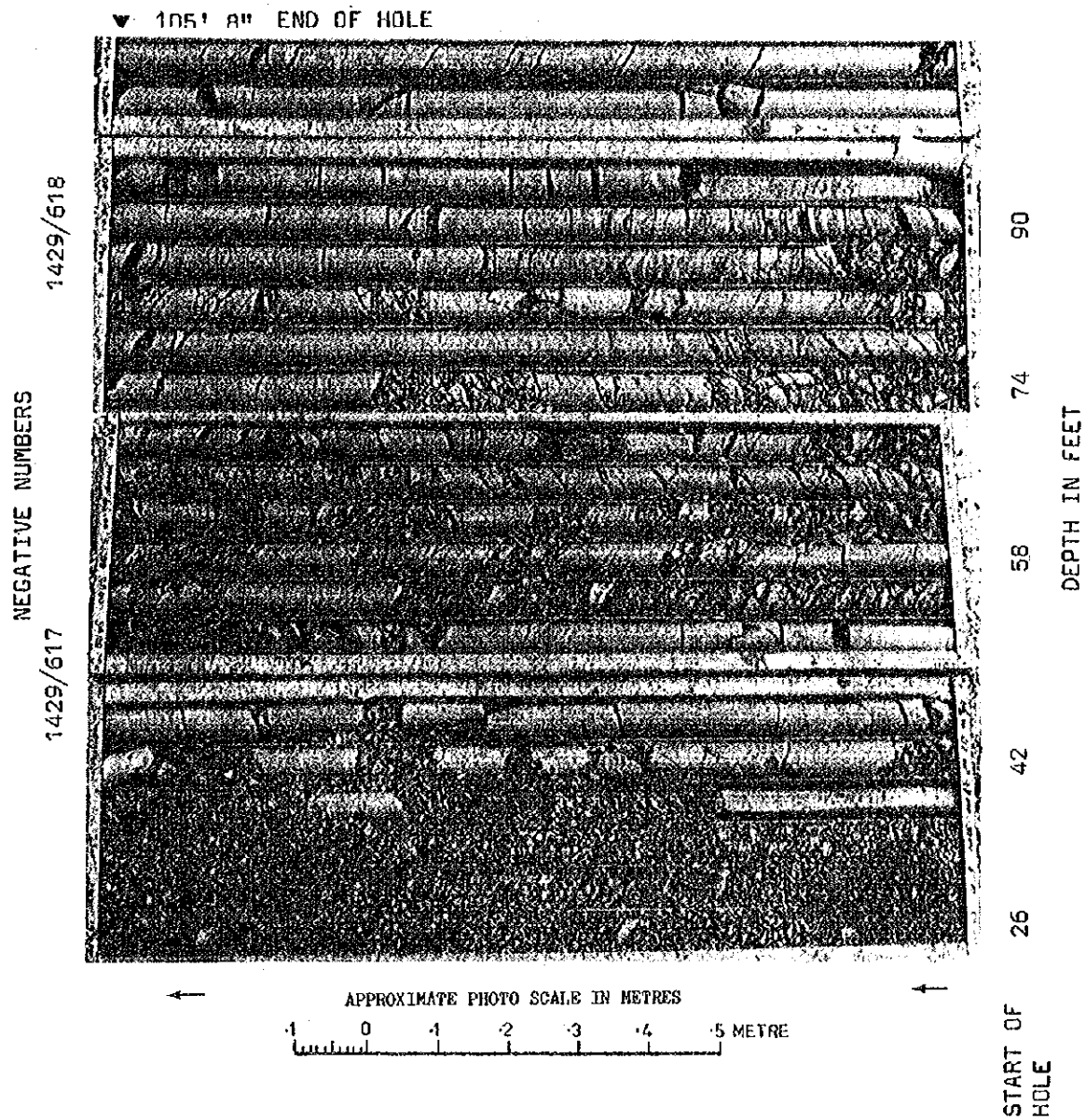
PROJECT WARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING L.W. M.W. S.W. V.W. C.W.	CORE SIZE	ELEVATN metres / DEPTH metres	LOG	LITH	CORE LOSS %	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE Dark grey Sand content increasing with depth			50				Bedding plane partings at 40°. Air slacking. 2 joints at 80°, rough Bedding plane partings at 40°		NOT RECORDED	NOT RECORDED	NOT TESTED
SANDSTONE Light grey, fine grained with thin interbeds of siltstone.		NX	45				Few joints or partings, but several drilling breaks SAMPLE REMOVED BY H.K. FOR TESTING. Drilling breaks only. Joint at 70°, rough, planar, undulating. Joint 70°, rough, planar. Joint at 60°, planar, undulating. Bedding plane partings at 40° developed in siltstone bands.				
END OF HOLE 32.4m (RL. 40.4m)											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 2

Dwg. No. 1429-S3103/2



DIAMOND DRILL HOLE R3

WABO POWER PROJECT

SNOWY MOUNTAINS ENGINEERING CORPORATION

S.M.E.C. – N.K. WABO PROJECT JOINT VENTURE STUDY

HOLE No. DD 101

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN PAN

LOCATION Power Station

CO-ORDINATES E 285 694.4 m, N 9 226 861.8 m

SYSTEM A.M.G. zone 55

SURFACE ELEVATION 46.1 m

ANGLE FROM HORIZONTAL 45°

DIRECTION 064°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING Fr Fr St SW MW HW CW	CORE SIZE	metres ELEVATN / DEPTH	CORE LOSS	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CASING, WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
Core in small fragments. Yellow-brown											
Dark grey		NXC	45				Bedding at 10° Several subvertical joints. Other joints at 65° a few at 40 to 45°				
MUDSTONE with 4mm thick SILTSTONE bands.							Minor shearing. Close jointing.				
Dark grey			40				Bedding at 0 to 10°				NOT TESTED
Rock friable, carbonaceous partings.							Bedding at 20°				
ORUBADI BEDS - MUDSTONE							Joints at 70 to 80°			FULL WATER RETURN 28 Jan 1976 — 9 Jan 1976	
About 10 to 20% of the rock consists of SILTSTONE, in bands up to 3mm thick.		NMLC	35				Bedding at 0 to 10° Several joints sub-parallel to drilling direction cause local fragmentation. Bedding partings common.				
							Bedding at 80° due to slumping.				

DRILL

Make Mindrill

Type F 20A

Driller Grech & Mulligan

Commenced 12 Nov 1975

Completed 10 Dec 1975

FRACTURE LOG

EXPLANATION

Natural breaks in core per metre.

Equivalent lengths of core pieces in centimetres.

Core preserved in plastic tube

WEATHERING

CW - Completely weathered

HW - Highly weathered

MW - Moderately weathered

SW - Slightly weathered

FrSt - Fresh, with Limonite stained joints

Fr - Fresh

ENGINEERING GEOLOGY B'CH

Logged G.A. Frenda

Drawn D.P.

Checked

Sheet 1 of 5

Dwg. No. 1429-S3048/

ARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD101

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES
MUDSTONE, about 10 to 20% of the rock consists of SILTSTONE, in bands up to 3mm thick.	Joints at 80°
	Core fragmentation due to steep joints.
Very silty	BEDDING AT 10° to 20° Incipient air slacking.
SILTSTONE ranging to MUDSTONE. A few fine sandy bands.	Core fragmented due to close jointing.
ORUBADI BEDS SILTSTONE, with fine grained sandy bands, up to 10mm thick. Incipient air slacking occurs.	Joints at 45° Bedding mostly at 10° to 30°. Local steeper dips are probably due to slumping. Few natural fractures, but core parts readily where there are calcareous blebs. Jointing at 45° and sub-parallel to drilling direction common. Joint at 60° Joint at 45°

DEGREE OF WEATHERING: F, FW, SW, HW, CW

CORE SIZE: NMLC

ELEVATION / DEPTH: 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44

CORE LOSS % PER CUT: 20, 30, 25, 20, 15

FRACTURE LOG: 0 4 8 12 16 20

FULL WATER RETURN

WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS: 0 2 4 6 8 10 12 14 16 18 20

NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD101

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE, with fine sandy bands up to 10mm thick.		NMLC	45			Joint at 75°–85°.				
			46			Few joints but numerous bedding plane partings.				
			47							
			48							
			49			Joint at 85°, clean, rough.				
			50							
			51							
Very weak in part.			52			Core fractured due to several closely spaced, steeply dipping joints.				
			53							
			54							NOT TESTED
			55							
			56			Zone of close jointing.				
			57			Sub-vertical joint.				
Fairly uniform, although somewhat sandy in part. Rock can be crushed between fingers.			58							
			59							
MUDSTONE grading into SILTSTONE.			60							
			61			Joints at 60°.				
			62							
			63			Core locally fragmented, mainly due to joints at 60° and steeper.				
			64							
Relatively more sandy than before.			65							
			66							
			67							
		NMLC	68							

URUBADI BEDS

BEDDING AT 0°–10°
Sub-vertical joints and joints at 65° are fairly common and cause local fracturing.

FULL WATER RETURN

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 5

Dwg. No. 1429-S3048/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD101

PROJECT. WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
Dark grey. MUDSTONE, silty, dark grey, uniform. MUDSTONE grading into SILTSTONE. Thin sandy bands, up to 3mm thick, are common throughout. ORUBADI BEDS MUDSTONE, silty, dark grey,		NMLC	69 70 71 -72 73 74 75 76 77 78 -79 80 81 82 83 84 85 -86 87 88 89 90 91 92			Rock fractured probably due to steep jointing. Crushed zone? Joints at 60°, clean, rough. Bedding mostly at 0°, but locally up to 5°. Few joints, but numerous bedding plane partings. A few sub-vertical joints. Joint at 60°, clean, rough. BEDDING AT 0°-5°. Four clean conjugate joints at 65°. Core breaks readily along bedding planes. Minor incipient air slacking. Joint at 70°.		FULL WATER RETURN		NOT TESTED 1.1 1.0 1.1 1.9

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD101

PROJECT. WADO POWER PROJECT

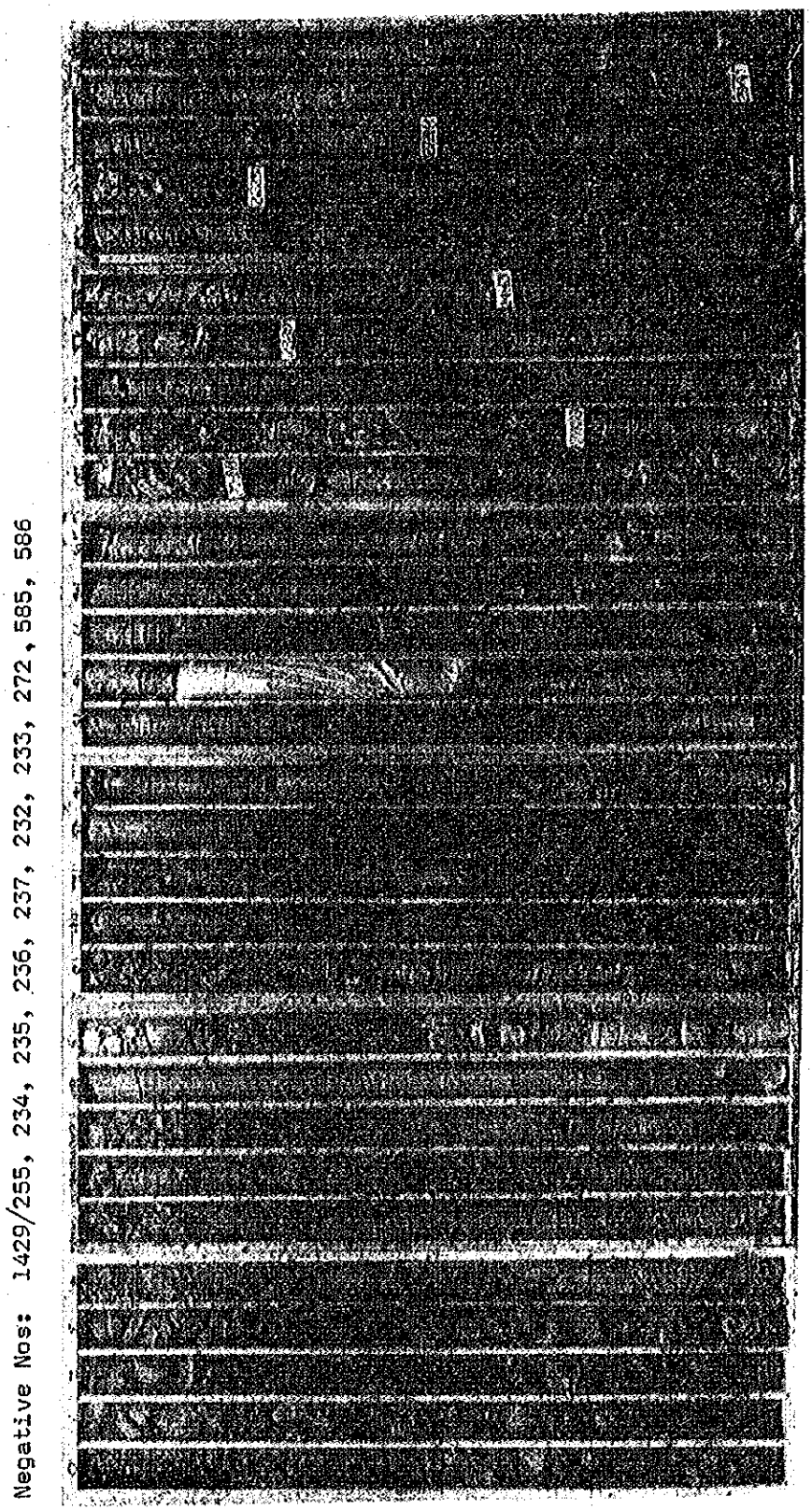
DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH (metres)	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	FULL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEUGEON UNITS
MUDSTONE, silty, dark grey. Core breaks easily along bedding planes.			-20			Zones of close jointing at 70°-80°, or minor crushing.				1.9
ORUBADI BEDS			94			BEDDING 20°-30°.				2.8
			95			Joints at 60°.				
			96			Joint at 65°.				
			97			Joint at 70°.				4.0
			98			Crush zone or close jointing.				
			99							
END OF HOLE 100.00m.(RL-24.6m)			100							

FULL WATER RETURN

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 5

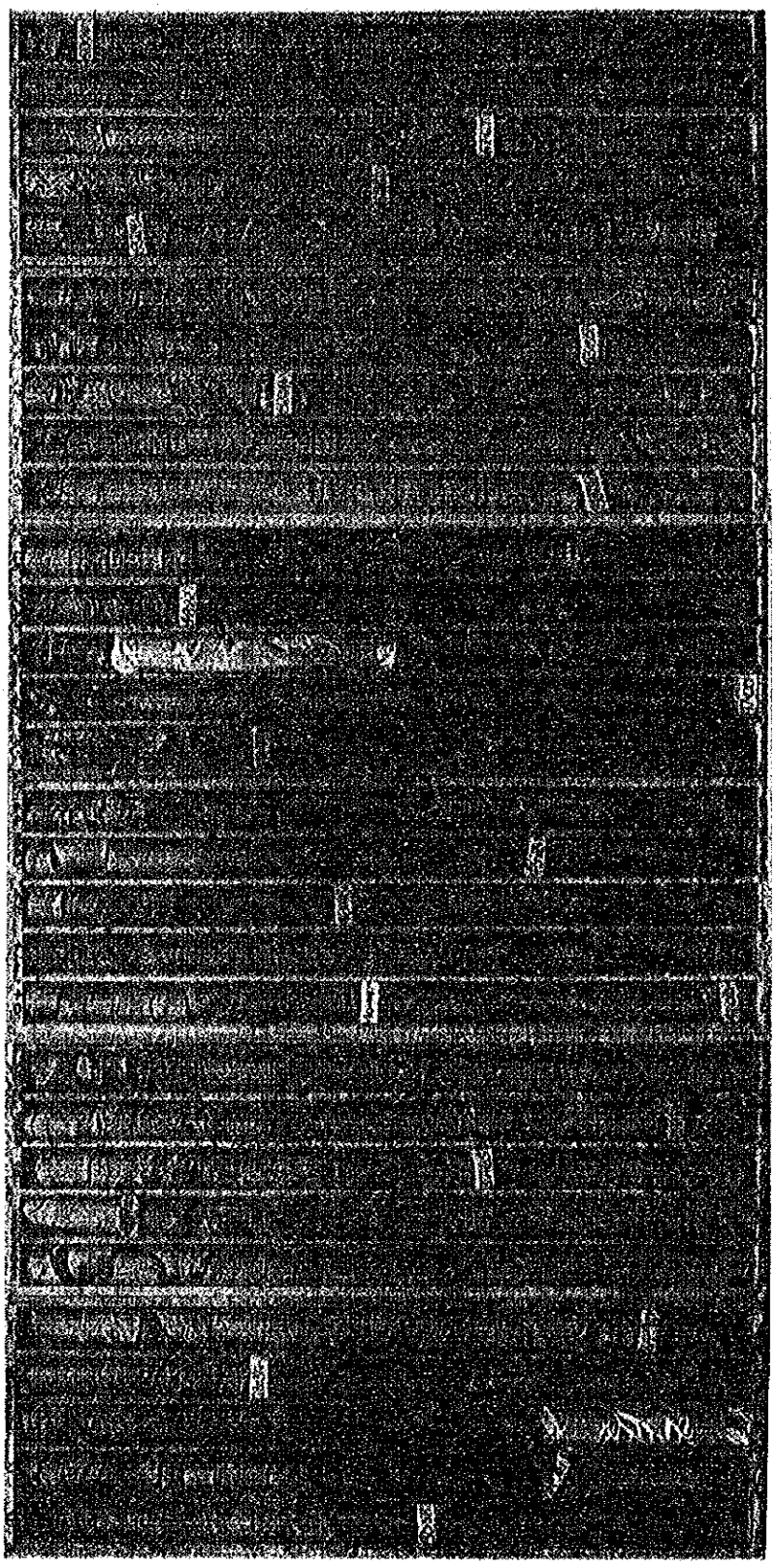
Dwg. No. 1429-S3048/5



DIAMOND DRILL HOLE DD101

WABO POWER PROJECT

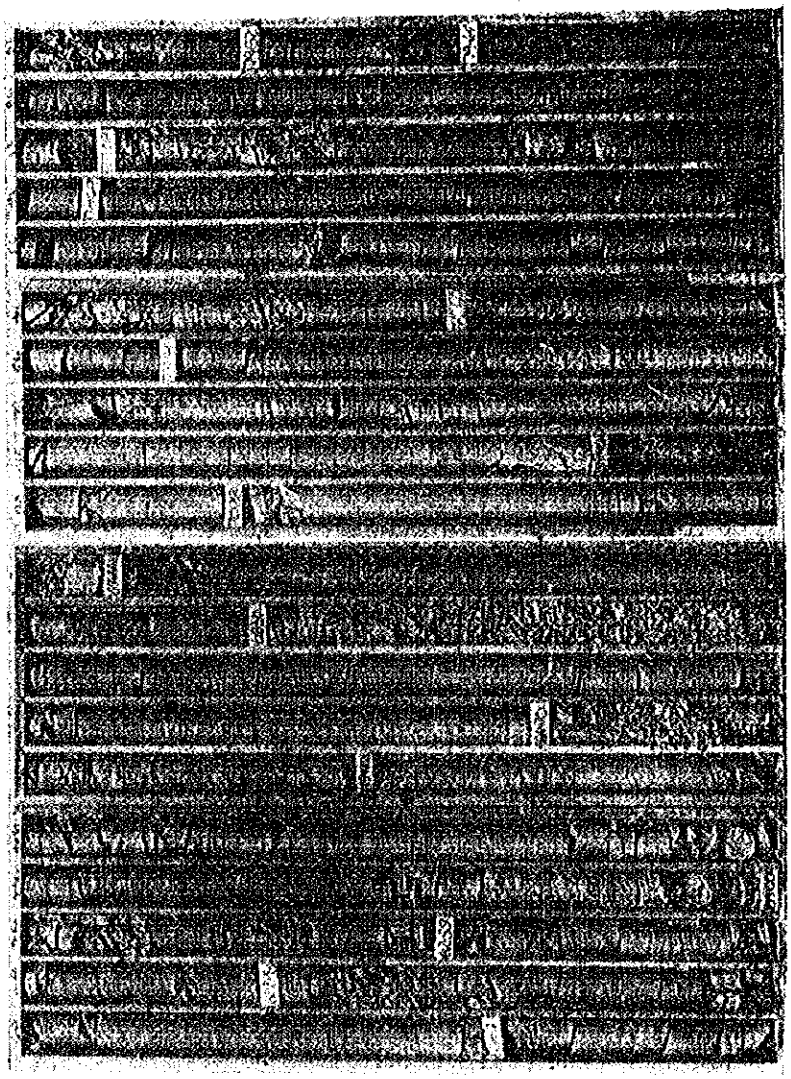
SHEET 1 of 4



DIAMOND DRILL HOLE DD101

WABO POWER PROJECT

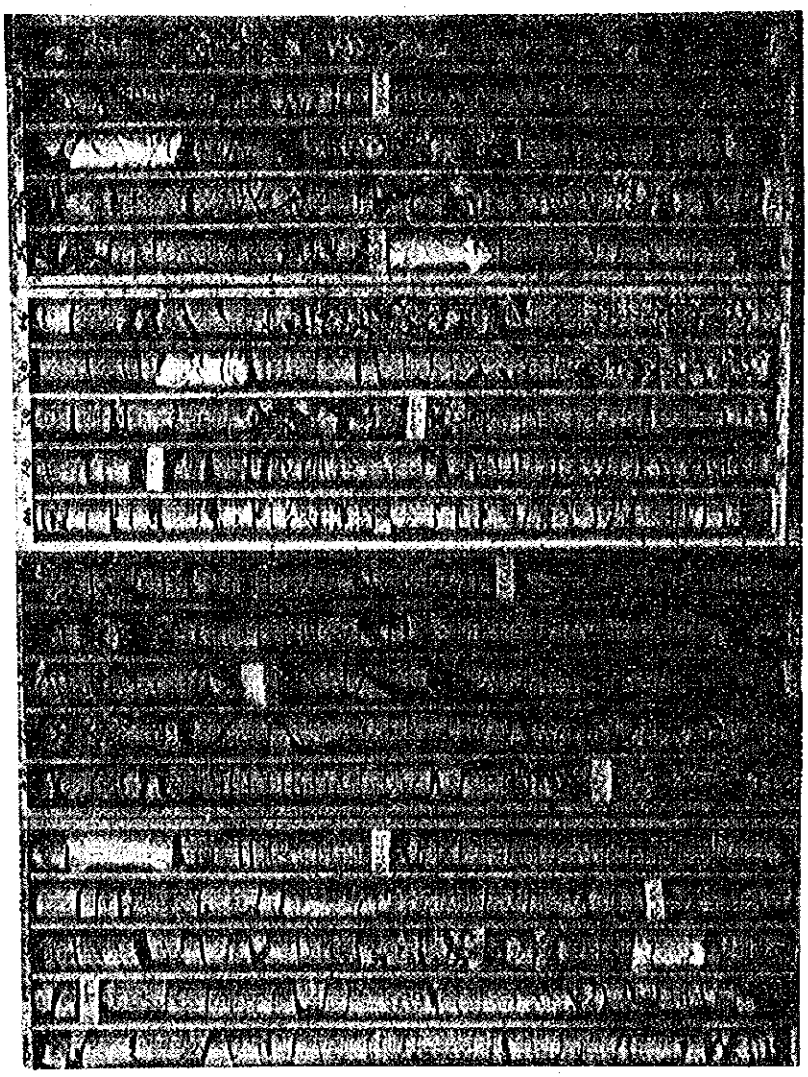
SHEET 2 of 4



DIAMOND DRILL HOLE DD101

WABO POWER PROJECT

SHEET 3 of 4



DIAMOND DRILL HOLE DD101

WABO POWER PROJECT

SHEET 4 of 4

SNOWY MOUNTAINS ENGINEERING CORPORATION

SHEC – NK WADO PROJECT JOINT VENTURE STUDY

HOLE No. DD 102

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WADO POWER PROJECT

FEATURE: MAIN DAM

LOCATION: Power Station

CO-ORDINATES: E 285,638.6 m; N 9,226,835.3 m

SYSTEM: AMG zone 55

SURFACE ELEVATION: 48.0 m

ANGLE FROM HORIZONTAL: 45°

DIRECTION: 064°

DESCRIPTION OF CORE — ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATN / DEPTH (metres)	LOG	CORE LOSS % PER LIFT	STRUCTURES — JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS — LEAKAGE RATES IN LUGEON UNITS
CLAY, with fragments of SANDSTONE. Yellow-brown. Dark grey.								DRY DRILLING	BLOCKED-DRY	
SANDSTONE boulder.										
Mostly no core. Core recovered consists of clay, with fragments of predominantly SANDSTONE, but also of MUDSTONE. NO CORE		NMLC	145				NOT APPLICABLE			NOT TESTED
NO CORE										
NO CORE										
NO CORE			140							
NO CORE										
NO CORE										
MUDSTONE BRECCIA— Mudstone fragments in clay matrix, a few rounded pebbles at base. Yellowish stained. Dark grey.						← A few rounded pebbles. Structureless.		FULL WATER RETURN		
MUDSTONE, dark grey, silty.			135			BEDDING 5° to 10° Two fractures at 65°; incipient air slacking.				

SLIDE DEBRIS AND SCREE

ERA BEDS

DRILL: Make Mindrill; Type F30; Driller Grech & Milligan; Commenced 30 Oct. 1975; Completed 13 Nov. 1975

FRACTURE LOG: cm

EXPLANATION: Natural breaks in core per metre. Equivalent lengths of core pieces in centimetres.

S (in fracture column) denotes air slacking.

Core preserved in plastic tube.

WEATHERING: CW - Completely weathered; HW - Highly weathered; MW - Moderately weathered; SW - Slightly weathered; FrSt - Fresh, with Limonite stained joints; Fr - Fresh

ENGINEERING GEOLOGY B'CH: Logged G. A. Frenda; Drawn; Checked

Sheet 1 of 5

Dwg. No. 1429-S3049/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD102

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES
MUDSTONE, dark grey, silty.	One subvertical joint.
	Core broken.
MUDSTONE and SILTSTONE, dark grey.	Fractures at 0° common, caused by drilling.
MUDSTONE and SANDSTONE	Fractures at 60° and minor fault.
SILTSTONE	
SANDSTONE, medium grained	Conjugate fractures at 65°.
SILTSTONE, dark grey with minor SANDSTONE bands.	BEDDING average 5°
	Several subvertical and 65° fractures. Core fragmented where fractures intersect.
REA BEDS	
SILTSTONE, dark grey.	Partings along near horizontal bedding common, most occured after drilling.
SANDSTONE, mostly dark grey, fine to medium grained, mostly massive. light grey	BEDDING mostly 5° to 10°
	Very tough, carbonate cement.
light grey	Very tough carbonate cement.
	BEDDING 5°
Possible unconformity.	Joints at 50° calcite coated.
MUDSTONE, SANDSTONE, SILTSTONE.	BEDDING 45°
	Contact with overlying sandstone dips 45°.
SILTSTONE, with minor SANDSTONE bands, dark grey.	Joints mostly at 65° to 70° calcite coated.
	Average BEDDING dip 70° to 75°.
ORUBADI BEDS	Minor incipient air slacking.
SILTSTONE, tending to MUDSTONE.	Four fractures at 60° to 75°.
	Driller's note: Hole caving at about 40m.

FULL WATER RETURN

NO WATER RETURN

NOT TESTED

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD102

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES
Clayey	Possible faulting.
	Bedding indistinct, about 65.°
SILTSTONE, tending to MUDSTONE, dark grey.	Core has rough surface due to intersection of 45° and 70° fabrics.
	Bedding indistinct about 30° below 47m.
	Incipient air slacking.
MUDSTONE, silty.	Pronounced air slacking. Bedding very indistinct but varies from 25° to 45°.
ORUBADI BEDS SILTSTONE to MUDSTONE, locally very silty.	MUDSTONE showing pronounced air slacking, SILTSTONE lesser air slacking. Bedding dip approximately 25°, mudstone layers can powdered by fingers.
MUDSTONE bands, relatively soft.	
	Pronounced air-slacking. Bedding indistinct. Vertually unjointed, core fragmentation due to air-slacking.
MUDSTONE bands, relatively soft.	Relatively soft MUDSTONE recovered as fragments, firmer SILTSTONE is air-slacked. No pronounced joints, faint slickensiding in soft zones.
	BEDDING INDISTINCT
Very clayey.	BEDDING DIPS 20°
	Very minor air-slacking.
Carbonaceous blebs along bedding partings.	Incipient air-slacking throughout.
MUDSTONE bands.	BEDDING DIPS FROM 0° to 20°

FRACTURE LOG: S

DRILL WATER LOSS: NO WATER RETURN

WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS: NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 5

Dwg. No. 4.09-5049/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD107

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATN / DEPTH in metres / CORE RUNS	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE grading to MUDSTONE, dark grey. Carbonaceous blebs along bedding partings			69							
MUDSTONE			70			Core in soft fragments.				
			71							
SILTSTONE, dark grey, shaly partings common.			72			Breaks easily sub-parallel to bedding at 0°, locally bedding dips 60° (slumping ?). Minor air-slacking.				
			73							
			74							
			75			BEDDING 0°to 10°.				
Sandy in part.			76							
			77							
			78			Soft and friable, carbonaceous. Fragments.				NOT TESTED
Abundant cabonaceous material on bedding partings.			79							
		NMLC	80			Air-slacking negligible. Bedding variable, ranging in dip from 0°to 20°at the top of this section, to 20°to 30°near the base. Core in about 60mm pieces, due to drilling.			NO WATER RETURN	
Sandy in part. Carbonaceous blebs common.			81							
			82							
			83							
			84							
SILTSTONE and MUDSTONE interbedded. Individual beds mainly from 5 mm to 10mm thick.			85			BEDDING 0°to 10°. Fragments due to sub-vertical joints.				
			86							
			87			BEDDING 0°to 10°. Parts readily along bedding. No air-slacking.				
			88							
MUDSTONE, silty, dark grey.			89							
SILTSTONE, dark grey, interbedded with SANDSTONE, light grey. Average thickness of siltstone beds is about 10mm, and sandstone beds about 5 mm.			90			Core exhibits slump folding with dips ranging between 65°and 10°. Virtually unjointed. No air slacking.				
			91							
			92							

ORUBADI BEDS

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 5

Dwg. No. 1429-S3049/4

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD102

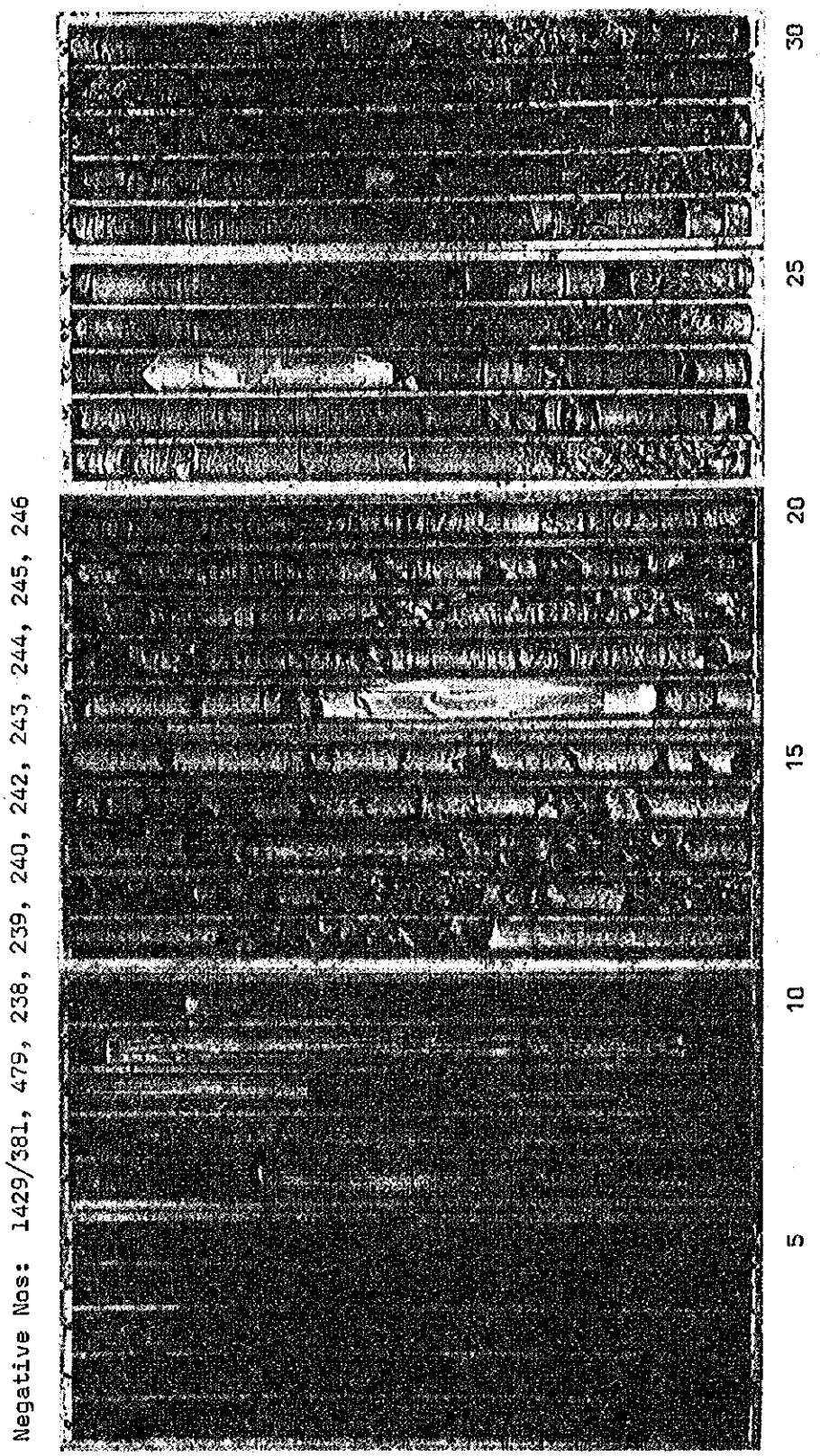
PROJECT. MARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL OF HOLE ELEVATION DEPTH	CASING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
CRETADI BEDS SILTSTONE, dark grey, interbedded with SANDSTON, light grey. Average thickness of siltstone beds is about 10mm and sandstone beds about 5mm.		NMLC	93 94 95 96 97 98 99				Core exhibits slump folding, with dips ranging between 65° and and 10°. Virtually unjointed. No air-slacking.		NO WATER RETURN		NOT TESTED
SILTSTONE with minor SANDSTONE bands up to 10mm, average 2mm thick.							BEDDING 0° to 10° No air slacking. Fragments due to sub-vertical joints.				
END OF HOLE 100.00m (RL-22.7m)											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 5

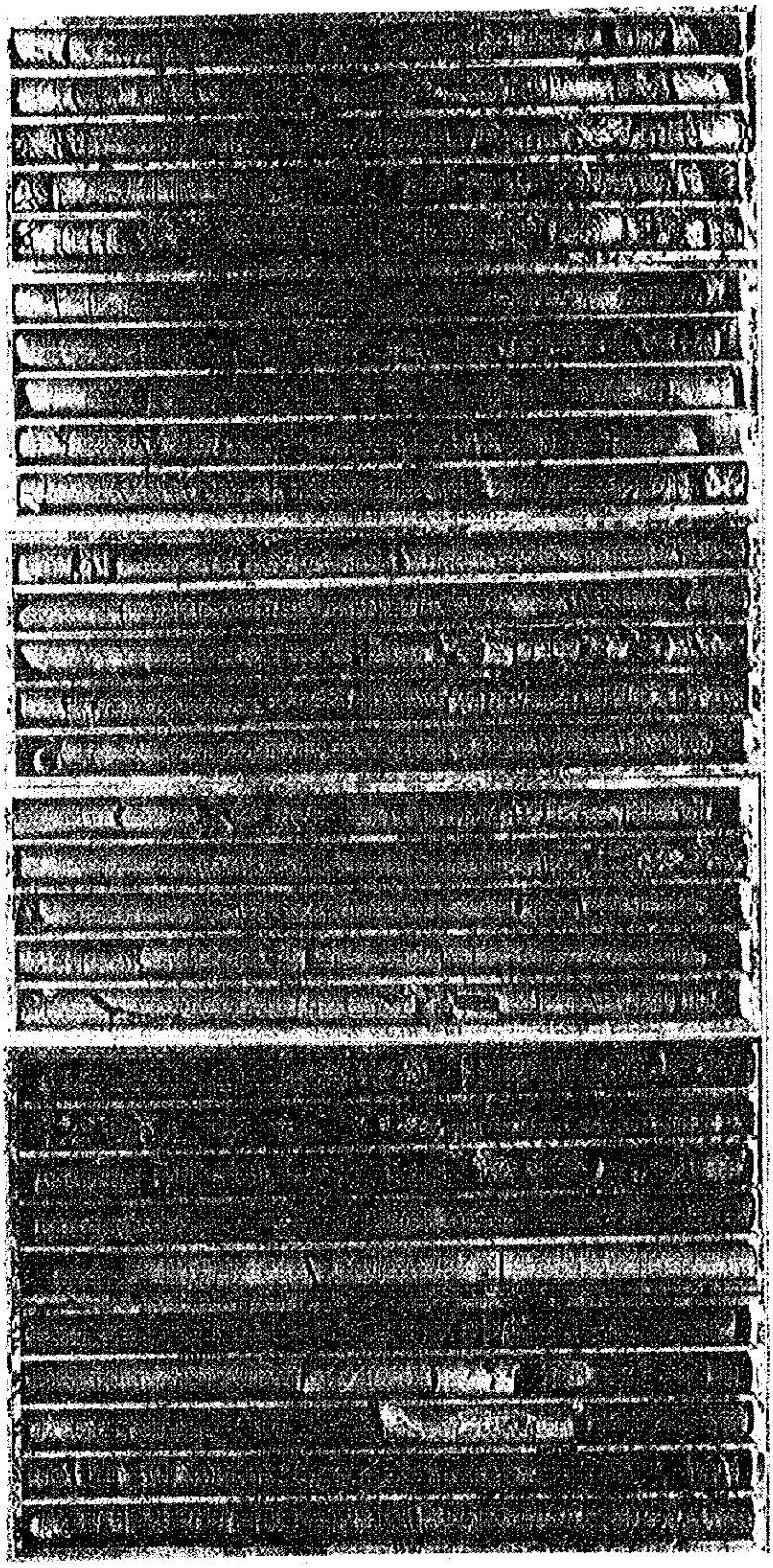
Dwg. No. 1429-S3049/5



DIAMOND DRILL HOLE DD102

WABO POWER PROJECT

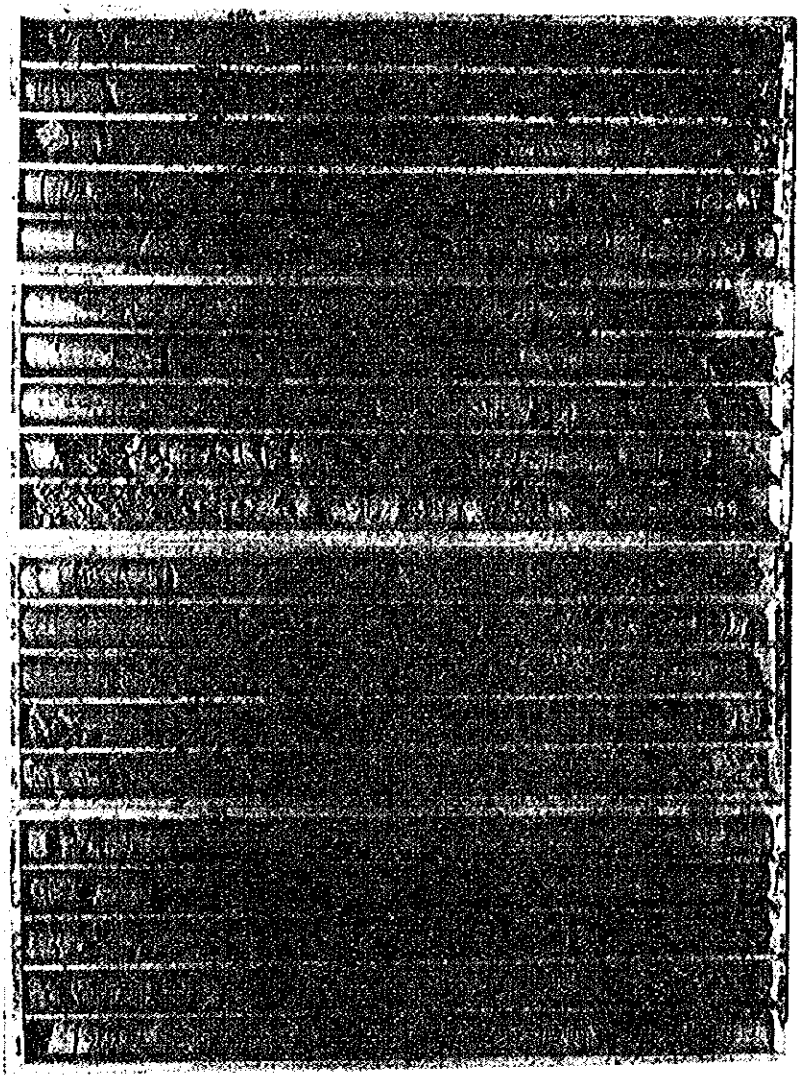
SHEET 1 of 4



DIAMOND DRILL HOLE DD102

WABO POWER PROJECT

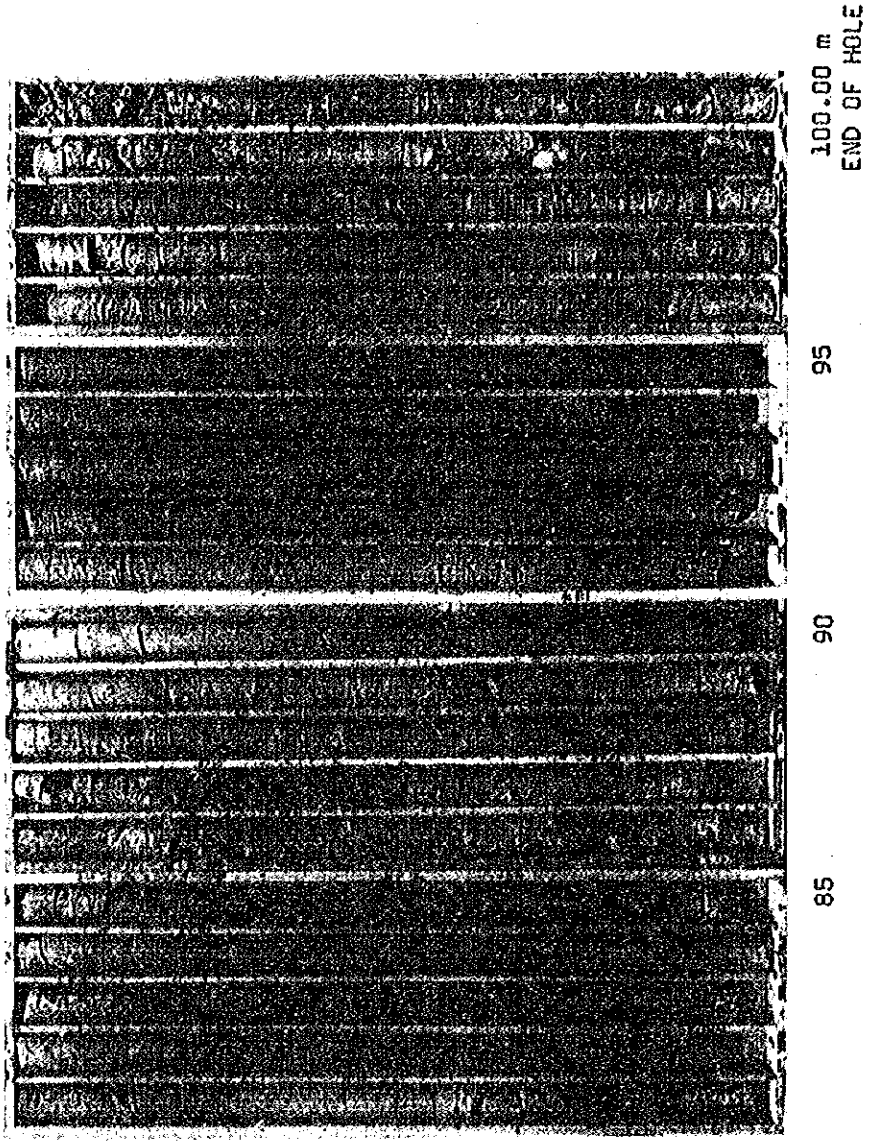
SHEET 2 of 4



DIAMOND DRILL HOLE DD102

WABO POWER PROJECT

SHEET 3 of 4



DIAMOND DRILL HOLE DD102

WABO POWER PROJECT

SHEET 4 of 4

SNOWY MOUNTAINS ENGINEERING CORPORATION
SMEC - NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. DD103

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Intake Structure/ Diversion Tunnel

CO-ORDINATES: E 285,441.4 m; N 9226,974.3 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 151.6 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: -

Unit	Depth (m)	Description of core	Structures
SLIDE DEBRIS OR TALUS ?	0–1	Sandy clay; yellow brown.	
	1–2	SANDSTONE boulder.	
	~2	NO CORE	
	2–3.5	Sandy clayey silt and SANDSTONE pieces.	Partly lithified but very crumbly.
	~3.5	NO CORE	
	3.5–6	Sandy clayey silt and SANDSTONE pieces.	Horizontal partings. Partly lithified; crumbly.
ERA BEDS	6–7	SANDSTONE with SILTSTONE bands.	Probably disturbed.
	~7	Sandy silt	Crumbly
	7–10	SANDSTONE - SILTSTONE - MUDSTONE interbeds. Beds from 1mm to 10mm thick, average 4mm.	Bedding dips 40°. Partings along bedding planes common.
	~10	MUDSTONE	
	12–16	MUDSTONE with about 30% SANDSTONE - SILTSTONE bands; dark grey.	Incipient air slacking; no joints.
	16–20	MUDSTONE - SANDSTONE-SILTSTONE interbedded; bands up to 10mm, average 3mm thick. Carbonaceous fragments common.	Bedding 40° throughout. Parts easily along bedding planes; incipient air slacking of MUDSTONE bands.

Core size: NXC (0–~2 m); NMLC (below)

Elevation marks: 150, 145, 140, 135

Fracture log: 0–6 m NOT APPLICABLE; 7–12 m Virtually unjointed; S at ~10.5 m and ~14 m.

Drill water loss: 0–5.5 m FULL WATER RETURN; below NO WATER RETURN.

Water pressure tests (leakage rates in Lugeon units): 0–5 m NOT TESTED; 5–9 m 200; 9–15.5 m 0.6; 15.5–19.5 m 1.0; below 19.5 m NIL.

DRILL
Make: Mindrill
Type: A 1000
Driller: Grech & Mulligan
Commenced: 29 Oct. 1975
Completed: 29 Nov. 1975

FRACTURE LOG / EXPLANATION
Natural breaks in core per metre
Equivalent lengths of core pieces in centimetres.
S Abnormal fracture due to air slacking.
Core preserved in plastic tube

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged: G.A. Frenda
Drawn: B.P.
Checked:
Sheet 1 of 2
Dwg. No. 1429-83050/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD103

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	RELEVATN metres DEPTH metres	LOG	SPT	CORE LOSS % PER RUN	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOG	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE - SANDSTONE - SILTSTONE interbedded. Bands up to 10mm, average 3mm thick. Carbonaceous fragments common.			130 22 23 24				No joints				NIL
SANDSTONE, alternating bands of medium light grey sandstone and fine dark grey silty sandstone.			25 26 125 27 28 29 30				One 65° rough joint; no air slacking; BEDDING 40°.				NIL
SANDSTONE and MUDSTONE interbedded.		NMLC	31 120 32 33				Incipient air slacking, bedding 40° One sub-vertical joint.				2.4
MUDSTONE with minor SANDSTONE and SILTSTONE bands.			34 35 36 115 37				Incipient air slacking; no joints.				0.8
MUDSTONE - SANDSTONE - SILTSTONE interbedded. About 20% sandstone.			38 39 40 110 42 43 44				Parting along bedding common; slight air slacking in part; bedding 40°. Joint at 60°				2.0

ERA BEDS

WATER RETURN

NO WATER RETURN

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 7

Dwg. No. 1429-S3050/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD103

PROJECT MARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION / DEPTH (CORE)	LOG	SITE	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
As above.			45				As above.				2.0
MUDSTONE to SILTSTONE with minor SANDSTONE bands; dark grey.			46				Fairly weak and friable incipient air slacking; no joints; BEDDING dip 40°.				
			47					S			
		105	48								4.3
			49								
MUDSTONE - SANDSTONE, interbeds.			50				No joints.				
MUDSTONE			51				Incipient air slacking.	S			
SILTSTONE - MUDSTONE, interbedded in roughly equal proportions. Bands up to 10mm, average 3mm.		NMLC	52				One sub-vertical rough joint. BEDDING dip 40°.		NO WATER RETURN		
		100	53						WATER RETURN		NIL
			54								
SANDSTONE, light grey medium grained and dark grey silty sandstone bands minor SILTSTONE to MUDSTONE lenticles.			55				Mostly recovered as continuous sticks. No joints, no air-slacking.				
ERA BEDS			56								
			57								
		95	58								
			59								0.5
			60								
			61								
			62								
		90	63								
			64								0.6
			65								
			66								
			67								
		85	68								0.5

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD103

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F FW SW HW CW	CORE SIZE	ELEVATN / DEPTH (metres) / CORING	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER / GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, light grey medium grained and dark grey silty sandstone bands, with minor SILTSTONE to MUDSTONE lenticles.			69 70 71						0.5
SANDSTONE - SILTSTONE interbedded in roughly equal proportions; and dark grey bands 1 - 5mm thick; minor MUDSTONE lenticles		NMLC	72 80 73 74 75 76 77 75 78 79 80 81 82 70 83 84			BEDDING dip 40°.		WATER RETURN	0.7 0.5
SILTSTONE and MUDSTONE dark grey. SANDSTONE bands common.			85			No natural fractures. BEDDING dip 30° - 40°.			0.6
SILTSTONE - MUDSTONE - SANDSTONE, interbedded bands average 3 - 4mm.			86 87 65 88 89						
SILTSTONE dark grey.			90			Weak, friable, incipient air slacking.			0.5
SILTSTONE - MUDSTONE			91 92						

ERA BEDS

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 7

Dwg. No. 1429-S3050/4

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD103

PROJECT WAIBO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SLW MOD HW CW CORE SIZE	RL/STATN DEPTH CASING	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG WATER RETURN CORE BARREL	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE - MUDSTONE finely interbedded; dark grey, bands average 2mm. Bands of fine sandstone common.		60 93 94 95 96 97 55 98 99			Incipient air slacking; weak. BEDDING dip 35°-40°	S S		0.5 0.5
SANDSTONE - SILTSTONE interbedded and a few friable siltstone beds.		100 101				S		
SANDSTONE fine silty and SILTSTONE with minor MUDSTONE bands.		102 50 103 104			BEDDING dip 36°-39°. Two sub-vertical joints rough, clean. Parts easily along bedding.			NIL
MUDSTONE, very silty, dark grey.		105 106 107			Weak, crumbly; partially air slacked.			
SILTSTONE, dark grey; minor fine SANDSTONE bands.		45 108 109 110			Two 45° fractures; clean; partial air slacking.	S		0.8
SILTSTONE - SANDSTONE interbedded.		111						
SILTSTONE with a few fine sandy bands and thin MUDSTONE lenticles common.		40 112 113 114 115 116			BEDDING dip 40°. Three rough 60° fractures at base otherwise all partings along bedding or due to drilling; minor air slacking.			50

ERA BEDS

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD103

PROJECT. WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES
SILTSTONE, with a few fine sandy bands and thin MUDSTONE lenticles common.	
SILTSTONE and SANDSTONE interbedded.	BEDDING dip 40°. Partings along bedding.
SILTSTONE, dark grey; a few SANDSTONE lenticles.	Core parted along bedding planes, average 50mm pieces. Minor air-slacking and fretting.
	Three joints dip 60°, clean.
SILTSTONE, clayey.	Broken to fragments due to sub-vertical joint.
MUDSTONE to SILTSTONE, minor sandy bands up to 10mm thick.	BEDDING dip 40°. Partings along bedding.

ERA BEDS

NMLC

WATER RETURN

WATER PRESSURE TESTS, LEAKAGE RATES IN LUGEON UNITS: 50, 200, 0.5, 5.0, 4.5

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD103

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	CORE RETAINED	DEPTH	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
MUDSTONE to SILTSTONE, minor sandy bands up to 10mm thick.				141							4.5
				142							
				143			Weak, friable broken to fragments due to steep joints.				2.0
MUDSTONE, silty.				144			Fairly tough; many bedding partings.				
				145			Weak, friable broken due to steep joints.				
ERA BEDS				146			Bedding dips 40°, minor incipient air slacking; parts easily along bedding.				
MUDSTONE, dark grey and sandstone bands up to 10mm increasing abundance with depth.				147							2.5
				148							
				149							
				150							
END OF HOLE 150.35m (RL1.2 m)											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 7 of 7

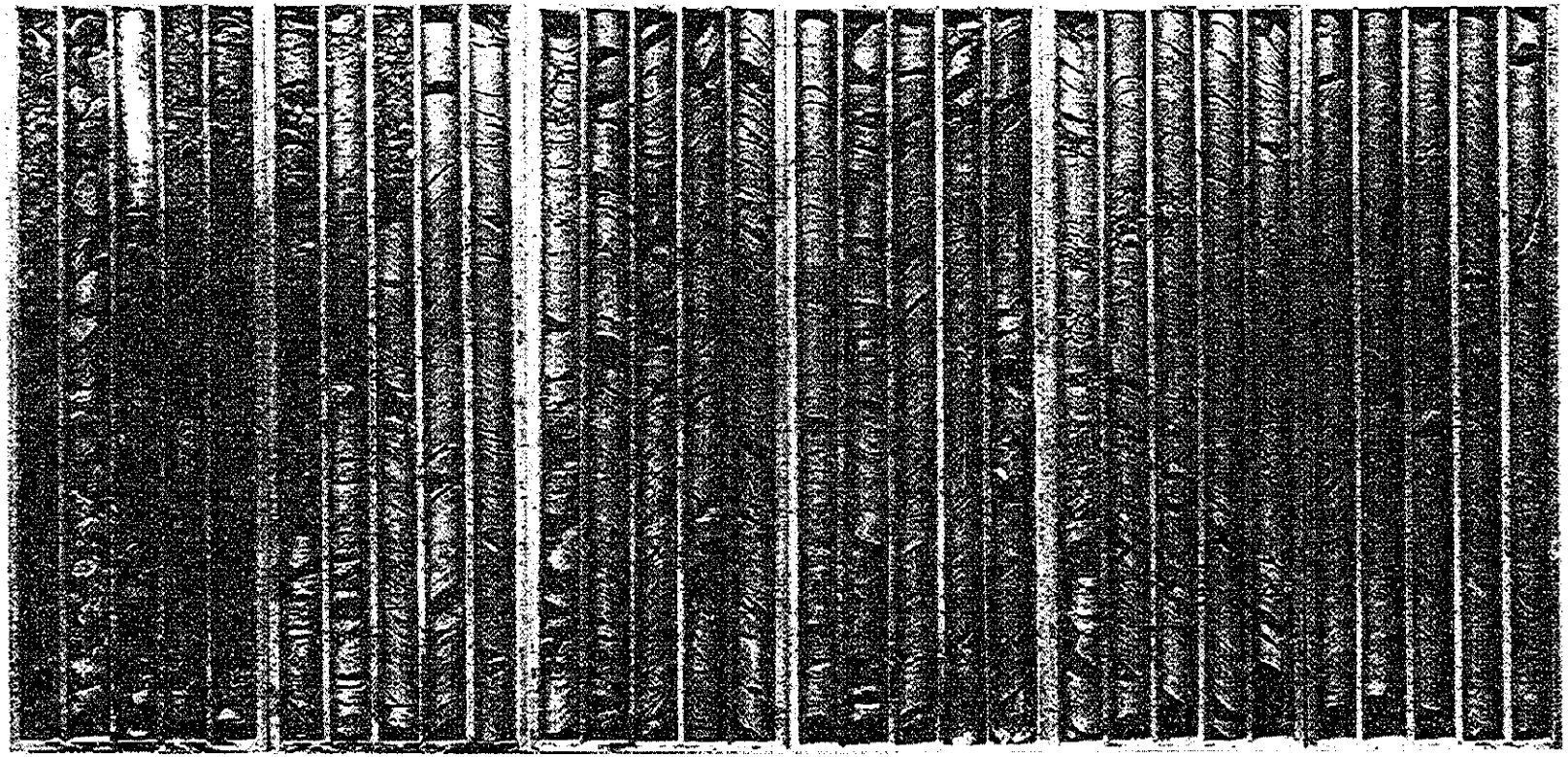
Dwg. No. 1429-S3050/7

DIAMOND DRILL HOLE DD103

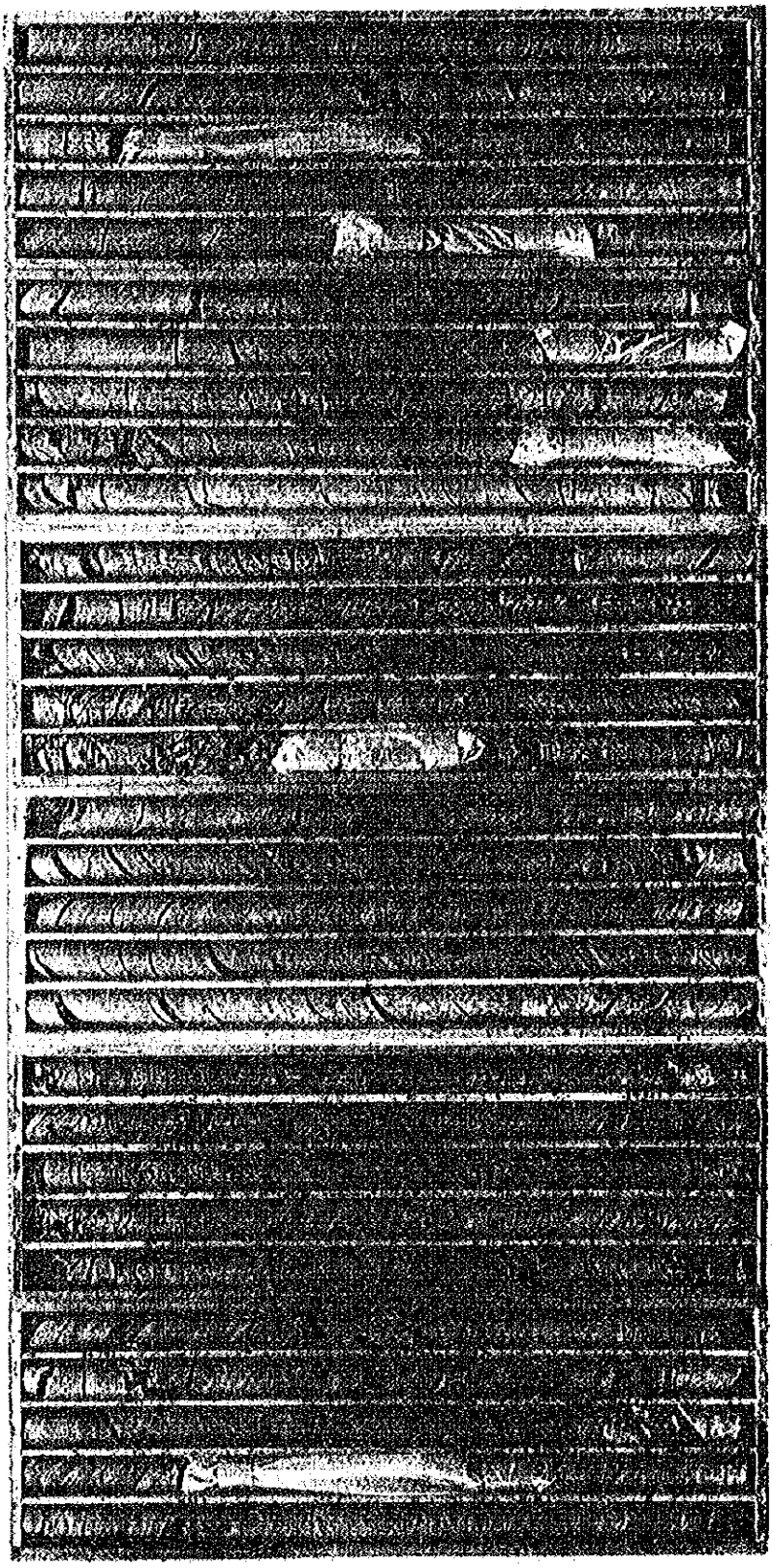
WABO POWER PROJECT

SHEET 1 of 5

Negative Nos: 1429/247, 248, 249, 250, 251, 252, 253, 254, 230, 231, 401
273, 274, 275, 279



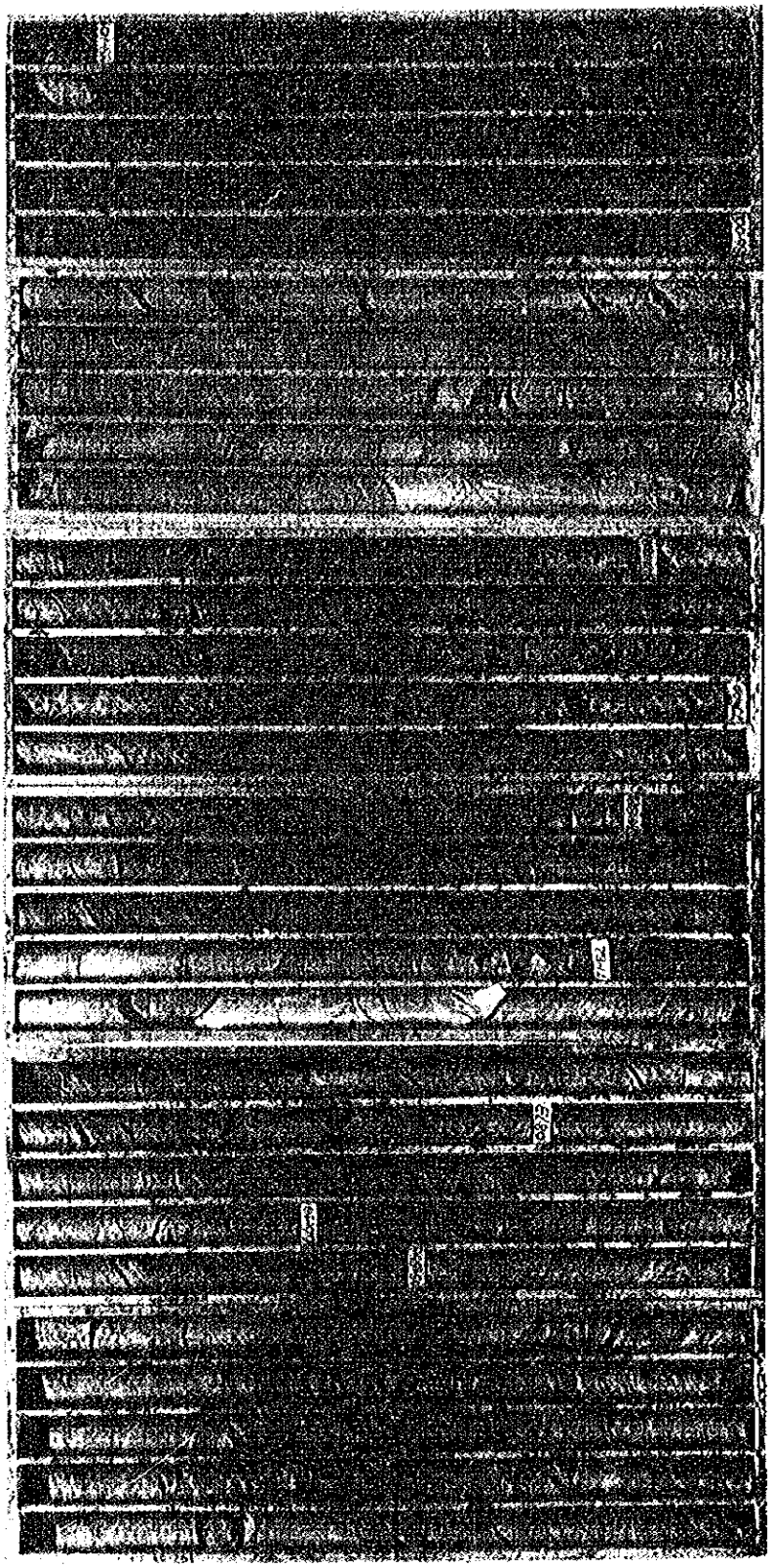
DEPTH IN METRES



DIAMOND DRILL HOLE DD103

WABO POWER PROJECT

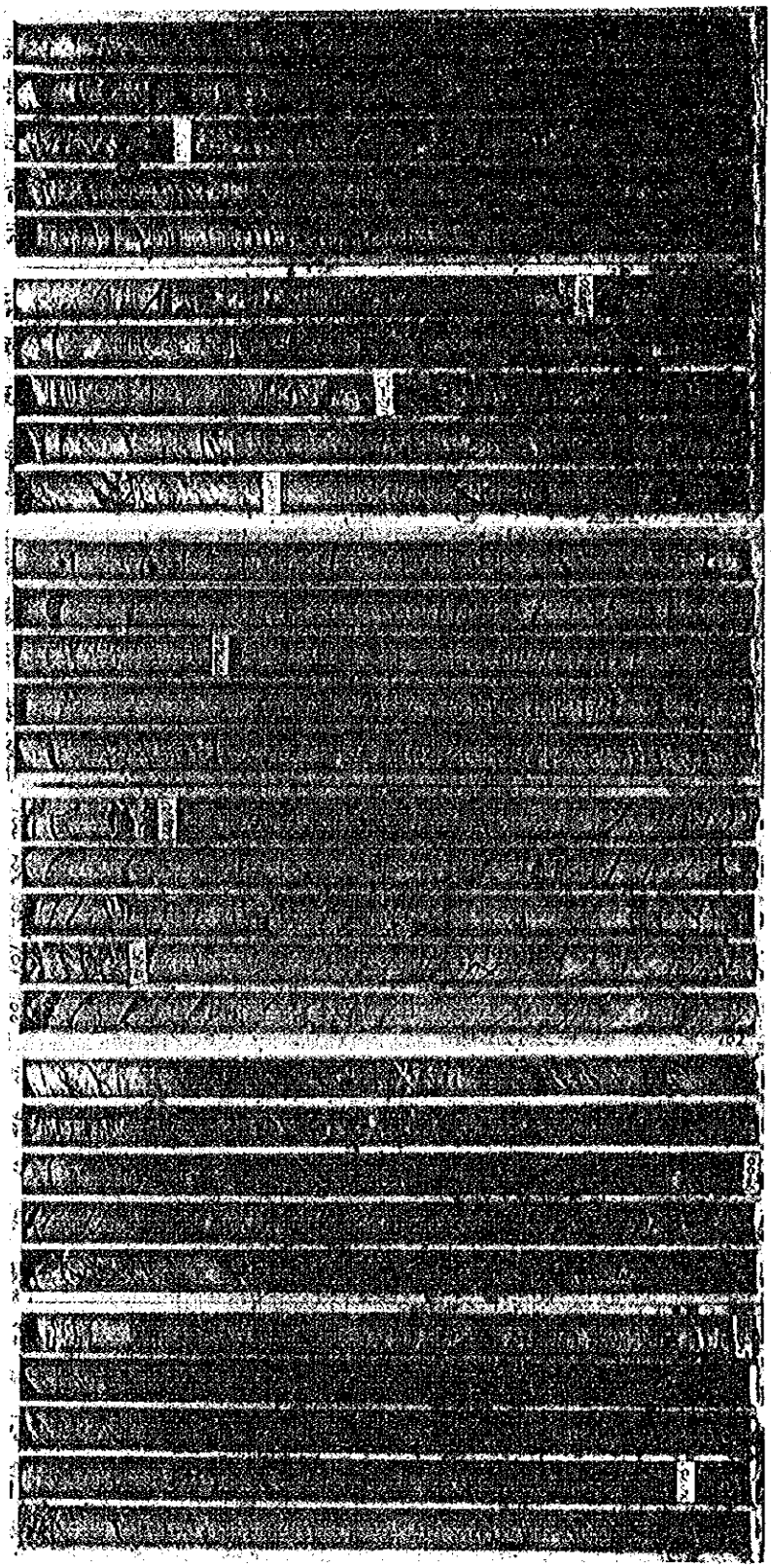
SHEET 2 of 5



DIAMOND DRILL HOLE DD103

WABO POWER PROJECT

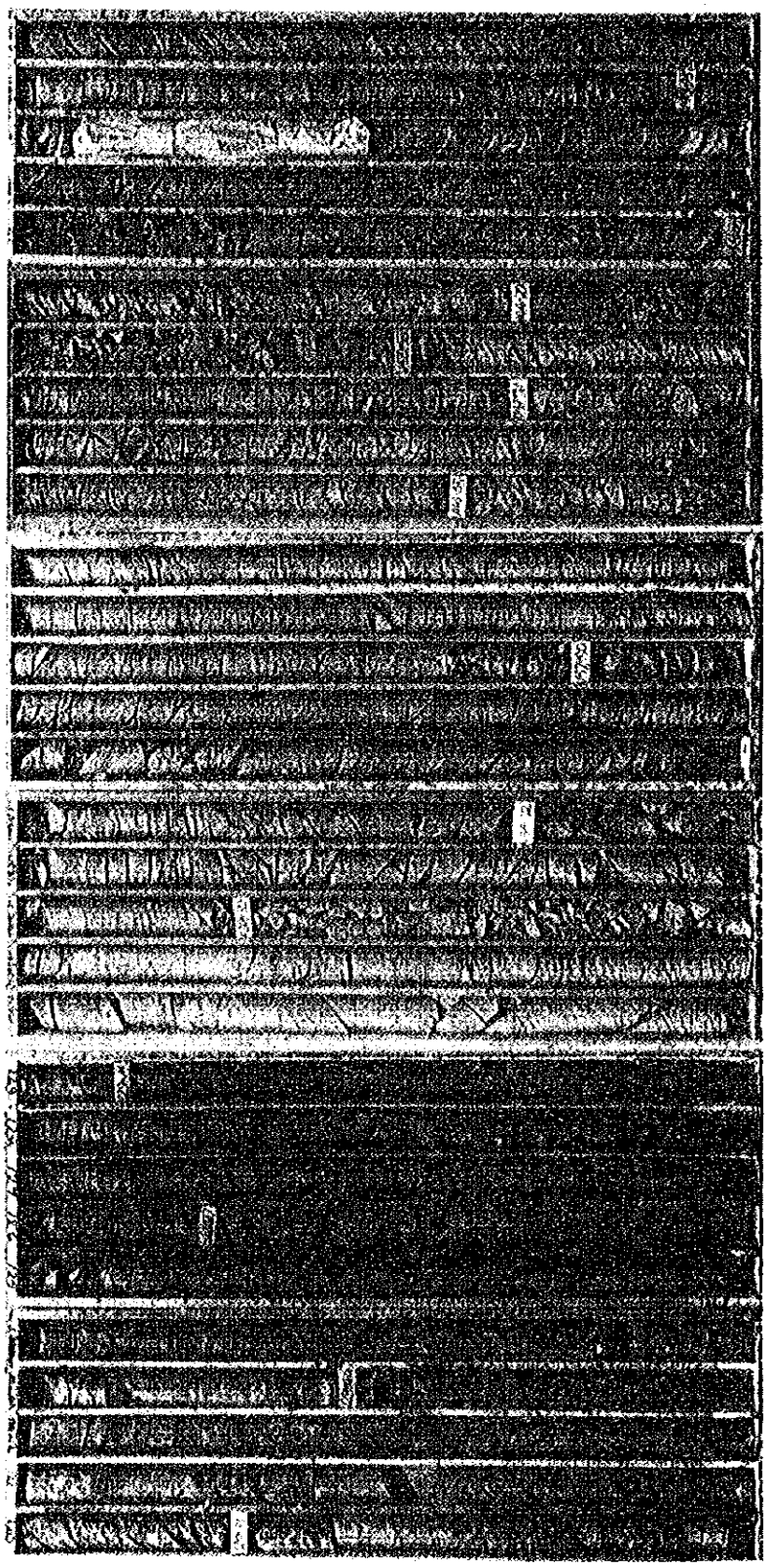
SHEET 3 of 5



DIAMOND DRILL HOLE DD103

WABO POWER PROJECT

SHEET 4 of 5



DIAMOND DRILL HOLE DD103

WABO POWER PROJECT

SHEET 5 of 5

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC – NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. DD 104

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION Intake Structure

CO-ORDINATES E 285,364.5 m, N 9226,780.3 m

SYSTEM AMG Zone 55

SURFACE ELEVATION 155.5 m

ANGLE FROM HORIZONTAL 48°

DIRECTION 066°

DESCRIPTION OF CORE (ROCK TYPE—colour, grain size, texture, mineral composition)	STRUCTURES (JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES)
Clay silty, yellow-brown and MUDSTONE fragments; probably in situ.	Recovered as fragments.
NO CORE	
MUDSTONE, silty with SILTSTONE bands up to 10mm wide common.	BEDDING 0° to 5°. No natural fractures. Bedding plane partings common.
SILTSTONE to very silty MUDSTONE; fine SANDSTONE bands up to 5mm common; fairly friable.	Core fractured due to drilling.
NO CORE	
SILTSTONE to very fine SANDSTONE; fairly hard.	BEDDING 0° to 5°. Rock parts easily along bedding. No natural joints.
MUDSTONE – SILTSTONE, dark grey, fairly friable. Average thickness of individual bands about 5mm.	Minor incipient air slacking.
	Fragmented during drilling
SILTSTONE, dark grey, friable; very fine sandstone and mudstone bands quite common.	No natural fractures.
	Air slacking.
SANDSTONE, dark grey, fine, silty, friable	Joint at 65° limonite stained. No other natural fractures.

ERA: MESOZOIC — BEDS

NMC

NOT APPLICABLE

HOLE BLOCKED

WATER RETURN

LOST WATER

NOT TESTED

23

0.3

1.0

S

DRILL	FRACTURE LOG	EXPLANATION	WEATHERING
Make Mindrill	1m 0.3 0.1 0.03 cm	Natural breaks in core per metre.	CW - Completely weathered
Type A 1000		Equivalent lengths of core pieces in centimetres.	HW - Highly weathered
Driller Grech & Mulligan		S (in fracture column) denotes air-slacking.	MW - Moderately weathered
Commenced 3 Dec. 1975			SW - Slightly weathered
Completed 17 Jan. 1976		Core preserved in plastic tube.	FrSt - Fresh, with limonite stained joints
			Fr - Fresh

ENGINEERING GEOLOGY B'CH

Logged G.A. Frenda

Drawn D.P.

Checked

Sheet 1 of 6

Dwg. No. 1429-S3051/1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD 104

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELATIVE DEPTH / CASING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN SUGEON UNITS
SANDSTONE, dark grey, fine grained, friable.			140							1.0
SANDSTONE, fine to medium grained, mid grey with many dark grey fine sandstone and siltstone bands up to 10mm, average 4mm wide.			21			BEDDING 5°. 6 clean, rough, irregular joints at 60° to 80° spaced approximately 1m.		NO WATER RETURN		
			22							
			23							
			24							30
			25							
			26							
			27							
			135							
			28							
			29							
SILTSTONE, dark grey with numerous fine SANDSTONE and MUDSTONE bands.			30			No natural joints. Bedding plane partings, common.				37
MUDSTONE, dark grey, shaly, and subordinate SILTSTONE bands up to 20mm wide; a few fine SANDSTONE inclusions.			31			BEDDING 0°. No natural fractures except fissile partings along bedding where shaly.				
			32							
			33					PARTIAL WATER RETURN		
and SILTSTONE MUDSTONE			34			Minor air slacking.				
			130							
			35							
			36			2mm clay seam.				0.6
			37							
SANDSTONE, medium to fine grained, light to mid grey. Irregular darker SILTSTONE bands and blebs throughout.			38							
			39							
			40			BEDDING 0° to 5°. No natural fractures.				
			125							
			41							
			42							0.4
			43							
			44							

EOA BEDS

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 6

Dwg. No. 1429-S3051/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD104

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	RELEVANT DEPTH CURVE	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, medium to fine grained, light to mid grey. Irregular darker SILTSTONE bands and blebs throughout.		NMLC	120		8998	BEDDING 0° to 5°. No natural fractures.				0.7
Darker grey and more silty. A few narrow beds of MUDSTONE.			115			Bedding partings are common along the mudstone beds.				0.1
SILTSTONE - MUDSTONE, interbeds, shaly, fissile locally.			110			BEDDING 0°. No natural fractures. Bedding plane partings common.				0.1
SANDSTONE, medium to fine grained, light to mid grey. Irregular darker bands and blebs of SILTSTONE throughout.						Bedding indistinct but dips at about 0°. No natural fractures.				
SILTSTONE, dark grey, fissile, grading to MUDSTONE.						Pronounced air slacking.	S	WATER LOST	PARTIAL WATER RETURN	0.7
SANDSTONE, medium grained, light to mid grey with SILTSTONE lenticles.						Joint at 60° rough, calcite cemented. Sub-vertical joint, rough. BEDDING DIPS 0°to5°				
SANDSTONE - SILTSTONE			105			Joint at 75° rough, calcite cemented.				1.1

ERA BEDS

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 6

Dwg. No. 1429-S3051/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD104

PROJECT. WARD POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION	DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE-SILTSTONE interbands, 60% light grey, fine to medium grained sandstone and 40% dark grey siltstone.				69			BEDDING 0° to 10°. No natural breaks, but parts readily along bedding.				
				70							
SANDSTONE, medium grained light grey, mostly massive, with a few SILTSTONE bands and streaks up to 10mm, average 3mm wide.				71			BEDDING 0° to 5°. Current bedding dips up to 20°.				1.1
				72							
				73							
				74							
		NMLC	100	75							
				76							2.2
				77			← Rough joint at 60°				
				78							
				79							
				80							
			195	81							
				82							
				83							2.1
				84							
				85							
				86							
				87			← Sub-vertical joint, rough.				
SANDSTONE, medium to fine grained with numerous dark grey SILTSTONE to fine sandstone bands up to 10mm wide but average 4mm, and comprising about 40% of rock.			190	88			BEDDING 0° to 5°. Partings common along bedding after drilling, but no other natural breaks.				
				89							
				90							
				91							
				92							

ERA BEDS

NO WATER RETURN

LOSS BEYOND PUMP CAPACITY

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet... 4 of 6

Dwg. No. 1429-S3051/4

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD104

PROJECT. MAIBO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATION DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, medium to fine grained, with numerous dark grey bands of SILTSTONE to fine grained SANDSTONE. These bands are up to 10mm wide, average 4mm wide, and comprise about 40% of the rock.			93 94 85 95 96 97 98 99 100			BEDDING 0°to 5°. Partings common along bedding after drilling, but no other natural breaks.				1.1
SILTSTONE - SANDSTONE, interbands average spacing 4mm.		NMLC	101 80 102 103			BEDDING 0° Partings common along bedding but few other natural fractures. ← Joint at 80°		NO WATER RETURN		3.3
MUDSTONE band, 20mm wide. →			104 105							
SANDSTONE, with about 20% SILTSTONE, dark grey, in irregular bands averaging 3 to 4mm wide.			106 107 108 75 109			BEDDING 0°to 5° No natural fractures apart from the few joints shown. ← Joint at 80°				1.5
			110 111 112 113			← Subvertical joint rough.				
MUDSTONE to SILTSTONE, dark grey, fairly friable.			114			Incipient air slacking throughout.	S			8.0
SILTSTONE with lenses of SANDSTONE, fine grained, and subordinate MUDSTONE.			70 115			Minor incipient air slacking throughout.	S			
MUDSTONE			116							

ERA BEDS

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 6

Dwg. No. 1429-S3051/5

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD104

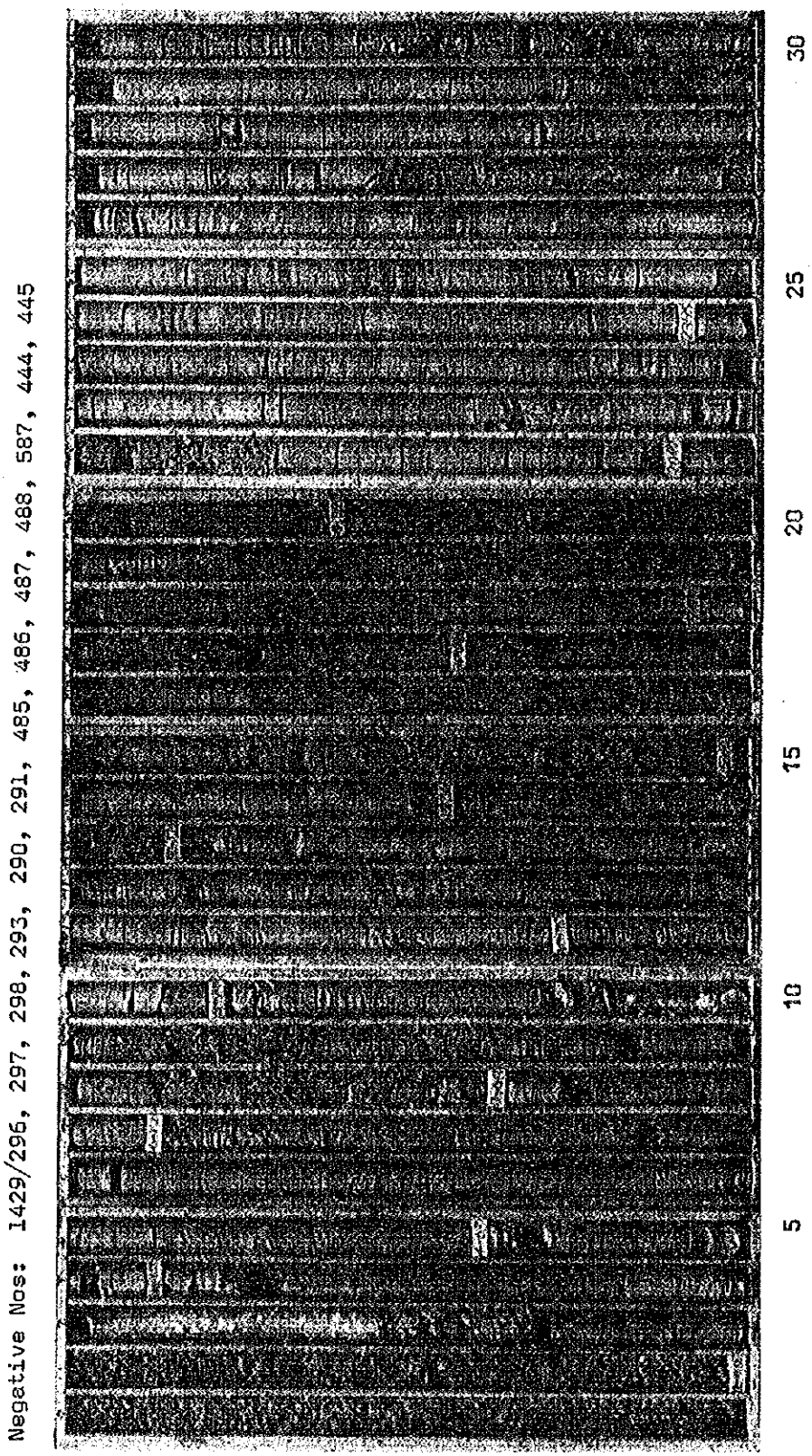
PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELATIVE ELEVATION / DEPTH (METRES)	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, persistence, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DAILY WATER LEVEL	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEONS UNITS
MUDSTONE SILTSTONE with lenses of SANDSTONE, fine grained, and subordinate MUDSTONE.			117			Minor incipient air-slacking throughout.	S			8.0
SANDSTONE, mid grey, fine grained and SILTSTONE bands in roughly equal proportions, are 5mm wide.		NMLC	119			BEDDING 0° to 5°. Partings common along bedding, but no natural fractures.		NO WATER RETURN		NOT TESTED
			119							
			120							
END OF HOLE 120.68m (RL65.8m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 6 of 6

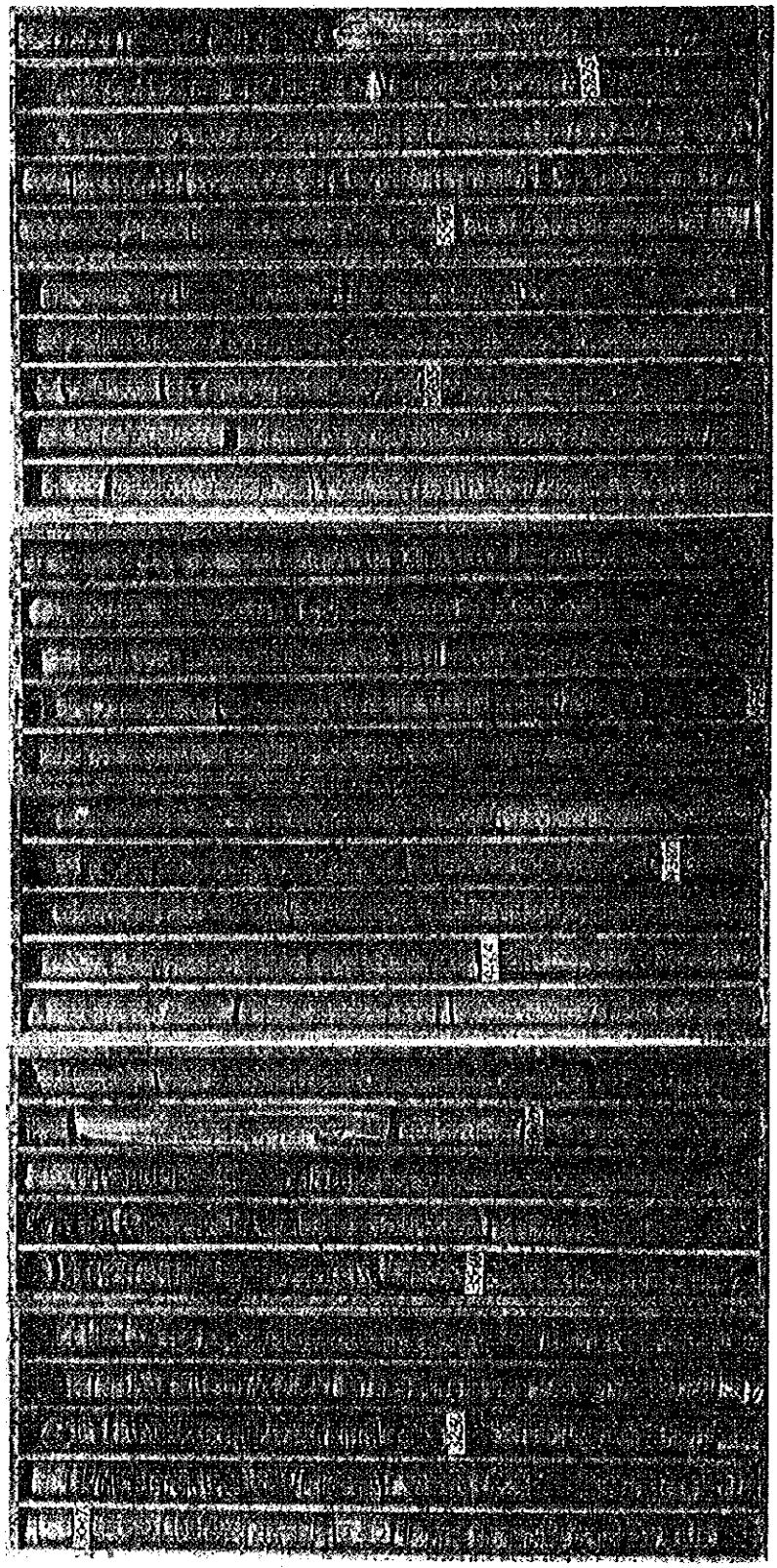
Dwg. No. 1429-S3051/6



DIAMOND DRILL HOLE DD104

WABO POWER PROJECT

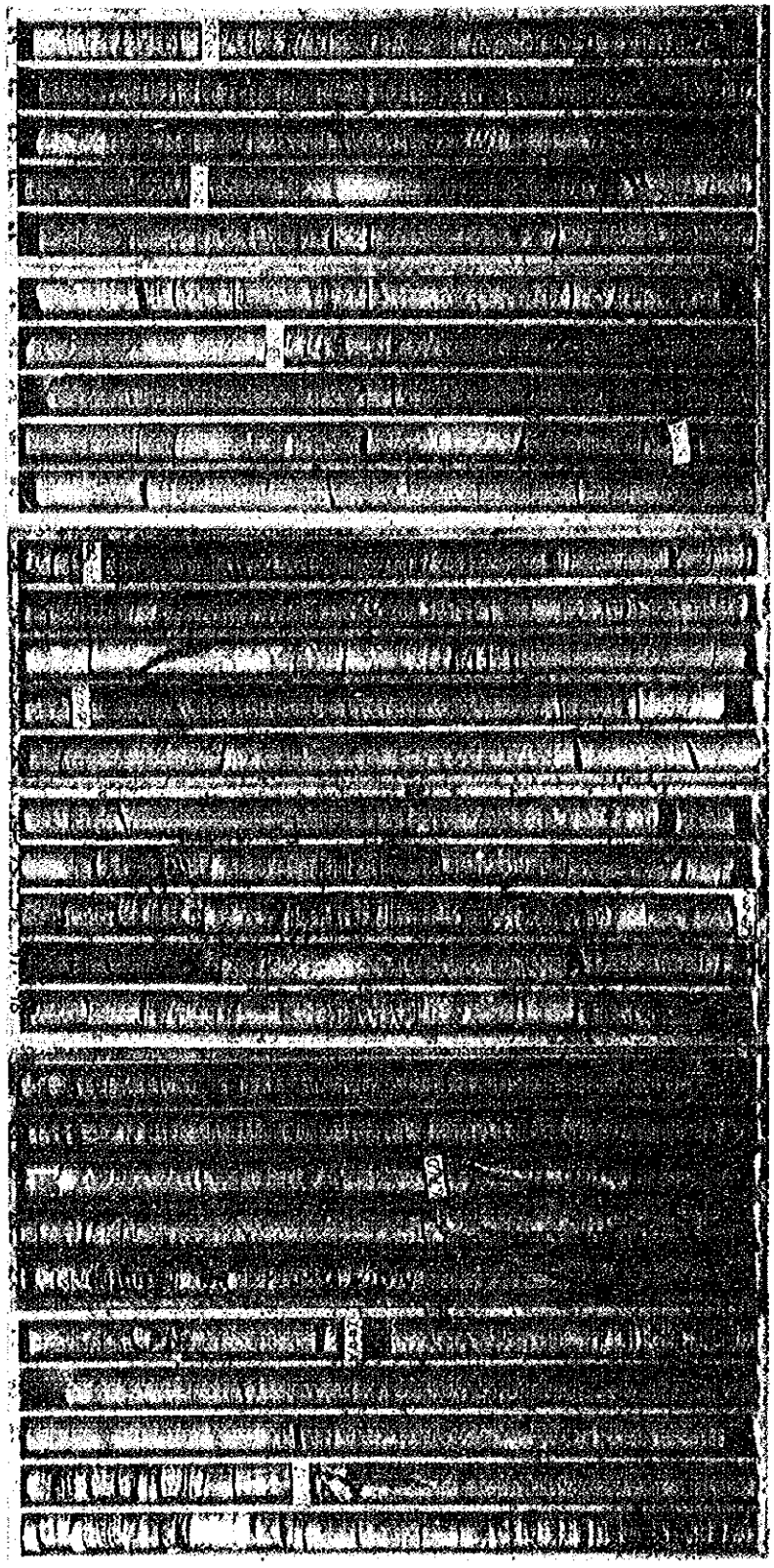
SHEET 1 of 4



DIAMOND DRILL HOLE DD104

WABO POWER PROJECT

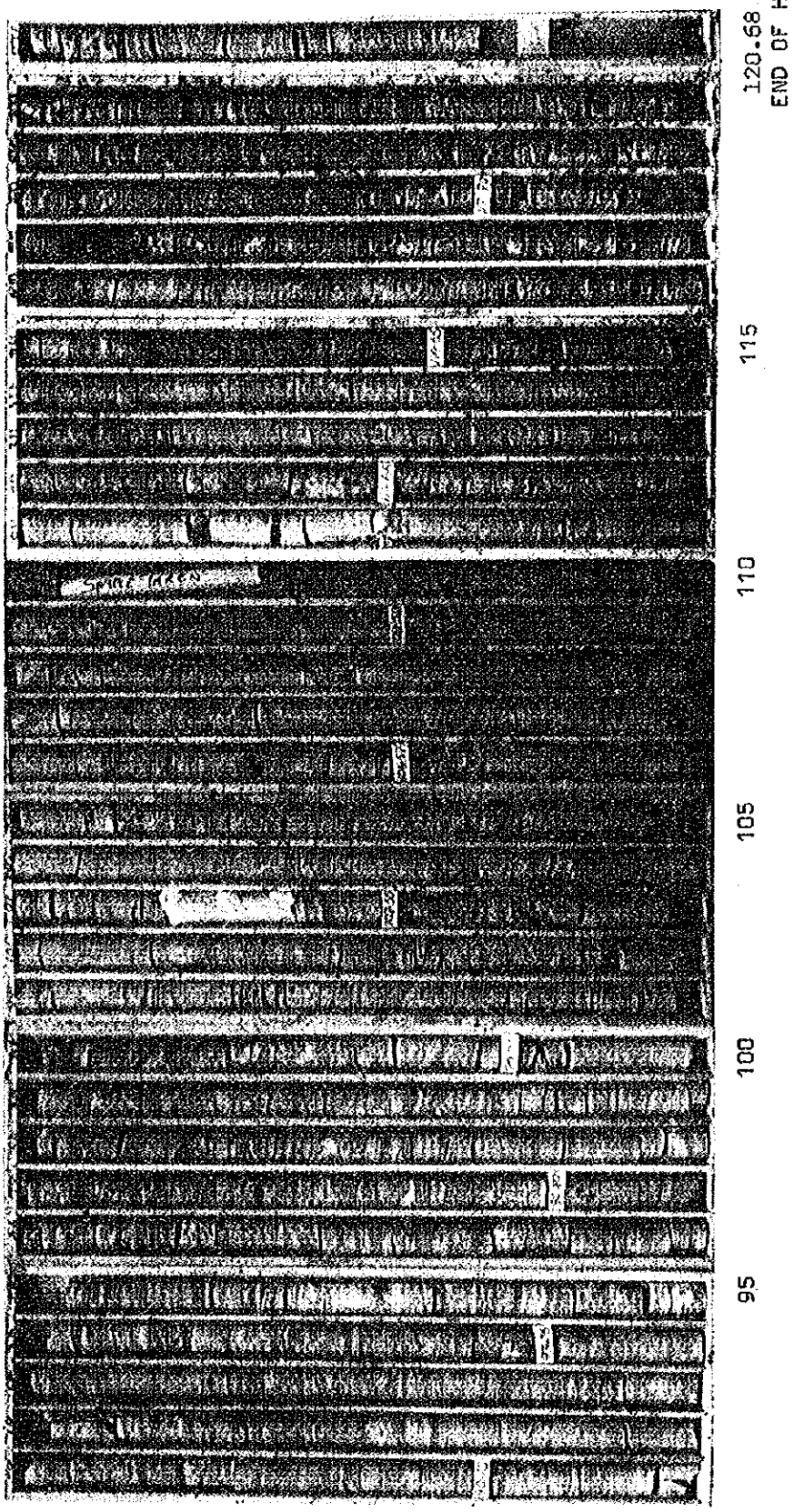
SHEET 2 of 4



DIAMOND DRILL HOLE DD104

WABO POWER PROJECT

SHEET 3 of 4



DIAMOND DRILL HOLE DD104

WABO POWER PROJECT

SHEET 4 of 4

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD 105

SMEC – NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT: WABO POWER PROJECT
FEATURE: MAIN DAM
LOCATION: Intake Structure

CO-ORDINATES: E 285 365.7 m, N 9 226 805.0 m
SYSTEM: AMG Zone 55

SURFACE ELEVATION: 156.6 m
ANGLE FROM HORIZONTAL: 90°
DIRECTION: –

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING Fr FrSt SW MW HW CW	CORE SIZE	metres ELEVATN	DEPTH CASING	LOG	CORE LOSS % PER RUN	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTY CLAY, yellow-brown and siltstone fragments.		NMC	155	1 2				NOT APPLICABLE		9 JANUARY 1976	
SILTSTONE, yellow-brown to pink.				3			Recovered as fragments.			(Level appears to be constant.)	
SANDSTONE, fine grained,				4			Steep joints.				
SILTSTONE, dark grey, with minor lenses of MUDSTONE.				5			BEDDING AT 30° Joints at 60°.				NOT TESTED
Friable, can easily be broken between the fingers.			150	6 7			Broken to fragments.	S	WATER RETURN		
Less friable and somewhat stronger				8							
Sandy.				9			BEDDING AT 37°				
Subordinate mudstone bands up to 5mm thick, and a few very fine grained sandstone bands.		NMC		10			A few partings along along bedding planes. Few if any, other natural fractures.				
Core can be broken between fingers.			145	11 12 13 14							3.0
SANDSTONE, grey to light grey medium to fine grained, silty				15							
			140	16			Joints at 60° limonite stained, open.				
				17							
				18			BEDDING AT 36°				8.5
SILTSTONE, bands, up to 10mm thick, fairly common.				19			Joint at 60°, clean, rough.				
				20							

EOH BEDS

DRILL
Make: Mindrill
Type: E 1000
Driller: Grech & Mulligan
Commenced: 27 Nov. 1975
Completed: 9 Dec. 1975

FRACTURE LOG
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

EXPLANATION
Core preserved in plastic tube.
S (in fracture column) denotes air-slacking.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged: G.A. Frenda
Drawn: D.P.
Checked:
Sheet 1 of 4
Dwg. No. 1429-S3052/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD105

PROJECT. WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION	DEPTH	CORE LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER RETURN	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, siltstone bands up to 10mm thick fairly common.				21			BEDDING AT 37° No joints. Friable.				8.5
SANDSTONE, very fine grained to SILTSTONE, with thin siltstone lenticles and carbonaceous partings.			1135	22							
				23							5.7
SILTSTONE, to fine SANDSTONE.				24			Friable.				
SANDSTONE, medium to fine grained, dark grey.				25							
SILTSTONE, to very fine SANDSTONE, dark grey, with thin sandstone bands up to 2mm.			1130	26			BEDDING AT 37° No joints or natural fractures.				
SILTSTONE, dark grey, fairly friable.				27			No natural fractures.				
SANDSTONE, very fine to SILTSTONE.		NMLC					BEDDING AT 38° No natural fractures.				
MUDSTONE, very silty, with abundant SILTSTONE bands up to 5mm thick, average 3mm throughout. Fairly friable can be easily broken with fingers.				28			Two joints at 80° clean.				2.1
				29							
				30			BEDDING AT 38°				
			1125	31							
				32							
				33							1.1
				34							
MUDSTONE, silty, dark grey, grading to SILTSTONE towards base.				35			Joint dip 80°. Parts easily along bedding at 40° but no other natural fractures. Friable.				
			1120	36							
				37							
				38							
				39							
				40			Bedding poorly developed.				1.1
SANDSTONE, medium grained, mid grey, with numerous hard, dark grey SILTSTONE, to fine sandstone bands, blebs and lenses, very irregular.			1115	41							
				42							
				43							
				44							

ERA BEDS

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. D0105

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATN / DEPTH (metres)	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, medium grained, mid grey, with numerous hard dark grey siltstone, to fine sandstone bands, blebs and lenses, very irregular.		NMLC	45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68			Very irregular, clean, sub-vertical joints, no other natural fractures. Banding (bedding) dips 36°	WATER RETURN	1.5
ERA BEDS			110 105 100 95 90					0.9
SILTSTONE, very sandy to very fine SANDSTONE, dark grey with many mid grey fine sandstone bands up to 10mm wide.						No natural fractures.		2.1
SANDSTONE, fine, very silty, to SILTSTONE, mid grey, dark grey siltsone bands up to 20mm thick are common.						Joint dip 70°; no other natural fractures except partings along bedding. More friable than above.		1.0
MUDSTONE to SILTSTONE, with siltstone bands up to 10mm common.						BEDDING AT 35° No joints, partings along bedding common.		0.8
SANDSTONE.								

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 4

Dwg. No. 429-S3052/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD105

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING F·Fr S·Sw M·Mw H·Hw C·Cw	CORE SIZE	ELEVATION in metres / DEPTH in metres / CORING	LOG	CORE LOSS % PER LIFT 2 9 9 8	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG 1 2 5 10 20 50 100 200	WATER RETURN	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS 0.2 0.5 1 2 5 10 20 50 100 200
ERA BEDS SANDSTONE, grey, fine to medium grained, with irregular lentiles of SILTSTONE.		NMLC	69 70			No natural fractures.		WATER RETURN		0.8
END OF HOLE 70.0m (RL86.6m)										

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

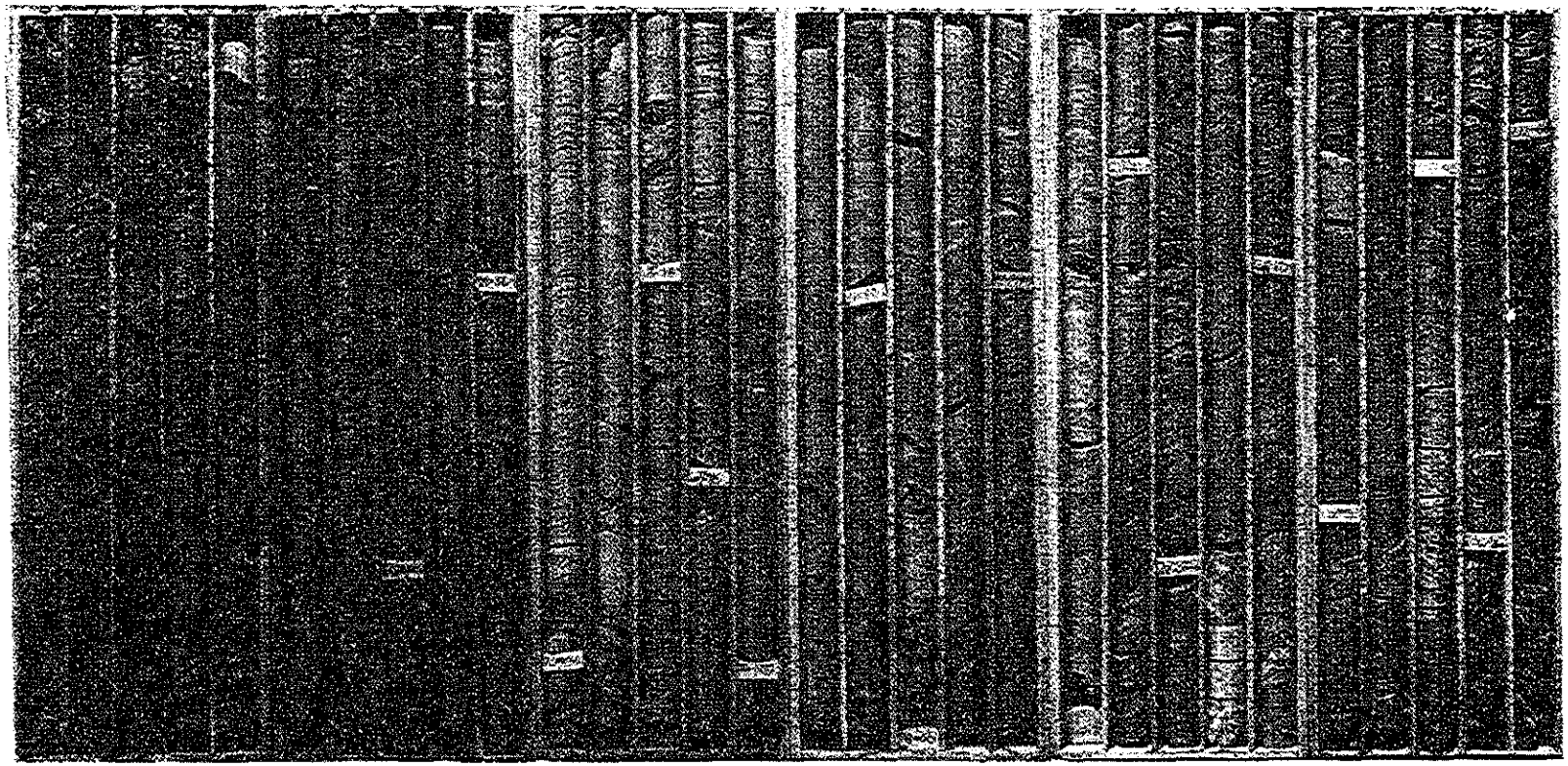
Sheet 4 of 4

Dwg. No. 1429-S3052/4

Negative Nos: 1429/309, 281, 280, 311, 310, 313, 588

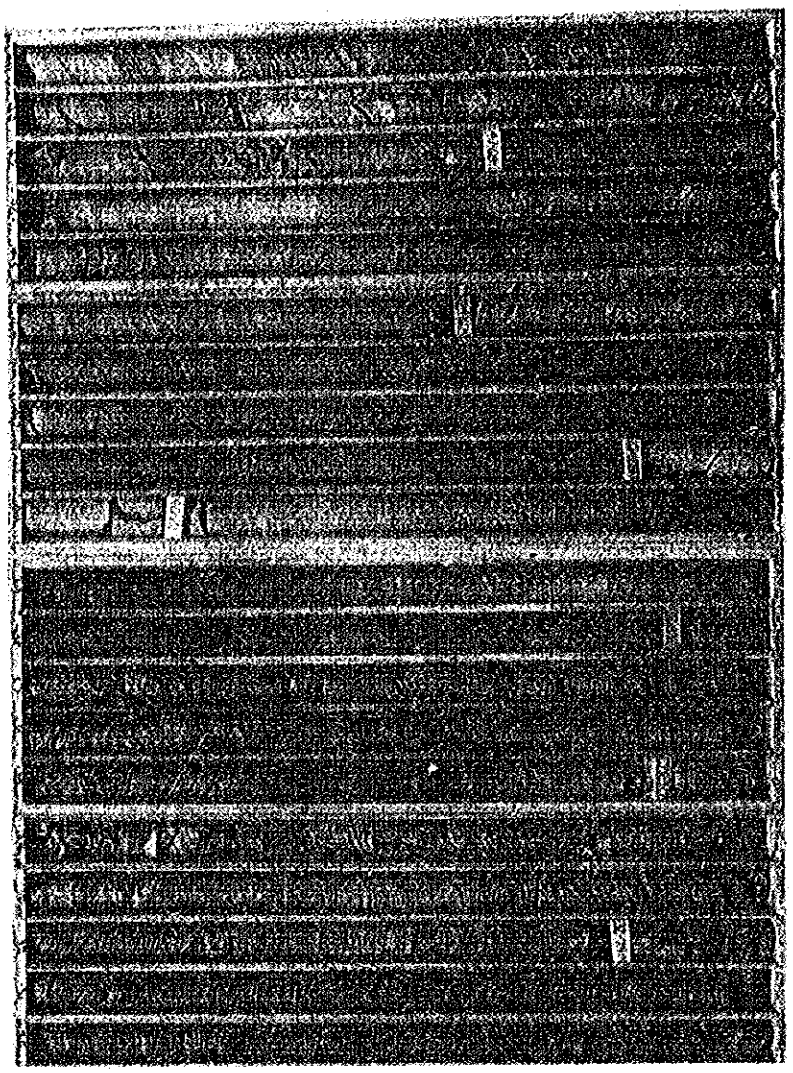
DIAMOND DRILL HOLE DD105

WABO POWER PROJECT



5 10 15 20 25 30

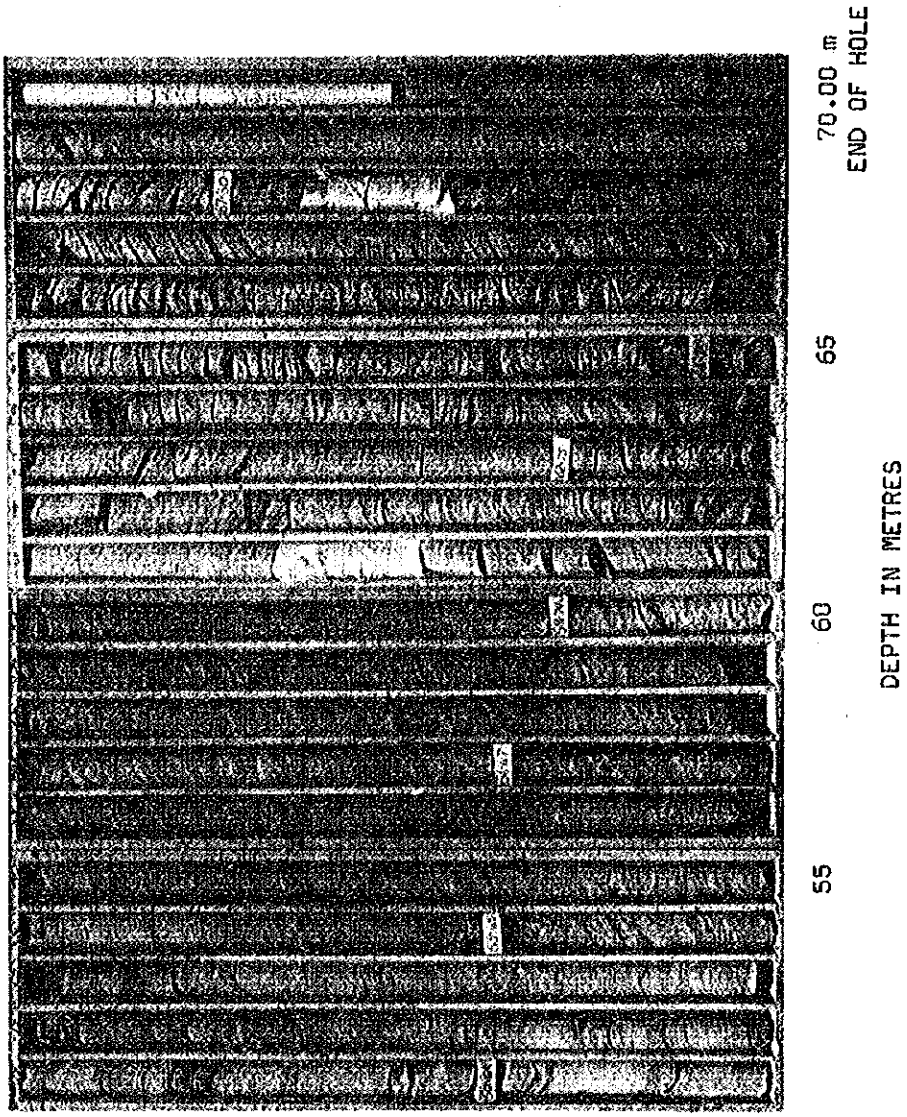
DEPTH IN METRES



DIAMOND DRILL HOLE DD105

WABO POWER PROJECT

SHEET 2 of 3



DIAMOND DRILL HOLE DD105

WABO POWER PROJECT

SHEET 3 of 3

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC – NK WABO PROJECT JOINT VENTURE STUDY

HOLE No. DD 106

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT

FEATURE MAIN DAM

LOCATION Damsite Left Bank

CO-ORDINATES E 285 308.1 m, N 9 226 519.1 m

SYSTEM AMG Zone 55

SURFACE ELEVATION 62.2 m

ANGLE FROM HORIZONTAL 50°

DIRECTION 063°

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING Fr SW MW HW CW	CORE SIZE	metres ELEVATN DEPTH CASING	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL GATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
Clay and sand yellow-brown.							NOT APPLICABLE			
SANDSTONE, very fine, silty.		NXC	1							
SILTSTONE to MUDSTONE dark grey; a few sandstone bands up to 3mm wide.			160 2 3 4			Bedding dips 5° Core fretted during drilling and was rather fissile along bedding planes. Very few other natural fractures.				NOT TESTED
			5			Fractured during drilling.				
SANDSTONE fine, to SILTSTONE; mudstone bands up to 5mm wide.			6			Bedding dips 5°, no natural fractures.				
			7			Joint at 45°				
			8			Subvertical joint, rough and clean.				
SANDSTONE fine to medium, with numerous dark grey siltstone bands up to 10mm wide.			155 9 10			Bedding dips 5°				49
ERA BEDS		NMLC	11							
SILTSTONE to MUDSTONE with bands of 3mm.			12			Clean joint at 45°				
			13			BEDDING 0° to 5°				
MUDSTONE, dark grey; a few siltstone bands to 2mm wide. Core easily broken with fingers.			14			Few natural fractures.				40
			15			Rough joint at 45°				
SANDSTONE, medium, mid to light grey; dark grey siltstone bands to 10mm wide common.			150 16 17			Joint at 65°, limonite stained.				
			18			Bedding dips 5°.				55
			19							
SILTSTONE to very fine SANDSTONE.			20			Sub-vertical limonite stained joint, rough.		WATER RETURN WATER LOST		

DRILL
Make Mindrill
Type E 1000
Driller Grech & Mulligan
Commenced 13 Dec. 1975
Completed 13 Jan. 1976

FRACTURE LOG
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.
Core preserved in plastic tube.

EXPLANATION

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged G.A. Fenda
Drawn D.P.
Checked
Sheet 1 of 3
Dwg. No. 1429-S3053/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD106

PROJECT MARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING Fr FSW SW HW MW CW	CORE SIZE	ELEVATION DEPTH CORE	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE, ranging to very fine grained SANDSTONE.			21			Subvertical, limonite stained joint, rough.				
SILTSTONE, fine sandy, and silty mudstone bands, average 10mm.			22							
MUDSTONE with subordinate siltstone bands.			23			Parts easily along bedding at 5°				
SILTSTONE-MUDSTONE inter-bands; mid to dark grey, quite tough.			24			Joint 65° No natural fractures.				
SANDSTONE, medium, tough.			25			Broken by drilling.				
SILTSTONE, sandy with abundant fine sandstone inclusions and bands through out; 50% siltstone-50% sandstone.			26			Sub-vertical joint.				
			27			Bedding dips 5°. No other natural fractures				
			28							
SILTSTONE with about 25% mudstone bands and 25% fine silty sandstone; average width 5mm.			29			Bedding dips 5°, no natural fractures, a few partings along bedding. Minor incipient air-slacking.				
MUDSTONE-SILTSTONE			30							
			31							
			32							
			33							
			34			Bedding 0-5°, no natural fractures.				
MUDSTONE; dark grey, a few siltstone bands to 2mm			35							
SILTSTONE, sandy, with estimated 35% sandstone and 25% mudstone bands and lenticles. Average width 5mm.			36							
			37			Sub-vertical joint, no natural fractures.				
			38			Sub-vertical calcite coated joint, rough, no other natural fractures.				
SILTSTONE, dark grey; a few mudstone bands to 1mm.			39							
			40							
SILTSTONE-MUDSTONE-SANDSTONE interbedded, but principally siltstone, dark grey.			41			Bedding dips 5° to 10°				
			42							
			43							
			44							

ERA BEDS

NMLC

NO WATER RETURN

10 FEBRUARY 1976

28 JANUARY 1976

30

120

14.5

4

80

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 3

Dwg. No. 1429-S3053/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD106

PROJECT WADO POWER PROJECT

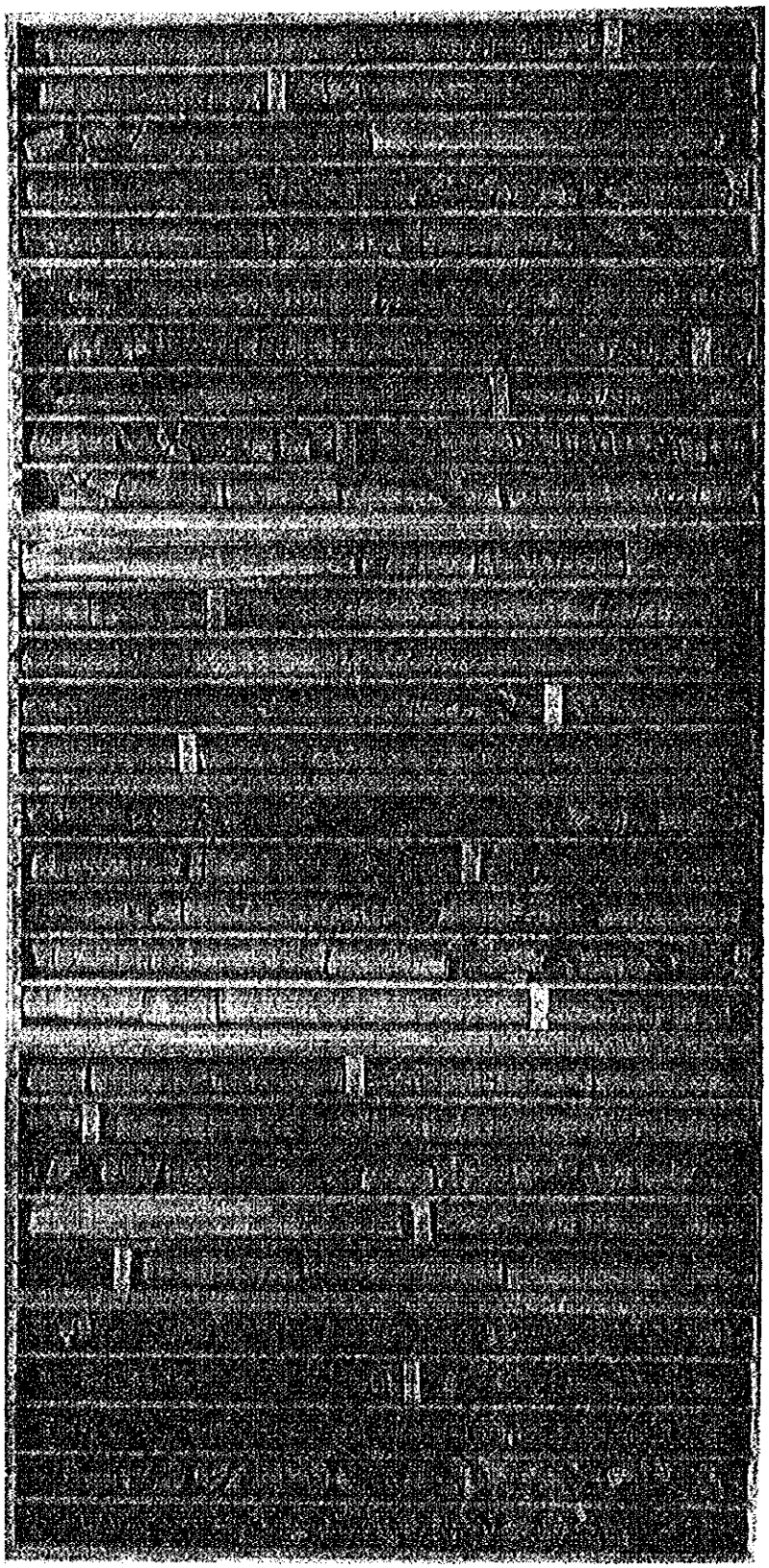
DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION metres	DEPTH metres	CORE LOG	CORE LOSS % PER LUT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE - MUDSTONE - SADNSTONE interbedded, but principally SILTSTONE dark grey.				45			Bedding dips 5°				80
				46			Sub-vertical joint.				
				47							
SANDSTONE, medium grained, grey, with about 30% dark grey SILTSTONE and MUDSTONE, in bands up to 10mm wide, averaging 3mm.				48							
				49			Rough sub-vertical joint.				1.5
				50							
				51							
				52							
				53							
ERA BEDS				54							2.3
				55							
As above but finer grained, siltstone beds more pronounced, estimate 40%				56							
				57							
				58			Sub-vertical joint, rough, irregular.				19
SANDSTONE grading into sandy SILTSTONE.				59							
				60							
END OF HOLE 60.00m (RL16.2m)											

NO WATER RETURN

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 3

Dwg. No. 1429-S3053/3

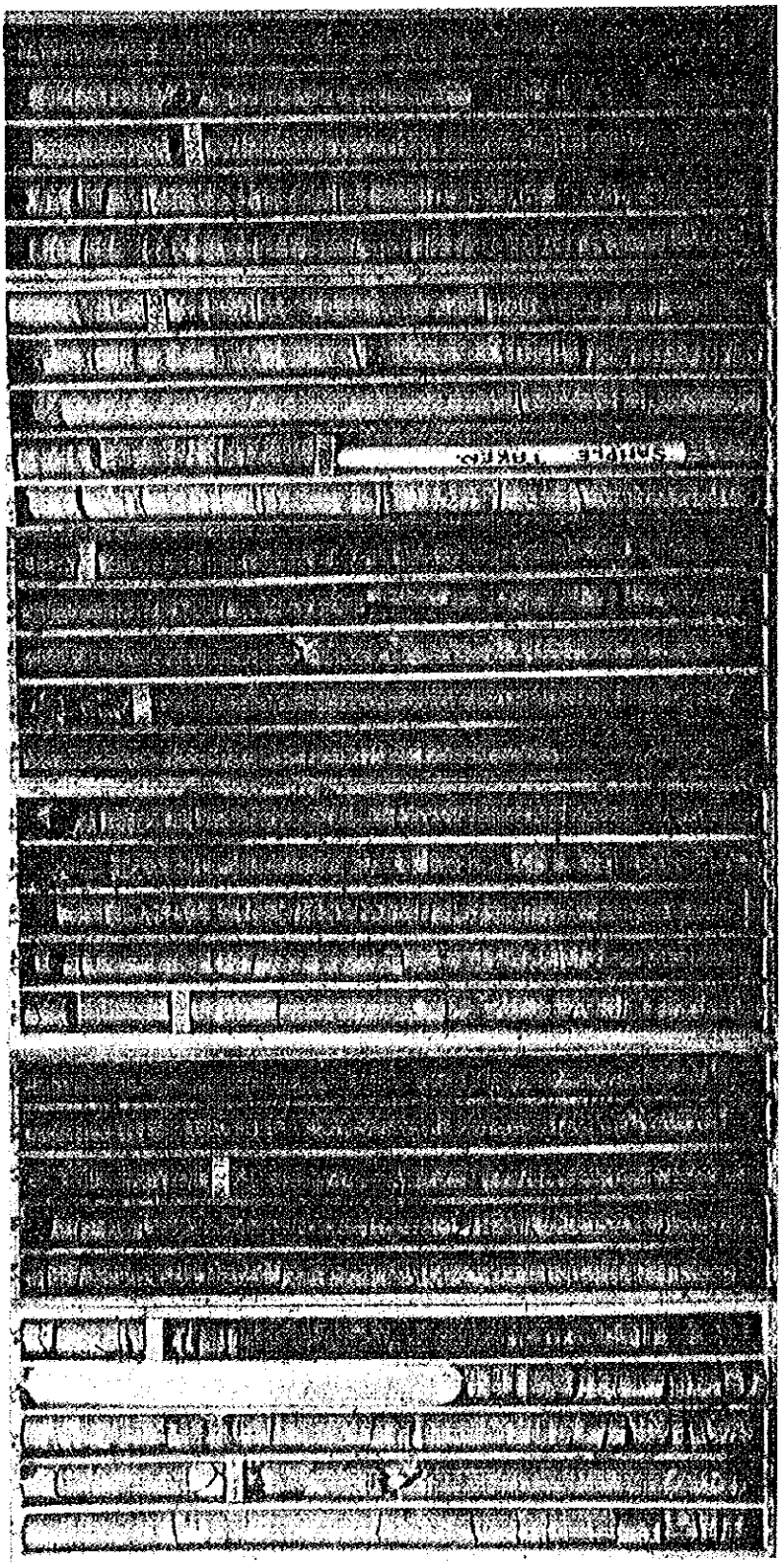


Negative Nos: 1429/284, 285,.286, 509, 510, 589

DIAMOND DRILL HOLE DD106

WABO POWER PROJECT

SHEET 1 of 2



DIAMOND DRILL HOLE DD106

WABO POWER PROJECT

SHEET 2 of 2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD 107

SMEC - NK WABO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

PROJECT WABO POWER PROJECT
FEATURE MAIN DAM
LOCATION Spillway/ Diversion Tunnel (Right Bank)

CO-ORDINATES E 285 904.6 m
N 9 226 478.2 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 37.8 m
ANGLE FROM HORIZONTAL 45°
DIRECTION 068°

DESCRIPTION OF CORE — ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING: Fr, SW, MW, HW, CW	CORE SIZE	RELEVATN / DEPTH (metres)	LOG	CORE LOSS % PER LIFT	STRUCTURES — JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES
SLIDE DEBRIS and/or TALUS: Brown sandy clay.						weathered into amorphous lumps.
Grey clayey fine sand derived from interbedded SANDSTONE and SILTSTONE.		NXC				Structureless lumps.
Friable light grey silty SANDSTONE.			3			Many small irregular fragments.
Dark grey SILTSTONE with occasional Sandstone pebbles embedded.			35 4			
			5			Crushing and slicken-siding.
SLIDE DEBRIS: Brecciated SILTSTONE, dark grey with some small fragments of sandstone, cemented with clay.			6 7 8 9 10			Slickensides absent.
			30 11			Completely brecciated.
NO CORE			12			
ERA BEDS: SILTSTONE, grey.		NMLC	13 14 15 16			Joints dip 70°, rough, clay cemented. Bedding planes dip 20°.
			17			Crushed zones, orientation indeterminable.
			25 18			
			19			BEDDING dips 20°.
			20			

FRACTURE LOG: NOT APPLICABLE

DRILL WATER LOSS: FULL WATER RETURN

GROUNDWATER LEVEL, DATE: 9 JANUARY 1976.

WATER PRESSURE TESTS — LEAKAGE RATES IN LUGEON UNITS: NOT TESTED

DRILL
Make Hindrill
Type F 30 R
Driller Grech & Mulligan
Commenced 26 Nov. 1975
Completed 3 Jan. 1976

FRACTURE LOG: 0.02 0.06 0.2 0.6 2 6 20 60 200 cm

EXPLANATION
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.
S (in fracture log) denotes air slacking.
Core preserved in plastic tube.

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with Limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged B. V. Radford
Drawn D.P.
Checked

Sheet 1 of 5
Dwg. No. 1409-S3054/1

SRCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD107

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES
SILTSTONE, dark grey.	Bedding planes dip 20°. Joints dipping 80° to 85° and 45°, smooth planar.
SANDSTONE bed.	No joints visible, only bedding plane partings and drilling breaks.
Becomes softer, more clayey.	Breakage probably due to drilling.
Zone of finely laminated SANDSTONE and SILTSTONE	
Becomes hard, with some thin sandstone interbeds.	
Bedding plane partings show traces of organic matter.	
SANDSTONE, light grey, fine grained, slightly friable, silty.	A few joints, smooth, planar, clean.
	Two joint sets visible, dipping 60° and 45°.
	Slickensided joint, dip 40°, intersected by quartz vein 1mm thick, dipping 60°.
Becoming darker, fines content increasing.	
Wisps of Siltstone.	
SILTSTONE, very dark grey, with occasional inclusions of Sandstone.	BEDDING dips 30°.
	Partial air slacking.
	Joints dip 40° to 60°.
	BEDDING dips 25°, bedding planes smooth, showing traces of organic matter.
	Crushed zone.
	Crushed zone at 60°, slightly slickensided.
	Joint sets strike at right angles to each other, one dipping 35°-45° (some faces slickensided) the other dipping at 60°.

ERA BEDS

GRUBADI BEDS

FRACTURE LOG

FULL WATER RETURN

LOST WATER RETURN

WATER PRESSURE TESTS
LEAKAGE RATES IN LUGEON UNITS

NOT TESTED

1.0

9.4

WATER LOSSES TOO HIGH TO TEST

6.3

NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD107

PROJECT MARO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE, colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	ELEVATION metres	DEPTH metres	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, cementation, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	SMALL WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE, very dark grey. In crush zones the rock is soft and semi-plastic.		NMLC		45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68			BEDDING dips 15°- 20°, bedding plane partings frequent. Rock is disturbed with much close fracturing and crushing. Joints dipping 40° to 60° and from 70° to near vertical. BEDDING planes dip 15°. Fracturing of core due mainly to drilling in zones where natural fractures are more frequent. Joints in three sets, dips 30°- 40°, perpendicular to set one, at 60°, third set near vertical, 30°- 40° dip predominates. BEDDING dips 40°. BEDDING dips 40° Joints dipping 45° to near vertical. Spacing generally indeterminate. Bedding dips 80° near vertical in places. Most joints dip 50°		NO WATER RETURN PARTIAL WATER RETURN		NOT TESTED
ORUBADI BEDS Traces of calcareous material, possibly broken and partly dissolved sea shells. SANDSTONE, grey, fine grained, slightly friable. SILTSTONE (MUDSTONE ?), very dark grey, with locally traces of fossil shells.											

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 3 of 5

Dwg. No. 1429-S3054/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD107

PROJECT WABO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL OF TOP OF HOLE / DEPTH BELOW SURFACE	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE (MUDSTONE ?), very dark grey.			69			Dip of BEDDING changes 70°-50° over 5m interval.				
Some SANDSTONE beds, less than 20mm thick.						BEDDING planes contain traces of organic matter.				
SANDSTONE, light grey, fine grained, slightly friable, with occasional bands and wisps of SILTSTONE/MUDSTONE.			70			Joints are sub-planar, rough, dip 50° to 70°, clean.				
			71			Fracture, curved, very rough, clean, near vertical.				
			72			Joints dip 60° to 70°, are mostly fairly rough, slightly curved.				
			73			Joint, vertical, curved, clean.				
			74			BEDDING DIPS 50°				
			75			Joint, dip 70°, traces of slickensiding.				
			76							
			77							NOT TESTED
			78			Joints dip 60°, sub-parallel to bedding planes, spacing variable.				
			79			BEDDING DIPS 50°. Partings frequent.				
ORUBADI BEDS			80			Core broken by air jacking.				
			81			Near vertical joints, smooth, curved.				
			82			Joints dip 50° to 70°.				
SILTSTONE (MUDSTONE), very dark grey.		NMLC	83			BEDDING planes dip 50°, some with traces of organic matter.				
			84							
			85			Joints dip 70°.				
			86			Joint, vertical, very rough.				
			87			Joint, 40°.				
			88			Apart from a few joints, all core breaks are bedding plane partings, dipping about 50°.				
			89							
			90			Joints dip 50°, perpendicular to bedding. Many bedding plane partings, dip 50°, and drilling breaks.				
			91							
			92							

PARTIAL WATER RETURN

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 5

Dwg. No. 1429-S3054/3

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD DD107

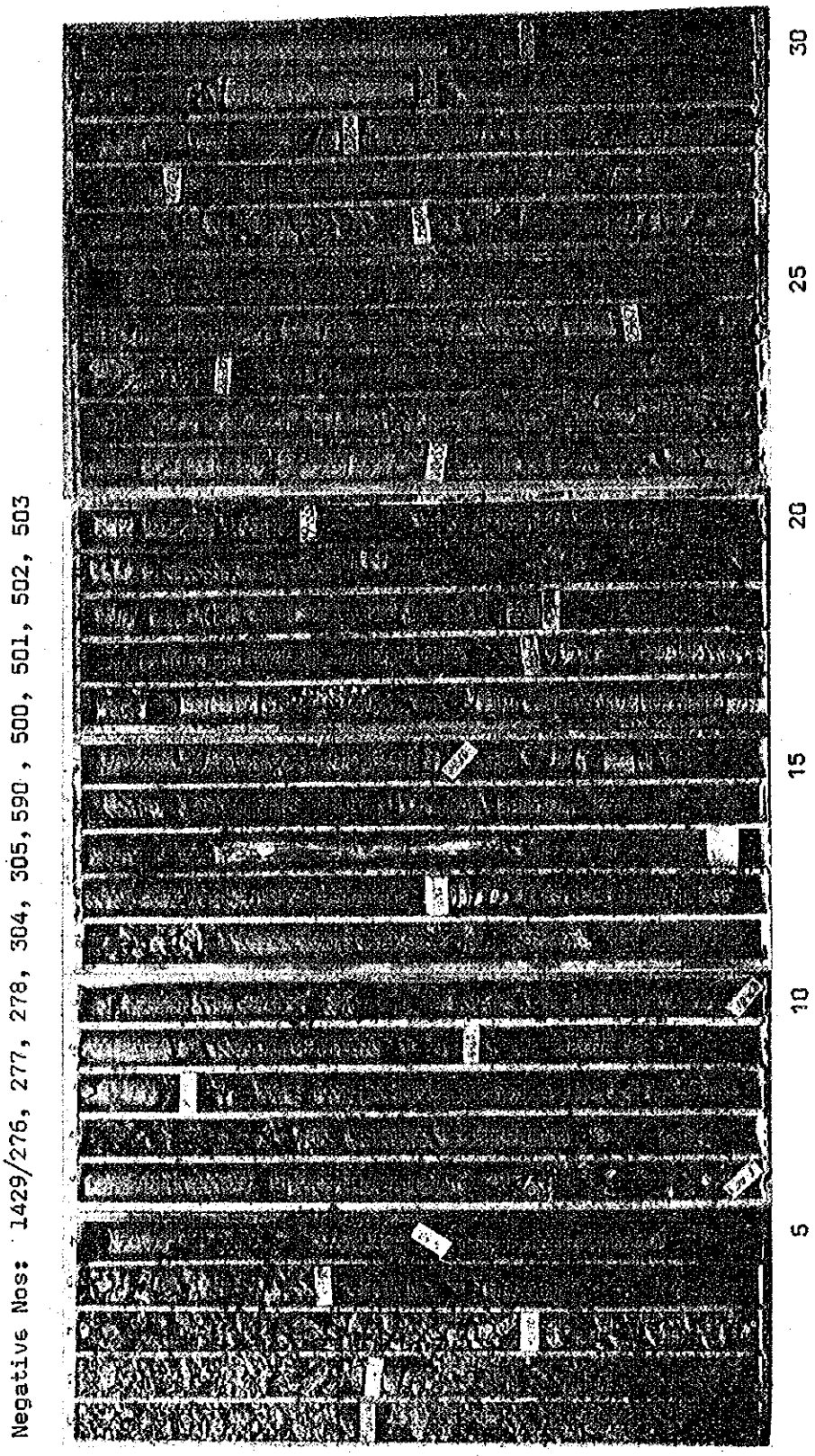
PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE, colour, grain size, texture, mineral composition	DEGREE OF WEATHERING HW SW MW HW CW	CORE SIZE	RL / DEPTH (metres)	LOG	CORE LOSS % PER UNIT	STRUCTURES JOINTS--spacing, attitude, smoothness, aperture, cementing, coating, filling. BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
ORDOVICIAN BEDS SILTSTONE(MUDSTONE), very dark grey. NO CORE		NMLC	-30 93 94 95 96 97 98 99 100			Fractures are combination of jointing, air slacking and drilling breaks ← Joint, vertical, curved, clean. Air slacking and drilling breaks included with joints. Joints near vertical to 60°	PARTIAL WATER RETURN		NOT TESTED
END OF HOLE 100.00m. (RL-32.90)									

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 5 of 5

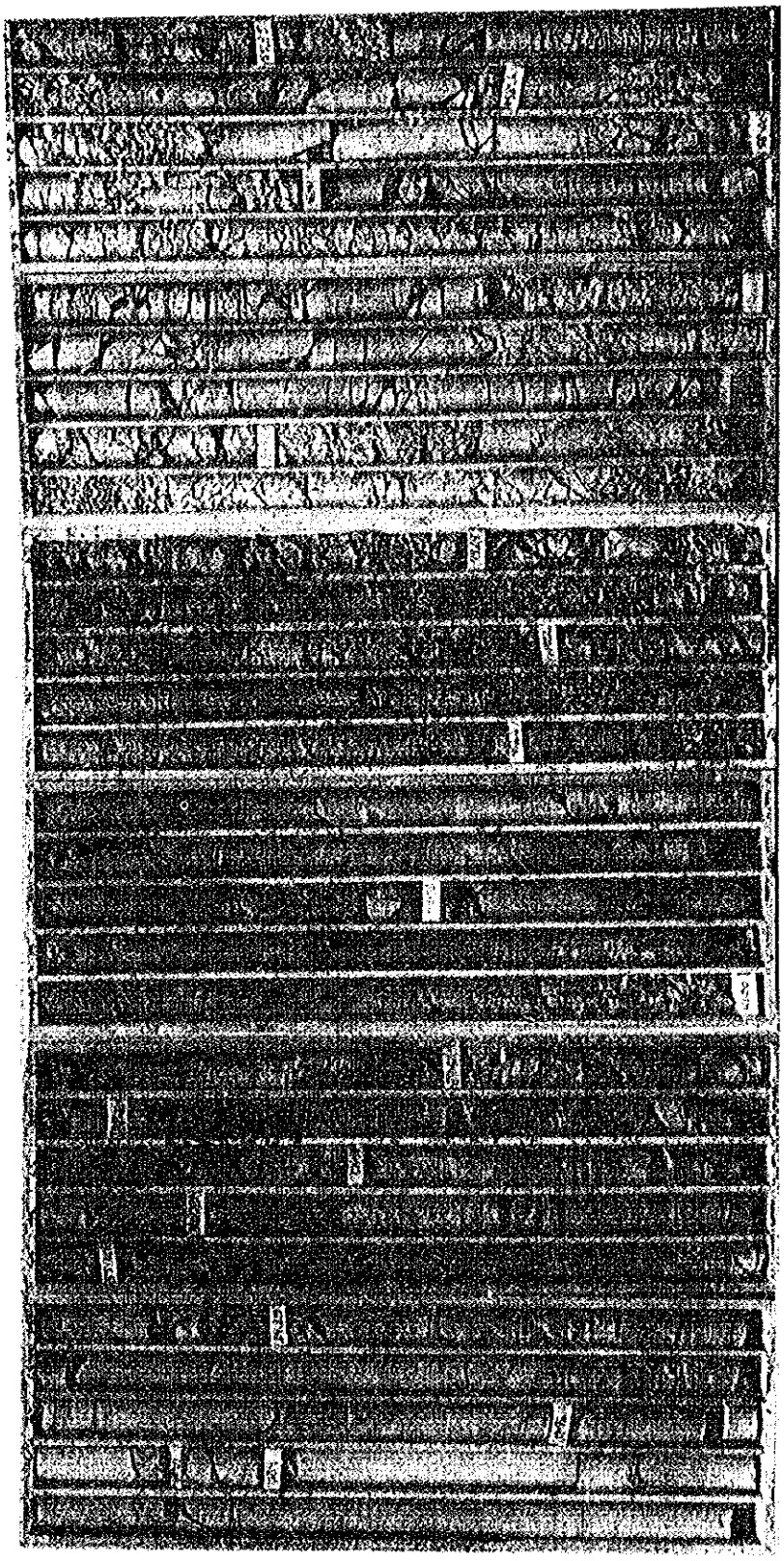
Dwg. No. 1429-S3054/3



DIAMOND DRILL HOLE DD107

WABO POWER PROJECT

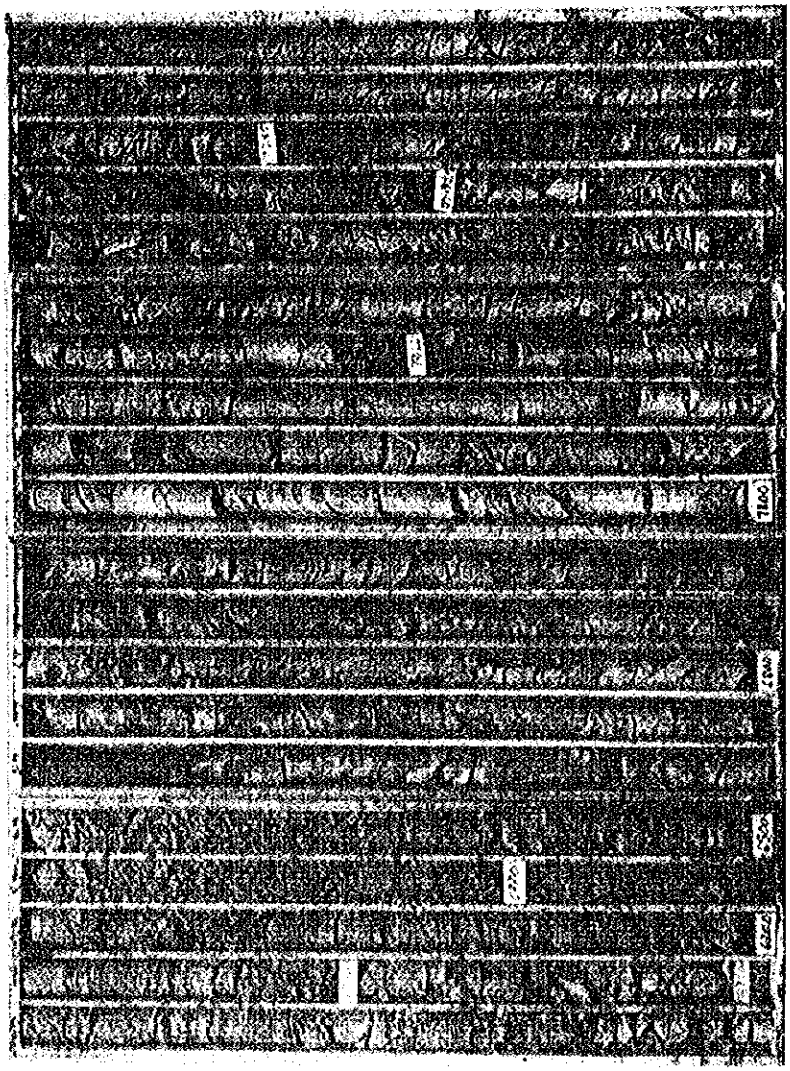
SHEET 1 of 4



DIAMOND DRILL HOLE DD107

WABO POWER PROJECT

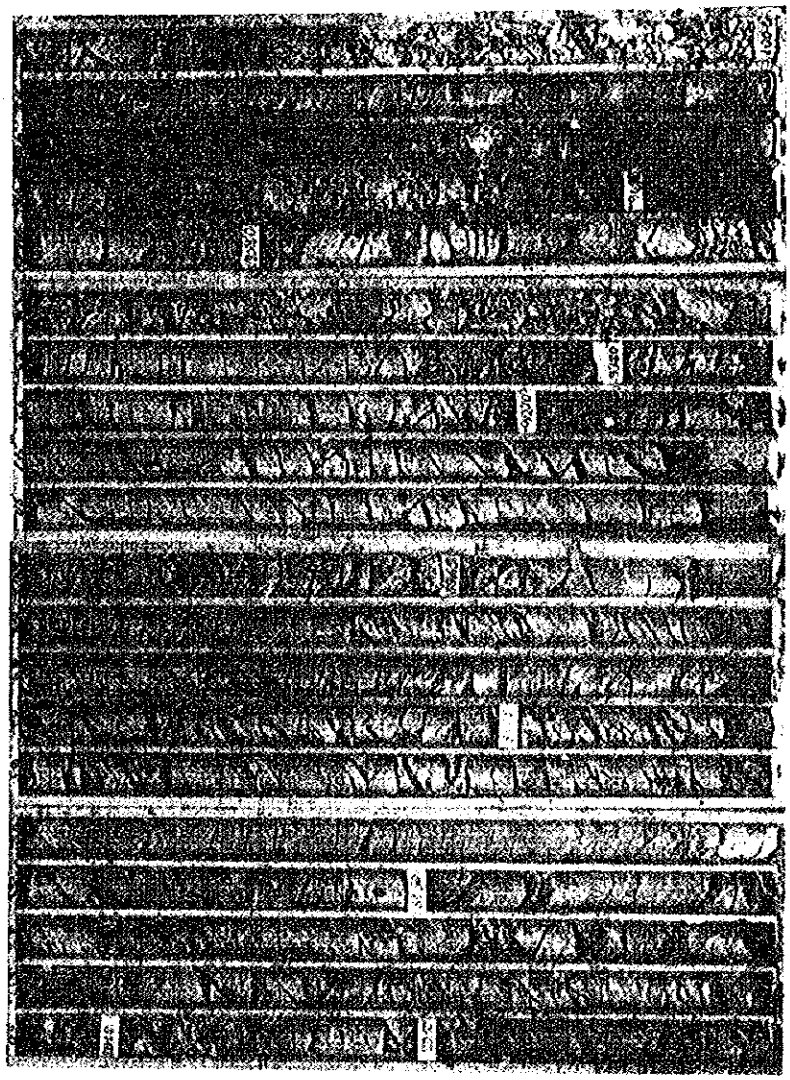
SHEET 2 of 4



DIAMOND DRILL HOLE DD107

WABO POWER PROJECT

SHEET 3 of 4



DIAMOND DRILL HOLE DD107

WABO POWER PROJECT

SHEET 4 of 4

SNOWY MOUNTAINS ENGINEERING CORPORATION

SMEC - NK WADO PROJECT JOINT VENTURE STUDY

DIAMOND DRILL HOLE — GEOLOGICAL LOG

HOLE No. DD 108

PROJECT WADO POWER PROJECT
FEATURE MAIN DAM
LOCATION Dam Abutment and Spillway

CO-ORDINATES E 285 781.5 m
N 9 226 186.8 m
SYSTEM AMG Zone 55

SURFACE ELEVATION 159.7 m
ANGLE FROM HORIZONTAL 90°
DIRECTION -

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture mineral composition	DEGREE OF WEATHERING FR SW MW HW CW	CORE SIZE	ELEVATION / DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	CORE WASH LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
Surface deposits, brown silty clay with SILTSTONE fragments.							NOT APPLICABLE			
Very fine sandy SILTSTONE, grey, containing many small fossil shells.		NXC	1			Core irregularly broken by drilling.				
Core slightly fretted.			2							
			3			BEDDING dips 40°.				NOT TESTED
Interbedded SILTSTONE, dark grey, and very fine grained light grey SANDSTONE. No fossils.			4			← Joint, rough, clean, dip 70°.				
			5							
SILTSTONE with minor bands of SANDSTONE.			6							
			7			Joints dip mostly 70° to 80°, and are clean.				
			8			← Close fracturing.				
ERA BEDS Small fossil shells		NMLC	9							
			10			Several drilling breaks and bedding plane partings dipping 35°.				1.8
			11							
Percentage of SANDSTONE increases locally.			12			Joints, clean, near vertical.				
			13							
			14							3.2
			15							
Interbedded SANDSTONE and SILTSTONE.			16			BEDDING plane partings dip 35°.				
			17							
			18			Most fractures are drilling breaks.				
SILTSTONE, slightly sandy.			19							NIL
			20							

FULL WATER RETURN

DRILL
Make Hindrill
Type A 1000
Driller Grech & Milligan
Commenced 22 Jan 1976
Completed 31 Jan 1976

FRACTURE LOG
Natural breaks in core per metre.
Equivalent lengths of core pieces in centimetres.

S (in fracture log column) denotes air slacking.

Core preserved in plastic tube.

EXPLANATION

WEATHERING
CW - Completely weathered
HW - Highly weathered
MW - Moderately weathered
SW - Slightly weathered
FrSt - Fresh, with limonite stained joints
Fr - Fresh

ENGINEERING GEOLOGY B'CH
Logged B.V. Radford
Drawn D.P.
Checked

Sheet 1 of 4
Dwg. No. 1429-S3055/1

MARCH 1976

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD108

PROJECT. WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RL / DEPTH	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	DRILL CUTTINGS	GROUNDWATER LEVEL DATA	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE, slightly sandy. Becoming sandier.			21			Joints, rough, slightly limonite stained, dip 70° to 75°.				NIL
Grey very fine grained SANDSTONE with minor SILTSTONE bands and wisps.			22 23 24 135 25			Few drilling breaks are sub-horizontal, or along bedding planes at 40°. Close fracturing.				Very high
			26			Joint, vertical, rough.				
			27			Joint, rough, 45°. Joint, smooth, clean, 45°.				
			28			Joint, rough, 45°.				5.6
		NMLC	29 130 30			Joint, 45°, slightly limonite stained.			LOST WATER RETURN	
			31			Joint, 80°, rough, curved with slight limonite. Joint, 70°, rough, stepped, clean.			BELOW 30.0m ON 10 FEB 1976	NOT TESTED
ERA BEDS Proportion of SILTSTONE increases with depth.			32							
			33			Joint, very rough, 45°. Joint, very rough, 45°.				
Rock grades into sandy SILTSTONE, dark grey.			34 125 35			Joint, curved, near vertical.				0.5
			36			Near vertical, rough, curved joints. Other fractures are sub-horizontal drilling breaks and bedding plane partings dipping 30°.			NO WATER RETURN	
			37 38 39 120 40			Many breaks in core due to drilling and air slacking.				0.2
			41			Joints are near vertical, curved, clean.	S			
			42 43 44							NOT TESTED

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 2 of 4
Dwg. No. 1429-S3055/2

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD108

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	STRUCTURES JOINTS—spacing, attitude, smoothness, openness, persistence, coating, filling, BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SILTSTONE, sandy, dark grey.	Joint, rough, 60° Core broken by air slacking. Joint, curved, clean, near vertical. Many drilling breaks and bedding plane partings dip 30°. Joint, near vertical, curved, clean.	S	NOT TESTED
SANDSTONE, silty, dark grey, very fine grained.	Joints, near vertical, curved, clean. Joints, very rough, clean, dip 60°.	NO WATER RETURN	NIL
Proportion of SILTSTONE increases.	Joint, 70°, clean, planar. Joint, 50°, rough, curved.		Very high
Interbedded sandy SILTSTONE and silty SANDSTONE, no clear boundaries between different rock types.	Fractures are drilling breaks and bedding plane partings dipping 30°. Joint, near vertical, curved. Other joints are rough, 45°.		NIL
SANDSTONE, fine grained, silty, light to medium grey.	Joint, 50°, rough. Close fracturing, probably due to drilling.		NIL

ERA BEDS

MILLO

105 110 100 95

45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

SNOWY MOUNTAINS ENGINEERING CORPORATION

HOLE No. DD108

PROJECT WADO POWER PROJECT

DESCRIPTION OF CORE ROCK TYPE—colour, grain size, texture, mineral composition	DEGREE OF WEATHERING	CORE SIZE	RELEVATION / DEPTH METRES	LOG	CORE LOSS % PER LIFT	STRUCTURES JOINTS—spacing, attitude, smoothness, aperture, cementing, coating, filling; BEDDING, FOLIATION, VEINS, SEAMS, FAULTS, CRUSHED ZONES	FRACTURE LOG	WATER LOSS	GROUNDWATER LEVEL, DATE	WATER PRESSURE TESTS LEAKAGE RATES IN LUGEON UNITS
SANDSTONE, fine grained, silty, light to medium grey.		NMLC	69 90 70 71 72 73 74			Joints, 30°, rough, planar. Bedding plane dips 30°. Joints, rough, planar, 60°. Joint, rough, planar, 60°.		NO WATER RETURN		NIL
Proportion of SILTSTONE increases locally.			18 75 76 77 78			Joint 60°, planar. Joints mainly rough, 45°-60°.				
Thinly interbedded SANDSTONE and SILTSTONE.			79 80 60 61 62 63			Joint, rough, curved, at 80°. Joints, near vertical, curved, clean. Few bedding plane partings dipping 40°. Joints, 60°, fairly rough, planar, clean.				NOT TESTED
Medium grey fine grained, SANDSTONE, silty in places.			64 17 85 66 67			Joints, rough, dip 45°, clean.				
Rock grades into fine sandy SILTSTONE, very dark grey.			68 89 70 90 91			Fractures are bedding plane partings dipping 30°.				

ERA BEDS

END OF HOLE 91.84m (RL67.9m)

FOR LOCATION OF DRILL HOLE AND OTHER RELEVANT INFORMATION, SEE SHEET 1

Sheet 4 of 4

Dwg. No. 1429-S3059/4