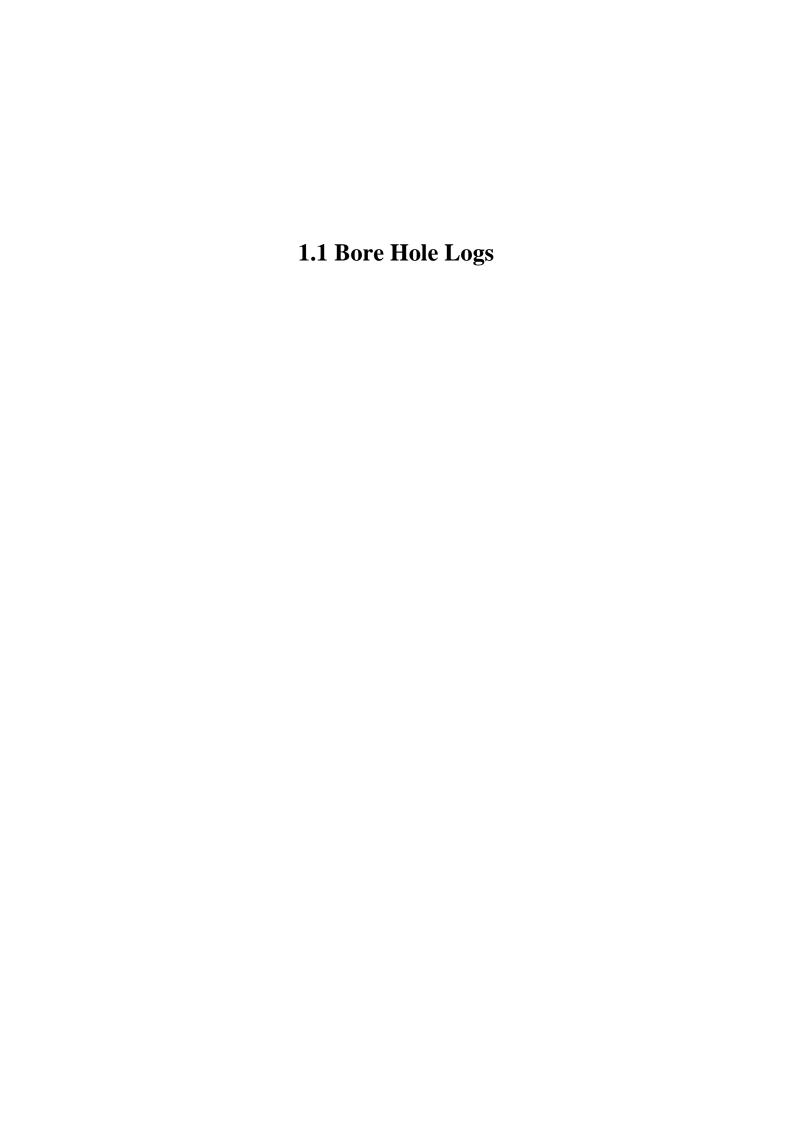
Geological Investigation for the Broadlands Hydropower Project

Appendix

CHAPTER 1

CORE DRILLING





	BOREHOLE LOG I								<u>OR</u>	ΕN	IG	IN	EE	:RI	NG	PURPOSES		COD		
LO	LOCATION :- DIVERSION TUNNEL, KEHELGAMU DRILLING DATA BOREHOLE DATA									T B	ΑN	IK					B.H No.:	DT 01		
		DRI	ILLI	NG	DAT	Ά		BOREHOLE DATA	1000							KEY		R GRAPHIC L	OG	
START					2/02			X-COORDINATE :164,981.324m		ery rou		SS				JOINT SEPARATION V= very tight T= tight	Sand Clay	slightly weathered cha	arnockito	
COMP	PLETE):		29/1	2/02			Y-COORDINATE :198,303.675m		ightly r	ough					MO= moderately open	Highly to	mod weathered char	nockite	
MACH	IING T	YPE	:	TON	1E			ELEVATION (COLLAR) :122.771m	SL=sli	ckensio						O= open OTHER SYMBOLS	Highly to	slightly weathered bio mod weathered biotit		
DRILL	ING M	ETH	OD :	ROI	ΓAR	′		ELEVATION (BOTTOM) :97.271m	VW= v	ery wi		2m				SL/CW - Soil & Completely Weathered	Quartzite Calc gnei	ss		
CORE	BARR	EL, I	BIT :	NQ				FINAL DEPTH :25.50m		modera	itely	wide				HW - Highly Weathered MW - Moderately Weathered	TCR Boulder	RQD	WEATH	
FORE	MAN :			KRN	١K			INCLINATION : Vertical	C= Clo	osely ery clo	sely					SW - Slightly Weathered TCR - Total Core Recovery				SL/CW HW
LOGG	ED BY	:		BMA	APM			BEARING : -								RQD - Rock Quality Designation GWL - Ground water Level				MW SW
H		DF	RILLIN	IG		SPT RE	SULT	JOINTS			PER	MEAE	BILITY		1 .	GENERAL DESCRIPTION	RECO	VERY		
DЕРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION FILL TYPE, AND THICKNESS SLICKENSIDED		TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	CORE RECOVERY %	R.Q.D. %	WEATHERING	DЕРТН (m)
	Ī	j				0.00									_	Brown colour, densed, clayey silty				
						0.45	31									sand with weathered rock particles				
1					1.00															1
					1.40											1.45m				
2					29 / 12			Joint at 1.91m(45 ⁰) (Partly weathered joint surface)								Fresh to slightly weathered rock of biotite gneiss 2.00m	30	12		2
								Vertical joint at 2.26-2.50m (Fresh tight								Fresh rock of biotite gneiss		64		
-	20							joint surface) Joint at 2.50m(65°) (Smooth joint surface												
3								filled with greenish material)			1		Nil							3
											7		0.40 0.70							
4									1.45	6.45	10		1.90	0	5*10 ⁻⁶					4
4											7 4		1.10 0.90							4
			Grey								1		0.40							
5			ō															_		5
								Joint at 5.43m(55°) (Weathered rough joint surface)										80		
								Joint at 5.92m(55 ⁰) (Iron stained joint												
6								surface)												6
-	21																			
7																7.00m				7
								Sub vertical joint at 7.12-7.50m (Fresh								Fractured, fresh rock of biotite		46		
								tight joint surface) Joint at7.68m(20°) (Iron stained, rough joint								gneiss (Rock broken into pieces due to				
8								surface)			1		0.80 0.80			joints) 8.00m Fresh rock of biotite gneiss				8
											7		1.20							
9									6.45	11.45	10 7		1.60 0.90	0	4*10 ⁻⁶					9
											4		0.60							
	22										1		0.50			9.40m Fresh rock of garnetiferous quartz				
10																rich gneiss				10
11			hite													11.00m				11
			Greyish white													Fresh rock of garnet biotite gneiss				'
			Gre													Some pyrites available				
12																				12
46																				4.5
13															<u> </u>					13

Γ		D	RILLI	NG		SPT RE	SULTS	JOINTS			PERM	MEAB	ILITY			GENERAL DESCRIPTION		RECO	VERY		
(w) DEGEL	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N'VALUE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROUGHNESS, PERSISTENCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, deaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТН (m)
	4 23 5 27							Foliation joint at13.20m(65°) (Smooth slickensided joint) Joint at13.33m(58°) (Fresh joint surface) Joint at13.93m(45°) (Fresh joint surface) Foliation joint at14.09m(40°) (Fresh joint surface)	11.45	16.45	1 4 7 10 7 4 1		Nil 0.10 0.40 1.10 0.50 Nil Nil	0	3*10 ⁻⁶	Fresh rock of garnet biotite gneiss Mica rich band from 14.00-14.30m 14.20m Fresh rock of quartzite Some garnets			60		14
1	28							Subvertical joint at 16.55-16.75m (Rough, irregular joint filled with thing film of greenish material & this goes along biotite rich band,Mica & pyrites available at the joint) Joint at16.78-16.94m(70°)(Rough,irregular								16.00m Fresh rock of quartz rich biotite gneiss			38		16
1			nite					joint surface) Joints at 17.57(60°) & 17.77(40°) (Joints partly filled with calcitic gauge) Subvertical joint at 16.55-16.75m (Joint filled with calcitic gauge)	16.45	21.45	1 4 7 10 7 4	(Nil 0.60 0.60 0.90 0.30 Nil	0	2*10 ⁻⁶	Fresh rock of Calc gneiss 18.15m Fresh rock of biotite gneiss 18.88m Fresh rock of Calc gneiss			48		18
2	0		Greyish white					Joints at 20.18m(20°),20.18m(50°), 20.22m(55°),20.27m(60°) Joints at 20.28-20.43m(73°),			1		Nil			19.94m Fresh, fractured rock of quartz rich garnetiferous biotite gneiss					20
2								20.50-20.68m(73°), 20.84-20-21.00m(73°) (Joints partly filled with calcitic gauge) Joints at 21.10-21.30m(70°), 20.31-21.49m(70°), 21.50-22.00m(70°) (Joint filled with calcitic gauge)			1 4		Nil 0.80			21.50m Fresh, fractured rock of quartz rich garnetiferous biotite gneiss Rock broken into pieces due to major joint pattern					22
2								Sub vertical joint at 23.30-23.64m (Joint partly filled with calcitic gauge)	21.45	25.50	7 10 7 4 1	(1.10 1.60 0.80 1.10 0.30	0	5*10 ⁻⁶	23.20m Fresh, fractured rock of quartz rich garnetiferous biotite gneiss			40		23
2								Foliation joint at24.57m(40°) (Joint goes along biotite rich layer) Foliation joint at25.32m,25.48, 25.53m(450)(Fresh joint surface)								25.60m			44		25
2	6							BOREHOLE COMPLETTED	AT 2	25.60	M					.25.6UT					26
2																					28
2	9																				29
3	0																				30

Γ	T		DRI	ILLIN	IG	\neg	SPT RE	SULTS	JOINTS		PERI	MEA	BILITY	,		GENERAL DESCRIPTION		REC	OVERY		
	DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEPTH (AA)	PRESSURE (bars)	Manometer Reading	WATER LOSS	(total{liters}/time{min}	LUGEON of K(m/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY%	R.Q.D. %	WEATHERING	DEРТН (m)
(31																				31
	32																				32
3	33																				33
3	34																				34
(35																			-	35
3	36																			-	36
<u> </u>	37																				37
(38																				38
3	39																				39
4	10																			-	40
4	11																			-	41
_	12																			-	42
_	13																				43
4	14																				44
4	15																				45
4	16																				46
4	17																				47



	BOREHOLE LOG FO									IN	E	ERI	NG	P	URPOSES	U	UNI	Т	
LO	CAT	A AXIS,RIGHT BANK									B.H No.:	MB 01							
	D	RILL	ING	DAT	Α		BOREHOLE DATA	1-00		o					KEY		R GRAPHIC L	.OG	
START	ED:	_	25/	10/02			X-COORDINATE :164,717.431m		ery ro		ESS				JOINT SEPARATION V= very tight	Sand Clay			
COMPL	LETED	:	200	2/11/	4		Y-COORDINATE :197,640.971m	R: rou SR: sl	igh lightly i	rough	1				T= tight MO= moderately open		slightly weathered ch mod weathered char		
MACHI	NG TYI	PE :	тоі	NE			ELEVATION (COLLAR) :122.585m	S= sm							O= open	Fresh to	slightly weathered bio	tite gneiss	
DRILLI	NG ME	THOD :	RO'	TAR	······		ELEVATION (BOTTOM) :81.815m	JOINT	SPA(CING					OTHER SYMBOLS	Quartzite		ie grieiss	
CORE							FINAL DEPTH :40.77m	W= wi							SL/CW - Soil & Completely Weathered HW - Highly Weathered	Calc gne Boulder	SS		
		L, DII						MW=	moder osely	ately	wide				MW - Moderately Weathered SW - Slightly Weathered	TCR	RQD	WEATH	SL/CW
FOREM	MAN :		WL				INCLINATION : Vertical		ery clo	sely					TCR - Total Core Recovery RQD - Rock Quality Designation				HW MW
LOGGE				APM			BEARING : -								GWL - Ground water Level				SW
╽┢		DRILL	ING		SPT RE	SULTS	JOINTS		e	PER	RMEA	BILITY	I	-	GENERAL DESCRIPTION	RECO	OVERY		
DЕРТН (m)	DAILY ADVANCE	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED		TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/fime{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТН (m)
					0.00										Brown to whitish brown colour				
		Light brown			0.45	6									clayey silt with few quartz sand				
1		ight b													1.00m				1
	25	-					Joint at 1.40m(30 ⁰)(Joint surface weathered into rock & rough joint filled with silty clay)								Highly weathered rock				
	2.5	ey	1				into rock & rough joint filled with sitty clay)								Fresh rock of charnockitic gneiss				
2		Dark brown to dark grey																	2
		to di		2.25 2.60			Joint at 2.41m(60 ⁰) & 2.53m(55 ⁰) (Weathered, rough joint surfaces)								2.36m Highly to mod . weathered rock of acidic charnockite				
		brown		27 / 10			Subvertical joint at 3.00m(Highly weathered								Moderately weathered rock of				
3		Dark					rough joint surface filled with clayey material) Joint at 3.35m(55°)(Joint surface weathered								biotite schist 2.95m Highly weathered rock/Rock in pieces	71			3
			1				into rock & rough joint filled with white gauge)								Fresh rock of charnockitic gneiss	/1			
							Joint at 3.75m(35 ⁰)(Fresh tight joint)												
4																			4
5							Joint at 5.16m(48 ⁰) (partly iron stained												5
							smooth joint surface)			1		0.50							
							Joint at 5.85m(48 ⁰) (Fresh joint filled with			4		2.10							
6							thing film of brownish material)	4.35	9.0	7 8 10		5.50 16.00	3	4*10 ⁻⁵	Quartz rich band from 6.15m-7.30m				6
								4.33	7.0	7		5.80		7 10	Quality from build from 0.1011 7.5011				
										4		1.90							_
7 2	26						Joint at 7.31m(15 ⁰)(Fresh tight joint)			1		0.20							7
0		>																	0
8		Light grey																	8
		Lig																	
9																			9
3																			9
2	27																		
10																			10
10										1		Nil							10
										4		Nil							
11								9.08	14.2	7 2 10		0.02	0	1*10 ⁻⁷					11
	29									7		0.03							
										4		Nil							
12										1		Nil			Biotite rich band from11.93m to				12
															12.38m				
13																			13
		-	_				•		-	•	-	•	_	_					

Г		D	RILLII	NG		SPT RE	SULTS	JOINTS			PERM	ИЕАЕ	BILITY			GENERAL DESCRIPTION		RECO	OVERY		
DEРТΗ (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	БЕРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТΗ (m)
14																Fresh rock of charnockitic gneiss					14_
15	<u>;</u>																				15
16	<u> </u>										1 4 7		Nil Nil 0.02								16
17									14.22	19.31	10 7 4 1		0.60 0.03 Nil Nil	0	2*10 ⁻⁷						17
18	<u> </u>																				18
19	30																				19
20	<u> </u>										1		Nil			Biotite rich band from19.56m to 20.13m					20
21	=		Light brown					Joint at 21.46m(60°) (Fresh joint filled with thing film of yellowish material)	19.31	24.17	4 7 10 7		Nil 0.02 0.50 0.20	0	1*10 ⁻⁷						21
22			Li					Foliation joints at 22.27,22.29 & 22.32m(15 ⁰) (Rough joint filled with thing film of greyish material)			1		Nil Nil			Biotite rich band from 21.95m to 22.14m					22
23																					23
24	1																				24
25											1		Nil								25 26
27									24.17	29.74	4 7 10 7		0.01 0.03 0.06 0.02	0	1*10 ⁻⁷						27
28											4		Nil Nil								28
29																					29
30																					30

Г	T		DRIL	LING		SPT R	ESULTS	JOINTS			PERI	MEAE	BILITY			GENERAL DESCRIPTION		RECO	OVERY		
DEPTH (m)	DAILY ADVANCE	DAILT ADVAINCE	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, deaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТΗ (m)
3											4		Nei			Fresh rock of charnockitic gneiss					31
3:	2								29.74	34.27	1 4 7 10 7		Nil Nil 0.04 0.08 0.05	0	2*10 ⁻⁷						32
3	3										1		Nil Nil								33
3	4																				34
3	5		1	ignt brown																	35
3	6		_						34.27	40.77	1 4 7 10		Nil Nil 0.30 0.09	0	2*10 ⁻⁷						36
3	3										7 4 1		0.04 0.01 Nil								37
3																					38
3																					39
4	4							BOREHOLE COMPLETTED	AT 4	40.7	7M					40.77m					
4:	2																				42
4	3																				43
4																					44
4																					46

GEOLOGICAL INVESTIGATION FOR THE BROADLANDS HYDROPOWER PROJECT



		BOREHOLE LOG FO								١G	N	EE	ERI	NG	P	URPOSES		C	CD INVE		
LO	OCA	١T١	10	l :-I	MA	N D	AM	AXIS,RIGHT BANK										B.H No.: I	MB 02		
		DR	RILL	ING	DAT	Ά		BOREHOLE DATA								KEY		LEGEND FO	R GRAPHIC L	OG	
STA	RTED :			200	2/10/	11		X-COORDINATE :164,701.313m		ery rou		ESS		_		JOINT SEPARATION V= very tight		Sand Clay			
CON	IPLETE	ED:		18/	10/02			Y-COORDINATE :197,626.567m	R: rou							T= tight MO= moderately open		Fresh to s	lightly weathered charmod weathered charm		
MAC	HING '	TYPE	 ::	TOI	NE			ELEVATION (COLLAR) :109.430m	S= sm	otth						O= open		Fresh to s	lightly weathered bio	tite gneiss	
DDII	LING I	METL	70D ·			,		ELEVATI ON (BOTTOM) :69.300m		ckensi						OTHER SYMBOLS		Highly to Quartzite	mod weathered biotit	e gneiss	
					IAN				VW= v W= wi	very wi	dely>	2m				SL/CW - Soil & Completely Weathered HW - Highly Weathered		Calc gnei: Boulder	SS		
COF	E BAR	REL,	, BIT :	NQ				FINAL DEPTH :40.13m		moder	ately	wide				MW - Moderately Weathered SW - Slightly Weathered		TCR	RQD	WEATH	ERING SL/CW
FOR	EMAN	:		WL	N			INCLINATION : Vertical		ery clo	sely					TCR - Total Core Recovery					HW
LOG	GED B	3Y :		BM	APM			BEARING : -								RQD - Rock Quality Designation GWL - Ground water Level					MW SW
		D	RILLI	NG		SPT RE	ESULTS	JOINTS			PER	MEA	BILITY	_	ı	GENERAL DESCRIPTION		RECO	VERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED		TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyrittic,ett: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DЕРТН (m)
Ť		Ü	J				_	Joint at 0.30-0.46m(70 ⁰)		Ċ		_	Ŭ	Ē	Ŭ	Fresh rock of charnockitic gneiss		<u> </u>	57		_
1	-							Joint at 0.52m(20°) (partly iron stained rough joint surfaces) Joint at 1.22m(40°) (Iron stained rough joint surfaces) Joint at 1.42-1.58m(70°)										75	75 84		1
2	-				1.70 18/10 2.20 2.45			Joint at 1.68-1.76m(70 ^o)(Iron stained, slightly weathered joint surfaces)			1		0.35								2
3	-				2.60 12 / 10 3.10			Parallel joints at 3.64m & 3.67m(5°) (Iron stained, weathered joint surfaces)	1.00	5.30	4 7 10 7		2.02 3.80 6.35 4.10	1	2*10 ⁻⁵						3
4	11										1		1.98 0.42								4
5																					5
6	-		Whitish grey																		6
7	12		Whiti						5.30	9.85			0.01 0.02 0.03 0.05	0	1*10 ^{:7}						7
8	-										7 4 1		0.04 0.01 Nil								8
9	13																				9
10											1		Nil								10
11									9.85	14.80	4 7 10 7		0.01 0.03 0.05 0.02	0	1*10 ⁻⁷	Biotite rich band at 10.82m-10.92m					11
12											1		0.02 0.01 Nil								12
13																					13

Γ	T		DR	RILLIN	IG		SPT RE	SULTS	JOINTS		1	PERI	MEAE	BILITY			GENERAL DESCRIPTION		RECO	VERY		
	DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEDTH (M)	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	RQD.%	WEATHERING	DEPTH (m)
1	4																Fresh rock of charnockitic gneiss					14
1	5	4																				15
1	6								Joint at 16.37m(45°) (Smooth mica rich joint surface)			1 4 7		Nil 0.01			Biotite rich band at 16.35m-16.55m					16
1	7									14.80	19.54	10 7 4 1		0.02 0.04 0.03 0.01 Nil	0	1*10 ⁻⁷	Biotite rich band at 17.35m-17.46m					17
	8																Biotite rich band at 17.89m-18.05m					18
	9																					20
2	21			у					Foliation joints at 20.82 &20.86m (30°) (Fresh, tight joints)			1 4 7		Nil Nil 0.01								21
2	22	5		Whitish grey						19.54	24.05	10 7 4 1		0.03 0.02 Nil Nil	0	9*10 ⁻⁸						22
4	23																23.22m Fresh rock of pegmatite					23
2	24								Edition 1 in 1 at 70 at								23.66m Fresh rock of granulitic biotite gneiss					24
	25								Foliation joint at 24.72m (30°) (Fresh, tight joint)			1 4		Nil 0.01								25
	26									24.05	29.93	7 10 7 4 1		0.02 0.04 0.03 Nil Nil	0	9*10 ⁻⁸						26 27
	28											'		1411								28
2	29	6																				29
3	80																					30

Г	T		DRILL	ING		SPT RI	ESULTS	JOINTS			PERI	MEAE	BILITY			GENERAL DESCRIPTION		RECC	VERY		
1-71-1-0-0	DET IN (III)	DAILY ADVANCE	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEPTH (M)		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyrittic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEPTH (m)
3	1															Fresh rock of granulitic biotite gneiss					31
3	2								29.93	35.25	1 4 7 10		Nil 0.01 0.02 0.04	0	1*10 ⁻⁷						32
3	3								27.70	33.23	7 4		0.02 Nil Nil	,							33
3	4																				34
3	5		Whitish gray	(a) B																	35
3	6																				36
3	7	7							35.25	40.13	1 4 7 10		Nil 0.01 0.02 0.04	0	1*10 ⁻⁷						37
3	8										7 4 1		0.02 0.01 Nil								38
3	9																				39
4	0 1	8														40.13m					40
4	1							BOREHOLE COMPLETTED	A1 2	40.1	3IVI										41
4	2																				42
4	3																				43
4	4																				44
4													9								45 46



							B	OREHOLE LOG FOR	REN	١G	IN	EE	RI	NG	P	URPOSES		U	SCD INVE	Т	
LC)C/	ΙTΙ	ON	l :-l	MAI	IN D	AM	AXIS,LEFT BANK										B.H No.:	MB 03		
		DR	ILL	ING	DAT	Ά		BOREHOLE DATA								KEY			R GRAPHIC L	.OG	
СОМ	PLETI	D:		21/1	2/12/			X-COORDINATE :164,673.670m Y-COORDINATE :197,602.979m	VR= v	ightly r	igh	ESS				JOINT SEPARATION V= very tight T= tight MO= moderately open O= open		Highly to	slightly weathered ch mod weathered char slightly weathered bio	nockite	
	HING			TOI				ELEVATION (COLLAR) :107.225m		ckensi						OTHER SYMBOLS			mod weathered bioti		
	E BAF				TARY	<u>′</u>		ELEVATION (BOTTOM) :57.225m FINAL DEPTH :50.00m	VW= v W= wi MW= i	ery wi dely moder	dely>					SL/CW - Soil & Completely Weathered HW - Highly Weathered MW - Moderately Weathered		Calc gnei Boulder		WEATH	ERING
FORI	EMAN	:		MR	АМНІ	Р		INCLINATION : Inclined (50°)	C= Clo	osely ery clo	sely					SW - Slightly Weathered TCR - Total Core Recovery					SL/CW HW
LOG	GED E	Υ:		ВМ	APM			BEARING : -								RQD - Rock Quality Designation GWL - Ground water Level					MW SW
		DI	RILLII	NG		SPT RE	SULTS	JOINTS			PER	MEAE	BILITY			GENERAL DESCRIPTION		RECO	OVERY		
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	ОЕРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION FILL TYPE, AND THICKNESS SLICKENSIDED	,	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, periessose, porphyrittic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТΗ (m)
					0.00 From 17 th											Fresh rock of charnockitic gneiss					
1					1.23																1
					7 /12						1		Nil								
2					2.38						7		Nil 0.03								2
	6				2.60			Joint at 3.64m (30°) (Fresh, tight joint)	0.65	5.00			0.05	0	1*10 ⁻⁷						
3					10 /12						7 4		0.02 Nil								3
											1		Nil								
4																					1
4																					4
5	7							Joint at 5.03m (60°)													5
								(Partly chloritized, tight joint)													
6																					6
			Grey								1		Nil								
7											4 7		Nil 0.03								7
									5.00	10.00	10		0.05	0	1*10 ⁻⁷	Biotite rich band at 7.36m-7.56m					
8	9										7 4		0.03 0.01								8
											1		Nil								
•																					
9																					9
10																					10
11	10										1		Nil Nil								11
- 1	10										7		0.03								
									10.00	15.00	10 7		0.05 0.04	0	1*10 ⁻⁷						
12											4		0.01 Nil								12
											'		INII								
13																					13

Г	T	D	RILLII	NG		SPT RE	SULTS	JOINTS			PERI	MEAE	BILITY			GENERAL DESCRIPTION		RECO	OVERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEETH (M)	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТΗ (m)
1.	1 11															Fresh rock of charnockitic gneiss					14
1	5																				15
1	6										1		Nil								16
1	7 12								15.00	20.00	4 7 10 7		0.03 0.10 0.15 0.12	0	4*10 ⁻⁷						17
1	3							Joint at 18.05m (50°) (Fresh, tight joint)			1		0.04 Nil			Biotite rich band at 17.58m-18.00m					18
1	9																				19
2	D 13																				20
2	1		,																		21
2	2		Grey					Foliation joint at 21.88m (30°) (Fresh, tight joint)		25.00	1 4 7		Nil 0.06 0.12	0	9*10 ⁻⁷	Biotite rich band at 21.88-22.42m					22
2	3							Joint at 23.16m (37°)	20.00	25.00	7 4		0.35 0.28 0.10 Nil	U	9 10						23
2	1 14							(Fresh,rough, tight joint) Joint at 24.05m (60°) (Fresh,chloritized, tight joint)													24
2	5																				25
2	6																				26
2	7								25.00	30.00	1 4 7 10		Nil Nil 0.04 0.07	0	2*10 ⁻⁷						27
2	3 16										7 4 1		0.03 Nil Nil								28
2	9																				29
3	0																				30

Г			DRIL	LING	ķ	SPT RE	SULTS	JOINTS			PERI	MEAB	ILITY			GENERAL DESCRIPTION		RECO	OVERY		
(m) HE000	DEFITT (III)	DAILY ADVANCE CASING/CEMENT	DRII I WATER (COLOR LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEDTH (M)		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY%	R.Q.D.%	WEATHERING	DEРТН (m)
3	1							Joint at 30.57m (45°) (Fresh,chloritized, tight joint)								Fresh rock of charnockitic gneiss					31
3	2 17	7						Foliation joint at 32.28m (55°) (Fresh, tight joint) Joint goes along biotite	30.00	35.00	1 4 7 10		Nil Nil 0.03 0.05	0	1*10 ⁻⁷	Biotite rich band at 32.28-32.50m					32
3	3							rich layer			7 4 1		0.03 0.01 Nil								33
3	4																				34
3	5																				35
3	6 18	8									1		Nil								36
3	7								35.00	40.00	4 7 10 7		Nil 0.02 0.04 0.03	0	1*10 ⁻⁷						37
3	8										1		Nil Nil								38
3	9			Grey																	39
4	0 19	9														40.40m					40
4	1										1		Nil			Fresh rock of garnet biotite gneiss					41
4	2								40.00	45.00	4 7 10 7	,	Nil 0.02 0.04 0.02	0	1*10 ⁻⁷						42
4	3										4 1		Nil Nil								43
4	4																				44
4	5 20	0																			45
4								Joint at 46.46m (60°) Joint at 46.55m (60°)											83		46
4	1							(Fresh,chloritized, tight joints)													47

Г			ORILLI	NG		SPT RE	SULTS	JOINTS			PERME	ABILI	Υ		GENERAL DESCRIPTION		RECO	OVERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	J.	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	LUGEON of K(m/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,-te: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
48	3								45.00		1 4 7 10	Ni 0.0 0.0 0.1	2 6 4 0	4*10 ⁻⁷	Fresh rock of garnet biotite gneiss					48
49	<u>)</u>		Grey								7 4 1	0.0 0.0 Ni	2							49
50	21							BOREHOLE COMPLETTED	AT :	50.0	OM				50.00m					50
51	=																			51
52	2																			52
53	<u> </u>																			53
54																				54
55	<u>i</u>																			55
56	5																			56
57	_																			57
58	3																			58
59)																			59
60)																			60
61	=																			61
62																				62
63	3																			63
64																				64



							В	DREHOLE LOG FOR	R EN	١G١	NE	EF	INC	G I	Ρl	JRPOSES		C	ecd inve	STIGATIO T	ON
LO	CA	TI	ON	:-N	ΙΑI	N D		AXIS,LEFT BANK									В.Н	No.:	MB 04		
					DAT			BOREHOLE DATA								KEY	LEGE		R GRAPHIC L	.OG	
TAR	TED :			26/1	2/02			X-COORDINATE :164,658.747m		ROUG		S				JOINT SEPARATION V= very tight		Sand			
OME	LETE	D:		2003	3/1/1			Y-COORDINATE :197,585.707m	R: rou	gh						T= tight		Fresh to	slightly weathered ch		
	IING 1			TON				ELEVATION (COLLAR) :116.814m	SR: sl S= sm	ightly ro iotth	ugh					MO= moderately open O= open		_	mod weathered char slightly weathered bid		
										ckensid SPAC						OTHER SYMBOLS		Highly to	o mod weathered biotine	te gneiss	
RILL	ING N	METH	IOD :	ROT	ARY	,		ELEVATION (BOTTOM) :76.814m		ery wid		m				SL/CW - Soil & Completely Weathered		Calc gne			
ORE	BAR	REL,	BIT :	NX				FINAL DEPTH :40.00m	MW=	modera	tely wi	de				HW - Highly Weathered MW - Moderately Weathered	TCR	Boulder	RQD	WEATH	
ORE	MAN			MRA	мн	•		INCLINATION : Vertical	C= Cle VC= v	osely ery clos	ely					SW - Slightly Weathered TCR - Total Core Recovery					SL/C\
.OGG	ED B	Y :		BM <i>A</i>	ΑPM			BEARING : -								RQD - Rock Quality Designation GWL - Ground water Level					MW SW
I		DI	RILLIN	G		SPT RE	SULTS	JOINTS			PERM	EABILI	TY			GENERAL DESCRIPTION		REC	OVERY		SW
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION FILL TYPE, AND THICKNESS SLICKENSIDER	FROM TOP		PRESSURE (bars)	WATER LOSS	Lugeon Unit (Lu)	officiant of Domescale illas (con (a)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic, etc. scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints		CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТН (m)
	ă	ð	DR	RA	W		ź		Ä	욘	PR :	(tot	, j	ć	$\overline{}$			8	R.O.	W	DE
						0.00	8									Yellowish brown soft silty clay(Top soil) 0.45m					
						-									Ì	Yellowish brown soft sandy clay					
1															ŀ	1.00m Boulder of weathered rock	1				1
					1.68											(Boulder has crushed into pieces)					
_					28 /12	1.55															_
2				-	29/12	2.00	17									Yellowish brown,soft, silty clay	ı				2
					23712										- 1	Highly to moderately weathered					
			Ę													rock of garnet biotite gneiss					
3			Light brown		27/12													ا			3
			Ligh																		
4																					4
+								Joint at 4.48m(65 ⁰)(Weathered ,rough,										8	5		4
								filled with clayey silt)													
5								100% water loss at 4.48m								4.88m					5
,	26	-														Fresh rock of charnockitic gneiss		ا			3
6																					6
1																					ь
7											1	N									7
٦											4	0.0									
											7	0.0			,						
3									5.40	10.00	10 7	0.0		2*	10 ⁻⁷						8
											4	0.0									٦
											1	N	ii								
9			λé																		9
			Grey		9.39											9.28m					Ť
				ſ	31 / 12											Fresh rock of pegmatite					
0																					10
Ť					10.19																
					1/1																
1											1	N	il		ŀ	T11.10m Fresh rock of charnockitic gneiss					11
1											4	0.0									
									E 000	15.00	7 10	0.0		2**	10 ⁻⁷						
2	27								5.00	15.00	7	0.1		3	IU						12
Ť											4	0.4	10								
											1	N	il								
3																					13

		DI	RILLI	NG		SPT RE	SULTS	JOINTS			PER	MEAE	BILITY			GENERAL DESCRIPTION		RECO	VERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DЕРТН (m)
14								Joint at 14.20m (60 ⁰) (Fresh, tight joint)								Fresh rock of charnockitic gneiss					14
15								Joint at15.04m(10 ⁰) (Partly iron stained rough joint surface)													15
16								Foliation joints at 16.50 & 16.53m (60°) (Fresh, tight joints)													16
17	28				17.23 30 / 12			Joint at 17.63m (50°) (Fresh, tight joint)	15.00	20.00	1 4 7 10		Nil 0.03 0.06 0.10	0	3*10 ⁻⁷						17
18								Joint at 17.92m (45°) (Fresh, tight joint) Foliation joints at 18.06,18.15,18.23, 18.48 &18.93m (60°) (Fresh, tight joints)			7 4 1		0.06 0.04 Nil			Biotite rich layers appeared & rock is jointed along this layers			63		18
20								Foliation joint at 19.25m (50°) (Fresh, tight joint)													20
21																					21
22			Grey					Rock in pieces due to joints (Chloritized, tight joint-may be foliation joints) Joint at 22.33-22.52m (75°)(Chloritized, tight joint) Foliation joint at 22.68-22.98m (75°)			1 4 7		0.02 0.16 0.28			Rock in pieces(From 21.00-21.56m) Maximum-5cm			30		22
23								(Chloritized,slickensided, tight joint) Joint at 22.80m (30°) (Chloritized, tight joint) Joints at 22.90 & 22.96m (50°) (Chloritized,slickensided, tight joint) Vertical joint at 23.00-23.30m (50°)	20.00	25.00	10 7 4 1		0.45 0.30 0.18 0.03	0	1*10 ⁻⁶				70		23
24								(Fresh, tight joint)													24
25	29																				25
26											1 4		Nil Nil								26
27									25.00	30.00	7 4		0.04 0.08 0.05 0.02	0	3*10 ⁻⁷						27
28											1		Nil								28
30																					30

Г	T		ORILLI	ING		SPT RE	ESULTS	JOINTS	I		PERI	MEAE	BILITY			GENERAL DESCRIPTION		RECO	OVERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	ОЕРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	_	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY%	R.Q.D. %	WEATHERING	DΕΡΤΗ (m)
3	1															Fresh rock of charnockitic gneiss					31
3:	2								30.00	35.00	1 4 7 10 7		Nil 0.03 0.18 0.25 0.19	0	6*10 ⁻⁷						32
3	3										4		0.04 Nil								33
34	4 30																				34
3	5		Grey	,												34.80m Fresh rock of calc. gneiss Mica rich band at 35.59-35.73m & core is partly washed out at this band					35
3	6							Joints at 36.55 & 36.88m(45°)											85		36
3.	7							(Joint filled with thing film of calcitic gauge)	35.00	40.00	1 4 7 10		Nil 0.03 0.18 0.25	0	6*10 ⁻⁷				73		37
3	3							Vertical joint at 37.65-37.92m (Joint filled with thing film of calcitic gauge)			7 4 1		0.19 0.04 Nil								38
3	9															39.00m Fresh rock of charnockitic gneiss					39
4	31							DODELL	01.5						T 44	40.00m					40
4	1							BOREH	OLE		VIP	LE	115	υA	1 40	.OOM					41
4:	2																				42
4	3																				43
4.	4																				44
4																					45



BOREHOLE LOG FO							וטו	IVI		ווח.	NG	г	JKPUSES			UNI					
LC	C						JIT .											No.: (
		DR	ILLI	NG	DAT	Ά		BOREHOLE DATA	IOINT	ROUG	LINE	ee				JOINT SEPARATION	LEGE		R GRAPHIC L	OG	
STAF	RTED	:		21/1	11/20	02		X-COORDINATE :164,584.150m		ery roug		33				V= very tight		Sand Clay			
СОМ	IPLET	ED:		24/1	11/20	02		Y-COORDINATE :197,638.873m	R: rou SR: sl	gh ghtly ro	ugh					T= tight MO= moderately open			slightly weathered char mod weathered char		
MAC	HING	TYPE	:	тот	NE			ELEVATION (COLLAR) :121.883m	S= sm							O= open		Fresh to s	slightly weathered bio mod weathered biotit	tite gneiss	
DRIL	LING	METH	HOD :	RO	TARY	′		ELEVATION (BOTTOM) :101.883m	JOINT	SPAC	ING	2				OTHER SYMBOLS		Quartzite		o grioloo	
COR	E BAF	RREL.	BIT :	NX				FINAL DEPTH :20.00m	W= wi							SL/CW - Soil & Completely Weathered HW - Highly Weathered		Calc gnei Boulder			
	EMAN				АМНІ				MW=	modera osely	tely v	vide				MW - Moderately Weathered SW - Slightly Weathered	TCR		RQD	WEATH	SL/CW
						r		INCLINATION : Vertical	VC= v	ery clos	ely					TCR - Total Core Recovery RQD - Rock Quality Designation					HW
LOG	GED E		RILLII		APM	SPT RE		BEARING : -	_				D.II. 1777. /			GWL - Ground water Level		-			SW
				NG		SPIRE	SULTS	JOINTS	-	1	PERI	MEAL	BILITY		(s	GENERAL DESCRIPTION		RECC	OVERY	•	
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION FILL TYPE, AND THICKNESS SLICKENSIDED	FROM TOP		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic.etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints		CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТΗ (m)
						0.00									Ū	Brown to muddy brown, sandy silty					
						0.45	4									Clay.(some weathered rock fragments) 0.45m Yellowish brown colour,loose,					
1																clayey silty sand					1
																(some weathered rock fragments)					
						1.55										1.55m Yellowish brown colour,soft sandy					
2						2.00	5									clay 2.00m					2
																Redish yellowish brown, loose,silty clayey sand (Lateritic Soil)					
																clayey Sand (Lateritic 30ii)					
3																					3
						3.00	7														
4																4.00m					4
																Yellowish brown,soft sandy clay					
l_						4.55															_
5						5.00	4									Redish brown to yellowish brown,					5
																loose,clayey silty sand					
6																					6
6					6.28	6.00															0
					24 /11	6.45	8														
7					6.78 23/11																7
																					•
8						7.55 8.00	2														8
																8.00m					
																Whitish brown micacious, very					
9					9.10											smooth,soft feldspathic inorganic clay					9
					22 /11	9.00										(Highly decomposed formation)					
						9.45	4														
10	21																				10
						10.55															
11						11.00	9														11
						11.55															
			L				50HB									11.72m	L				
12	-															Fresh rock of charnokitic gneiss		78	36		12
			Grey					Joints at 12.00m(50°) &12.33m(30°) (iron stained, rough joint surfaces)													
			٥					, , , , , , , , , , , , , , , , , , ,													
13							<u> </u>														13

		E	RILLI	NG		SPT RE	SULTS	JOINTS			PEF	RMEA	BILITY			GENERAL DESCRIPTION		RECO	VERY		
DEPTH (π)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)		O BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
14			1			1	-		12.50		1 4 7		Nil Nil 0.05 0.07 0.04 Nil Nil			Fresh rock of charnokitic gneiss				,	14
16	22							Joint at 15.72m(40°) (Iron stained rough surface)								15.35m Fresh rock of charnokitic gneiss (High content of quartz) 15.88m-16.00m weatheredportion.		81	81		16
17			Grey					Joint at 16.46m(32°) (tight joint)	15.35	20.00	ı		Nil 0.12 0.20 0.28	0		Weathered portion from 17.67m to 17.80m					17
19											7 4 1		0.23 0.13 Nil			Highly to moderately weathered rock of charnokitic gneiss			71		19
20	23							Joint at 19.85m(60°) (fresh tight joint) BOREHOLE COMPLETED A	AT 20	0.00	M					Fresh rock of charnokitic gneiss			57		20
21																					21
23																					23
24																					24
25 26																					25
27																					27
28																					28
30																					30



							B	OREHOLE LOG FOR	K EI	NGI	Ni		KI.	NG	יי	UKPUSES			UNI	Г	
LO	LOCATION :- CONDUIT DRILLING DATA						IT TI	RACE									B.H	No.: (CT 2		
		DR	ILLI	NG	DAT	Ά		BOREHOLE DATA								KEY	LEGE		R GRAPHIC L	.OG	
STAR	TED:	: -		200	2/2/1	1		X-COORDINATE :164,321.890m	_	r ROUG		SS				JOINT SEPARATION V= very tight		Sand Clay			
СОМ	PLETE	ED :		200	2/9/1	1		Y-COORDINATE :197,892.802m	R: rou							T= tight MO= moderately open		Fresh to s	lightly weathered chara		
MACH	HING	TYPE	:	TON	ΝE			ELEVATION (COLLAR) :113.713m	S= sn							MO= moderately open O= open		Fresh to s	lightly weathered bio	tite gneiss	
DRILL	ING I	METH	HOD :	RO	ΓARY	,		ELEVATION (BOTTOM) :98.213m	JOIN	T SPAC	ING					OTHER SYMBOLS		Quartzite	mod weathered biotit	e gneiss	
			BIT :		I AIX I			FINAL DEPTH :15.50m	VW= v	very wid idely	lely>	2m				SL/CW - Soil & Completely Weathered HW - Highly Weathered		Calc gnei: Boulder	SS		
									MW= C= Cl	modera oselv	tely v	vide				MW - Moderately Weathered SW - Slightly Weathered	TCR		RQD	WEATH	ERING SL/CW
FORE	MAN	:		MRA	AMH	•		INCLINATION : Vertical		ery clos	ely					TCR - Total Core Recovery RQD - Rock Quality Designation					HW MW
LOGG	SED E				APM			BEARING : -								GWL - Ground water Level					SW
1 1		D	RILLIN	NG		SPT RE	ESULTS	JOINTS	Η.		PERI	MEAB	BILITY		-	GENERAL DESCRIPTION	-	RECC	VERY		
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION FILL TYPE, AND THICKNESS SLICKENSIDED		то воттом	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyrittic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints		CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
																Highly to moderately weathered boulder of gneissic rock					
2			Light brown		1.52 6/11 2.10											(Rock in pieces due to weathering and drilled with T/C casing bit) 1.70m Fresh rock of charnockitic gneiss		66			1 2
					2.21			Joints at 2.21m(50°) ,2.50m(45°),								with little amount of garnets					
					9/11			2.53m(60°) & 2.83m(40°) (Fresh tight joints)								(From 1.70m to1.75m rock has slightly weathered)					
3	2				5/11			(i real agint joints)								Silgrity weatheredy					3
								Joint at 3.05m(57 ⁰) (Fresh tight joint)													
											1		Nil								
4	6										4		0.05								4
									2.50	7.00	7 10		0.08	0	3*10 ⁻⁷	4.17m Fresh rock of garnetiforous biotite	ł				
									2.00	7.00	7		0.07	Ü	0 10	gneiss					
5								Sub vertical joint at 5.46-5.73m (weathered			4		0.04								5
								rough joint surface) Joint at 5.87m(65°) (Tight, slightly iron			1		Nil						44		
								stained joint surface)													
6								Sub vertical joint at 5.73-5.92m (Slightly weathered, rough, iron stained joint surface)											83		6
								Joint at 6.65m(50 ⁰) (Tight, slightly iron											00		
7								stained joint surface)								7.00m					7
Ħ																Fresh rock of garnetiforous biotite	i				
			Grey													gneiss (Distinct in Lease					
8																(Biotite% is less Quartz% & garnet% are high)					8
								Joint at 8.80m(55°) (Fresh tight joint)			1		Nil								
9	7							, , , , , , , , , , , , , , , , , , , ,			4		Nil								9
									7.00	12.00	7 10		0.02	0	1*10 ⁻⁷	9.56m					
									7.00	12.00	7		0.03	J	1 10	Fresh rock of charnockitic gneiss					
10											4		0.02								10
											1		Nil								
																					.
11																					11
12																					12
14																					12
13																					13
		_					-		-	•	_										

Γ	L		DRILL	ING		SPT RE	SULTS	JOINTS			PERI	MEAE	BILITY			GENERAL DESCRIPTION		RECO	VERY		
(m) DEGREE	DET III (III)	DAILY ADVANCE CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS. (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)		то воттом	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DЕРТН (m)
1	4	3	Grey						12.00	15.50	1 4 7 10 7		Nil Nil 0.02 0.05	0	2*10 ⁻⁷	Fresh rock of charnockitic gneiss					14
1	5										1		0.02 Nil			15.50m					15
1								BOREHOLE COMPLETTED	AT	15.5	OM					10.3011					16
1	7																				17
1	8																				18
1	9																				19
2	0																				20
2	1																				21
2	2																				22
2	3																				23
2	4																				24
2	5																				25
2	6																				26
2	7																				27
2	8																				28
2	9																				29
3	0																				30



							B	OREHOLE LOG FOR	K Er	١G	IN	E	:RI	NG	P	URPOSES		JUNI	т	
LO	DCATION :- MAIN TUNNEL DRILLING DATA BOREHOLE DATA					EL									B.H No.:	MT 1				
		DR	ILLI	NG	DAT	ГΑ		BOREHOLE DATA								KEY	LEGEND FO	R GRAPHIC L	.OG	
START	ED:			200	2/10/	/11		X-COORDINATE :164,028.099m		ROU		ESS				JOINT SEPARATION V= very tight	Sand Clay			
COMPL	ETE.	:D :		19/1	10/02	2		Y-COORDINATE :198,008.066m	R: rou			ı				v= very tight T= tight MO= moderately open	Fresh to	slightly weathered char		
MACHI	NG T	TYPE	:	тог	NE			ELEVATION (COLLAR) :124.491m	S= sm							O= open	Fresh to	slightly weathered bid	otite gneiss	
DRILLIN	ING METHOD: ROTARY ELEVATION (BOTTOM):88.951m					ELEVATION (BOTTOM) :88.951m	JOINT	SPAC ery wi	CING					OTHER SYMBOLS SL/CW - Soil & Completely Weathered	Quartzite		te grieiss			
CORE E	E BARREL, BIT : NX FINAL DEPTH :35.54m						W= wi	dely						HW - Highly Weathered	Calc gne Boulder		BA/FATI	EDINO		
FOREM	IAN :	:		MR	АМН	IP.		INCLINATION : Vertical	C= Clo			wide				MW - Moderately Weathered SW - Slightly Weathered	TCR	RQD	WEATH	SL/CW
LOGGE					APM			BEARING : -	VC= v	ery clo	sely					TCR - Total Core Recovery RQD - Rock Quality Designation				HW MW
$\overline{}$			RILLIN				ESULTS	JOINTS			PER	MEA	BILITY	,		GWL - Ground water Level GENERAL DESCRIPTION	RECO	OVERY		SW
			SS)						0.00	(IM)					(cm/s)					
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	ОЕРТН	N'VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION FILL TYPE, AND THICKNESS SLICKENSIDED	l,	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (c	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyrittic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТН (m)
						0.00										Brown to yellowish brown colour,				
						0.46	3									soft, sandy silty clay with pebbles & fine to coarse grained quartzitic				
1																sand 1.10m				1
						1.50										Dark brown colour,soft, silty clay with highly weathered rock fragments				
						1.95	5									Some plant roots				
2																				2
																2.43m				
3																Boulder 2.65m Dark brown colour, silty clay with	-			3
						3.10										highly weathered rock fragments3.10m				Ů
						3.55	11									Whitish brown colour, medium				
4																dense, fine to coarse grained silty sandy material				4
																(May be completely weathered rock)				
						4.50 4.95	12													
5																4.95m				5
																Light brown to yellowish brown colour, medium dense to dense,				
																fine to medium grained, silty sandy				
6						6.00										material				6
1	1					6.45	14													
7																				7
'																				<u> </u>
						7.50	401 :-													
8						7.85	46HB									7.85m Boulder 8.00m	1			8
																Whitish brown, colour completely weathere				
																fine grained, silty material 8.47m Boulder 8.66m	1			
9																Whitish brown, colour completely				9
						9.00 9.45	34									weathered, fine grained, silty material Weathered rock fragments available				
10																9.83m				40
10																Highly to moderately weathered biotite shist with garnets	53 50			10
																Rock in pieces due to weathering				
11																(Rock in pieces) 10.70m Highly to moderately weathered				11
	2		rown													quartzo feldspathic gneiss with	40			
			Light brown													coarse quartz grains & garnets				
12			_													(Rock in pieces)				12
																	43			
13																				13

Г	T		DRILL	ING		SPT RE	ESULTS	JOINTS		PERM	MEAE	BILITY			GENERAL DESCRIPTION		RECO	VERY		
DEPTH (m)	HADVANCE	DAILY ADVANCE	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DЕРТН (m)
1	4		Light brown							1	100% W.L. AT 13.85				Highly to moderately weathered quartzo feldspathic gneiss with coarse quartz grains & garnets (Rock in pieces)		26			14
1:	5																39			15
1	6																27			16
1	7																20			17
1	8				17.95 16/10												45			18
1	9 15	5													Highly to moderately weathered charnockitic gneiss 19.20m Highly to moderately weathered		80			19
2	0														quartzo feldspathic gneiss with garnets (Rock in pieces)		44			20
2	1				21.16												24			21
2	2																42			22
2	3				23.32 23.46										Highly to moderately weathered quartzo feldspathic gneiss with garnets		37			23
2	4				17/10												32			24
2	5																34			25
2	6														26.00m Moderately weathered rock of charnockitic gneiss		65	20		26
2	7 16	6													27.00m Highly to moderately weathered quartzo feldspathic gneiss with		36			27
2	8							Sub vertical joints at 28.30mto 28.46m (Weathered,rough, Iron stained joint surface) Joint at 28.95m(70°)							gamets		84	27		28
2	9							(Weathered,rough, Iron stained joint surface)							29.48m		71	63		29
3	0 17	7													Slightly weathered quartzo feldspathic gneiss with garnets					30

Г			ORILLI	NG		SPT RE	SULTS	JOINTS			PER	MEA	BILITY			GENERAL DESCRIPTION		RECO	VERY		
DЕРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)		TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, ineated, flow banded, greissos, porphyrittic, etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
3′																Same above rock,quartz bands & biotite rich layers available 30.47m Highly weathered quartzo feldspathic gneiss with garnets (Rock in pieces)		58 35	41		31
32	2										1 4 7		0.52 1.35 2.06					44			32
33	<u> </u>							Sub vertical joint from 33.68m to 33.92m	30.00	35.54	10 7 4 1		2.72 2.19 1.42 0.60	0	6*10 ⁻⁶	33.00m Moderately to slightly weathered quartzo feldspathic gneiss with		58			33
34	<u> </u>							(Weathered joint surface) Foliation joint at 34.52m(15°) (Slightly weathered,rough,brownish joint								garnets (Rock in pieces) 34.00m Fresh quartzo feldspathic gneiss with garnets 34.48m					34
38	18							surface)								Fresh garnetiferous biotite gneiss Fresh to slightly weathered quartzo feldspathic gneiss with garnets 35.54m					35
36	5							BOREHOLE COMPLETTED	AT :	35.5	4M										36
37	, _																				37
38	3																				38
39)																				39
40)																				40
4	_																				41
42																					42
43																					43
44																					44
4																					45
46																					46



	BOREHOLE LOG FO																			
ILO	CA	ΙTΙ	ON	:-	PEI	NST	OC	K									B.H No.:	MT 2		
		DR	ILLI	NG	DAT	Ά		BOREHOLE DATA								KEY	LEGEND FO	R GRAPHIC LO	OG	
STAR	TED :			15/1	0/20	02		X-COORDINATE :161,508.252m		ROUGI ery roug		S				JOINT SEPARATION V= very tight	Sand Clay			
COMP	PLETE	D :		25/1	0/20	02		Y-COORDINATE :198,150.331m	R: rou	gh						T= tight	Fresh to	slightly weathered cha		
MACH				TON				ELEVATION (COLLAR) :100.007m	SR: sl S= sm	ightly roi notth	ugh					MO= moderately open O= open		mod weathered charn slightly weathered biot		
										ckenside SPACI						OTHER SYMBOLS	Highly to Quartzite	mod weathered biotite	gneiss	
DRILL	ING N	ИЕТН	IOD :	RO	TAR	1		ELEVATION (BOTTOM) :65.007m	VW= V	ery wide		!m				SL/CW - Soil & Completely Weathered	Calc gnei			
CORE	BAR	REL,	BIT :	NQ				FINAL DEPTH :35.00m	W= wi	idely moderat	ely wi	ide				HW - Highly Weathered MW - Moderately Weathered	TCR Boulder	RQD	WEATH	ERING
FORE	MAN	:		KRI	ΝK			INCLINATION : Vertical	C= Cle	osely ery close	alv					SW - Slightly Weathered TCR - Total Core Recovery				SL/CW HW
LOGG	ED B	Y :		вм	APM			BEARING : -	-	01, 01001	.,					RQD - Rock Quality Designation				MW
Н		D	RILLII			SPT RE	SULTS	JOINTS	+	F	ERM	EABIL	ITY			GWL - Ground water Level GENERAL DESCRIPTION	REC	OVERY		SW
			(S)							(M)					(cm/s)					
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	ОЕРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION FILL TYPE, AND THICKNESS SLICKENSIDER	,	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(intersprint)	Lugeon Unit (Lu)	Coefficient of Permeability (cn	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, pophyritlic, etc. scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТН (m)
	Ī	Ü				0.00								_	_	Dark brown, silty clay with tree roots	Ŭ			
						0.45	3									(Top soil layer) 0.45m				
1																Redish brown, loose, silty fine to				1
																coarse sand with rock fragments				-
	15															1.50m				
2						1.50	25									Light redish brown dense silty fine				2
						1.95	25									to coarse sand with some weathered rock fragments. (high percentage of				
																quartz)				
3																				3
																3.45m				
						3.45										Dark brown, medium dense, clayey				
4						3.90	17									silt	_			4
	16				4.45											Dark yellowish brown, clayey fine to coarse moderately dense sand 4.40m				
																Boulder of weathered gneissic	i			
5																rock 5.				5
																Brown completely weathered material(silty sand) 5.45m				
																Light reddish brown, dense, silty				
6						5.70										fine to coarse sand with weathered				6
	17					6.15	24									feldspathic particles.				
	17															(Insitu formation)				
7																				7
						7.65										7.75m				
8							35HB									Dense completely weathered	1			8
																material (Brown silty sand) 8.25m				
																Weathered rock boulder 8.45m Completely weathered material	1			!
9																(sludge sample- is fine to coarse				9
	18															silty sand with weathered feldspar				
																particles)				
10																				10
			grey																	
11			Yellowish grey																	11
			Yell																	<u> </u>
12																				12
12																				'-
12																				12
13				<u> </u>					1	1			24	ĺ				<u> </u>		13

Γ	L		DR	RILLIN	IG		SPT R	ESULTS	JOINTS		1	PERM	ИЕАВ	ILITY			GENERAL DESCRIPTION		RECO	OVERY		
DEPTH (m)	()	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic, etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
1:	4 5 6 8 8	19		Yellowish grey													Completely weathered material (sludge sample-is fine to coarse silty sand with weathered feldspar particles)					14 15 16 17 18 19
2	1	21							Vertical joint at 21.80m-21.90m (Tight and iron stained)								21.80m Fresh to slightly weathered rock of			17		21
2	3								Vertical joint from 22.05m-23.00m(partly tight fresh joint)			1 4 7		0.40 0.60 0.90			biotite gneiss (From 22.05m-22.30m rock is broken into pieces because of vertical joints) 23.35m Fresh rock of biotite gneiss			L		23
2	2	22								21.80	26.80	10 7 4 1		1.40 0.60 0.30 0.30	0	4*10 ⁻¹	24.25m Fresh to slightly weathered rock of biotite gneiss			69		24
2				Grey					Joint at 25.05m(40°) Sub vertical from 25.05m-25.55m(slightly weathered discoloured joint surface)								From 25.05m-25.55m rock is broken into pieces and slightly weathered due to joints. In this joited portion quartz content is high.					25
2	7																26.40m Fresh rock of biotite gneiss.					27
2		23							Joint at 28.51m (37°) (Fresh joint partly filled with whitish guage)	26.45	31.45	1 4 7 10 7		Nil Nil Nil 0.08 Nil	0	2*10 ⁻¹						28
3									Fracturing starts at 29.51m			1		Nil Nil			29.51m Fractured fresh quartzite					30

Γ	T		RILLI	NG		SPT RE	SULTS	JOINTS	П		PER	MEA	BILITY	,		GENERAL DESCRIPTION		RECO	OVERY		
	DEPTH (m)	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	ОЕРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEDTH AM		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gnelissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor tithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	RQD.%	WEATHERING	DEРТН (m)
3	i1															Fractured fresh quartzite 30.25m Fresh rock of quartzite.			85		31
3	32		Grey					Joint at 32.32m(25°) (Partly iron stained rough joint surface)			1		Nil								32
3	3		ğ					Joint at 32.83m(35°) (partly iron stained rough joint)	31.45	35.00	7		Nil Nil 0.02 Nil	0	7*10 ⁻⁸						33
3	34	_									1		Nil								34
3	5 25															35.08m					35
3	66							BOREHOLE COMPLETED A	\T 3	5.08	M										36
3	57																				37
3	8																				38
3	9																				39
4	.0																				40
4	.1																				41
4	.2																				42
4	-3																				43
4	.4																				44
4	.5																				45
4	-6																				46
4	.7																				47



							В	DREHOLE LOG FOR	יום ג	IGI	NI		KII	NG	<u> </u>	JRPUSES		UNIT	Ī	
LO	LOCATION :- PENST(ГОС	K									B.H No.: N	NT 3		
	DRILLING DATA STARTED: 28/11/2002							BOREHOLE DATA								KEY	LEGEND FOR	R GRAPHIC LO	OG	
STAR	COMPLETED: 05/12/2002							X-COORDINATE :161,448.998m		ROUG		SS				JOINT SEPARATION V= very tight	Sand Clay			
COM	PI FTF	D:		05/1	12/20	02		Y-COORDINATE :198,139.480m	R: rou	gh						T= tight	Fresh to s	lightly weathered char		
-									SR: sli S= sm	ightly r	ough					MO= moderately open O= open		nod weathered charne lightly weathered bioti		
MACH	HING '	TYPE	:	TON	NE			ELEVATION (COLLAR) :77.842m	SL=sli	ckensi						•	Highly to r	nod weathered biotite		
DRILL	ING I	METH	HOD :	RO	TARY	′		ELEVATION (BOTTOM) :52.272m		SPAC ery wi		2m				OTHER SYMBOLS SL/CW - Soil & Completely Weathered	Quartzite Calc gneis	ss		
CORE	BAR	REL,	BIT :	NQ				FINAL DEPTH :25.57m	W= wi							HW - Highly Weathered	Boulder		WEATH	EDING
EODE	MAN			WLI	NI			INCLINATION : Vertical	C= Clo		alely 1	wide				MW - Moderately Weathered SW - Slightly Weathered	TCR	RQD	WEATH	SL/CW
-									VC= v	ery clo	sely					TCR - Total Core Recovery RQD - Rock Quality Designation				HW MW
LOGO	SED B				APM			BEARING : -								GWL - Ground water Level				SW
		D	RILLIN	IG	1	SPT RE	SULTS	JOINTS	-		PER	MEAB	ILITY			GENERAL DESCRIPTION	RECO	OVERY		
			(SSO						3	(M)					(cm/s)					
			DRILL WATER (COLOR, LOSS)					NO OF JOINTS, SETS, TYPE, SPACING,	, 2	Ŗ					bility	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated,	vo.			
	Ж	Ę	(COL	ING	S			ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION,			ırs)		(min)	(ermes	lineated, flow banded, gneissose,	RY %			
e	DAILY ADVANCE	CASING/CEMENT	TER	RATE OF DRILLING	WATER LEVELS		ш	FILL TYPE, AND THICKNESS SLICKENSIDED	۸	Ψõ	PRESSURE (bars)	SSO-	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability	weathering, alteration, minor lithological characteristics, strengths, joints	CORE RECOVERY %		S NG	e
DEPTH (m)	≺AD	ING/C	/M	E OF	TER L	Ŧ	N' VALUVE		FROM TOP	то воттом	SSUF	ER	(liter	on U	fficien	OI HA	# #		WEATHERING	DЕРТН (m)
DEF	Ā	CAS	DRI	RAT	WA-	DEPTH	ż		Ä	10	PRE	WA.	(tota	Lug	Coe	GR/	ÖÖ	д. О.	WE	DEF
						0.00										Reddish brown, dense, silty fine to				
	- [0.45	8									coarse sand with some gravels.				
1	- [1
	- 1																			
	- 1																			
2						1.95 2.40	54													2
						2.40	54													
3																3.00m				3
																Reddish brown, dense, silty fine to				
																coarse sand				
4					5.10	3.90														4
					29/12	4.15	76HB									4.15m				
	28															Highly to moderately weathered				
_																garnet-quartzo feldspathic gneiss.				_
5																5.20m				5
																Moderately to highly weathered rock	i r			
																of biotite gneiss.(Rock in pieces	81			
6																max.9cm & min.<1cm) 6.00m	_			6
											1		Nil			Moderately to highly weathered				
					7.70						7		0.60 1.60			rock of biotite gneiss. Rock in pieces	75			
7									4.15	9.15	10		4.00	1	1*10 ⁻⁵	7.00m				7
											7		1.20			Highly to moderately weathered				
	29										4		0.50			rock of garnet-quartzo feldspathic				
8											1		Nil			gneiss.				8
Ĭ																		1		
			λ																	
			Grey														75			
9																				9
																	94			
10																				10
											1		1.00				80			
11											7		1.50				80			11
									9.15	14.15	10		3.00	1	8*10 ⁻⁶					
					11.60						7		2.10							
					4 / 12						4		1.50				72			
12											1		0.90							12
					13.10												75			
13					5 / 12															13
																				

Γ			DR	ILLIN	lG		SPT RI	ESULTS	JOINTS			PER	MEA	BILITY			GENERAL DESCRIPTION		RECO	OVERY		
				.oss)						W DEGE	(m)					(cm/s)						
	ц	<u>.</u>	2	DRILL WATER (COLOR, LOSS)	ING	S			NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION,		3	(bars)		{min}	=	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing),		ERY %			
DEPTH (m)	240	ADVANC	CASING/CEMEN	- WATER	RATE OF DRILLING	WATER LEVELS	Į	N' VALUVE	FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	MOTTC	PRESSURE (ba	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	cient of P	weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	%':	WEATHERING	DЕРТН (m)
DEPT	2	DAILY	SAS S	DRILL	RATE	WATE	DEPTH	N.V.		FRO	TO BC	PRES	WATE	(total{	Lugec	Coeffi	Lighty to moderately weathered	GRAF	CORE	R.Q.D. %	WEAT	DEPT
1	3 4	3															Highly to moderately weathered rock of garnet-quartzo feldspathic gneiss.		49			14
																	Fresh rock of garnet biotite gneiss.					
1	5								Joint at 14.80m(40°) (partly weathered joint surface)											80		15
												1		Nil			15.60m Weathered garnet biotite gneiss 15.85m			60		
1	6											7		1.10 1.30			Fresh rock of garnet biotite gneiss.					16
1	7								Joints at 16.81m(15°) &16.90m(20°) (weathered rough joint surfaces)	14.15	19.15	10 7 4 1		2.00 1.40 0.90 0.40	0	5*10 ⁻⁶						17
1	8								Sub vertical joint at 17.95m to 18.29m (Tight joint)													18
1	9			Grey													19.00m Fresh rock of quartz rich garnet			42		19
2	0			9					Vertical joint at 20.09m-20.4m (Partly iron stained)								biotite gneiss. 20.00m Fresh rock of garnet biotite gneiss.			47		20
2	1	<u>i</u>							Here the rock is in pieces due to that joint.			1 4		Nil Nil								21
2	2								Joint at 21.40m-21.49m(55°) (fresh tight joint)	19.15	24.15	7 10 7 4		Nil 0.02 Nil Nil	0	5*10 ⁻⁶				86		22
2	3											1		Nil			23.00m Moderately weathered garnet biotite					23
2	4								Joint at $24.80m(40^{\circ})$ (fresh tight joint)								gneiss 24.00m Fresh rock of garnet biotite gneiss.			68		24
2	5								Sub vertical joint at 24.80m- 25.50m (Partly tight joint)	24.15	25.50	10		0.00	0	0	25.57m		57	76		25
2									BOREHOLE COMPLETED A	T 2	5.57	М										26
2	7																					27
2	8																					28
2	9																					29
3	0																					30



							В	DREHOLE LOG FOR	CI	IGII	NE	<u>EK</u>	INC	<u> </u>	URPUSES		UNI	Г	
LC	LOCATION :- PENSTO DRILLING DATA STARTED: 29/10/2002 COMPLETED: 11/11/2002					NST	ГОС	K								B.H No.: I	VT- 4		
	DRILLING DATA STARTED: 29/10/2002					ГΑ		BOREHOLE DATA							KEY	LEGEND FOR	R GRAPHIC LO	OG	
STAF	RTED	:		29/1	10/20	02		X-COORDINATE :161,468.184m		ROUGH ery rough		S			JOINT SEPARATION V= very tight	Sand Clay			
COM	IPLET	ED:		11/1	11/20	02		Y-COORDINATE :198,200.832m	R: rou	gh					T= tight	Fresh to s	lightly weathered cha		
									SR: sli S= sm	ghtly rou otth	igh				MO= moderately open O= open		nod weathered charn- lightly weathered bioti		
MAC	HING	IYP	= :	101	NE			ELEVATION (COLLAR) :87.558m		spacifi SPACII					OTHER SYMBOLS		nod weathered biotite		
DRIL	LING	MET	HOD :	RO	TAR	Y		ELEVATION (BOTTOM) :57.008m	VW= v	ery wide		m			SL/CW - Soil & Completely Weathered	Calc gneis	ss		
COR	E BAI	RREL	, BIT :	NQ				FINAL DEPTH :30.55m	W= wi	dely noderate	ely wi	de			HW - Highly Weathered MW - Moderately Weathered	Boulder TCR	RQD	WEATH	ERING
FOR	EMAN	l:		KRI	NK			INCLINATION : Vertical	C= Clo	sely					SW - Slightly Weathered		I G		SL/CW
1.00	GED I	DV -		DM	APM			BEARING : -	VC= v	ery close	ly				TCR - Total Core Recovery RQD - Rock Quality Designation				HW MW
	020.		RILLI		AFIVI		SULTS		1		EDM	EABILIT	· ·		GWL - Ground water Level GENERAL DESCRIPTION	DE0/	OVERY		SW
				NG	<u> </u>	SPIRI	-SUL18	JOINTS	-		EKM	EABILIT	<u> </u>	·	GENERAL DESCRIPTION	RECO	DVERY	-	
			DRILL WATER (COLOR, LOSS)						E C	5				(cm/s)					
			R, I					NO OF JOINTS, SETS, TYPE, SPACING,	į	į		_		Coefficient of Permeability	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated,	%			
	H	Ę	CO)	RATE OF DRILLING	οq			ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION			ars)	WATER LOSS (total{liters}/time{min}	9	erme	lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing),	CORE RECOVERY %			
(i	DAILY ADVANCE	CASING/CEMENT	ATER	DRIL	WATER LEVELS		ш	FILL TYPE, AND THICKNESS SLICKENSIDED	n)	MO	g G	s)/tim	Lugeon Unit (Lu)	t of P	weathering, alteration, minor lithological characteristics, strengths, joints	NO CO		WEATHERING	Ê
DEPTH (m)	.≺ AD	NG/G	× ×	E OF	ERL	Ŧ	N' VALUVE		FROM TOP	то воттом	SSO	(liters	O nos	fficien	OHA	Ä R	.G.	ΉF	DЕРТН (m)
DEP	DAIL	CAS	DRII	RAT	WAT	DEPTH	ž		FRC	10 E	PRESSURE (bars)	(tota	Luge	Coel	GRA	COR	R.Q.D.	WEA	DEP
						0.00			Ĭ						Yellowish brown, loose fine to medium				
						0.45	8								silty sand. Some coarse sand also				
1															available 1.00m				1
Ľ															1.00m				-
2						1.95													2
						2.40	15								Daddish brown moderately denoted				
															Reddish brown, moderately densed fine to coarse silty sand with some				
3															weathered rock fragments				3
															-				
1,																			
4	29					3.90 4.35	15								4.00m				4
						4.35	15								Reddish brown, densed silty,fine to coarse quartzitic sand with some				
															pebbles				
5															5.00m				5
															Dark reddish brown, fine sandy				
						- 0-									clayey,silt				
6						5.85 6.30	27								6.00m				6
Ť						0.00									Light reddish brown, densed silty, fine				
															to coarse quartzitic sand with some				
															pebbles				_
7																			7
					7.70														
					3/11	7.80													
8						8.25	31												8
	2			ļ											8.25m				
															Highly weathered rock of garnet	53			
9															biotite gneiss				9
3															Highly weathered rock in pieces	68			3
I																			
I																			
10																			10
I			No													64			
I			Greyish yellow																
11			reyis																11
			٥													64			
Ī																			
4.0																			10
12																68			12
I																			
I																			
13																			13

Γ	L		D	RILLII	NG		SPT RE	SULTS	JOINTS			PERM	ИЕАВ	ILITY			GENERAL DESCRIPTION		RECO	OVERY		
	ОЕР I П (Ш)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	то воттом	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyriflic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
	4																Highly weathered rock of garnet biotite gneiss Highly weathered rock in pieces		60			14
1	5					15.30													70			15
1	6	3				8 / 11											16.27m		40			16
1	7	4		Greyish yellow	9	,10,11/	11		Foliation joints at 17.17,17.21,17.31m(50°,								Highly weathered rock of biotite gneiss, Rock in pieces Moderately weathered rock of biotite		82	39	ŀ	17
1	8			U					(Weathered,rough, joint surfaces) Foliation joint at 18.08m(50°) (Tight,rough, joint)								gneiss		70			18
1	9	5										1 4 7		Nil 0.40 0.60			Highly weathered rock of garnet biotite gneiss, Rock in pieces		54			19
2	20									18.30	21.90	10 7 4 1		1.10 0.60 0.30 0.10	0	4*10 ⁻⁶			82			20
2	<u>!1</u> :	8	,		•				Foliation joints at 21.08,21.13m(45 ⁶) (Weathered,rough, joint surfaces)								20.92m Fresh rock of biotite gneiss Few garnets available			78		21
2	2																From 21.00 to 21.70m biotite% is high					22
2	:3								Sub vertical joint from 23.20m-23.70m (Tight joint)			1		Nil						25		23
2	:4								Sub vertical joint from 23.79m-23.95m (Tight joint)	21.90	27.05	4 7 10 7		Nil 0.02 0.05 0.02	0	2*10 ⁻⁷						24
2	25	9		Whitish grey								1		Nil Nil								25
2	:6			Whiti													Biotite rich layer from 25.43-26.60m					26
2	27																					27
2	28	10							Foliation joint at 28.87m(42°)			1 4 7		Nil Nil 0.03		7						28
	:9								(Fresh, tight joint)	27.05	30.55	10 7 4 1		0.06 0.02 Nil Nil	J	2*10 ⁻⁷	Fresh,quartz rich, biotite gneiss Few garnets available					29
3	0																					30

Г		[DRILLI	NG		SPT RE	SULTS	JOINTS			PER	MEA	BILITY			GENERAL DESCRIPTION		RECO	OVERY		
	ANCE		OLOR, LOSS)					NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGINESS, PERSITANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)		(w)					Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic.etc: scale as for joint spacing), weathering, alteration, minor tithological	90-	CORE RECOVERY %		ING	
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	ORILL WAT	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE		FROM TOP	го вотто	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Soefficient	characteristics, strengths, joints	GRAPHIC LOG	SORE REC	R.Q.D. %	WEATHERING	DEРТН (m)
	11		Whitish				_							1	Ü	Fresh,quartz rich, biotite gneiss	Ü	<u> </u>			
31								BOREH	IOLE	CC	OMI	PLE	ETE	D A	Т 30	.55M					31
																					-
32	-																				32
33																					33
34																					34
35																					35
36																					36
37																					37
38																					38
39	=																				39
40	=																				40
41	-																				41
42																					42
43																					43
44																					44
45																					45
46																					46
47																					47

A SHEET STORE GEOLOGICAL INVESTIGATION FOR THE BROADLANDS HYDROPOWER PROJECT LABORATORY & SITE cecb INVESTIGATION **BOREHOLE LOG FOR ENGINEERING PURPOSES** UNIT B.H No.:DT 2 Page 1 of 4 **LOCATION: - Divertion Tunnel** DRILLING DATA **BOREHOLE DATA** LEGEND FOR GRAPHIC LOG KEY JOINT ROUGHNESS 2003/7/7 K-COORDINATE :164,804.155m VR= verv rough /= very tight ecomposed mica T= tight Garnet biotite gneiss COMPLETED : 2003/12/7 Y-COORDINATE: 197,605.418m SR: slightly rough MO= mod Quartzo feldspathic gneiss O= open Charnockite MACHINE TYPE : TONE ELEVATION (COLLAR) :139.440m SL=slickensided ranitic Gneiss JOINT SPACING OTHER SYMBOLS Quartzite DRILLING METHOD: ROTARY ELEVATION (BOTTOM) : SL/CW - Soil & Completely Weathered alc gneiss/Crystalline Lime stone W= widely HW - Highly Weathered CORE BARREL, BIT: NX FINAL DEPTH :60.00m WEATHERIN MW - Moderately Weathered C= Closely SW - Slightly Weathered INCLINATION : Angle 450 FOREMAN VC= very closely TCR - Total Core Recovery HW RQD - Rock Quality Designation MW LOGGED BY : SRMS/RMLKR BEARING GWL - Ground water Level SW JOINTS PERMEABILITY GENERAL DESCRIPTION RECOVERY SSO PT VALUES DRILL WATER (COLOUR, Rock type, colour, grain size, texture and tructure (massive, cleaved, foliated, lineate NO OF JOINTS, SETS, TYPE, SPACING ORIENTATION, CONNECTIONS, (ROUGHNESS, PERSISTENCE, AANOMETER READING RATE OF DRILLING DAILY ADVANCE CASING/CEMENT RESSURE (BARS) :otal{liters}/time{min} low banded, gneissose, porphyritlic,etc: scal RECOVERY WATER LEVELS as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints ugeon Unit (Lu) SEPARATION, FILL TYPE, AND WATER LOSS MOSAIC LOG TO BOTTOM THICKNESS SLICKENSIDED) DEPTH (m) -ROM TOP DEPTH O.D. Brown Fine to coarse grained,moderate dense, brown, clayey silty sand (Some gravels available) (Top soil layer) 0.52 1 1 Fresh charnockitic gneiss Grey (Boulder) Fine to medium grained, brown sand 2 2 (Sludge sample) 3 3 4 4 5 5 6 6 7 7 8 8 8.32 08/07 9 9 10 10 11 11 12 12

13.00

		•	Ŧ	ΕA	SI	BIL		Y STUDY OF THE									POWER PROJECT		ce	cb LABOR	RATORY E FIGATION	
L	C	ΑТ	ION	l :-	Div	ert	ior	n Tunnel									B.H No.:DT 2				ige 2	of 4
			D	RILLIN	IG			JOINTS			PE	RME	EABIL	TY			GENERAL DESCRIPTION		RECO	VERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH(m) SPT VALUES		NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM	PRESSURE (bars)	Manometer Reading	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	ROCK TYPE, COLOUR, GRAIN SIZE, TEXTURE AND STRUCTURE (MASSIVE, CLEAVED, FOLIATED, LINEATED, FLOW BANDED, GNEISSOSE, PORPHYRITIC, ECT: SCALE AS FOR JOINT SPACING), WEATHERING, ALTERATION, MINOR LITHOLOGICAL CHARACTERISTICS, STRENGTH, JOINTS	MOSAIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEPTH (m)
14			Brown														Fine to medium grained, brown sand (Sludge sample) 13.72 Fine grained, brown sand					14
15																	(Mica & weathered feldspar available) (Insitu formation) (Sludge sample) (Highly decomposed material)					15
			Greyish brown		15.24 09/07												(Highly decomposed material)					
16																						16
17																						17
18			Light brown																			18
19			Lig																			19
20	8				20.48 12/07																	20
21																						21
22																						22
23																						23
24																						24
25			Greyish brown																			25
26			9																			26
27																						27
28																						28
29																						29
30																	30.00					30

			F	EΑ	SI	BIL	Y STUDY OF THE OREHOLE LOG F									POWER PROJECT	-	ce		RATORY E TIGATION	
LC	OC.	ΑT	ION	l :-	Div	ert	Tunnel									B.H No.:DT 2			Pa	age 3	of 4
			D	RILLIN	1G		JOINTS			PE	RME	EABIL	ITY			GENERAL DESCRIPTION		RECO	OVERY		
DEPTH (m)		CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH(m) SPT VALUES	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM	PRESSURE (bars)	Manometer Reading	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	ROCK TYPE, COLOUR, GRAIN SIZE, TEXTURE AND STRUCTURE (MASSIVE, CLEAVED, FOLIATED, LINEATED, FLOW BANDED, GNEISSOSE, PORPHYRITIC, ECT: SCALE AS FOR JOINT SPACING), WEATHERING, ALTERATION, MINOR LITHOLOGICAL CHARACTERISTICS, STRENGTH, JOINTS	MOSAIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТН (m)
31	9	30.12														Fine grained, brown sand (Mica & weathered feldspar available) (Insitu formation) (Sludge sample) (Highly decomposed material)					31
32	-																				32
33	-																				33
34	-															34.00 Fine grained, brown sand (Mica & weathered feldspar available high % of micas) (Insitu formation)					34
35	-															(Sludge sample) (Highly decomposed material)					35
36																					36
37			brown																		37
39			Greyish brown																		39
40																40.03					40
41	-															Brown mica layer (Flackey grains) (Sludge sample) (Highly decomposed material)					41
42	-																				42
43	-																				43
44	-																				44
45																					45
46	11		Redish brown																		46
47			Redis													47.00					47

			F	ΈA	SI	BIL	IT. B	Y STUDY OF THE OREHOLE LOG F	BR OR	OA EN	DL GII	.A NE	ND El	S I RIN	HYE IG F	RC UR	POWER PROJECT	Γ	се		RATORY E TIGATION	
L	ЭC	ΑT	IOI	1 :-	Div	ert		Tunnel									B.H No.:DT 2			P	age 4	of 4
			С	RILLIN	IG			JOINTS			PE	RME	ABIL	TY			GENERAL DESCRIPTION		RECO	OVERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLIN	WATER LEVELS	DEPTH(m) SPT VALUES		NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TOBOTTOM	PRESSURE (bars)	Manometer Reading	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	ROCK TYPE, COLOUR, GRAIN SIZE, TEXTURE AND STRUCTURE (MASSIVE, CLEAVED, FOLIATED, LINEATED, FLOW BANDED, GNEISSOSE, PORPHYRITIC, ECT: SCALE AS FOR JOINT SPACING), WEATHERING, ALTERATION, MINOR LITHOLOGICAL CHARACTERISTICS, STRENGTH, JOINTS Brown mica layer	MOSAIC LOG	CORE RECOVERY%	RQ.D.%	WEATHERING	DEPTH (m)
48																	(Flackey grains) (Sludge sample) (Highly decomposed material)					48
49	<u> </u>																					49
50)																					50
51																						51
52																						52
53			Redish brown														53.00 Reddish brownish mica layer (Flackey grains) (Sludge sample) (Highly decomposed material)					53
54			. œ																			54
56																						56
57																						57
58																						58
59																						59
60	12								P	oro	ho		C C -	nni	Ofor	2f (60.00 60.00m					60
			ĺ	ĺ	ĺ	ĺ			6	ore	1101	e (COI	 	e.ea	at t					[
61																						61
62																						62
63																						63
64																						64



LABORATORY & SITE INVESTIGATION UNIT

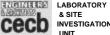
L	OC.	ΑT	101	1 :-	DA	M A		S,LEFT BANK								B.H No.: MB5			P	age 1	of 2
F					DAT			BOREHOLE DATA								KEY		LEGEND FO	R GRAPHIC	_	
STA	RTED	:		18-0	09-03	3		X-COORDINATE :164,631.381m		T ROU		ESS				JOINT SEPARATION		Sand			
COM	IPLET	ED:		26-0	09-03	3		Y-COORDINATE :197,564.127m	R: rou	-	-					V= very tight T= tight			iotite gneiss		
						-			SR: sl	lightly i notth	ough					MO= moderately open O= open		Quartzo Charnock	eldspathic gneiss		
	HING			TOI				ELEVATION (COLLAR) :138.601m	SL=sl	ickens						OTHER SYMBOLS		Granitic q	gneiss		
DRII	LING	MET	HOD :	RO	TAR	′		ELEVATION (BOTTOM) :m	VW= v	very w						SL/CW - Soil & Completely Weathered		Calc gne	iss/Crystaline lime st	one	
COF	E BAI	RREL	, BIT	NQ				FINAL DEPTH :30.15m	W= wi MW=	noder	ately	wide				HW - Highly Weathered MW - Moderately Weathered		TCR Boulder	RQD	WEATH	ERING
FOR	EMAN	1:		UK	SJ			INCLINATION : Vertical	C= Clo	osely /ery clo	selv					SW - Slightly Weathered TCR - Total Core Recovery					SL/CW HW
LOG	GED I	BY:		SRI	VIS/R	MLK	R	BEARING : -			,					RQD - Rock Quality Designation					MW
-		D	RILLIN	NG		SPT RE	SULT	JOINTS			PER	MEAE	BILITY			GWL - Ground water Level GENERAL DESCRIPTION		RECO	OVERY		SW
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNES: SLICKENSIDED)		TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyrillic, etc. scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEРТΗ (m)
																Fine to coarse grained brown silty					
																sand with road aggregate 0.20					
1	18															Fine to coarse grained yellowish brown to reddish brown clayey sand					1
H	10		Brown													(small amount of gravels & organic					
1			Δ													material avaliable)					
_																1.75					2
2		2.20			2.20											Brown fine to coarse grained silty sand (some amount of gravel & pebbles available) 2.20					2
		z.2U			20/03			Joint at 3.17m (60 ⁰)								quanto amount or graverα peubles available) 2.20					
								Joint surface weathered & rough													
3																<u> </u>					3
l	19															Fresh charnocktic gneiss					
					3.75 23/09																
4																					4
					4.35 21/09											4.10					
1										c -		•		of wa	iter	Fresh charnocktic gneiss		22	22		
5								Joint at 4.10m (50°) & 4.55m(Highly weathered jointed zones)	3.25	8.50			ough o dev	joints		(Core loss at 4.10-4.55m)			73		5
Ĕ												ssure	1	2.0P		5.00			73		
	20																				
_								Joint at 5.85m (45 ⁰)								Fresh charnockitic gneiss					
6					6.35			(Tight smooth joint surface)								At 6.80m some amount of graphite available					6
					26/09											avaiidDle					
7	21		Witish Grey					Joint at 7.37m (35°) Joint at 7.38m (30°)and 7.44m (40°)								7.00					7
8			Witish					(Tight fresh joint surfaces, filled with blac thin film of secondary materials)	K.		1 4		Nil Nil								8
Ĕ			_					Joint at 8.00m (Joint surface slightly			7		Nil								
	22				8.60 25/09			weathered in to rock & filled with thin film	8.50	13.30	ı		Nil	0	0	Fresh charnocktic gneiss					
_								of dark brown secondary materials)			7		Nil								
9											4		Nil								9
l											1		Nil								
10																10.00					10
11																Fresh charnocktic gneiss					11
	23															(some amount of garnet available)					
12																					12
12																12.00 Fresh quartz rich charnocktic gneiss					12
1																(qtz grain size relatively large)					
																					<u>,</u>
13																13.00					13



L	<u> </u>	Δ٦	ΓIΩ	N -	-D/	м		DREHOLE LOG FOR S,LEFT BANK		NGI	IV		-KI	INC	<u>, </u>	B.H No.:MB5			UNIT Pa	age 2	of 2
۳			DRILL		ייי		ESULT	JOINTS			PERI	MEAI	BILITY	,		GENERAL DESCRIPTION		RECO	OVERY	.gc 2	J. 2
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	ОЕРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP		PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etic scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY%	R.Q.D.%	WEATHERING	DEРТН (m)
14								Joint at 13.78m(40°) ((Tight joint filled with thin film of grey and black secondary materials)								Fresh quartz rich charnocktic gneiss (qtz grain size relatively large)					14
15	5										1 4 7		Nil Nil Nil								15
16	6								13.50	19.20	10 7 4 1		Nil Nil Nil Nil	0	0	16.00					16
17	24																				17
18																					18
20																Fresh quartz rich garnet biotite gneiss					20
21			brown						19.50	25.50	1 4 7 10		3.3 5.7 7.3 10.6	2	10 ⁻⁵						21
22)		Whitish brown								7 4 1		7.7 6.1 3.4								22
23																23.84					23
24	25	;														Fresh garnet biotite gneiss			16		24
26																26.00					26
27	,															Fresh quarty sich cornet histing					27
28	3															Fresh quartz rich garnet biotite gneiss (relatively quartz % high)					28
29																					29
30	26				<u> </u>			E	ore	e ho	ole	C	om	ple	ted	at 30.15m					30



							BC	DREHOLE LOG FO	OG FOR ENGINEERIN					RII	١G	PURPOSES	U	ecn "	IIT	
L	OC	ΑTI	ION	l :-	C	ONI	רוטכ	Γ TRACE	<u> </u>							BH No: CT 3		ı	Page 1	of 2
F		DR	ILLI	NG	DAT	ГА		BOREHOLE DATA	Ic.:							KEY	LEGEND FO	R GRAPHIC	LOG	
ST	ARTE) : 		200	3/9/2	28		X-COORDINATE :164,465.645m	JOINT VR= v			ESS				JOINT SEPARATION V= very tight	Sand Clay			
CO	MPLE	TED :		200	3/10	/1		Y-COORDINATE :197,713.476m	R: roug		ough					T= tight MO= moderately open		iotite gneiss feldspathic gneiss		
M	CHINO	S TYPE	:	то	NE			ELEVATION (COLLAR) :106.730m	S= sm SL=sli	otth						O= open	Charnoci Granitic	kite		
DF	RILLING	METI	HOD :	RO	TAR'	Y		ELEVATION (BOTTOM) :m	JOINT	SPAC	ING					OTHER SYMBOLS	Quartzite			
CC	RE BA	RREL	. BIT :	NQ				FINAL DEPTH : 20.35 m	VW= v W= wi	dely						SL/CW - Soil & Completely Weathered HW - Highly Weathered	Boulder	iss/ Crystaline lime		
	REMA			UK				INCLINATION : Vertical	MW= r C= Clo		ately	wide				MW - Moderately Weathered SW - Slightly Weathered	TCR	RQD	WEATH	SL/CW
H								BEARING : -	VC= v	ery clo	sely					TCR - Total Core Recovery RQD - Rock Quality Designation				HW
LC	GGED		RILLIN			SPT RE		JOINTS			DEDI	MΕΔ	BILIT	·		GWL - Ground water Level HB -Hammer bounced GENERAL DESCRIPTION	RECO	OVERY		SW
				Ĭ	f	OI I IKE	OOLIC	SONITO	ź			VIL	DILIT		(s/	GENERAL BESONII HON	KEO	JVEI(1	1	
			DRILL WATER (COLOR, LOSS)						DEPTH (M)						Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and				
	l	⊢	COLO	NG				NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS,	-		s)		min}		meabi	structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic, etc: scale	%			
L	/ANCE	EMEN	TER (C	DRILLI	VELS			(ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	<u> </u>	M	E (bar	SSC	/time{r	it (LLu)	of Per	as for joint spacing), weathering, alteration, minor lithological characteristics, strengths,	SOVE		9 ≅	_
OFPTH (m)	DAILY ADVANCE	CASING/CEMENT	L WA	RATE OF DRILLING	WATER LEVELS	Ŧ	N' VALUVE	THICKNESS SLICKENSIDED)	FROM TOP	SOTTC	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	ficient	as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
DEP	DAIL	CAS	DRIL	RAT	WAT	DEPTH	> .z		FRC	TOB	PRE	WAT	(total	Luge	Coef	GRA	SOS	О.	WEA	DEP
																Fine to medium grained, yewllowish				
																brown,silty sand (Top soil layer) 0.30 Boulder (Fresh gneissic rock) 0.50	75			
1																5. 5. (1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	15			1
																Fine to coarse grained, brown,				
						1.50	_									clayey silty sand				
2	2					1.95	5									(Some large rock fragments avilable, may be broken pieces				2
																of boulder)				
																				ш
3	,					3.00	>5													3
Ė						3.15	HB									3.33				
					3.50 29/9											Boulder (Garnet biotite gneiss) 3.40	95			1
																Fine to coarse grained, light brown,				
_	-															silty sand (Some gravels and				4
	28				4.60											rock fragments avilable) 4.2 Fresh to highly weathered garnet	50			1
					1/10											biotite gneiss (Boulder)				
Ę	5																			5
																5.70				
6	6															Fine to medium grained, brown,				6
																silty sand (Sludge sample)				ш
																(Some large rock fragments avilable, may be broken pieces of boulder)				ш
7																(Some weathered micas available)				7
																7.25				
																Fine to coarse grained,brown,silty sand				
8	3															(Some gravels and rock fragments avilable) 8.00				8
			Ę													Fine to medium grained, brown,				
			Pale brown													silty sand (Sludge sample)				
9	,		Pale													(Some weathered micas available)				9
F																				9
																				40
ľ	0																			10
1	1																			11
1	2															12.00				12
																Fine to medium grained, brown,silty				
																sand (Sludge sample) (Some gravels and rock fragments				
1	3															available) 13.00				13



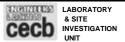
								DREHOLE LOG FO	RE	EN	GI	N	EE	RII	١G			U		NIT	
LC	OC.				_	_		TRACE								B.H No.: CT 3				Page 2	of 2
			(S)	IG		SPT RE	SULTS	JOINTS	W		PERI	MEA	BILIT	Y	m/s)	GENERAL DESCRIPTION		RECO	OVERY	_	
DΕРТΗ (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N'VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TOBOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
	29															Fine to medium grained, brown,silty sand (Sludge sample)					
14																Fine to medium grained, brown,silty sand					14
15			Brown			15.00 15.05										Fine to medium grained, brown,silty					15
16	-															sand (Some gravels and large rock fragments avilable)					16
17	-	16.95														16.95 Slightly to moderately weathered crystaline lime stone		50	48	F	17
18	30		brown					(Due to joints and weathering rock								(Some hormblende,biotite and diopsite available) 1 Fresh to highly weathered crystaline lime stone		74	35	ŀ	18
19	-		Light grey to brown					broken into pieces,could'n determine exact positions of the joints due to core loss)								(Some hornblende and micas available) 19.00 Moderately to highly weathered crystaline lime stone		27		Ь	19
20	1															(Some amount of weathered micas available) 20.35					20
	1 1	1		1 1		Ī	I	1	Во	re l	Ho	le	CC	mp	lete	ed at 20.35m	1	İ	I	1	1
21																					21
22																					22
23	-																				23
24	-																				24
25																					25
26																					26
27																					27
28																					28
29																					29
30																					30



							BC	REHOLE LOG FOR	E	١G	IN	EE	ERI	NG	P	URPOSES	U		JNIT	ION
LC)C	ΑT	101	J :-	СО	NDU	JTE	TRACE								B.H No.: CT4			Page 1	of 2
		DF	RILL	NG	DA٦	Α		BOREHOLE DATA	10	TPC	IC!	ESS				KEY	LEGEND FO	R GRAPHI	C LOG	
	RTED				3/10/ 3/10/			X-COORDINATE :164261.681m Y-COORDINATE :197938.506m	VR= v	T ROU very ro ugh lightly	ugh					JOINT SEPARATION V= very tight T= tight MO= moderately open		iotite gneiss feldspathic gneis	e	
MAC	HING	TYPI	E :	TOI	NE			ELEVATION (COLLAR) :103.040m	S= sn		-					O= open	Charnoc	kite	3	
DRIL	LING	MET	HOD :	RO	TARY	,		ELEVATION (BOTTOM) :m	JOIN	T SPA	CING					OTHER SYMBOLS	Granitic Quartzite	:		
			, BIT :					FINAL DEPTH :20.00m	W= w							SL/CW - Soil & Completely Weathered HW - Highly Weathered	Boulder			
	EMAN		.,					INCLINATION : Vertical		mode losely	rately	wide	:			MW - Moderately Weathered SW - Slightly Weathered	TCR	RQD	WEATH	SL/CW
				UK					VC=	very cl	osely					TCR - Total Core Recovery RQD - Rock Quality Designation				HW MW
LOG	GED		RILLIN		VIS/R	MLKF SPT RE		BEARING : - JOINTS	1		PER	MEA	BILIT	v		GWL - Ground water Level GENERAL DESCRIPTION	REC	OVERY	_	SW
				Ň		J		50.1110	;	ξ	T		I.S.E.T.	· 	(s/u	SENERAL BESSAM HOW	- KEO		1	
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N'VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNES SLICKENSIDED)		TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic, etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	CORE RECOVERY %	R.O.D. %	WEATHERING	DEРТН (m)
1					<u>0.40</u> 7/10											Fine to coarse grained,brown clayey silty sand Some amount of gravels & rock fragments available				1
						1.50										1.50				
						1.95	1									Fine to coarse grained, yellowish				
2					2.2 10/10											brown clayey silty gravelly sand 2.00				2
3					10/10	3.00 3.45	7													3
	7																			
4																Flora to account made and analysis in				4
																Fine to coarse grained, yellowish brown clayey silty sand				
_																Some rock fragments & coarse				١.
5																gravels available				5
6						6 6.45	9													6
_																				L
7																				7
	8					7.50														
8						7.95	8									8.00 Fine to coarse grained, light brown clayey silty sand				8
9						9.00 9.45	20									Weathered feldspars & micas available (Highly decomposed material)				9
10																0.00				10
11						10.50 10.95	17									Light brown to white clayey sandy silt. Weathered feldspars & micas available (Highly decomposed material)				11
12	9					12.00 12.45	23									n ng ny decomposed Material)				12
13																13.00				13



L						_		REHOLE LOG FOR	EN	IGI	NE	E	RI	NG			-	Ů.		JNIT	_
L	00		TIOI DRILL		-CC	_	UTE	TRACE			PERM	EAF	ידי וונ			B.H No.: CT4 GENERAL DESCRIPTION		DECO	VERY	Page 2	of 2
DEPTH (m)	DAII Y ADWANCE		OLOR,LOSS)	RATE OF DRILLING	WATER LEVELS		N.VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP				(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D %	WEATHERING	DEPTH (m)
14			Dark brown			14.00 14.45										Light brown to white clayey sandy silt. Weathered feldspars & micas available (Highly decomposed material) Light brown clayey silt Weathered feldspars & micas available (Highly decomposed material)					14
10	6		L			16.00 16.45) 5 11														16
1	7		Brown													Brown clayey sandy silt Weathered feldspars & micas available (Highly decomposed material)					17
18	_) 18.3	7													18.25					18
19	9		Whitish grey													Fresh rock of crystaline limestone					19
20) 11	ı									Ш					20.00					20
2	1							В	ore	Но	le		omį	olet	ed	at 20.00m					21
2:	2																				22
2:	3																				23
24	1																				24
2	5																				25
20	6																				26
2	7																				27
28	3																				28
2	9																				29
30)																				30



LOCATION :-MAIN TUNNEL						NG!	IVI		·N	INC	ין נ				UNI						
LC	C	DCATION:-MAIN TUNNEL DRILLING DATA BOREHOLE DATA						-	1							B.H No.: MT5 KEY		I EGEND FO	P: R GRAPHIC I	age 1	of 2
STAR	RTFD				3/8/2			X-COORDINATE :164,050.587m		ROUG		SS				JOINT SEPARATION		Sand	IN GRAPHIC I	_00	
									VR= v R: rou	ery rou gh	gh					V= very tight T= tight		Clay Garnet b	iotite gneiss		
COM					3/9/3	5		Y-COORDINATE :198,005.489m		ightly ro	ugh					MO= moderately open		Quartzo	feldspathic gneiss		
MACH	HING	TYPI	Ē: 	М	NE			ELEVATION (COLLAR) :123.838m	SL=sl	ickensi						O= open		Charnock Granitic	gneiss		
DRILI	LING	MET	HOD :	RO	TAR	Υ		ELEVATION (BOTTOM) :m	VW=	ery wic		2m				OTHER SYMBOLS SL/CW - Soil & Completely Weathered		Quartzite Calc gne	iss/Crystaline lime st	one	
COR	E BAI	RREL	, BIT :	NQ				FINAL DEPTH :30.25m	W= w MW=	dely modera	tely v	vide				HW - Highly Weathered MW - Moderately Weathered		Boulder TCR	RQD	WEATH	ERING
FORE	MAN	1:		WLI	N			INCLINATION : Vertical	C= CI							SW - Slightly Weathered TCR - Total Core Recovery					SL/CV HW
OGC	GED I	BY:		SRI	MS/R	MLKI	₹	BEARING : -	v C= V	ory UIUS	ыу					RQD - Rock Quality Designation					MW
\neg			RILLIN			SPT RE		JOINTS		F	PERM	ЛЕАЕ	BILITY	,		GWL - Ground water Level GENERAL DESCRIPTION		RECO	OVERY		SW
	1CE	ENT	DRILL WATER (COLOR, LOSS)	LLING	ST:			NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE,	T C		pars)	S	ne{min}	-n)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing),	9	VERY %		(n	
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	ILL WATEI	RATE OF DRILLING	WATER LEVELS	DEРТН	N'VALUVE	SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	товоттом	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	efficient of	weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEPTH (m)
DE	DAI.	CAS	DRI	RA	WA	-	ż		FR	TO	PRE	WA	(tote	Lug	Coe		GR,	Ö	A. A	WE	ä
						0.00	4									Fine to coarse grained,loose,silty sand .Some gravels available 0.45					
1						0.40	7									U.45					1
-																					<u> </u>
2						1.50	F									Fine to coarse grained,loose,					2
_						1.95	5									gravelly sand Some highly weathered rock					 _
																fragments					
3	22					3.00															3
						3.00 3.45	5									3.45					
							-									3.40					
1																					4
						4.50										Fine to coarse grained, reddish brown silty sand					
5						4.95	4														5
٦					E ^-																
					<u>5.60</u> 24/08	F 50															
3	23					5.50 5.95	42														6
1	_0					5.35	74									6.30					١Ť
,						7.0-										Fine to coarse grained, reddish					_
7						7.00 7.45	26									brown silty sand Some highly weathered rock					7
						~										fragments					
																(Highly decomposed material)					
3																					8
	24			uwc												8.25 Highly weathered biotite gneiss		20			
				Lighlt greish brown												(Boulder ?)					
9				hlt gre																	9
				Lig		0.25										9.25					
						9.25 9.70	58														
0						0	55									Fine to coarse grained, brown silty					10
																sand.Some highly weathered rock					
				ter												fragments					
1				of wa		10.80	45									(Highly decomposed material)					11
1				ssol		11.20	40									11.25					L''
				Complete loss of water												Fresh to slightly weathered garnet		32			
إ				Com												biotite gneiss 11.75					
2																Fresh to moderately weethered		44			12
																Fresh to moderately weathered garnet biotite gneiss					
																(Rock brocken into pieces)					
13																13.00					13



							BC	REHOLE LOG FOR		IGI	NE		<u> </u>	١G	<u> </u>	UKPUSES			SCD INVI	Т	
LC	C	١TI	٥N	I :-	MΑ	IN.	TUN	INEL								B.H No.: MT5			Р	age 2	of 2
		DR	RILLIN	IG		SPT RI	ESULTS	JOINTS		_	ERMI	ABIL	ITY			GENERAL DESCRIPTION		RECC	VERY		
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEPTH (M)		PRESSURE (bars)	WATER ECGS	(iocal moral and moral	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic, etc. scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEPTH (m)
	25				13.20 26/08											Biotite gneissic rock brocken into pieces 13.25					
14 15			Light grey to light brown													Fresh to highly weathered garnet biotite gneiss (Rock brocken into pieces along the joints)					14
16			Light													Fine to coarse grained, dark brown sitty sand (Highly decomposed material)					16
17	26															17.30					17
18			Light cream													Slightly to moderately weathered garnet biotite gneiss		33			18
19	27	L																			19
20																Fresh to moderately weathered garnet biotite gneiss.(Garnet % is high)		40	53	L	20
21		_														Fine to medium grained, brown silty sand (Highly decomposed material Sludge sample)			60		21
22																Fresh to moderately weathered , garnet rich quartazo feldspathic gneiss.					22
23																Fine to medium grained, brown silty sand (Highly decomposed material-Sludge sample) 23.60					23
24																Fresh to moderately weathered ,garnet rich quartazo feldspathic gneiss. 24.00			55		24
25			White to light brown													Fine to medium grained, brown silty sand (Highly decomposed material Sludge sample)					25
26			M													Fresh to moderately weathered ,garnet biotite gneiss. 25.95		46		L	26
27																Fine to medium grained, brown silty sand (Highly decomposed material Sludge sample)					27
28																Mod. to highly weathered ,garnet biotite gneiss/27.6					28
29		28.9														Fine to medium grained, brown silty sand. Some gravels & rock fragments available (Highly decomposed material Sludge sample)					29
30																					30



L									·UI	\ <u></u>	NC	ИII		K	_	G PURPOSES			UNI		
L	OC.						UN	NEL BATA							┙	B.H No.: MT 6		LEGEND E		age 1	of 3
CT.	DTC		RILLI					BOREHOLE DATA	JOINT	ROUG	HNES	SS		_	丁	JOINT SEPARATION		LEGEND FO	OR GRAPHIC	LUG	
	RTED				3/9/6			X-COORDINATE :164,015.436m	VR= v	ery rou gh	gh				١	V= very tight T= tight		Clay	biotite gneiss		
-	//PLET)3/9/	16		Y-COORDINATE :197,995.307m		ightly re	ough				ŀ	MO= moderately open		Quartzo	feldspathic gneiss		
MA	HING	TYPE	≣:	то	NE			ELEVATION (COLLAR) :134.126m	SL=sli	ckensi						O= open		Charno	gneiss		
DRI	LLING	METI	HOD :	RO	TAR	Υ		ELEVATION (BOTTOM) :m	VW= v	ery wid		m			9	OTHER SYMBOLS SL/CW - Soil & Completely Weathered			eiss/Crystalline Limes	tone	
CO	RE BA	RREL	, BIT :	NQ				FINAL DEPTH :40.10 m	W= wi MW= i	dely modera	ıtely wi	de				HW - Highly Weathered MW - Moderately Weathered		Boulde TCR	RQD	WEATH	ERING
FOR	EMAN	۱:		WL	.N			INCLINATION : Vertical	C= Clo	osely ery clo:	sely					SW - Slightly Weathered TCR - Total Core Recovery					SL/CW HW
LOC	GED	BY:		SR	MS/F	RMLKE	₹	BEARING : -							F	RQD - Rock Quality Designation GWL - Ground water Level					MW SW
		D	RILLIN	IG		SPT RE	SULTS	JOINTS		F	ERME	ABILIT	Υ		ゴ	GENERAL DESCRIPTION		REC	COVERY		OW
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TOBOTTOM	PRESSURE (bars)	(total{liters}/time{min}	Lugeon Unit (Lu)			Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	% O'D'%	WEATHERING	DEPTH (m)
Ď	/Q	ò	ä	Α.	×	0.00	Ż		F	7	4 3	\$ 8	3		_	Fine to coarse grained,dark brown , loose	9	ŏ	ů.	<u> </u>	5
1	-		wn			0.45	1								i E	clayey silty sand (Top soil layer) 0.45 Fine to coarse grained,brown, clayey silty sand with weathered rock fragments 1.00 Fine to coarse grained,brown, dense					1
2	6		Light brown			1.50 1.95	57								1	silty sand with weathered rock fragments 2.15 Moderate to highly weathered biotite gneiss (may be a boulder)		90			2
3				_		3.00 3.45	61									Fine to coarse grained silty sand with highly weathered rock fragments					3
4	7		/ie												9	3.90 Fresh to highly weathered garnet biotite gneiss 4.10		80			4
5			Dark Brown to gray												((Medium to coarse grained brown sand with mica (Sludge sample) (Highly decomposed rock) Fresh to highly weathered garnet biotite gneiss 5.3		77			5
6						5.75 6.20	16								\	Fine to coarse grained,light brown, silty sand with weathered feldspar and mica (Highly decomposed rock)					6
7															1	Fine to medium grained,brown sitty sand with mica (Sludge sample) 7.00 Moderate weathered to highly weathered garnet biotite gneiss 7.20		50			7
8															F	Fine to medium grained,brown silty sand with weathered mica (Sludge sample) 7.70 Fine to coarse grained,yellowish brown silty sand with weathered feldspar and mica					8
9			nwo			9.25 9.70	74								((Highly weathered rock)					9
10	ğ		Light brown													10.20 Fine to coarse grained,reddish brown					10
11	-					10.65	33								<u>(</u>	clayey silty sand (Weathered rock fragments) 11.00 Fine to medium grained,brown silty sand (Sludge sample) 11.30					11
12	-					12.40 12.60	>50								ſ	Fine to coarse grained,brown, silty sand with mic 12.00 Fine to coarse grained,light brown, silty sand with weathered feldspar					12
13																13.00					13



-	<u> </u>	ΔΤΙ	ON	- <u>-</u>	M	VIN .		NEL	Oi	<u> </u>	ING	1146		/II/	B.H No.: MT 6		0.50	,00	UNIT Page	2 0	of 3
۲	L		RILLIN		141/	SPT RE	_	JOINTS	L	P	ERME	BILITY			GENERAL DESCRIPTION		RECO	VERY	. age	T	. 3
DЕРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	-	PRESSURE (bars) WATER LOSS	(total{liters)/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING		DEРТΗ (m)
															Fine to coarse grained,light brown, silty sand vith weathered feldspar 13.50						
14	Ļ														Highly weathered biotite gneiss 14.00 Fine to medium grained,brown, silty		40				14
15			Brown to Light gray												sand with weathered mica (Sludge sample) (May be decomposed rock)		55				15
			rown to												Highly weathered biotite gneiss 15 Fine to coarse grained,dark brown, silty		55				
16	9														sand with mica (Sludge sample) 15.80 Fine brown silt (Sludge sample) 16.00						16
															Fine to coarse grained,dark brown, silty sand with mica (Sludge sample)						
17																					17
															Fine to coarse grained, light brown, silty						
18	3														sand with weathered feldspar and mica (Sludge sample)						18
															18.30 Fine to coarse grained,dark brown, silty						
19)		amy red												sand with weathered feldspar and mica (Sludge sample)						19
			Light creamy red																		
20)																				20
21	10																				21
			vater loss)																		
22	2		5m Complete water loss)												22.00						22
															Yellowish brown silty sand(Sludge sample) 22 Fresh to moderately weathered garnet biotite gneiss22.50		64				
23	3		Whitish brown (at 22												Fine to coarsegrained,brown silty sand with weathered mica(Sludge sample) 23.00						23
	12		W												Fresh to moderately weathered garnetiferrous quartzo feldspathic gneiss 23.35		60				
24															Fresh to moderately weathered biotite gneiss		27				24
															24.25 Moderate to highly weathered garnet		29				
25															biotite gneiss						25
															25.55						
26			۸n												Fine to coarse grained,dark brown, silty gravelly sand with weathered mica						26
			Light to dark brown												(Sludge sample)						
27			Light to																		27
28																					28
					28.45 16/9										28.20 Fine to coarse grained,dark brown silty						
29					16/9										gravelly sand with highly weathered rock fragment						29
	13		N.												(May be weathered rock) 29.						23
30			Gray to brown												Fine to medium grained,dark brown, silty sand with weathered mica (Sludge sample) 30.00						30
30	1		Ø				1					<u> </u>			(Sludge sample) 30.00		<u>I</u>	<u> </u>			JU



H	20	Λ T	101	1	NA 4	. 141 /		INEL	· Or	\ <u></u>	147	וכ	INE	<u>-C</u>	_	B H No . MT 6			UNI	age 3	of 3
۲			RILLIN			AIN SPT RE		JOINTS		Р	ERM	IEAE	ILITY			B.H No.: MT 6 GENERAL DESCRIPTION		RECO	OVERY	age 3	01 3
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	OLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DЕРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	(w)	rs)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, Joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРTΗ (m)
31																Fine to coarse grained,dark brown, silty gravelly sand with rock fragments 31.20 Fine to coarse grained,dark brown silty gravelly sand					31
33			k brown													32.70 Fine to coarse grained,dark brown silty sand with weathered mica (Sludge sample)					33
34	14		Light brown to dark brown																		34
36			brown																		36
38		38.00		-												Slight to highly weathered garnet biotite gneiss 38.00 Fresh garnet biotite gneiss (High % of Quartz)		85 93	93		38
39 40			Light gray(38.95m complete water loss)					Joint at 40.10(sub horizontal) joint surface slightly weathered													39
	15		ž					into rock	ORF	HOI	F	CC	MP	I FT	FD	AT 40.10m					
41																					41
42																					42
44																					44
45																					45
46 47																					46



<u> </u>	<u> </u>	л Т			CI	IDC		TANK	<u> </u>	`-	-	<u> </u>					- 1
Ľ					DAT			TANK BOREHOLE DATA	ı							B.H No.: MT 7 Page 1 of KEY LEGEND FOR GRAPHIC LOG	4
07			LLII						JOIN	T ROU	GHN	ESS			—	JOINT SEPARATION Sand	\dashv
	RTED				3/9/1			X-COORDINATE :161,591.171m		very ro						V= very tight Clay	
CON	IPLET	ΓED :		200	3/10/	6		Y-COORDINATE :198,111.429m	SR: s	lightly	rough	1				T= tight MO= moderately open Garnet biotite gneiss Quartzo feldspathic gneiss	
MAC	HING	TYPI	E :	TOI	NE			ELEVATION (COLLAR) :124.040m	S= sr SL=s	notth lickens	ided					O= open Charnockite Granitic gneiss	
DRII	LING	MET	HOD :	RO	TAR	1		ELEVATION (BOTTOM) :m		T SPA very w						OTHER SYMBOLS Quartzite SL/CW - Soil & Completely Weathered Calc gneiss/Crystalline Lime Stone	
COF	E BA	RREL	, BIT	:NX				FINAL DEPTH :60.00m	W= w	ridely						HW - Highly Weathered Boulder	200
FOR	EMAN	d ·		MD	АМН	D		INCLINATION : Vertical		modei losely	ately	wide				MW - Moderately Weathered TCR RQD //EATHER SW - Slightly Weathered S	L/CW
									VC=	very clo	osely						HW MW
LOG	GED				VIS/R	MLK		BEARING : -	┡							GWL - Ground water Level	sw
		1	RILLII	NG		SPT RES	SULTS	JOINTS	+	ŝ	PER	(IVIE)	ABILIT	Y	(S)	GENERAL DESCRIPTION RECOVERY	
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	товоттом	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyrittic,etc. scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints 90 90 80 90 80 90 90 90 90 90 90 90 90 90 90 90 90 90	DЕРТН (m)
						0.00										Fine to coarse grained,reddish brown,loose	
						0.45	6									clayey, silty sand(Top soil layer) 0.45	
1																Fine to coarse grained,reddish brown, silty sand (More % of coarse grains available)	1
2						1.55 2.00	8										2
																	Ī
3						2.00										0.00	3
3						3.00 3.45	16									3.00 Fine to coarse grained,red to pink, clayey	3
																sity,sand	
																(Some gravels available)	
4																	4
						4.55											
5	17					5.00	12										5
6						6.00											6
			_			6.45	7										
			Brown														
7			_														7
					7.89	7.55										7.68	
8					7.89 18/9	7.68	>50								Į	Fine to medium grained,reddish brown silty sand	8
Ť															Į	(Some weathered micas available)	Ť
															Į		
_					9.04										Į		
9					9.04 19/9	9.00	>50								Į		9
						3.21	-30										
10																	10
						10.55											
						11.00	42										
11					10.92 21/9											11.00	11
																Fine to coarse grained,reddish brown,dense	
																Quartz sand	
12						12.00											12
	18					12.38	>50										
13															Į	13.00	13
_				_		_			•	•	_			_			—



_	20	<u> </u>	101	\I -	CI	IDC		BOREHOLE LOG F	<u>Ur</u>	<u> </u>	NC	JII	NE	EK	IIIC				UNIT		of 4
Ц			RILLI		· St	JK(TANK JOINTS			PER	MEA	BILIT	Y		B.H No.: MT 7 GENERAL DESCRIPTION		RECO	OVERY	e 2 c	л 4 Т
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM	PRESSURE (bars)		(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyriffic,etc: scale as for joint spacing), weathering, alteration, minor linbological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DEPTH (m)
14	-					13.00 13.45	16									Fine to medium grained,brown silty sand (Some weathered micas available)					14
15	-					15.00 15.45	14														15
16			Brown			16.55 17.00	18														16
18																17.50 Fine to medium grained,light brown silty sand					18
19	-				18.95 22/9	18.00 18.24	>50									(Some weathered micas available) (May be highly decomposed rock)					19
20		20.48				19.55 19.60	>50									20.48					20
21	-															Moderate to highly weathered biotite gneiss		35 18			21
22	-															23.00					23
24			Light brown to light grey													Slightly to moderately weathered biotite gneiss 24.00 Moderate to highly weathered biotite		22			24
25	21		Light bro					(Core loss due to weathered zone from 25.0 to 25.45m) Joint at 25.45(irregular) highly								gneiss 25.00 Slightly to moderately weathered biotite gneiss (Pegmatitic feature appeared)		58	44	ŀ	25
26	-							weathered in to rock Joint at 25.85m(30 ⁶) joint surface slightly weathered into rock)	25.50		1 4 7		- 0.05 0.25	0.1	2v10 ⁻⁶	(Core loss due to weathered zone) 26.00 Slightly weathered biotite gneiss (Some garnets available)		25			26
27								(Joint set has developed from 27.50 to 28.33m along the foliation planes foliation planes, joint intensity 5/m)	25.50	29.00	10 7 4 1		0.63 0.30 0.14 0.03	U.1	3x10 ⁻⁶	27.50 Slightly weathered biotite gneiss		80 90	60 50		27
28			Light grey													(In some places pegmatitic feature appeared) 28.33 Fresh biotite gneiss (Quartz % is high)		100	100		28
30			hgil													30.00					30



1 (CA	TI	10	V :-	· SI	JR		<u>BOREHOLE LOG F</u> TANK	<u> </u>	<u> </u>	10	1146			B.H No.: MT 7			Pag	e 3 c	of 4
Ì			RILLIN			PT RI		JOINTS			PERM	IEABILI	ΤΥ		GENERAL DESCRIPTION		RECO	OVERY		П
DЕРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM	PRESSURE (bars)	(total(liters)/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DЕРТН (m)
31 32 33 34 35	23							Joint at 31.48m(25°) (tight joint) Joint at 31.63m(35°) (tight joint- surface filled with thin film of white material) Joints at 32.05 & 32.25m(15°) Joint at 32.90(20°) (tight joints- surfaces slightly weathered into rock) Joint at 32.94(45°) (tight joint, surface filled with white secondary material) Joint zone from 32.97 to 33.10m (Joint surfaces slightly weathered into rock) Joint from 33.25 to 33.35m(55°) Suface filled with grey thin film Joint at 33.50(subvertical) tight joint surfaces slightly weathered into rock Joint at 34.00(40°) tight joint Foliation joint at 34.36(30°) Highly jointed zone(subvertical & subhorizontal) from 34.36 to 36.40m (joint surfaces filled with black material, Rock has broken into pieces due to joints) Joint at 34.90(35°) (surface filled with	29.00		1 4 7 10 7 4 1 1 1 4 7 10 7 4 1 1	- 0.00 1.33 1.56 1.33 1.33 0.42 0.00 0.00 0.16 0.22 0.17	0.20		Fresh biotite gneiss (Quartz % is high) 31.00 Fresh garnet biotite gneiss 33.00 Fresh biotite gneiss (Quartz & garnet rich layer from 33.40 to 33.47m) (Small amount of garnet avilable section from 34.00 to 34.36m) 7.84 Fresh biotite gneiss (Biotite % is high) (Small biotite bands available)		90	100 95 82 70		31 32 33 34 35
38	25		Light grey					thick white material)							36.40 Fresh biotite gneiss (Quartz % is high) (Small amount of garnet avilable)		100	100		38
40	27							Joint from 39.22 to 39.66m(subvertical) surface filled with white secondary material Joint at 40.98m(30°) (tight folition joint)		44.00	1 4 7 10 7 4 1	0.20 0.10 0.15 0.12 0.40	0.0	3x10 ⁻⁷	40.00 Fresh garnet biotite gneiss (Quartz % is high)			64 98		40
42	28							Joint from 42.22 to 42.41m(vertical) (surface filled with white secondary material) Joint at 42.73m(30 ⁰) (tight joint-surface filled with grey secondary material)										100		42
44	29							Joint at 43.45m(30°) Joint at 43.75m(45°) (surfaces filled with black secondary material Joint from 44.0 to44.20m(subvertical) Joint at 44.80m(30°))						Fresh biotite gneiss (Small amount of garnet available) 44.20			90		44
45 46								(surface filled with dark grey material)	43.90	49.00	1 4 7 10 7	- 0.04 0.15 0.20	0.0	4x10 ⁻⁷	Fresh biotite gneiss (Quartz % is high)			100		45
47											7 4 1	0.16			Fresh biotite gneiss 47.00					47

G	EC	LC	G	ilC	Αl	_ I		/ESTIGATION FOR BOREHOLE LOG F								DS HYDROPOWER PR	OJI	ECT C	ach 8	ABORATO SITE IVESTIGA	
LO	CA.	TIO	N	:- §	U	₹G		TANK		-						B.H No.: MT 7		10000		age 4	
		DRILL	ING		PT	RES	SULT	JOINTS			PER	MEA	BILIT	Y		GENERAL DESCRIPTION		RECO	OVERY	Ì	П
DEPTH (m)	DAILY ADVANCE	DRILL WATER (COLOR, L	RATE OF DRILLING	WATERIEVELS		DEPTH	N'VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability	rock type, colour, grain size, texture and structure massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D.%	WEATHERING	DЕРТН (m)
																Fresh garnet biotite gneiss					
48	30																				48
49								Joint from 49.30 to 49.55m(subvertical-tight joint surface filled with grey material) Joint at 49.78m(30°)								49.40			52		49
50								(surface filled with dark grey material) Joints from 49.90 to 50.15 & 50.20 to 50.47m(80°) (surface filled with dark grey material)			1		_			Fresh biotite gneiss 50.47					50
51	1							Joint at 50.53m(subhorizontal-tight joint)	49.00	54.00	4 7 10 7		0.02 0.10 0.14 0.10	0.0	3x10 ⁻⁷	Fresh garnet biotite gneiss (Quartz % is high)			L	100	51
52								Joints from 52.45 to 52.62 &			1		0.03						74		52
53	2	light arev	6.6					52.72 to 52.80m(80°) (tight joints) Joint at 53.52m(30°) (Trimolite available along the joint)													53
54		i	i								1 4		- 0.02							100	54
55									54.00	59.00	7 10 7 4		0.08 0.13 0.09 0.04	0.0	3x10 ⁻⁷						55
56	4										1		-								56
57								Joint at 57.61(30°) (fresh,tight joint)													57
58									57.50	60.00	1 4 7 10		- - 0.05 0.08	0.0	3x10 ⁻⁷				65		58
59	5							Joint at 59.53(40°)(fresh,tight joint- surface filled with grey secondary material) Joint from 59.88 to 60.00m(subvertical) (surface filled with light grey material))) 		7 4 1		0.06 0.02 -								59
60	5							Joint at 60.00m(20 ⁰)(tight & fresh joint)								60.00					60
61									В	ore	h	ole	c C C	om	olete	ed at 60.00m					61
62																					62
63																					63
64																					64



							В	OREHOLE LOG FO	RE	NG	IN	EE	RII	NG	Pι	JRPOSES		C	CD IN	VESTIGATI NIT	011
LC	C	ΑT	101	V :-	M	AIN	I TU	INNEL								B.H No.: MT 8			I	Page 1	of 5
		DF	RILLI	ING	DAT	ГА		BOREHOLE DATA								KEY		LEGEND FO	R GRAPHIC	LOG	
STAR	RTED) :		200	3/12	/8		X-COORDINATE :161,984.829m		y rough		S				JOINT SEPARATION V= very tight		Sand Clay			
СОМ	PLET	TED :		200	3/9/9)		Y-COORDINATE :197,955.406m	R: rough							T= tight		Garnet bioti			
MACI	HING	TYP	E:	TOT	NE			ELEVATION (COLLAR) :154.587m	S= smo	tth						MO= moderately open O= open		Charnockite			
DRILI	LING	MET	THOD :			,		ELEVATION (BOTTOM) :m	SL=slick	SPACIN	G					OTHER SYMBOLS		Granitic gne Quartzite	is		
					IAIN	•		·	VW= ve W= wide		/> 2r	n				SL/CW - Soil & Completely Weathered HW - Highly Weathered		Calc gneiss Boulder	Crystaline lime sto	ne	
			L, BIT					FINAL DEPTH :80.06m	MW= m C= Clos		y wio	de				MW - Moderately Weathered SW - Slightly Weathered		TCR	RQD	WEATH	SL/CW
FORE	MAN	N :		MR	АМН	Р		INCLINATION : Vertical		y closel	y					TCR - Total Core Recovery					HW
LOGO	GED	BY:		SRI	VIS/R	MLK	R	BEARING : -								RQD - Rock Quality Designation GWL - Ground water Level					MW SW
		D	RILLII	NG		SPT RE	SULTS	JOINTS			PER	MEAE	BILITY		_	GENERAL DESCRIPTION		RECO	VERY	4	
			DRILL WATER (COLOR, LOSS)						3	(m)					Coefficient of Permeability (cm/s)						
			LOR,	(D				NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS,	9	1			~		ability	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated,		%			
	Š	ENT) X	ILIN	SI:			(ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNES	c		bars)	S	ne{min	(n)	Perme	lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing),	9	VERY		(ª)	
(m)	DAILY ADVANCE	CASING/CEMENT	VATE	RATE OF DRILLING	WATER LEVELS		JVE	SLICKENSIDED)	g P	MOT	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	entof	weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	%	WEATHERING	Ê
DЕРТН (m)	AILY /	ASING	RILL	ATE C	ATER	рертн	N' VALUVE		FROM TOP	TOBOTTOM	RESS	ATER	otal{lite	noabr	oefficie		RAPH	ORE F	R.Q.D. %	EATH	DEPTH (m)
٥	۵	Ö	Δ	ď	>	0.00	Ż		ш	Ĭ	Δ.	3	£	ĭ	Ö	Fine to medium grained,dark brown,	g	Ō	~	3	Δ
						0.45	5									clayey silty sand (Top soil layer) 0.55					
																Slightly weathered garnet hornblend		40			
1																gneiss					1
	12				1.45 12/8											(May be a boulder)					
	12				12/8	2.00										Fine to medium grained, brown,					
2						to 2.24	>50									dense,silty sand					2
																(Some weathered micas available)					
																2.24 Fine to medium grained, light brown,					
3					2.88 19/8											silty sand (Sludge sample)					3
					18/0											(Some weathered micas available)					
4																					4
4																					4
5																					5
6																					6
			Brown																		
7			l																		7
																					H
					7.53 13/8																
_																					
8																					8
9																					9
	40																				
-	13															9.50 Fine to coarse grained, light grey,					
10																silty sand (Sludge sample)					10
																(Some weathered micas and					
																feldspars available)					
11																(May be highly decomposed rock)					11
12																					12
																Fresh slightly weathered, highlite		27	24		
					12.84 7/9											Fresh slightly weathered, biotite gneiss (Small amount of garnets		37	21		
13					//9											available) 13.00					13



L						Е	OREHOLE LOG FO	R E	<u>NGI</u>	N	EE	RII	١G	Pυ	RPOSES		U	UNIT	·	
L	OCA			- N	_		JNNEL								B.H No.: MT 8				ige 2 o	f 5
		DRILI	T		SPT R	ESULT	JOINTS			PERN	ЛЕАВІ	LITY			GENERAL DESCRIPTION		RECO	VERY		1
DEPTH (m)	DAILY ADVANCE	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DЕРТН (m)
14			Œ	Α		2			T	п.	۸	0)	Г		Fresh slightly weathered, biotite gneiss (Small amount of garnets avilable)	9	24	16		14
15	-	Brown													Fine to coarse grained, light grey, silty sand (Sludge sample) (Some weathered micas and feldspars available) (May be highly decomposed rock)					15
16	15	.0	1				Joint at 16.18m (sub horizontal) (irregular, joint surface weathered into rock) Joint at 17.78m (sub horizontal)	16.50	20.00	1 4 7		- 0.43 0.85 1.28	0.3	4x10 ⁻⁶	16.00 Fresh garnet biotite gneiss		95	90		16
17							(irregular joint) Joint at 17.28m (10°) (joint surface slightly weathered into rock)	10.50	20.00	7 4 1		0.86 0.45	0.5	42.10	17.00 Fresh biotite gneiss (Small amount of garnets avilable)		97	85	_	17
18	-	Light grev					Joint from 17.52 to 17.56m (Weathered zone) Joint at 18.56m(sub vertical)										71	50		18
19	-	Lig					(joint surface weathered into rock) Joint at 19.06m (subhorizontal) (tight joint,surface filled thin film of								19.00 Fresh Quartz rich garnet biotite gneiss		98	86		19
20	19						reddish brown material) (Highly jionted zone from 20.0 to 21.0m core loss due to joints)								20.00 Fresh to moderately weathered Quartz richgarnet biotite		63	30		20
21	-						Joint at 21.07(sub horizontal)			1 4 7		- 0.30 0.87			21.00 Fresh Quartz rich garnet biotite gneiss		100	90		21
22							(irregular, joint surface slightly weathered into rock)	19.50	24.55	10 7 4 1		1.85 1.37 0.82 0.15	0.3	5x10 ⁻⁶	(Quartz rich bands from 22.67 to 22.72m from 23.83 to 24.24m from 24.36 to 25.00m			100		22
23	-	Grev													from 25.35 to 25.55m from 26.90 to 27.10m from 29.00 to 29.20m)					23
24	20																			24
25							Joint at 25.26m (35°) (joint surface filled thin film of grey secondary material)													25
26										1 4										26
27		Light grev						24.60	29.00	7 10 7 4		0.07 0.12 0.08 0.03	0.0	3x10 ⁻⁷						27
28	22									1		-								28
29																				29
30	23														30.00					30



							В	OREHOLE LOG FO	R E	NGI	NI	EE	RII	NG	Pι	JRPOSES		00	CU	JNIT	
LC)C/	٩T	101	-: ا	· M	_		JNNEL								B.H No.: MT 8				Page 3	of 5
		DI	RILLII	NG		SPT RI	ESULT	JOINTS			PERM	1EAB	LITY	_		GENERAL DESCRIPTION		RECO	VERY	┩ ̄	
DEPTH (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, perissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHICLOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
											1		_			Fresh Quartz rich garnet biotite gneiss		100		100	
31									29.00	34.00	7		- 0.04		2x10 ⁻⁷	(Quartz rich bands from 31.40 to 31.52m from 34.92 to 35.04m)				ı	31
32											1		-			(Pegmatitic features appaered from 36.75 to 37.15m)					32
33																					33
34	26																				34
35																					35
36									34.00	39.00	1 4 7 10		- 0.03 0.05 0.12		3x10 ⁻⁷						36
37	27							Two parellel joints at 37.36 & 37.93m(45' (joint surfaces filled with thick film of white secondary material))) 		7 4 1		0.06 0.05 0.02			37.00 Fresh biotite gneiss				91	37
38			Light grey					Joint at 37.75m (50°) (joint surface filled thin film of black secondary material) Joint at 37.53m (45°) tight joint								(Pegmatitic features appaered from 38.16 to 38.86m)					38
39	28		_					Joint at 39.75m (45°) (joint surface filled by thin grey film)								39.00 Fresh biotite gneiss (Biotite % is high)			68		39
40								Joint at 40.30m (50°) (joint surface filled by thin black material Joint at 40.80m (50°) (slicken sided joint) (joint surfaces filled with thin film of)							(aloute 7 d ingr)					40
41								black secondary material)			1 4		- 0.06	ı					в	100	41
42									39.15	44.63	7 10 7 4		0.09 0.15 0.09 0.05	0.0	4x10 ⁻⁷						42
43											1		-								43
44	30																				44
45								Joint from 45.70 to 46.30m(vertical)	44.50	49.00	1 4 7 10		- 0.02 0.06 0.17		5x10 ⁻⁷	(Biotite rich layer from 45.70 to					45
46								Joint at 47.07m (30°)	77.50	75.00	7 4		0.09		5810	46.95m)			70		46
47			_					(joint surfaces filled with thin film of grey secondary material)								47.00					47

GEOLOGICAL INVESTIGATION FOR THE BROADLANDS HYDROPOWER PROJECT EZIONIZIERAS A RECUERSO LABORATORY cecb INVESTIGATION **BOREHOLE LOG FOR ENGINEERING PURPOSES LOCATION: MAIN TUNNEL B.H No.: MT 8** Page 4 of 5 GENERAL DESCRIPTION RECOVERY Soefficient of Permeability rock type, colour, grain size, texture and DRILL WATER (COLOR, NO OF JOINTS, SETS, TYPE, SPACING, RATE OF DRILLING structure (massive, cleaved, foliated, total{liters}/time{min} ORIENTATION, CONNECTIONS, SORE RECOVERY lineated, flow banded, gneissose, DAILY ADVANCE (ROGHNESS, PERSISTANCE, PARATION, FILL TYPE, AND THICKNESS SLICKENSIDED) WATER LEVELS Lugeon Unit (Lu) rphyritlic,etc: scale as for joint spacing veathering, alteration, minor lithological characteristics, strengths, joints LOSS TO BOTTOM RESSURE (δP DEPTH (m) WATER I FROM T Fresh biotite gneiss (Biotite % is high) (Small amount of garnets available) 48 48 Joint at 48.58m (irregular) (Biotite rich layer from 48.05 to 50.30m) (joint surface filled with thin film of grey secondary material) 49 49 31 Joint at 50.70m (irregular) (joint surface filled with thin film of black secondary material) Joint at 51.18m (60°) tight joint 50 50 Joint at 51.40m (30°) tight joint (joint surface filled with thin film of black secondary material) 0.07 51 51 49.00 54.00 10 0.12 0.0 0.08 0.02 52 52 (Biotite rich layer from 52.34 to Joint at 52.26 & 53.97m (30°) tight joint 53.28m) (joint surfaces filled with thin film of grey secondary material) 53 53 Grey 54 54 Fresh biotite gneiss 55 55 56 56 0.08 54 00 59.00 10 0 14 0.0 4v10 57 57 0.08 0.03 58 58 59 59 Joint at 59.30m (35°) tight joint Light joint surface filled with thin film of 60 60 black secondary material Joint at 60.95m (40°) tight fresh joint 61 61 0.03 0.09 62 Joint at 62.05m (70°) tight joint 62 59.00 64.00 10 0.18 0.0 5x10 joint surface filled with thin film of 0.10 dark grey secondary material 0.04 Joint from 62.30 to 62.47 (60°) tight joint 63 joint surface filled with thin film of 63 black secondary material

64



LO	OC.	ΑT	IOI	V :-	· M	AIN		INNEL					-			B.H No.: MT 8		Pa	ige 5	of 5
Ħ			RILLI		_	SPT RI				Р	ERM	EABIL	ITY			GENERAL DESCRIPTION	RECO	OVERY		
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS	рертн	N'VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP DEEDTH /AM	TOBOTTOM	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor tithological characteristics, strengths, joints	CORE RECOVERY%	R.Q.D. %	WEATHERING	DE РТН (m)
																Fresh biotite gneiss	100	100		
65	-																			65
66	-								64.00	69.00			- 0.04 0.09 0.20 0.10	0.0	5x10 ⁻⁷					66
67	-										7 4 1		0.10 0.05 0.02							67
68	-		Light grey																	68
69	5	-									1 4		74.0 80.0							69
70	-							Two parellel joints at 70.80 & 80.86m (tight,joint surfaces filled with thin film of dark grey secondary material)	69.00	74.00	5 4 1		95.0 82.0 80.0	10.8	2x10 ⁻⁴					70
71	-							Joint zone from 71.55 to 71.70m (irregular joint surfaces filled grey and										81		71
72	=		100%					white secondary material) (pyrite avaslable along the joint surfaces) Joint at 72.10m (sub horizontal) (joint surface filled with white thin film)										66		72
73	-		00% to 100%					Joint at 72.30m (50°) (joint surface filled with grey thin film) Joint at 72.52m (40°) (Garnets available along the surface)										92		73
74	6	-	Loss 100%	-				Two parellel joints at 73.55 & 74.85m(40°) (joint surface filled with grey thin film)												74
75	-							Joints from 75.44 to 75.49m(subvertical) & at 76.70(45°) & at 76.90(60°) (joint surfaces filled with grey thin film)			1 4 7		- 0.03 0.10					78		75
76	-							Joints at 77.0 & 77.13m(40°) (joint surfaces filled with grey thin film) Joints at77.30 & 77.50m(50°) tight joints	73.50	78.46			0.17 0.13 0.05 0.02	0.0	4x10 ⁻⁷					76
77	-		Light grey					Joints at 78.02 & 78.16m(45°) tight joints Joints at 78.68m(30°) (joint surfaces filled with grey thin film) Joints at 78.76m(30°)					J.UZ			77.50	89	53		77
78	7							(joint surface slightly weathered into rock) Joints at 78.79,78.85,79.0,79.1,79.18, 79.25,79.34,79.4,79.55,79.77,79.88m			1 4		- 0.04			77.56 Fresh biotite gneiss (Small amount of garnets available)	94	83		78
79	-							(horizotal) slightly slicken sided joints Joint from 79.10 to 79.61m (subvertical) (tight joint)	78.00	80.06	7 10 7 4		0.09 0.15 0.09 0.03	0.1	7x10 ⁻⁷	78.46 Fresh garnet biotite gneiss	100	100		79
80	8							(Due to these joints in section from 78.46 to 80.06 rock has broken into pieces)			1		-							80
30	ı °	l	I I	<u> </u>	I I	l	1 <u> </u>	I into pieces)	Bor	e ho	le	СО	mp	let	ed a	at 80.06m	_	ı		30
81																				81



						BOREHOLE LOG FO	<u> DR</u>	EN(GIN	NE	EF	RIN	G F	PURPOSES			NIT	
LO	CA	TIO	N :-	TAI	LR/	CE								B.H No.: TR 1			Page 1	of 2
	D	RILLI	NG D	ATA		BOREHOLE DATA								KEY		FOR GRAPI	IIC LOG	
STAR	TED :		2003	10/10		X-COORDINATE :161313.227m		ROUGH ry rough		•				JOINT SEPARATION V= very tight	Sand Clay			
COMP	LETE	D:	2003	/10/16		Y-COORDINATE :198240.940m	R: roug							T= tight	Biotit	e gneiss		
MACH	IING T	YPE :	TONI			ELEVATION (COLLAR) :65.845m	S= smo	tth						MO= moderately open O= open		tzo feldspathic gne nockite	55	
								kenside SPACIN						OTHER SYMBOLS	Gran Quar	itic gneiss tzite		
		ETHOD		AK I		ELEVATION (BOTTOM) :m	VW= ve W= wid	ery widel elv	y> 2m	1				SL/CW - Soil & Completely Weathered HW - Highly Weathered	Calc Bould	gneiss/Crystalline L ter	imestone	
CORE	BARF	REL, BIT	NX			FINAL DEPTH : 25.30m	MW= m	oderate	ly wide	е				MW - Moderately Weathered	TCR	RQD	WEATH	
FORE	MAN :		MRA	MHP		INCLINATION : Vertical	C= Clos VC= ve	sely ry close	ly					SW - Slightly Weathered TCR - Total Core Recovery				SL/CW HW
LOGG	ED BY	':	SRM	S/RML	KR	BEARING : -								RQD - Rock Quality Designation GWL - Ground water Level				MW SW
Π		DRILLIN	IG	SPT R	ESULT	JOINTS			PERM	IEAE	BILITY			GENERAL DESCRIPTION	RE	COVERY		
		(SSO)					947 :	<u> </u>					(s/wɔ					
						NO OF JOINTS, SETS, TYPE, SPACING,	TE OU	_ 					Coefficient of Permeability (cm/s)	Rock type, colour, grain size, texture and structure (v _o			
	<u>ب</u> ج	DRILL WATER (COLOR,	LING			ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION,			ars)		(min)	ŝ	ermea	massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint	CORE RECOVERY %			
Ê	DAILY ADVANCE	ATER	RATE OF DRILLI WATER LEVELS		je je	FILL TYPE, AND THICKNESS SLICKENSIDED)	9	WO.	PRESSURE (bars)	ross	(total{liters}/time{min}	Lugeon Unit (Lu)	nt of P	spacing), weathering, alteration, minor lithological characteristics, strengths, joints	00		WEATHERING	Ê
DEPTH (m)	ILY AI	ILL W	TE OF	DEPTH	VALUVE		FROM TOP	то воттом	ESSU	WATER	al{liter	Jeon L	əfficie	APHIK	RE RI	.Q.D.	ATHE	DEРТН (m)
DE	<u> </u>	DR	RATE	+-	ź		뜐	TO	A.	W	(tot	Ĵη	ő		8	R.G	×	DE
				0.00	6									Fine to coarse grained,brown,loose,silty				
				0.45	"									sand with some gravels(Top soil layer) 0.45 Fine to coarse grained,brown,silty sand				
1																		1
														1.55				
2				1.55 2.00										Medium to coarse grained brown ,dense, gravelly sand 2.00				2
				2.00	10									Fine to coarse grained, reddish brown,sand				
														(Some amount of coarse graines & gravels				
		Brown												available)				
3		ā		3.00										3.00				3
				3.21	>500									Highly weathered to highly decomposed rock 3.27 Fine to coarse grained,light brown,silty sand				
														(Sludge sample) (Some weathered micas				
4														available)				4
				4.50														ш
				4.50 4.68										4.50 Highly weathered to highly decomposed rock 4.68				
5														Fine to coarse grained,light brown,silty sand				5
														(Sludge sample) (Some weathered micas				
			<u>5.</u> 11/	10										available) (May be highly weathered rock)				
6														5.48				6
0	10 6.0	10												Highly to moderaterly weathered boitite gneiss (High % of Quartz and feldspars) 6.00	59			6
		grey												Highly to moderaterly weathered boitite gneiss	35			
		Light grey																
7																		7
						(Rock has broken into pieces and core loss observed due to weathered zones									27			
		at	<u>7.</u> 14/	34		and joints section from 5.48 to 9.00m)												
8		Water loss at 7.56m	14/	10		and joine occion non or to to crosmy												8
		Wat	<u>8.</u> 17/	1 <u>5</u> 10											34			
9						Joint from 9.0 to 9.05m(weathererd zone)								9.00 Fresh biotite gneiss		## 70		9
Ť						Joint at 9.44m(40°) (tight foliation joint)								(Quartz % is high)		## 70		-
	11					Joint at 9.60m(subhorizontal-tight joint)												
4.0						Joints at 9.76 &9.80m(45 ⁰) (tight joint)												40
10	12					Joint at 9.95m(45°) (white patches observed along the joint surface)			1					10.00 Fresh biotite gneiss		_	05	10
		œ,				observed along the joint sulfidee)			4		0.03						-50	
		Light grey				Joint at 10.79m(30°) (tight joint)			7		0.08							
11		يَّڌ				(joint developed along biotite rich layer)	9.50	14.00			0.15	0	4x10 ⁻⁷					11
						Joints at 10.79 & 11.70m(30 ⁰) tight joints			7		0.09							
						(joints developed along biotite rich layer)			4		0.04							
12																1	00	12
13														13.00				13
				-		•						_					_	_



L)C	;AT	10	N	:- 7	ΓAΙΙ	RA	BOREHOLE LOG FO	<u> </u>		311	N L	<u> </u>	VII.A	<u> </u>	B.H No.: TR 1		10000	UNIT Pa	ige 2	of 2
f	Ĺ		RILLIN			SPT RE		JOINTS			PERM	IEAB	ILITY			GENERAL DESCRIPTION		RECO	OVERY	_	
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEPTH	N' VALUVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	то воттом	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DEРТН (m)
								Joints at 13.54 & 13.90m(25 ⁰)(tight joints)								Fresh biotite gneiss				<u>'</u>	
	14	-						Joint from 15.0 to 15.08m(70°) (tight joint) Joints at 15.27m(30°) (tight foliation joint) Two parellel joints at 15.63 & 15.72m(45°)								Fresh biotite gneiss (Quartz % is high)					14
15								(tight joints)			1		-			Fresh biotite gneiss			80		15
16	<u> </u>								14.00	19.00	4 7 10 7 4		- 0.06 0.13 0.07 0.02	0	3x10 ⁻⁷	16.00 Fresh biotite gneiss (Quartz % is high)			100		16
17											1		-			17.00					17
18	<u>.</u>							Joint from 17.15 to 17.33m(subvertical- tight joint) Joint from 17.73 to 17.89m(80°) (tight joint) Joint at 18.23m(30°) (tight foliation joint)								Fresh biotite gneiss			62		18
19	15		rey																		19
20			Light grey																		20
21	_							Joint at 21.27m(30°) (tight foliation joint- joints developed along biotite rich layer)	19.50	25.30	1 4 7 10 7		- 0.03 0.07 0.04	0	2x10 ⁻⁷				90		21
22								Joint at 21.46m(30°)(tight joint) (Compositional layers have folded from 21.53 to 21.73m)			1		-						100		22
23																					23
24	16	-																			24
25	17															25.30					25
26	ĺ								Во	re h	ole	e c	om	ple	eted	at 25.30m					26
27																					27
28																					28
29																					29
30																					30

GEOLOGICAL INVESTIGATION FOR THE BROADLANDS HYDROPOWER PROJECT LABORATORY & SITE INVESTIGATION UNIT



					E	30	REHOLE LOG FOR I	<u> </u>	IG	IN	ΕE	ΞR	IN	G	PURPOSES		U	UNI		
LOC						RRY	<i>'</i>								B.H No.: BQ1				age 1	of 2
-	DF	RILL					BOREHOLE DATA	10	INT R	OLIG	HNE	22			JOINT SEPARATION		LEGEND FO	R GRAPHIC I	_OG	
STARTE	ĒD :		200	3/7/2	1		X-COORDINATE :165,079.076m	VR	= ver	y rou		.00			V= very tight		Clay			
COMPL	ETED :		200	3/7/2	7		Y-COORDINATE :198,278.868m		rough : sligh		ugh				T= tight MO= moderately open			otite gneiss eldspathic gneiss		
MACHIN	IG TYP	Ε:	том	ΝE			ELEVATION (COLLAR) :176.102m		smot =slick		ded				O= open		Charnock Granitic g			
DRILLIN	IG MET	HOD :	RO	ΓAR	1		ELEVATION (BOTTOM) :m		INT S /= ver			2m			OTHER SYMBOLS SL/CW - Soil & Completely Weathered		Quartzite Calc gnei:	ss/Crystaline lime st	one	
CORE E	BARREI	L, BIT	: NX				FINAL DEPTH :25.05m		wide		telv v	vide			HW - Highly Weathered MW - Moderately Weathered		Boulder TCR	RQD	WEATH	ERING
FOREM	AN:		MR	АМН	Р		INCLINATION : Vertical	C=	Close	ely					SW - Slightly Weathered TCR - Total Core Recovery					SL/CW HW
LOGGE	D BY :		SRI	/IS/R	MLKR	1	BEARING : -	ľ	- 10.	, 0.00	,				RQD - Rock Quality Designation GWL - Ground water Level					MW SW
	D	RILLII	NG		SPT RE	SULTS	JOINTS	t		PER	MEA	BILIT	Υ		GENERAL DESCRIPTION		RECC	VERY		SW
		(SSC							<u>§</u> I					(s/wɔ						
		.OR, L					NO OF JOINTS, SETS, TYPE, SPACING,		DEPTH (M)					ability (Rock type, colour, grain size, texture and structure (massive, cleaved, foliated,		%			
Ļ	ENT	(COI	LLING	S			ORIENTATION, CONNECTIONS, (ROGHNESS PERSISTANCE, SEPARATION, FILL TYPE,	Г		oars)	w	le{min}	(î	Perme	lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing),	(2)	ÆRY		(D	
DEPTH (m)	DAILT ADVAINCE CASING/CEMEN	DRILL WATER (COLOR, LOSS)	RATE OF DRILLING	WATER LEVELS		JVE	AND THICKNESS SLICKENSIDED)	TOP	MOL	PRESSURE (bars)	WATER LOSS	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	%	WEATHERING	(E)
DEPTH (m)	ASING	RILLY	ATE C	MTER	DEPTH	N' VALUVE		FROM TOP	TO BOTTOM	RESS	ATER	otal{lite	ndeon	oeffici		RAPH	ORE F	R.Q.D. %	ЕАТН	DEPTH (m)
	٥		ď	>	0.00	z		<u>"</u>	É	_	>	٤	_	0	Fine to coarse grained brown clayey	Ø	O	α	>	
					0.45	8									silty sand (Top soil layer) 0.45					
1															Fine to coarse grained brown clayey					
1															silty sand					1
															1.50					
					1.50															
2					1.95	11									Fine to coarse grained reddish brown silty quartz sand					2
															(High % of coarse grains)					
															(Some quartz gravels available)					
3					3.00															3
					3.45	18														
4																				4
-				4.26 21/07																-
				21/07											4.50					
					4.50										Fine to coarse grained pinkish brown					
5					4.95	15									silty sand					5
															(Some quartz gravels available)					
6					6.00															6
2.	1	Ę			6.00 6.45	14														
		Brown																		
7																				7
					7.50															
8					7.95	15									7.95					8
															Fine to coarse grained pinkish brown clayey silty sand					
															clayey sitty sand					
9															(Some gravels and weathered					9
					9.00										feldspars available)					
					9.45	20														
10																				10
					10.50										Fine to coarse grained, brown					
11					10.95	23									silty sand					11
															(Some weathered feldspars					
															available)					
12															12.00					12
					12.00										Fine to coarse grained, pink, very					
					12.45	57									dense,silty sand (Some gravels					
13															available) 12.45					13
		_	_	_		_		-	_	•	•	_		_			1			

LABORATORY GEOLOGICAL INVESTIGATION FOR THE BROADLANDS HYDROPOWER PROJECT INVESTIGATION UNIT cecb **BOREHOLE LOG FOR ENGINEERING PURPOSES** LOCATION :- QUARRY Page 2 of 2 PERMEABILITY GENERAL DESCRIPTION rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, NO OF JOINTS, SETS, TYPE, SPACING, DRIENTATION, CONNECTIONS, (ROGHNESS PERSISTANCE, SEPARATION, FILL TYPE, RATE OF DRILLING total{liters}/time{min} PRESSURE (bars) WATER LEVELS ugeon Unit (Lu) porphyritlic,etc: scale as for joint spacing) SSOT GRAPHIC LOG AND THICKNESS SLICKENSIDED) weathering, alteration, minor lithological characteristics, strengths, joints TO BOTTOM FROM TOP WATER DEPTH (Fine to coarse grained ,brown,silty 13.50 Sludge sample) 14 14 23 13.73 13.95 Fresh to slightly weathered .impure (Rock has broken into pieces) 15 15 16 25 16 resh .impure Quartzite Rock has broken into pieces) 17 17 Loss , Sub horizontal joints available inbetween Fresh, garnety ferrous Quartzo 17.05m to 18.16m,(Couldn't determine feldspathic gneiss) exact possition due to core loss) (Rock has broken into pieces due 18 18 oint surfaces filled with thin film of to sub horizontal joints) black secondary material Rock changing zone fresh to slightly Sub horizontal joints available inbetween weathered. Quartzo feldspathic 19 18.16m to 20.60m,(Couldn't determine gneiss to impure Quartzite) 19 exact possition due to core loss) oint surfaces filled with thin film of dark brown secondary material 20 20 Fresh to slightly weathered, impure 21 21 Quartzite (Small amount of micas available) 22 22 23 23 resh Quartzite Sub vertical joints available inbetween In some places rock has broken into 22.75m to 25.05m,(Couldn't determine ieces due to sub vertical joints) exact possition due to core loss) 24 oint surfaces filled with thin film of 24 greyish black secondary material 25 25 Bore hole completed at 25.05m 26 26 27 27 28 28 29 29

30

GEOLOGICAL INVESTIGATION FOR THE BROADLANDS HYDROPOWER PROJECT BORFHOLE LOG FOR ENGINEERING PURPOSES LABORATORY & SITE INVESTIGATION UNIT **BOREHOLE LOG FOR ENGINEERING PURPOSES**



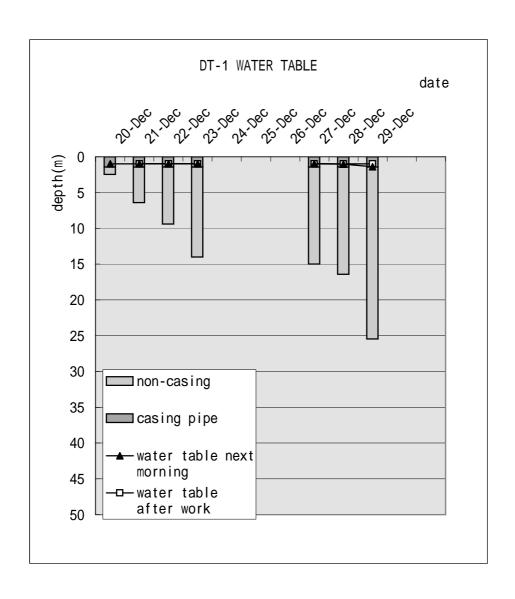
				OREHOLE LOG FOR	Εľ	NG	iΙΝ	1E	E	ΚI	_			0	UNIT		
LOCATIO			RRY	_								B.H No.: BQ 2'				ige 1	of 2
	LING I			BOREHOLE DATA	JOI	NT R	OUG	HNE	SS		_	JOINT SEPARATION		LEGEND FO Sand	R GRAPHIC L	_OG	
STARTED :	2003	3/10/2		X-COORDINATE :164,757.367m	VR:	= very	y rou		-00		\exists	V= very tight		Clay			
COMPLETED:	2003	3/10/5		Y-COORDINATE :198,200.350m		ough sligh		ugh				T= tight MO= moderately open			otite gneiss eldspathic gneiss		
MACHING TYPE :	TON	ΙE		ELEVATION (COLLAR) :157.017m		smott =slick		ded				O= open		Charnock Granitic g			
DRILLING METHO	D: ROT	ARY		ELEVATION (BOTTOM) :m	_	NT S						OTHER SYMBOLS SL/CW - Soil & Completely Weathered		Quartzite	ss/Crystalline Lime s	tono	
CORE BARREL, BI	T: NQ			FINAL DEPTH : 25.10 m	W=	wide	ly					HW - Highly Weathered		Boulder			
FOREMAN :	WLN	J		INCLINATION : Vertical	C=	/= mo	ely		wide			MW - Moderately Weathered SW - Slightly Weathered		TCR	RQD	WEATH	SL/CW
LOGGED BY :		IS/RML	VD.	BEARING : -	VC:	= very	/ clos	sely				TCR - Total Core Recovery RQD - Rock Quality Designation					HW MW
DRILI			RESULT		-	Р	PERM	1FAF	3ILIT	Υ	4	GWL - Ground water Level GENERAL DESCRIPTION		RECO	OVERY		SW
	1 1				-						(cm/s)						
DEPTH (m) DAILY ADVANCE CASING/CEMENT DRILL WATER (COLOR, LOSS)					į	DEPIH (M)					lity (cn	Dealth are released as the testing and attention (
±	9 Z			NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS	<u>,</u> –'		s)		min}		meabi	Rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyritlic,etc: scale as for joint spacing),		RY %			
DEPTH (m) DAILY ADVANCE CASING/CEMENT	RATE OF DRILLING	WATER LEVELS DEPTH		PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	_	M	PRESSURE (bars)	SSC	(total{liters}/time{min}	Lugeon Unit (Lu)	Coefficient of Pern	weathering, alteration, minor lithological	FOG	CORE RECOVERY %		5 NI	_
DEPTH (m) DAILY ADV CASING/CE	EOFI	핆	N'VALUVE		FROM TOP	товоттом	SSUR	WATER LOSS	(liters)	on Ur	ficient	characteristics, strengths, joints	GRAPHIC LOG	E REC	.O.D. %	WEATHERING	DEРТН (m)
DAIL CASI	RATI	WATER	ž		FRC	TO B	PRE	WAT	(total	Luge	Coef		GRA	COR	я. Q	WEA	DEP
		0.0										Fine to coarse grained, brown,loose					
		0.4	5 4									clayey silty sand (Top soil layer) 0.45 Fine to coarse grained, reddish brown,clayey					
1												silty sand (Some rock fragments available) 1.00					1
												Fine to coarse grained, yellowish brown,clayey					
												silty sand					
2												(Some weathered rock fragments available) 2.00					2
												Fine to coarse grained, light yellow,clayey					
												silty sand					
3		2.90 2/10										(Highly weathered rock)					3
~ 	7	2/10										3.00 Medium to coarse grained yellowish brown					-
												silty sand (Sludge sample)					
4		3.90										(Some weatherred feldspars available) 3.65					,
4	•	3.90 3/10										Highly weathered to highly decomposed granitic gneiss					4
												4.65					
												Fine to coarse grained, light brown,sandy		,			
5												silty clay					5
												Fine to coarse grained yellowish brown silty sand (Sludge sample)					
												, , , , , , , , , , , , , , , , , , , ,					
6																	6
												6.60 Highly weathered to highly decomposed granitic					
7												gneiss (In some places rock weathered into clay)7.0					7
td.												Fine to coarse grained, light yellow,					
7 Molley Holl of eileM												silty sand (Sludge sample)					
8 White												(Sludge sample)					8
												Highly weathered granitic gneiss (Rock has					
												broken into pieces due to weathering)					
9												Fine to medium grained, light yellow, silty sand (Sludge sample) 9.00					9
												Highly weathered to highly decomposed		•			
												granitic gneiss					
10												10.00					10
2												Fine to coarse grained, light yellow,					"
												silty sand 10.					
11												Highly weathered to highly decomposed hornblende					44
11												biotite gneiss(High % of hornblende) 11.00 Highly weathered to highly decomposed					11
12 didwict years												granitic gneiss					
J Very												11.70					
12		12.8										Fine to coarse grained, light yellow,					12
12.4		4/10										silty sand (Sludge sample) (Some weathered feldspars available) 12.40					
												High to moderately weathered granitic gneiss		80			
13										60	Ш	13.00					13



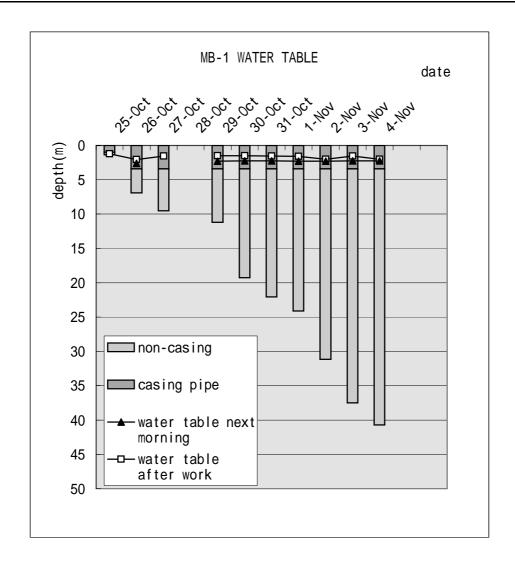
h	oc.	ΑT	IOI	N :	-ი	UAI			REHOLE LOG FOR		V.C	7111	4 L	<u> </u>	NII.	_	B.H No.: BQ 2'		100000	UNI	age 2	of 2
F			RILLII		_	SPT		_	JOINTS		F	PERM	ЛΕΑΙ	BILIT	Υ		GENERAL DESCRIPTION		RECO	OVERY	Ī	
DEРТН (m)	DAILY ADVANCE	CASING/CEMENT	DRILL WATER (COLOR,LOSS)	RATE OF DRILLING	WATER LEVELS	DEРТН	H / 1	N VALOVE	NO OF JOINTS, SETS, TYPE, SPACING, ORIENTATION, CONNECTIONS, (ROGHNESS, PERSISTANCE, SEPARATION, FILL TYPE, AND THICKNESS SLICKENSIDED)	FROM TOP	TO BOTTOM DEPTH (M)	PRESSURE (bars)	WATER LOSS	(total{liters)/time{min}	Lugeon Unit (Lu)	Coefficient of Permeability (cm/s)	rock type, colour, grain size, texture and structure (massive, cleaved, foliated, lineated, flow banded, gneissose, porphyrittlic,etc: scale as for joint spacing), weathering, alteration, minor lithological characteristics, strengths, joints	GRAPHIC LOG	CORE RECOVERY %	R.Q.D. %	WEATHERING	DЕРТН (m)
14			Light grey to white						Joint 14.00 & 14.32 (subhorizontal) (joint surfaces weathered into rock & filled with black material) Two parellel joints from 14.0 to 14.12 & from14.17 to 14.32m(80°) (joint surfaces moderately weathered into rock & formed redish brown material) (Rock has broken into pieces due to								High to moderately weathered granitic gneiss (Rock broken into pieces due to weathering & joints) (Some hornblende & biotite rich layer observed) 14.00 Fresh to moderately weathered granitic gneiss (Biotite rich layer available along the joint from (vertical) 14.38 to 15.00m) 15.00		77 78 88	33 25		14
16 17			Light brown to white						subhorizontal & sub vertical joints in section from 15.0 to 16.0m, joint intensity 7/m ,joint surfaces weathered into rock) Joint from 16.13 to 16.28m(60°) (joint surface weathered into rock & filled with thick black secondary material) Two parellel joints at 16.70 & 16.73m(55°)								Slight to moderately weathered granitic gneiss		88			16
18	3								(Surfaces filled by yellowish brown material) Sub vertical joint from 16.32 16.73 (joint surfaces slightly weathered into rock) Joint from 16.78 to 16.90m(60°) (joint surface weathered into rock & filled with black secondary material)							•	Fesh granitic gneiss		100 89	100 89		18
20			ite Light grey						Joints at 19.0,19.2,19.32,19.55m (subhorizontal) (joint surfaces weathered into rock) Weathered zone from19.62 to 20.0m (Core loss is due to this zone)								19.62 Slight to moderately weathered granitic gneiss		100 39		ı	20
21			Light brown to white	_					Joints at21.22 & 22.00m(35°) (tight joints, weathered into rock) Joint at21.45m(70°) (tight joint, surface filled with yellow material) Joint at22.65m(subhorizontal-irregular								(Inbetween section from 20.06 to20.59m rounded patches formed due to solution activities and due to this rock has moderately weathered)			90 85		21
23			Light brown to light grey						joint surface highly weathered into rock) Joints at23.28m(10 ⁰) & 23.72(15 ⁰) (joints weathered into rock) (surfaces filled with dark brown material) Tight joint from23.4 to 23.65(vertical)								22.65 Fresh to slightly weathered granitic gneiss (In some places rock has discoloured due to solution activities)		85	62		23
25			Light b						(Rock has broken into pieces due to joints & weathering in section from 24.00 to 25.10m, joint intensity 6/m)	ore	h	ole	e c	or	np		Fresh to highly weathered granitic gneiss (In some places rock has discoloured due to solution activities) 25.10 ted at 25.10m			26		25
26																						26
28																						28
29																						29
30)																					30

1.2 Water tables of Drilling holes

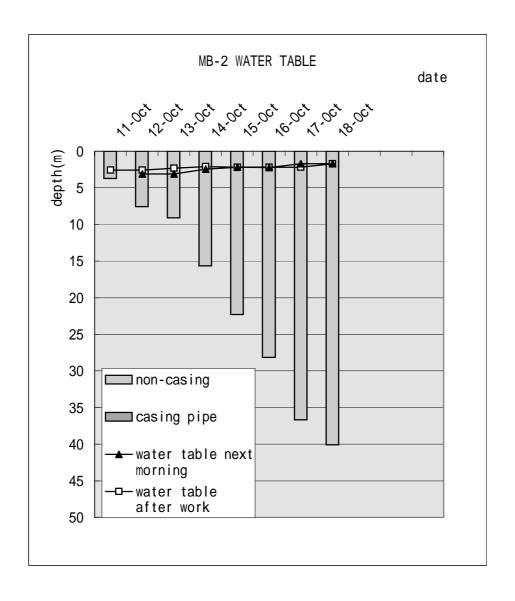
Bori	ng No.	DT-1	25m						Dive	rsion t	unne		
Date	daily advance	water table after	water table next	casing pipe	non- casing		Standa etration			Lugion	n Test		Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
20-Dec	2.50		1.00	1.45	1.05	0	0.45	31					
21-Dec	6.45	1.00	1.00	1.45	5.00				1.45	6.45	0		
22-Dec	9.45	1.00	1.00	1.45	8.00				6.45	11.45	0		
23-Dec	14.05	1.00	1.00	1.45	12.60				11.5	16.45	0		
24-Dec													
25-Dec													
26-Dec													
27-Dec	15.04	1.00	1.00	1.45	13.59				16.5	21.45	0		
28-Dec	16.45	1.00	1.04	1.45	15.00				21.5	25.5	0		
29-Dec	25.50	1.00	1.40	1.45	24.05								



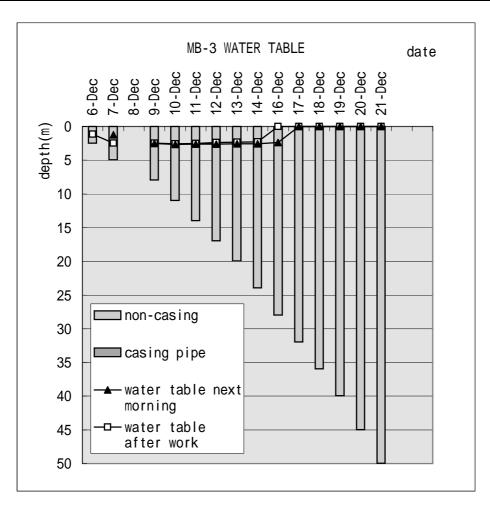
Bor	ing No.	MB-1	40m						Main l	Dam			
Date	daily advance	water table after work	water table next morning	casing pipe	non- casing		tanda tratio			Lugio	n Tes	t	Remarks
	depth	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
25-Oct	1.40	1.20		1.00	0.40	0	0.45	5					
26-Oct	6.95	2.05	2.60	3.40	3.55								
27-Oct	9.58	1.55		3.40	6.18				4.35	9.08	3	4.37*10	5
28-Oct					0.00								
29-Oct	11.24	1.50	2.30	3.40	7.84								
30-Oct	19.31	1.50	2.25	3.40	15.91				9.09	14.22	0		
31-Oct	22.12	1.55	2.25	3.40	18.72				14.22	19.31	0		
1-Nov	24.17	1.60	2.30	3.40	20.77				19.31	24.17	0		
2-Nov	31.20	2.00	2.30	3.40	27.80				24.17	29.74	0		
3-Nov	37.54	1.55	2.25	3.40	34.14				29.74	34.27	0		
4-Nov	40.77	2.00	2.25	3.40	37.37				34.27	40.77	0		
					0.00								



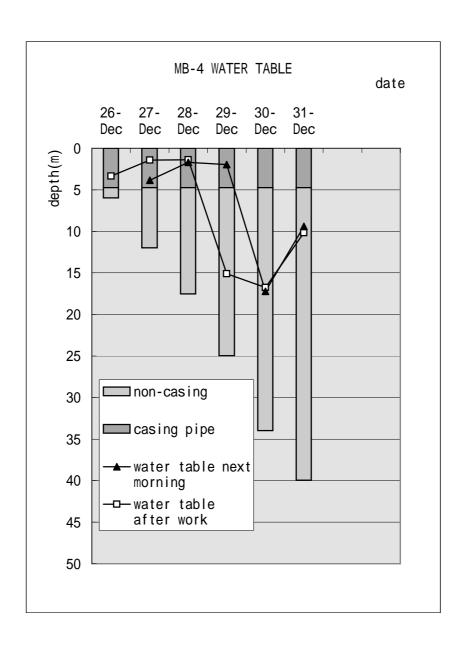
Bor	ing No.	MB-2	40m						Main	Dam			
Date	daily advance	water table after	water table next	casing pipe	non- casing		tanda tratio	rd n Test		Lugior	n Test		Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
11-Oct	3.76	2.60		0.00	3.76				1.00	5.30	1	85*10 ⁻⁵	
12-Oct	7.62	2.60	3.10	0.00	7.62				5.30	9.85	0	39*10 ⁻⁷	
13-Oct	9.14	2.30	3.10	0.00	9.14				9.85	14.80	0	29*10 ⁻⁷	
14-Oct	15.67	2.10	2.45	0.00	15.67				14.80	19.54	0	08*10 ⁻⁷	
15-Oct	22.34	2.20	2.20	0.00	22.34				19.54	24.05	0	46*10 ⁻⁸	
16-Oct	28.17	2.20	2.25	0.00	28.17				24.05	29.93	0	15*10 ⁻⁸	
17-Oct	36.71	2.20	1.70	0.00	36.71				29.93	35.25	0	88*10 ⁻⁸	
18-Oct	40.13	1.70	1.70	0.00	40.13				35.25	40.13	0	06*10 ⁻⁷	



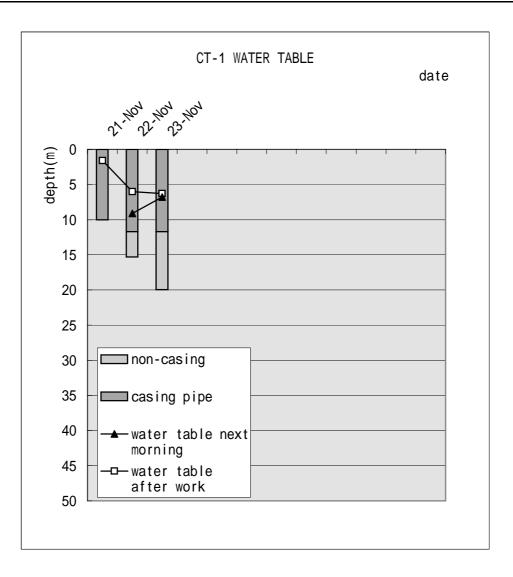
water water				(50 deg	rees)				Mair	n Dar	n		
Date	daily advance	water table after	water table next	casing pipe	non- casing		tanda ratio	ırd n Test		Lugi	on Test	į	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)		cm/sec	
6-Dec	2.50	1.16			2.50				0.65	5	0.00		
7-Dec	5.00	2.45	1.23		5.00				5	10	0.00		
8-Dec					0.00				10	15	0.00		
9-Dec	8.00	2.46	2.53		8.00				15	20	0.00		
10-Dec	11.00	2.56	2.65		11.00				15	20	0.00		
11-Dec	14.00	2.54	2.63		14.00				20	25	0.00		
12-Dec	17.00	2.36	2.60		17.00				25	30	0.00		
13-Dec	20.00	2.35	2.58		20.00				30	35	0.00		
14-Dec	24.00	2.30	2.55		24.00				35	40	0.00		
16-Dec	28.00	0.00	2.38		28.00				40	45	0.00		
17-Dec	32.00	0.00	0.00		32.00				45	50	0.00		
18-Dec	36.00	0.00	0.00		36.00								
19-Dec	40.00	0.00	0.00		40.00								
20-Dec	45.00	0.00	0.00		45.00								
21-Dec	50.00	0.00	0.00		50.00								



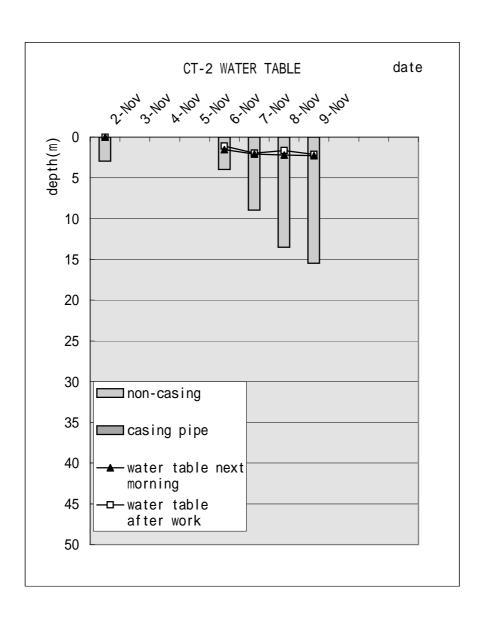
Borin	g No.	MB-4	40m						Mair	ı Dar	n		
Date	daily advance	water table after	water table next	casing pipe	non- casing		tanda tratio			Lugio	on Tes	t	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
26-Dec	6.00	3.36		4.75	1.25				5	10	0		
27-Dec	12.00	1.42	3.85	4.75	7.25				10	15	0		
28-Dec	17.55	1.40	1.68	4.75	12.80				15	20	0		
29-Dec	25.00	15.10	1.95	4.75	20.25				20	25	0		
30-Dec	34.00	16.74	17.23	4.75	29.25				30	35	0		
31-Dec	40.00	10.16	9.39	4.75	35.25								



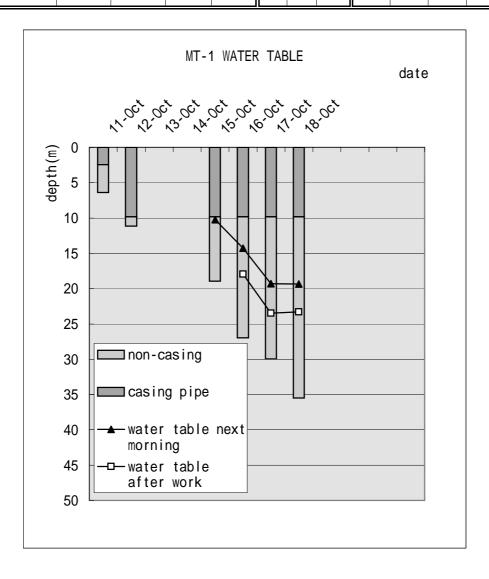
Bori	ng No.	CT-1	20m					Con	duit				
Date	daily advance	water table after	water table next	casing pipe	non- casing	S Pene		Lugio	on Tes	t	Remarks		
	depth					from	from	to	Lu-	k			
	(m)	(m)	(m)	(m)	(m)	(m) (m) value ((m)	(m)	value	cm/sec	
21-Nov	10.00	1.60		10.00	0.00	0.00 0.45 4							
22-Nov	15.35	6.00	9.10	11.72	3.63	1.55	2.00	5					
23-Nov	20.00	6.28	6.78	11.72	8.28	3.00	3.45	7					
						4.55	5.00	4					
						6.00	6.45	8					
						7.55	8.00	2					
						9.00	9.45	4					
						10.55	11.00	9					



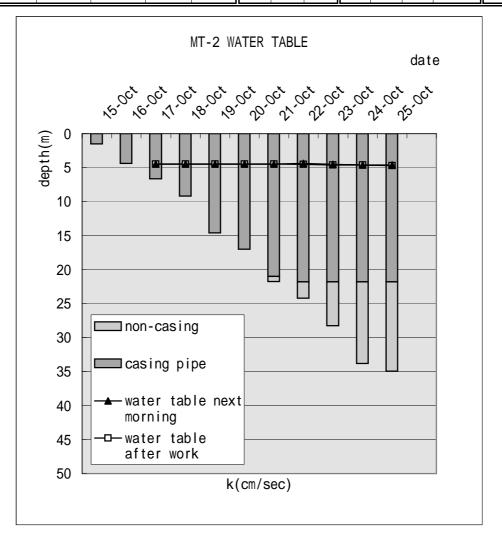
Bori	ng No.	CT-2	15m						Cone	duit 7	Ггасе		
Date	daily advance	water table after	water table next	casing pipe	non- casing		tanda tratio	ırd n Test		Lugio	on Tes	t	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
2-Nov	3.00	0.00	0.00	0.00	3.00								
3-Nov													
4-Nov													
5-Nov													
6-Nov	4.00	1.10	1.52	0.00	4.00								
7-Nov	9.00	1.96	2.10	0.00	9.00				2.5	7	0		
8-Nov	13.55	1.64	2.21	0.00	13.55				7	12	0		
9-Nov	15.50	2.13	2.29	0.00	15.50				12	15.5	0		



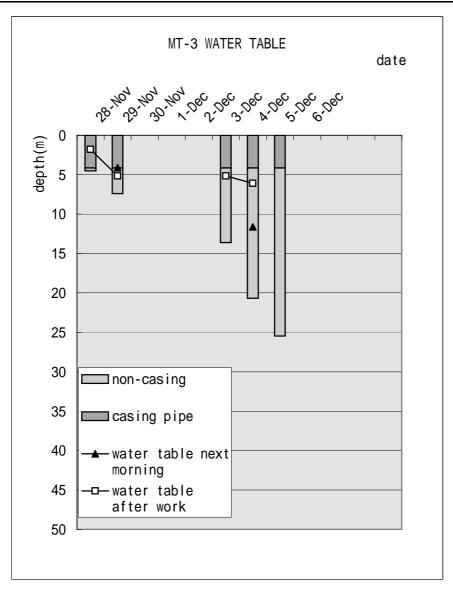
Bor	ing No.	MT-1	30m						Main	Tunn	el		
Date	daily advance	water table after	water table next	casing non- pipe casing Penetration Test						Lugio	on Test		Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
11-Oct	6.45			2.43	4.02	0.00	0.45	3					
12-Oct	11.20			9.83	1.37	1.50	1.95	5					
13-Oct						3.10	3.55	11					
14-Oct						4.50	4.95	12					
15-Oct	19.00		10.25	9.83	9.17	6.00	6.45	14					
16-Oct	27.00	17.95	14.30	9.83	17.17	7.50	7.85	46					
17-Oct	30.00	23.46	19.33	9.83	20.17	9.00	9.45	34					
18-Oct	35.54	23.32	19.36	9.83	25.71				30.00	35.54	0.4	5.57*10	-6



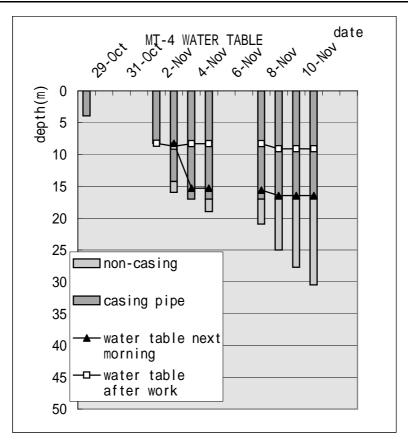
Bor	ing No.	MT-2	35m						Pens	tock			
Date	daily advance	water table after	water table next	casing pipe	non- casing		tandaı tration			Lugi	ion Te	est	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
15-Oct	1.50			1.50	0.00	0.00	0.45	3					
16-Oct	4.40			4.40	0.00	1.50	1.95	25					
17-Oct	6.65	4.45	4.45	6.65	0.00	3.45	3.90	17					
18-Oct	9.20	4.45	4.45	9.20	0.00	5.70	6.55	24					
19-Oct	14.60	4.45	4.45	14.60	0.00	7.65	8.10	HB					
20-Oct	17.00	4.45	4.45	17.00	0.00								
21-Oct	21.80	4.45	4.45	21.00	0.80								
22-Oct	24.25	4.50	4.40	21.80	2.45								
23-Oct	28.30	4.60	4.50	21.80	6.50				21.8	26.8	0	1.01*10	5
24-Oct	33.85	4.60	4.60	21.80	12.05				26.5	31.5	0	5.07*10	7
25-Oct	35.00	4.70	4.60	21.80	13.20				30	35	0	5.07*10	7



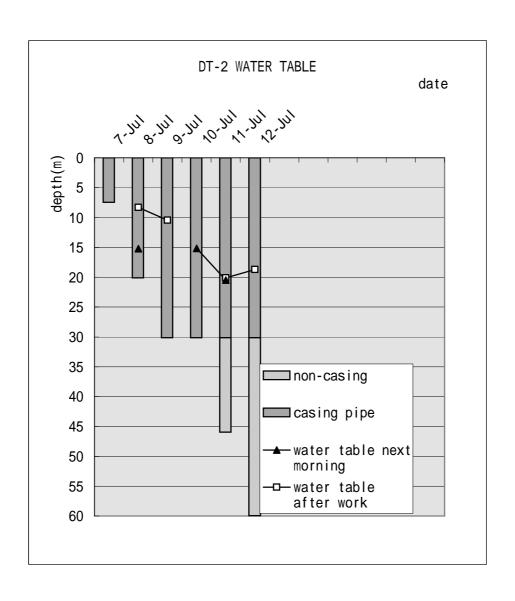
Born	ng No.	MB-3	25m						Pensto	ock			
Date	daily advance	water table after work	water table next morning	casing pipe	non- casing	Standa	rd Pene Test	tration		Lugion	Test		Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	valu	cm/se	
28-Nov	4.55	1.80		4.15	0.40	0.00	0.45	8	4.15	9.15	0.8		
29-Nov	7.45	5.15	4.10	4.15	3.30	1.95	2.40	54	9.15	14.15	0.7		
30-Nov						•							
1-Dec													
2-Dec													
3-Dec	13.65	5.15		4.15	9.50	3.90	4.15	28	14.15	19.15	0.7		
4-Dec	20.70	6.10	11.60	4.15	16.55				19.15	24.15	0		
5-Dec	25.50			4.15	21.35				24.15	25.5	0		
6-Dec													



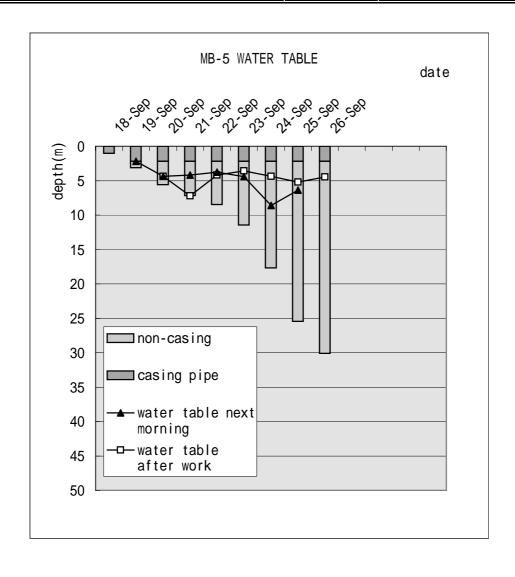
<u>Bori</u>	ng No.	MT-4	30m						Pens	tock			
Date	daily advance	water table after	water table next	casing pipe	non- casing		Standa tration	rd 1 Test		Lugi	on Te	est	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
29-Oct	3.90			3.90	0.00	0	0.45	8					
30-Oct					0.00	2	2.4	15					
31-Oct					0.00	3.9	4.35	15					
1-Nov					0.00	5.9	6.3	27					
2-Nov	8.25	8.25		8.25	0.00	7.8	8.25	31					
3-Nov	16.00	8.70	8.25	14.25	1.75								
4-Nov	17.00	8.30	15.30	17.00	0.00								
5-Nov	19.00	8.30	15.30	17.00	2.00								
6-Nov					0.00								
7-Nov					0.00								
8-Nov	21.00	8.30	15.60	17.00	4.00								
9-Nov	25.05	9.10	16.45	17.00	8.05				17	21.9	0	2.7*10 ⁻⁶	
10-Nov	27.75	9.10	16.45	17.00	10.75				2.19	27.1	0	3.8*10 ⁻⁶	
11-Nov	30.55	9.10	16.45	17.00	13.55				27.1	30.6	0	3.9*10 ⁻⁶	i



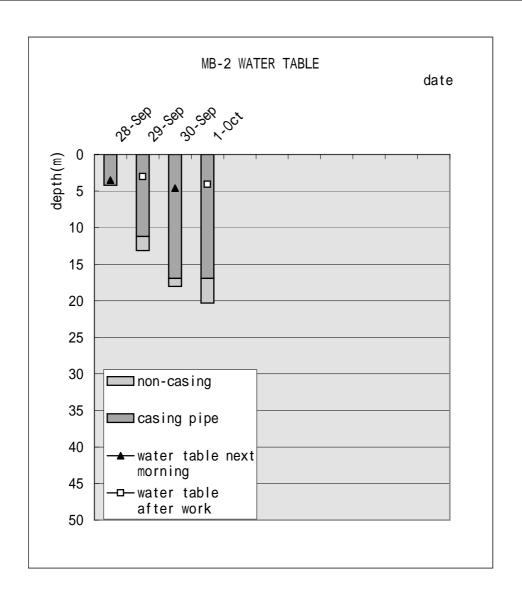
Bori	ng No.	DT-2	60m (45	degrees	s)				Dive	rsion (unne		
Date	daily advance	water table after	water table next	casing pipe	non- casing		Standa etration	rd n Test		Lugio	n Test		Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
7-Jul	7.45			7.45	0.00								
8-Jul	20.10	8.32	15.24	20.10	0.00								
9-Jul	30.12	10.45		30.12	0.00								
10-Jul	30.12		15.18	30.12	0.00								
11-Jul	46.00	20.13	20.48	30.12	15.88								
12-Jul	60.00	18.73		30.12	29.88								



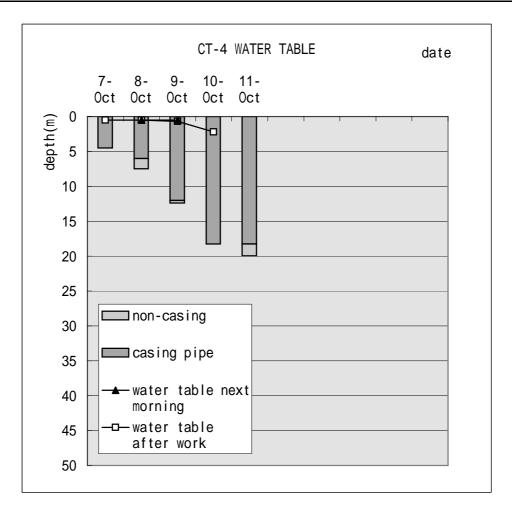
Bori	ing No.	MB-5	30m						Main l	Dam			
Date	daily advance	water table after work	water table next morning	casing pipe	non- casing		tanda tratio			Lugio	n Tes	t	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
18-Sep	1.00			1.00	0.00	1	1.45	1					6.20-7.20
19-Sep	3.15		2.20	2.20	0.95								water loss
20-Sep	5.65	4.35	4.35	2.20	3.45				3.25	8.50	>50		
21-Sep	7.20	7.20	4.20	2.20	5.00				8.50	13.50	0		
22-Sep	8.50	4.20	3.75	2.20	6.30				13.50	19.20	0		
23-Sep	11.50	3.60	4.40	2.20	9.30				19.50	25.50	2.1		
24-Sep	17.70	4.35	8.60	2.20	15.50								
25-Sep	25.50	5.20	6.35	2.20	23.30								
26-Sep	30.15	4.45		2.20	27.95								



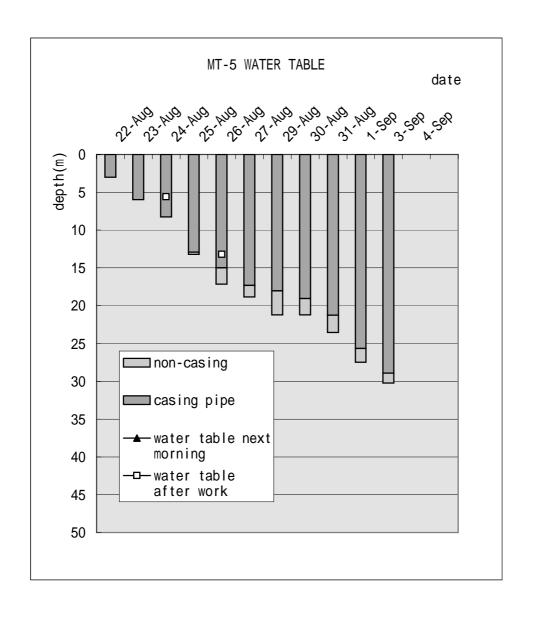
Bori	ng No.	CT-3	20m						Cond	uit			
Date	daily advance	water table after	water table next	casing pipe	non- casing		tanda tration	rd 1 Test		Lugio	n Test		Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
28-Sep	4.20		3.50	4.20	0.00	1.50	1.95	5					
29-Sep	13.20	3.00		11.20	2.00	3.00	3.15	10					
30-Sep	18.10		4.60	16.95	1.15	4.50		>50					
1-Oct	20.35	4.05		16.95	3.40	15.00		>50					



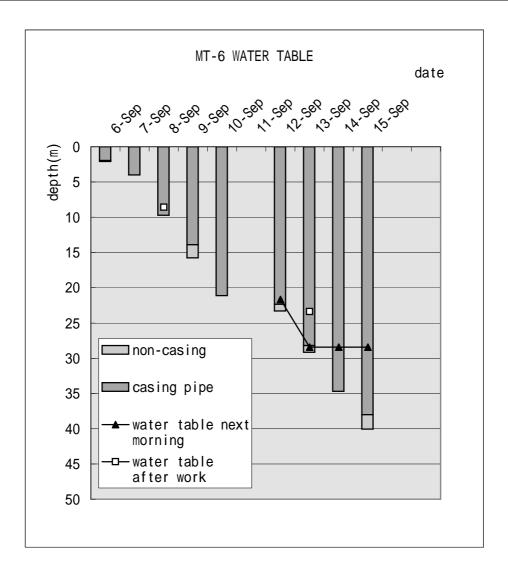
Bori	ng No.	CT-4	20m						Conc	duit			
Date	daily advance	water table after	water table next	casing pipe	non- casing		tandar tration			Lugi	on Tes	st	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
7-Oct	4.50	0.50		4.50	0.00	1.50	1.95	1					
8-Oct	7.50	0.50	0.50	6.00	1.50	3.00	3.45	7					
9-Oct	12.45	0.70	0.50	12.00	0.45	6.00	6.45	9					
10-Oct	18.25	2.20		18.25	0.00	7.50	7.75	24					
11-Oct	20.00			18.25	1.75	9.00	9.45	20					
						10.50	10.95	17					
						12.00	12.45	23					
						14.00	14.45	11					



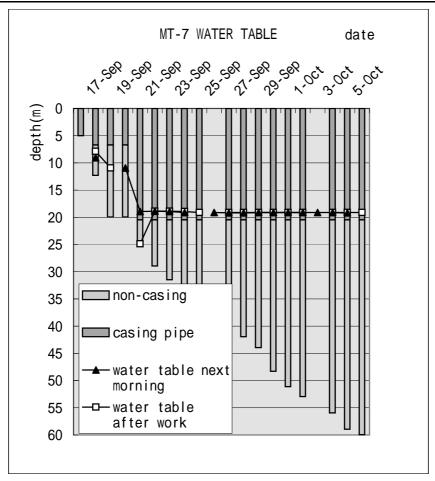
Boring	g No.	MT-5	30m						Mair	ı Tuı	nnel		
Date	daily advance	water table after	water table next	casing pipe	non- casing		tandar tration	-		Lugio	on Tes	st	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
22-Aug	3.00			3.00	0.00	0.00	0.45	4					14.1 m leak
23-Aug	5.95			5.95	0.00	1.50	1.95	5					17.64 m leak
24-Aug	8.25	5.60		8.25	0.00	3.00	3.45	5					28.25 m leak
25-Aug	13.25			12.90	0.35	4.50	4.95	4					
26-Aug	17.20	13.20		15.00	2.20	7.00	7.45	26					
27-Aug	18.90			17.30	1.60	9.25	9.70	58					
29-Aug	21.25			18.05	3.20	10.80	11.25	45					
30-Aug	21.25			19.05	2.20								18m- collapse
31-Aug	23.60			21.25	2.35								
1-Sep	27.50			25.65	1.85								
3-Sep	30.25			28.90	1.35								
4-Sep	30.25												



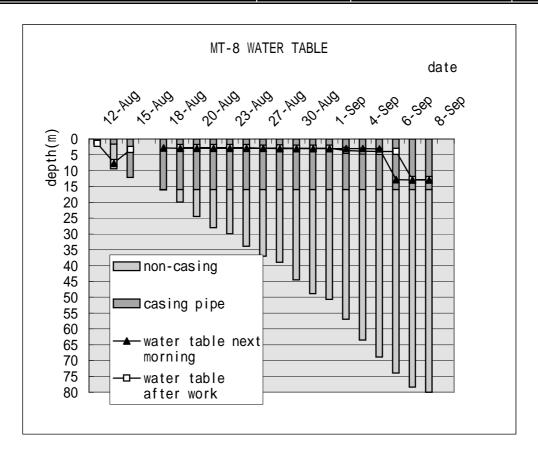
Bori	ng No.	MT-6	40m						Mair	ı Tui	nnel		
Date	daily advance	water table after	water table next	casing pipe	non- casing		tandar tration			Lugi	on Tes	st	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
6-Sep	2.15			1.95	0.20	0.00	0.45	1					22.65 m leak
7-Sep	4.00			4.00	0.00	1.50	1.95	57					38.95 m leak
8-Sep	9.70	8.60		9.70	0.00	3.00	3.45	61					
9-Sep	15.80			13.90	1.90	5.75	6.20	16					
10-Sep	21.10			21.10	0.00	9.25	9.70	74					
11-Sep						10.65	11.10	33					
12-Sep	23.35		21.65	22.35	1.00	12.40	12.60	>50					
13-Sep	29.20	23.40	28.45	28.20	1.00								
14-Sep	34.70		28.45	34.70	0.00								
15-Sep	40.10		28.45	38.00	2.10								



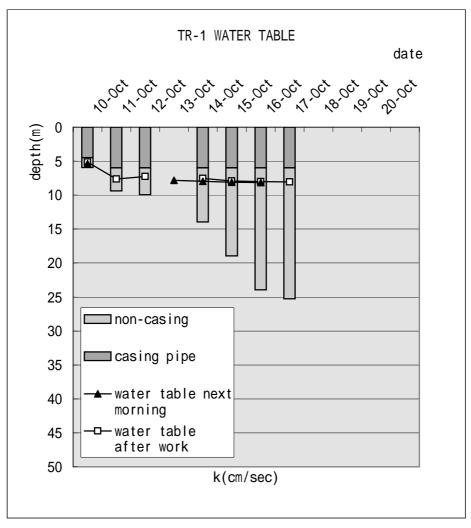
Bori	ng No.	MT-7	60 m						Surg	e Ch	ambe	ı	
Date	daily advance	water table after	water table next	casing pipe	non- casing		tandaı tration			Lugio	on Tes	t	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
17-Sep	5.00			5.00	0.00	0.00	0.45	6	25.50	29.00	0.1		
18-Sep	12.38	7.89	9.04	6.72	5.66	1.55	2.00	8	29.00	34.36	0.3		
19-Sep	20.00	10.95		6.72	13.28	3.00	3.45	16	34.25	39.00	0		
20-Sep	20.00		10.92	6.72	13.28	4.55	5.00	12	39.00	44.00	0		
21-Sep	25.00	24.86	18.95	20.48	4.52	6.00	6.45	7	43.90	49.00	0		
22-Sep	29.00	18.90	18.90	20.48	8.52	7.55	7.68	>50	49.00	54.00	0		
23-Sep	31.50	18.90	18.95	20.48	11.02	9.00	9.27	>50	54.00	59.00	0		
24-Sep	34.36	18.92	19.10	20.48	13.88	10.55	11.00	42	57.50	60.00	0		
25-Sep	37.00	19.10		20.48	16.52	12.00	12.38	>50					
26-Sep			19.14		0.00	13.00	13.45	16					
27-Sep	40.00	19.10	19.15	20.48	19.52	15.00	15.45	14					
28-Sep	42.00	19.12	19.16	20.48	21.52	16.55	17.00	18					
29-Sep	44.00	19.12	19.12	20.48	23.52	18.00	18.24	>50					
30-Sep	48.37	19.10	19.11	20.48	27.89	19.55	19.68	>50					
1-Oct	51.16	19.10	19.12	20.48	30.68								
2-Oct	53.00	19.10	19.14	20.48	32.52								
3-Oct			19.14		0.00								
4-Oct	56.00	19.11	19.12	20.48	35.52								
5-Oct	59.00	19.10	19.15	20.48	38.52								
6-Oct	60.00	19.12		20.48	39.52								



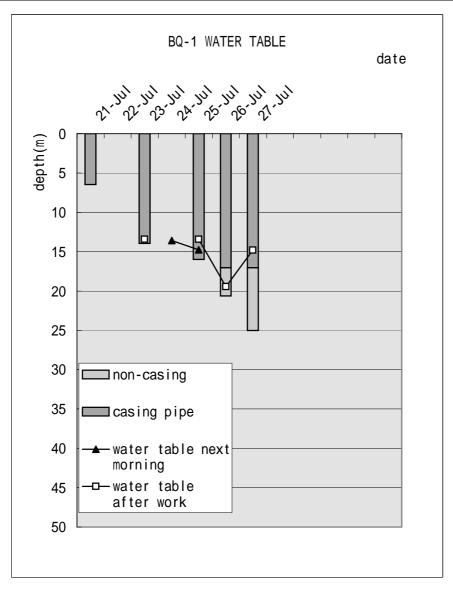
Bori	ng No.	MT-8	80m						Main	Tunn	el		
Date	daily advance	water table after	water table next	casing pipe	non- casing		tanda tratio			Lugio	on Test		Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
12-Aug	1.60	1.45		1.60	0.00	0.00	0.45	5	16.50	20.00	0.4		72.06 m leak
13-Aug	9.50	7.53	7.68	1.60	7.90	2.00	2.24	>50	19.50	24.55	0.3		
15-Aug	16.18	3.35		12.18					24.60	29.00	0.0		
16-Aug									29.00	34.00	0.0		
18-Aug	16.18		2.88	16.00	0.18				34.00	39.00	0.0		
19-Aug	20.00	2.69	2.89	16.00	4.00				39.15	44.63	0.0		
20-Aug	24.55	2.75	2.92	16.00	8.55				44.50	49.00	0.0		
22-Aug	28.10	2.77	2.90	16.00	12.10				49.00	54.00	0.0		
23-Aug	30.00	2.69	2.91	16.00	14.00				54.00	59.00	0.0		
26-Aug	34.00	2.78	2.97	16.00	18.00				59.00	64.00	0.0		
27-Aug	37.07	2.90	2.96	16.00	21.07				64.00	69.00	0.0		
28-Aug	39.00	2.88	3.01	16.00	23.00				69.00	74.00	26.6	3.54×10)-4
30-Aug	44.63	2.92	3.02	16.00	28.63				73.50	78.46	0.0		
31-Aug	49.00	2.94	3.04	16.00	33.00				78.00	80.06	0.1		
1-Sep	50.75	2.97	3.04	16.00	34.75								
3-Sep	57.00	3.62	3.04	16.00	41.00								
4-Sep	63.61	3.84	3.02	16.00	47.61								
5-Sep	69.00	3.98	3.16	16.00	53.00								
6-Sep	74.00	3.98	12.84	16.00	58.00								
7-Sep	78.46	12.82	12.94	16.00	62.46								
8-Sep	80.06	12.86	12.95	16.00	64.06								



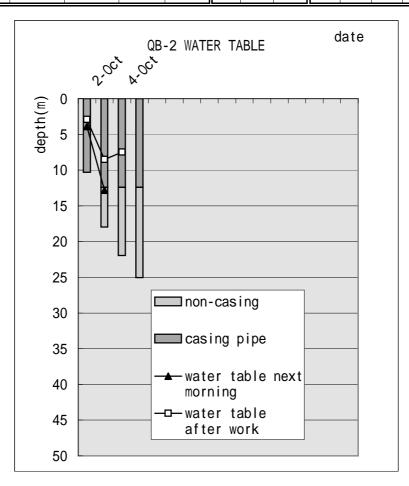
Bor	ing No.	TR-1	35m						Tailr	ace			
Date	daily advance	water table after	water table next	casing pipe	non- casing		tanda tratio			Lug	ion Te	est	Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec	
10-Oct	6.00	5.13	5.38	4.50	1.50	0.00	0.45	6	9.5	14	0		
11-Oct	9.44	7.62		6.00	3.44	1.55	2.00	48	14	19	0		
12-Oct	10.00	7.26		6.00	4.00	3.00	3.27	>50	19.5	25.3	0		
13-Oct			7.84		0.00	4.50	4.68	>50					
14-Oct	14.00	7.56	7.96	6.00	8.00								
15-Oct	19.00	7.92	8.10	6.00	13.00								
16-Oct	24.00	8.02	8.15	6.00	18.00								
17-Oct	25.30	8.06		6.00	19.30								
18-Oct					0.00								
19-Oct					0.00								
20-Oct	-				0.00								



Boring No.		BQ-1	25m						Quarr	:у В			
Date	daily advance	water table after work	water table next morning	casing pipe	non- casing	Standard Penetration Test			Lugion Test				Remarks
	depth					from	to	N-	from	to	Lu-	k	
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	valu	cm/se	
21-Jul	6.45			6.45	0.00	0.00	0.45	8					16.82 m leak
22-Jul					0.00	1.50	1.95	11					19.47 m leak
23-Jul	13.95	13.43		13.95	0.00	3.00	3.45	18					cemented
24-Jul			13.58			4.50	4.95	15					20.60 m
25-Jul	16.00	13.42	14.75	16.00	0.00	6.00	6.45	14					
26-Jul	20.65	19.45		17.05	3.60	7.50	7.95	15					
27-Jul	25.05	14.82		17.05	8.00	9.00	9.45	20					
						10.50	10.95	23					
						12.00	12.45	57					
						13.50	13.73	>50					



Boring No.			25m						Quarry C					
Date	daily advance	water table after	water table next	casing pipe	non- casing	Standard Penetration Test							Remarks	
	depth					from	to	N-	from	to	Lu-	k		
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	value	(m)	(m)	value	cm/sec		
2-Oct	10.30	2.90	3.90	10.30	0.00	0	0.45	4						
3-Oct	18.00	8.50	12.80	12.40	5.60									
4-Oct	22.00	7.50		12.40	9.60									
5-Oct	25.10			12.40	12.70									



1.3 Photographs of Drilling Location and Drilling Co	0.00
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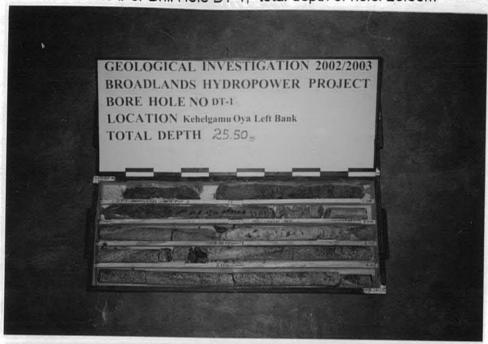


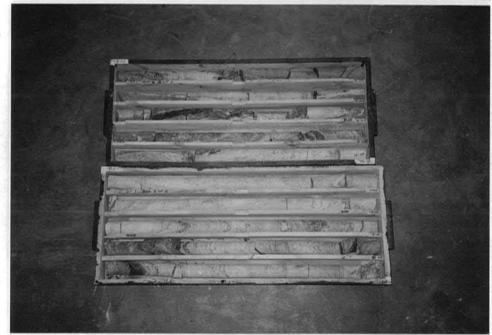
Plate # 1: Drilling Location of DT-1 Total depth of hole: 25.50m



Plate # 2: Hole monument of DT-1 with cap

Plate # 3: Drill Hole DT-1, total depth of hole: 25.50m







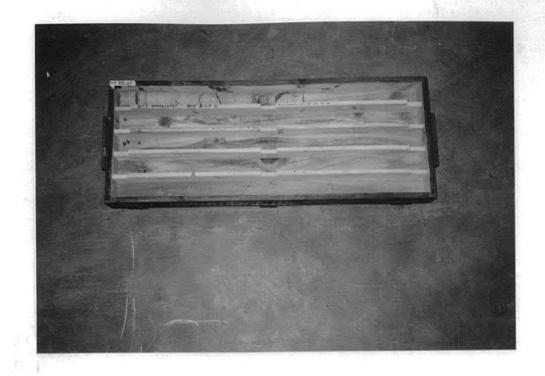


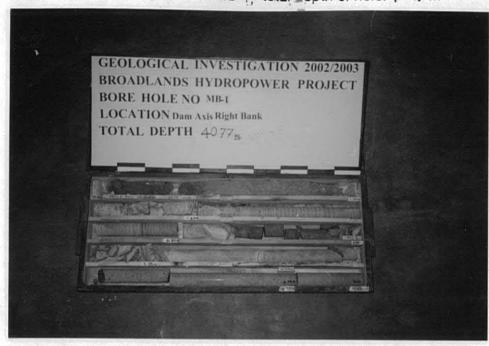


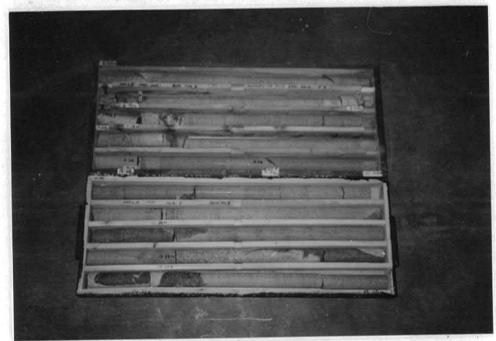
Plate # 4: Drilling Location of MB-1 Total depth of hole: 40.77m

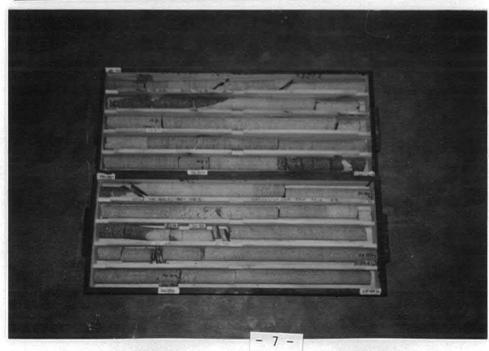


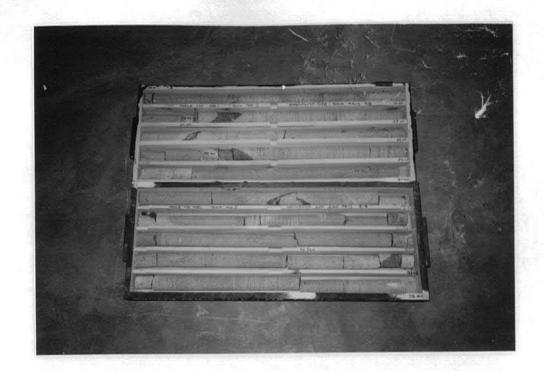
|Plate # 5: Hole monument of MB-1 with cap

IPlate # 6: Drill Hole MB-1, total depth of hole: 40-77 m









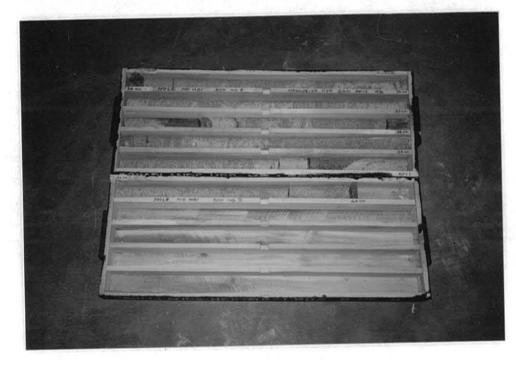


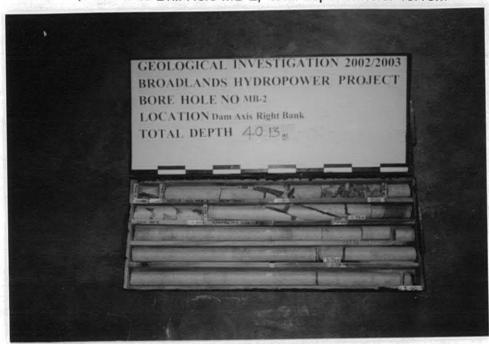


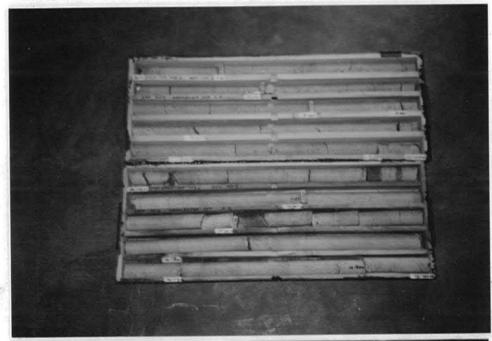
Plate # 7: Drilling Location of MB-2 Total depth of hole: 40.13m

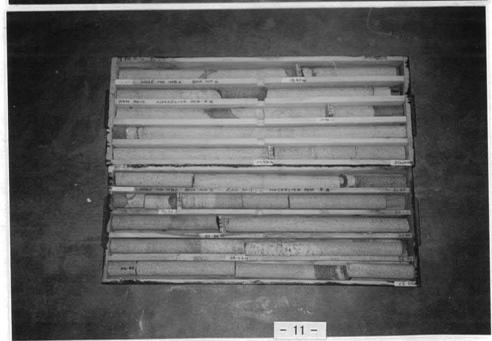


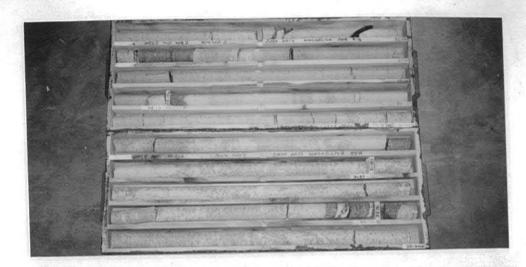
Plate # 8: Hole monument of MB-2 with cap

| Plate # 9: Drill Hole MB-2, total depth of hole: 40.13m











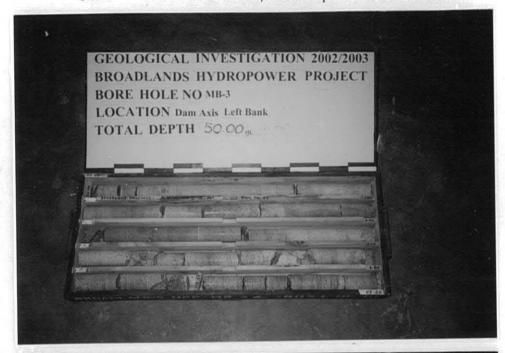


| Plate # 10: Drilling Location of MB-3 Total depth of hole: 50.00m

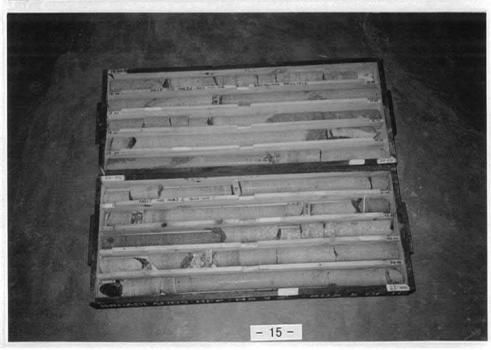


Plate # 11: Hole monument of MB-3 with cap

Plate # 12: Drill Hole MB-3, total depth of hole: 50.00m











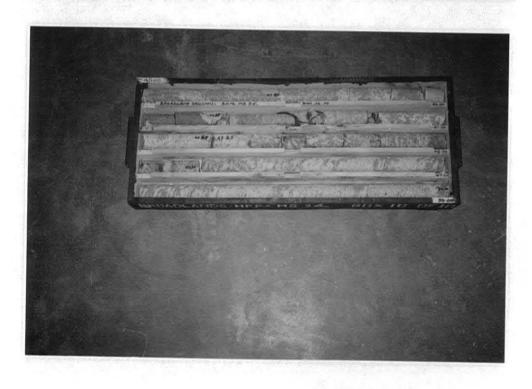


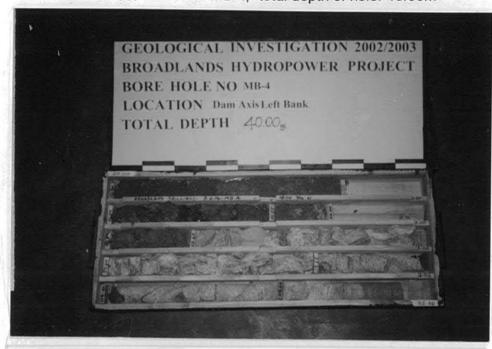


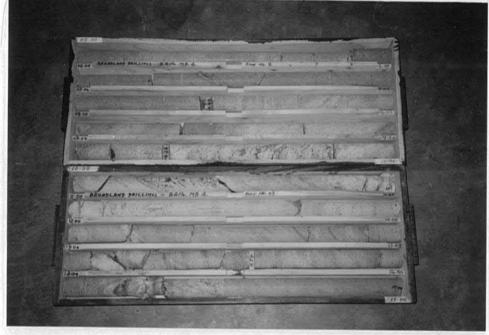
Plate # 13: Drilling Location of MB-4 Total depth of hole; 40.00m

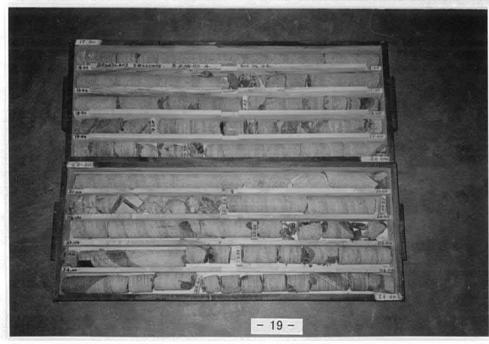


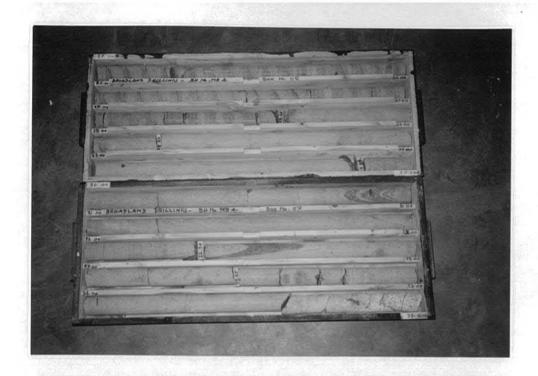
Plate # 14: Hole monument of MB-4 with cap

Plate # 15: Drill Hole MB-4, total depth of hole: 40.00m









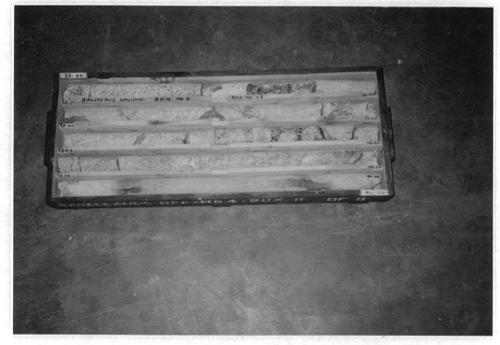


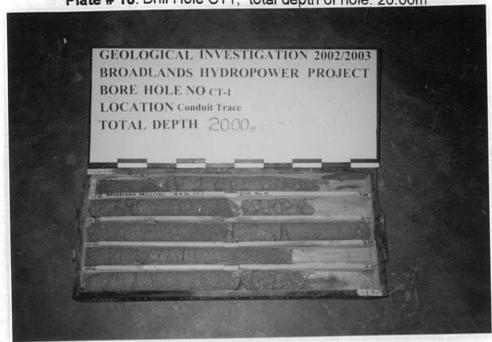


Plate # 16: Drilling Location of CT1
Total depth of hole: 20.00m



Plate # 17: Hole monument of CT1 with cap

Plate # 18: Drill Hole CT1, total depth of hole: 20.00m





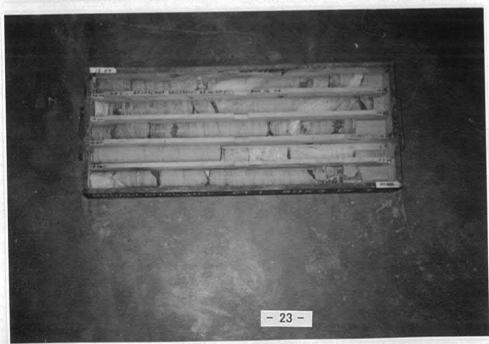


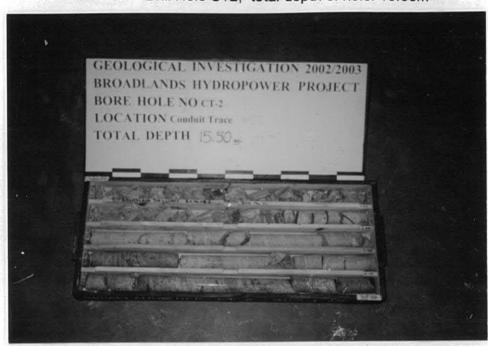


Plate # 19: Drilling Location of CT2 Total depth of hole: 15.50m



Plate # 20: Hole monument of CT2

Plate # 21: Drill Hole CT2, total depth of hole: 15.50m





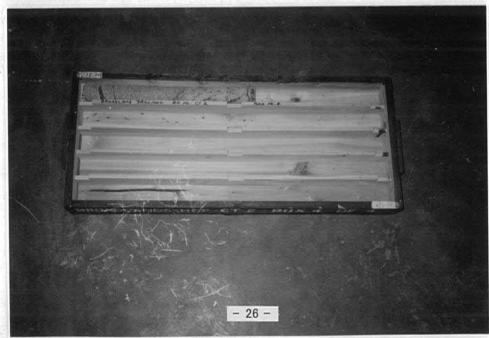




Plate # 22: Drilling Location of MT-1 Total depth of hole: 35.54m

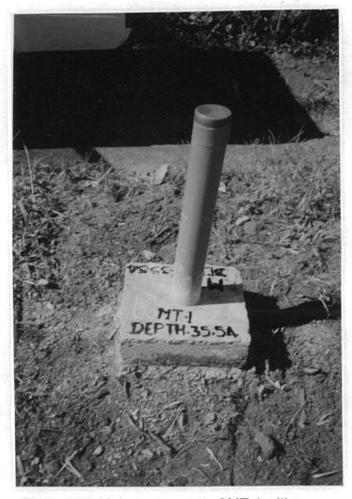
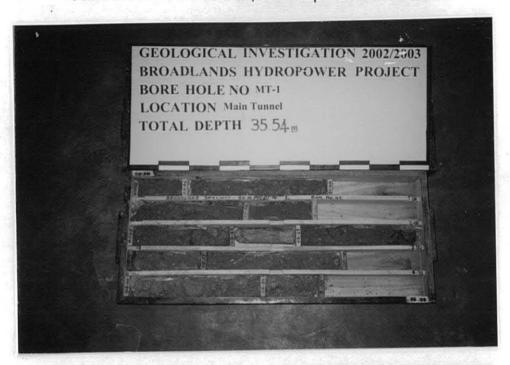
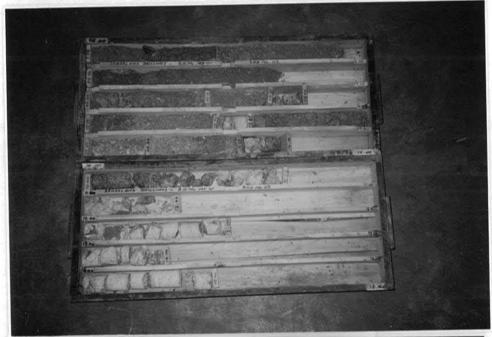


Plate # 23: Hole monument of MT-1 with cap

Plate # 24: Drill Hole MT-1, total depth of hole: 35.54m









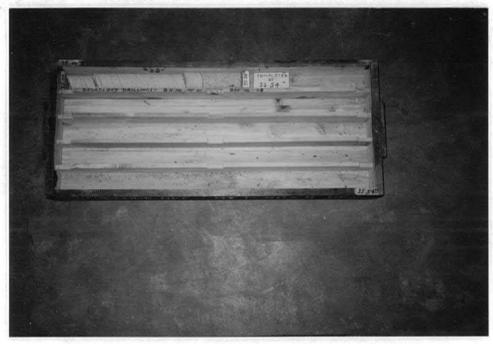




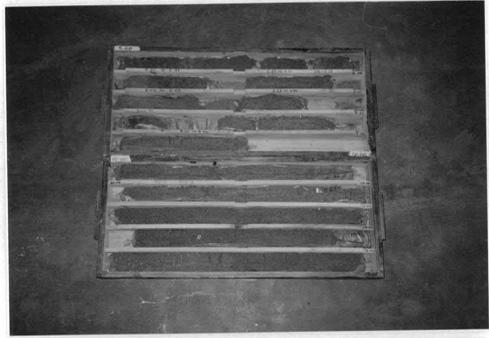
Plate # 25: Drilling Location of MT-2
Total depth of hole: 35.00m

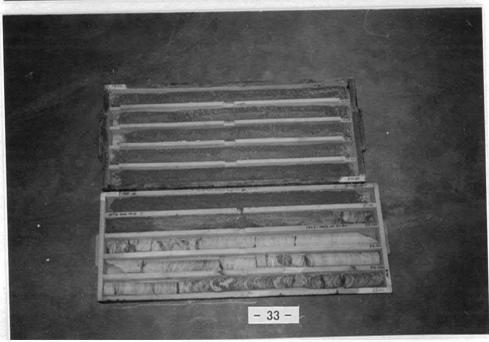


Plate # 25: Hole monument of MT-2 with cap

Plate # 26: Drill Hole MT-2, total depth of hole: 35.00m







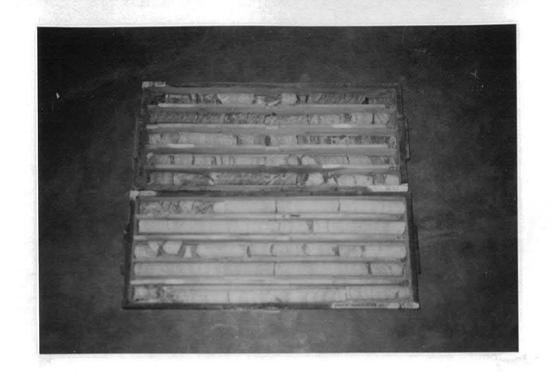


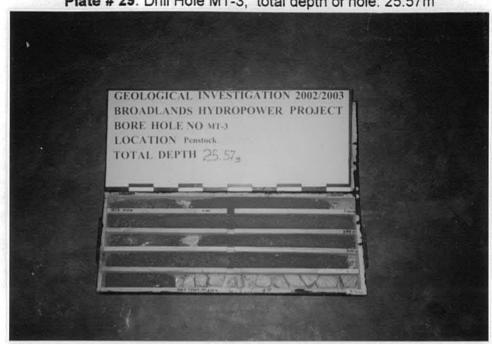


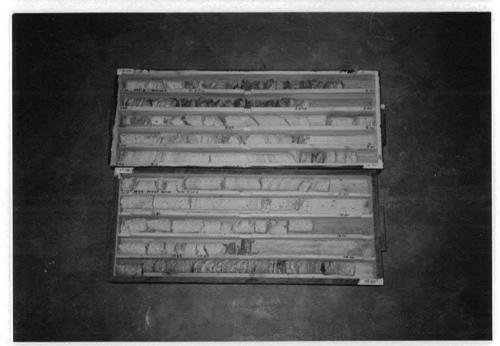
Plate # 27: Drilling Location of MT-3 Total depth of hole: 25.57m

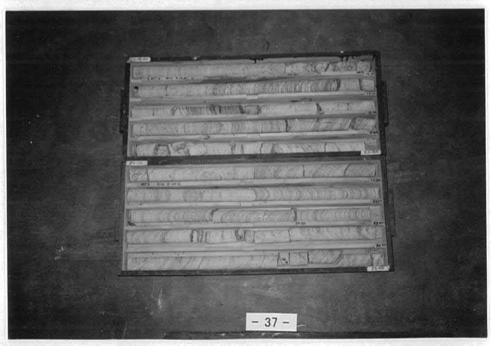


Plate # 28: Hole monument of MT-3 with cap

Plate # 29: Drill Hole MT-3, total depth of hole: 25.57m







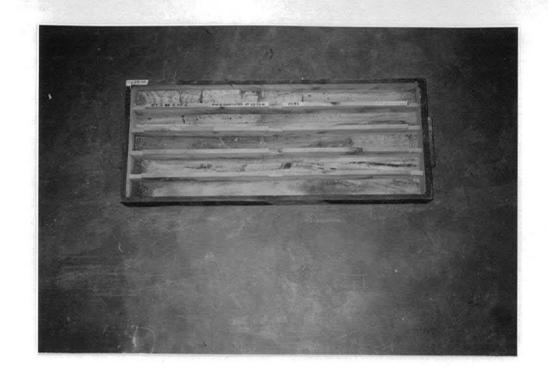


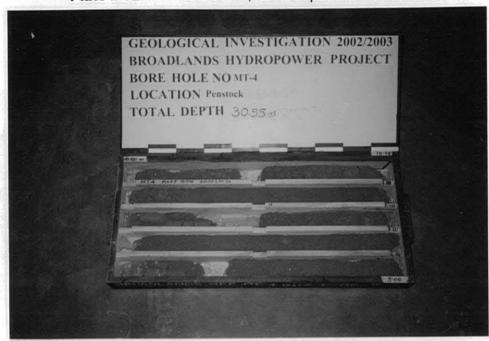


Plate # 30: Drilling Location of MT-4 Total depth of hole:30.55m

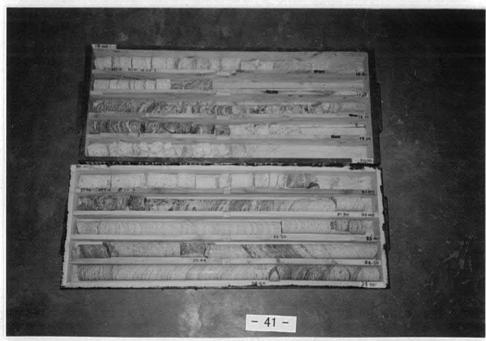


Plate # 31: Hole monument of MT-4 with cap

Plate # 32: Drill Hole MT-4, total depth of hole: 30.55m







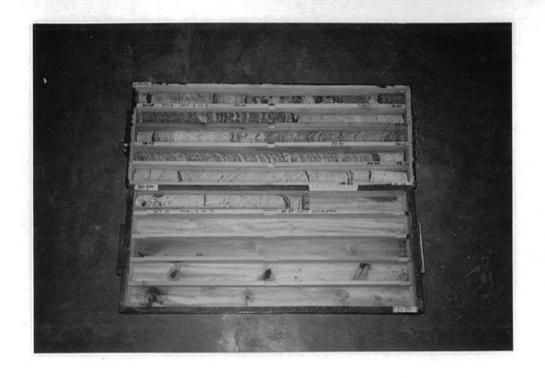
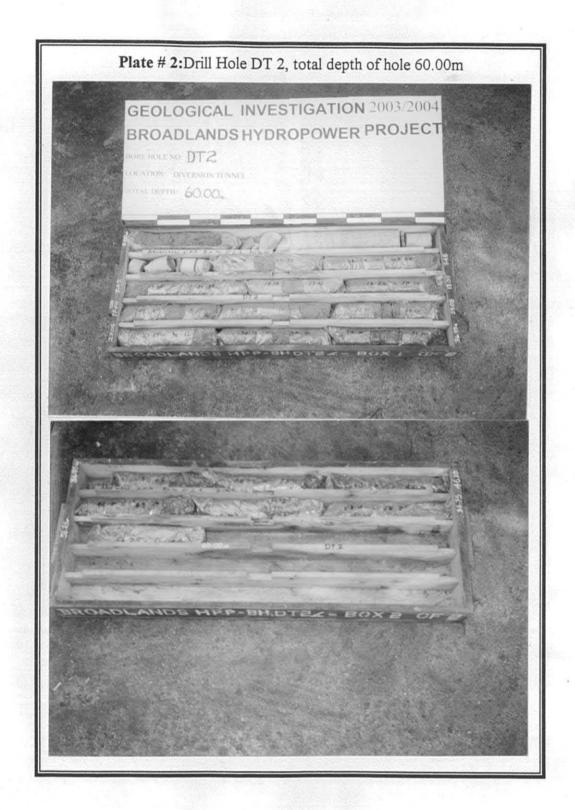




Plate # 1: Drilling Location of DT 2 total depth of hole 60.00m



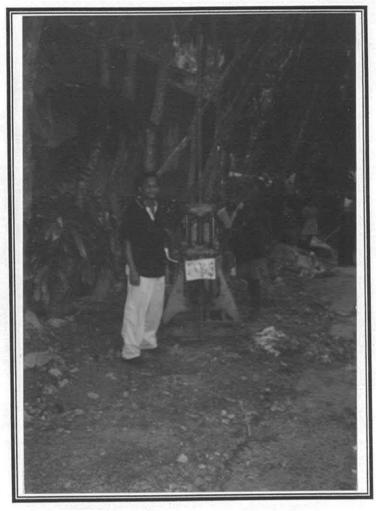


Plate #3: Drilling Location of MB 5 total depth of hole 30.15m



Plate # 4: Hole monument of MB 5

Plate # 5:Drill Hole MB 5, total depth of hole 30.15m GEOLOGICAL INVESTIGATION 2003/2004 BROADLANDS HYDROPOWER PROJECT BORE HOLE NO MB5 LOCATION: DAM AXIS, LEFT BANK FOTAL DEPTH 30.00 Las 111 - 47 -

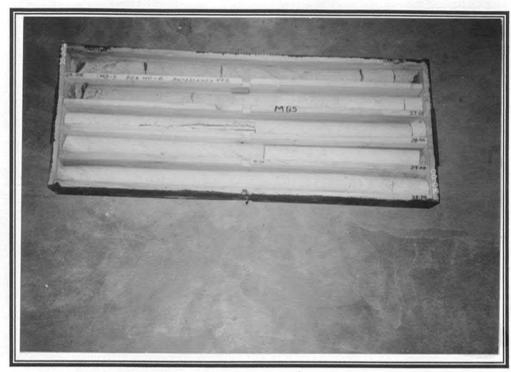


Plate # 5: Cont....

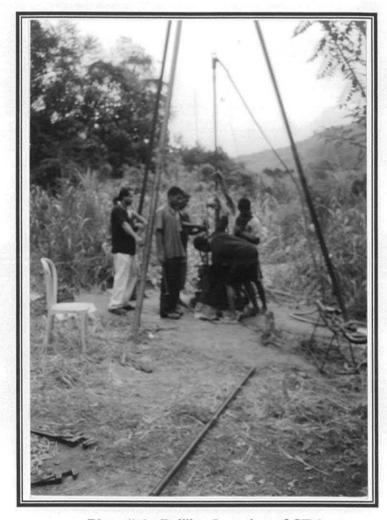


Plate # 6: Drilling Location of CT 3 total depth of hole 20.35m



Plate # 7: Hole monument of CT 3

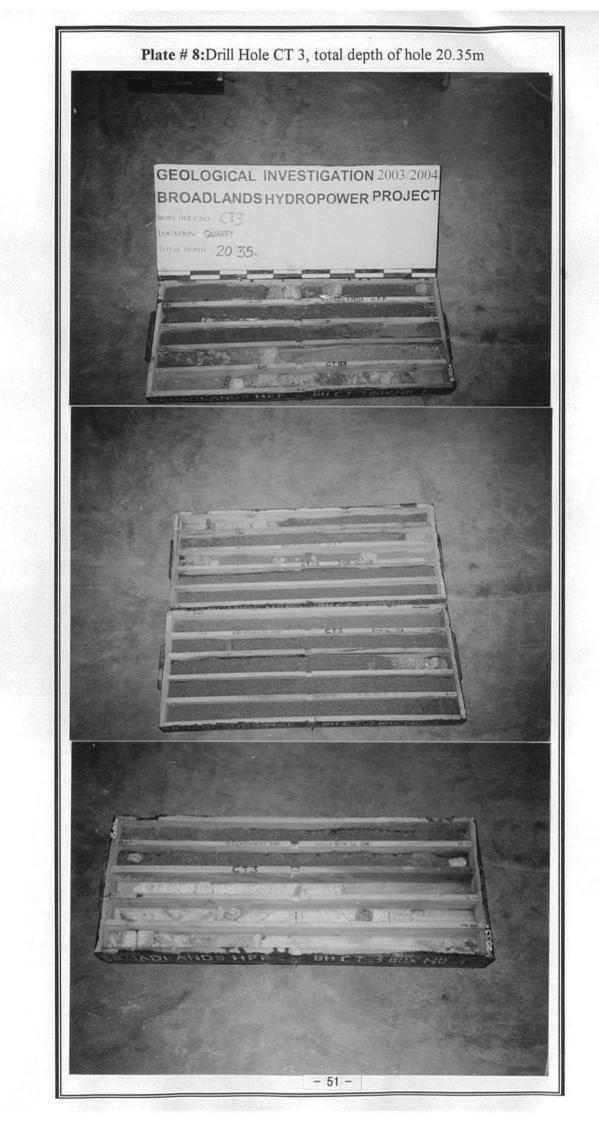




Plate # 9: Drilling Location of CT 4 total depth of hole 20.00m



Plate # 10: Hole monument of CT 4

Plate # 11:Drill Hole CT 3, total depth of hole 20.00m GEOLOGICAL INVESTIGATION 2003/2004 BROADLANDS HYDROPOWER PROJECT LOCATION: CONDUIT TRACE TOTAL DEPTH: 20 00. - 54 -



Plate # 12: Drilling Location of MT 5 total depth of hole 30.25m



Plate # 13: Hole monument of MT 5

Plate # 14:Drill Hole MT 5, total depth of hole 30.25m **GEOLOGICAL INVESTIGATION 2003/2004** BROADLANDS HYDROPOWER PROJECT BORE HOLE NO: MT5 LOCATION: MAIN TUNNEL TOTAL DEPTH: 30.25 ... 6 - 57 -



Plate # 14: Cont....

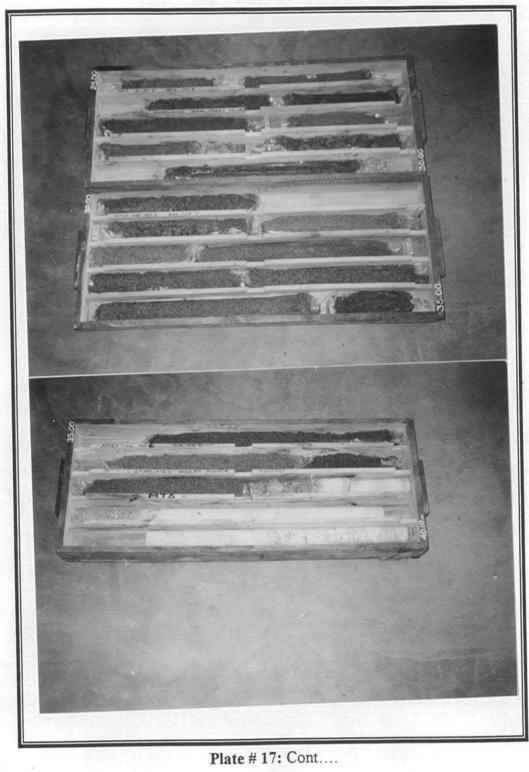


Plate # 15: Drilling Location of MT 6 total depth of hole 40.10m



Plate # 16: Hole monument of MT 6

Plate # 17:Drill Hole MT 6, total depth of hole 40.10m GEOLOGICAL INVESTIGATION 2003/2004 **BROADLANDS HYDROPOWER PROJECT** BORE HOLE NO MT6 TOTAL DEPTH 4010m MT6 BOXE - 61 -



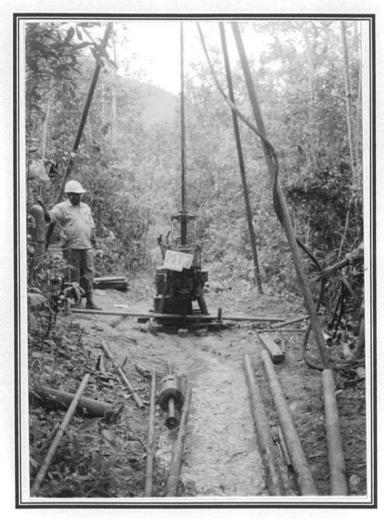


Plate # 18: Drilling Location of MT 7 total depth of hole 60.00m



Plate # 19: Hole monument of MT 7

Plate # 20:Drill Hole MT 7, total depth of hole 60.00m GEOLOGICAL INVESTIGATION 2003/2004 BROADLANDS HYDROPOWER PROJECT

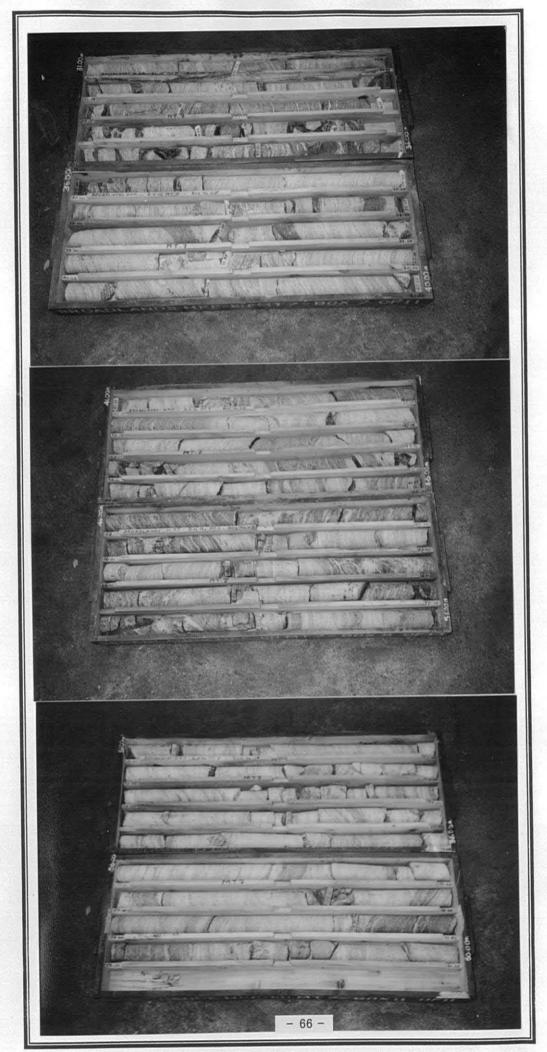


Plate # 20: Cont....



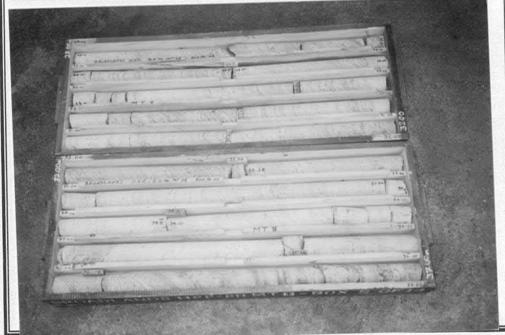
Plate # 21: Drilling Location of MT 8 total depth of hole 80.06m



Plate # 22: Hole monument of MT 8







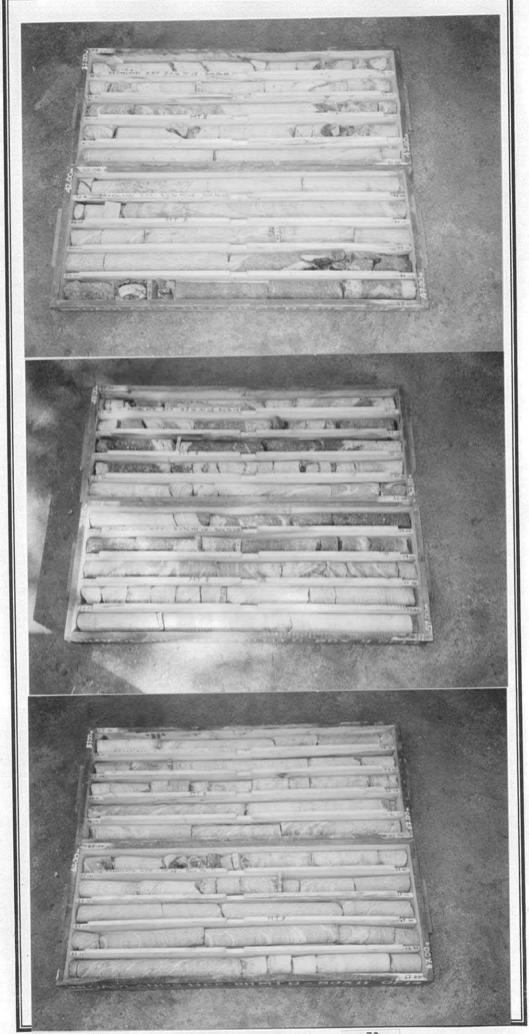


Plate # 23: Cont.... - 70 -

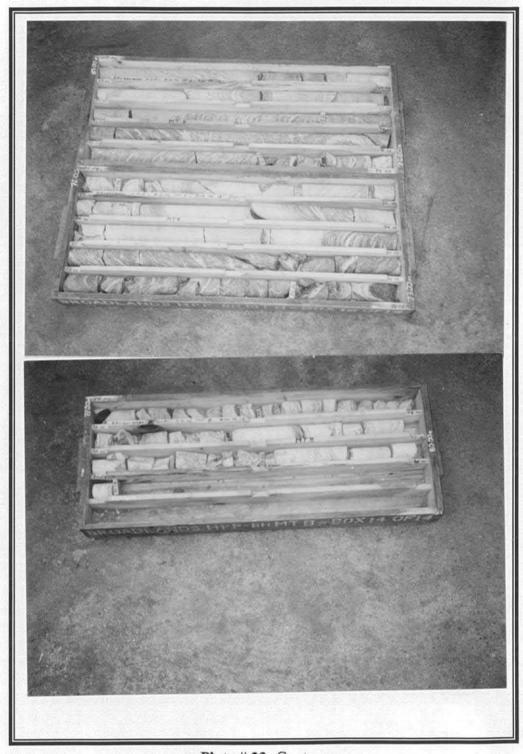


Plate # 23: Cont....



Plate # 24: Drilling Location of TR 1 total depth of hole 25.30m

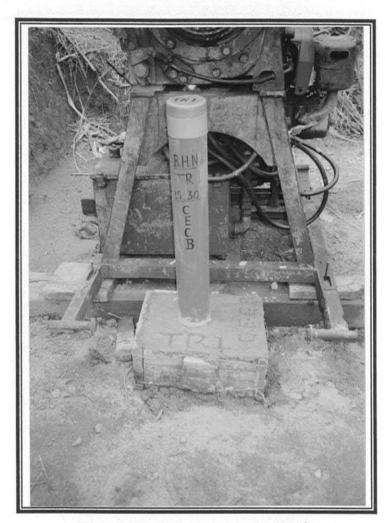


Plate # 25: Hole monument of TR 1

Plate # 26:Drill Hole TR 1, total depth of hole 25.30m GEOLOGICAL INVESTIGATION 2003/2004 BROADLANDS HYDROPOWER PROJECT - 74 -

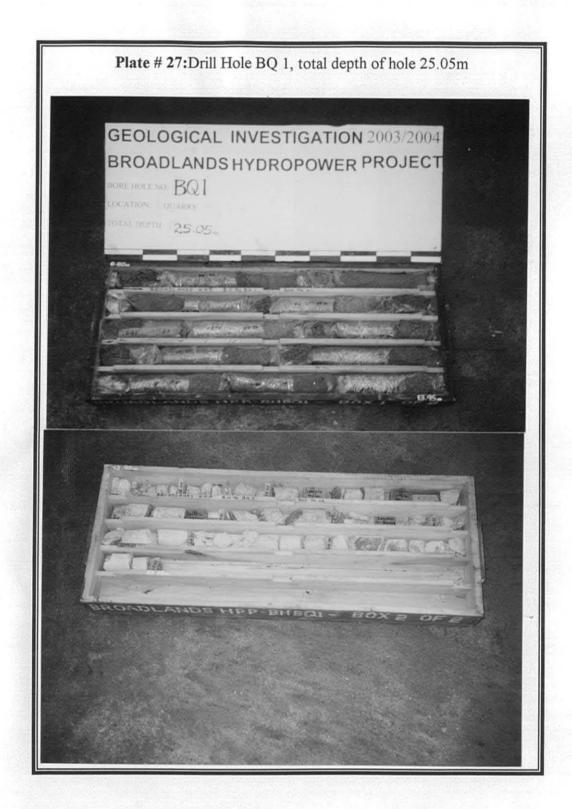




Plate # 28: Drilling Location of BQ 2' total depth of hole 25.10m



Plate # 29: Hole monument of BQ2'

