

**Geological Investigation
for
the Broadlands Hydropower Project**

Appendix

CHAPTER 3

LABORATORY TESTS

Quantity of Laboratory Test for the Broadlands Hydropower Project

No.	Items	ASTM No.	Unit	Quantity
Phase 1				
1	Concrete Aggregates (from test pits sample)			
1.1	Sieve analysis of aggregates	ASTM C136	samples	2
1.2	Specific gravity and water absorption (fine)	ASTM C128	samples	2
1.3	Specific gravity and water absorption (coarse)	ASTM C127	samples	2
1.4	Clay lumps and friable particles in aggregate	ASTM C142	samples	2
1.5	Soundness tests by sodium sulfate	ASTM C88	samples	2
1.6	Abrasion test of coarse aggregate by Los Angeles machine	ASTM C535	samples	2
1.7	Chemical (Alkali) reactivity test	ASTM C289	samples	2
2	Rock (from drilling-core sample)			
2.1	Water absorption and bulk specific gravity	ASTM C127	samples	6
2.2	Unconfined compression and Poisson's ratio	ASTM D2938	samples	6
2.3	Ultra-sonic wave velocity	ASTM D2845	samples	6
2.4	Soundness tests by sodium sulfate	ASTM C88	samples	2
2.5	Chemical (alkali) reactivity test	ASTM C289	samples	2
3	Test Pitting and Sampling (includes Geodetic Measurement)		nos.	2
Phase 2				
1	Concrete Aggregates (from test pits sample)			
1.1	Sieve analysis of aggregates	ASTM C136	samples	2
1.2	Specific gravity and water absorption (fine)	ASTM C128	samples	2
1.3	Specific gravity and water absorption (coarse)	ASTM C127	samples	1
1.4	Clay lumps and friable particles in aggregate	ASTM C142	samples	2
1.5	Soundness tests by sodium sulfate	ASTM C88	samples	1
1.6	Abrasion test of coarse aggregate by Los Angeles machine	ASTM C535	samples	1
1.7	Chemical (Alkali) reactivity test	ASTM C289	samples	1
2	Rock (from drilling-core sample)			
2.1	Water absorption and bulk specific gravity	ASTM C127	samples	18
2.2	Unconfined compression and Poisson's ratio	ASTM D2938	samples	20
2.3	Ultra-sonic wave velocity	ASTM D2845	samples	18
2.4	Soundness tests by sodium sulfate	ASTM C88	samples	1
2.5	Chemical (alkali) reactivity test	ASTM C289	samples	1
2.6	Abrasion test of coarse aggregate by Los Angeles machine	ASTM C535	samples	1
3	Test Pitting and Sampling (includes Geodetic Measurement)		nos.	2

Our Ref: CB/EPC/LAB/04C

TEST CERTIFICATE NO: DRL/AT/2003060

Issued By : Laboratory & Site Investigation Unit
 Engineering Procurement Construction Division
 CECB, No.11, Jawatte Road, Colombo 05.

Assured To : Jica Study Team
 Electric Power Development Co., Ltd
 Nippon Koel Co., Ltd.

Project : Broadlands Hydropower Project

Job Requested : Testing of Aggregates, Rock & Soil samples from Broadlands Hydropower Project.

Job Ref : DRL/2/011

Tested for : 1) Concrete Aggregates (from test pit samples)

 1.1) Sieve Analysis of Coarse Aggregates, Fine Aggregates & Soil samples
 1.2) Specific gravity and water absorption (Fine)
 1.3) Specific gravity and water absorption (Coarse)
 1.4) Clay lumps and friable particles in (Coarse & Fine) Aggregates
 1.5) Soundness tests by sodium sulphate
 1.6) Abrasion test of Aggregate by Los Angeles machine
 1.7) Chemical (Alkali) reactivity test

 2.) Rock (from drilling core samples)

 2.1) Water absorption and bulk specific gravity
 2.2) Unconfined compression and Poisson's ratio
 2.3) Ultra-sonic wave velocity
 2.4) Soundness tests by sodium sulphate
 2.5) Chemical (Alkali) reactivity test

Results: As tabulated in pages 02-05.

Results:

1.1) Results of Sieve Analysis of Coarse Aggregates, Fine Aggregates & Soil Samples

Sample Description	Φ 60% (mm)	Φ 30% (mm)	Φ 10% (mm)	C _u	C _c
TP-2(Coarse Aggregates)	10.600	10.300	10.100	1.050	0.991
River Sand	0.370	0.220	0.120	3.083	1.090
TP-1 (Soil)	2.800	0.510	-	-	-
TP-2 (Soil)	4.300	1.100	0.280	15.357	1.005

1.2) Results of Specific Gravity and Water Absorption of Fine Aggregates

Sample Description	Bulk Specific Gravity	Bulk Specific Gravity (SSD* Basis)	Apparent Specific Gravity	Water Absorption (%)
River Sand	2.541	2.562	2.594	0.802

*SSD- Saturated-Surface-Dry Basis

1.3) Results of Specific Gravity and Water Absorption of Coarse Aggregates

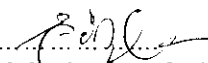
Sample Description	Bulk Specific Gravity	Bulk Specific Gravity (SSD* Basis)	Apparent Specific Gravity	Water Absorption (%)
TP-1(Coarse Aggregates)	2.476	2.540	2.646	2.596
TP-2(Coarse Aggregates)	3.013	3.027	3.054	0.445


*SSD- Saturated-Surface-Dry Basis

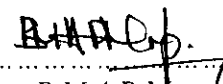
1.4) Results of Clay Lumps and Friable Particles in (Coarse & Fine) Aggregates

Sample Description	Particle Size (mm)	Percentage of Clay Lumps and Friable Particles (%)
TP-2(Coarse Aggregates)	4.75-9.5	0.17
	9.5-19.0	0.58
	19.0-38.1	0.10
River Sand	>1.18	27.5

Reported By: 
R.M.K.R. Bandara / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By 
A.A. Virajh Dias
Engineer In Charge


B.M.A.P. Mapa
Project Manager Laboratory
& Site Investigation Unit

Date : 12-02-2003.

Results:

1.5) Results of Soundness Tests by Sodium Sulphate of Aggregates


Sample Description	Soundness of Rock sample (Loss in weight) %
TP-1(Coarse Aggregates)	1.52
TP-2(Coarse Aggregates)	0.22

1.6) Results of Loss Angeles Abrasion Test of Aggregates

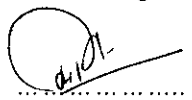
Sample Description	Los Angeles Abrasion Value (%)	
	100 Revolutions	500 Revolutions
TP-1(Coarse Aggregates)	22.18	65.77
TP-2(Coarse Aggregates)	8.61	30.18

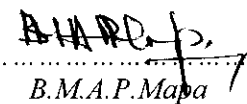
1.7) Results of Chemical (Alkali) Reactivity Test of Aggregates

Sample Description	Quantity of Dissolved Silica (Sc) mmol/L	Quantity of Reduction in Alkalinity (Rc) mmol/L
TP-1(Coarse Aggregates)	2.90	60
TP-2(Coarse Aggregates)	4.42	30

Reported By: 
R.M.K.R. Bandara / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By 
A.A. Virajh Dias
Engineer In Charge


B.M.A.P. Mapa
Project Manager Laboratory
& Site Investigation Unit

Date : 12-02-2003.

Results:


2.1) Results of Water Absorption and Bulk Specific Gravity of Rock Samples


Bore Hole No.	Rock Type	Depth (m)	Bulk Specific Gravity	Bulk Specific Gravity (SSD* Basis)	Apparent Specific Gravity	Water Absorption (%)
MB 1	Charnokitik-gneiss	24.49-25.00	2.638	2.641	2.645	0.091
MB 3	Biotite rich gneiss	22.00-22.38	3.071	3.072	3.074	0.035
DT 1	Calk-gneiss	19.45-19.85	2.871	2.895	2.939	0.815
MT 3	Garnet rich biotite gneiss	14.31-14.76	2.813	2.815	2.818	0.059
MT 2	Quartzite	32.56-33.00	2.624	2.625	2.628	0.051
MT 1	Quartz rich feldspathic gneiss	34.93-35.35	2.581	2.600	2.631	0.727


*SSD- Saturated-Surface-Dry Basis

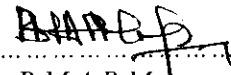
2.2) Results of Unconfined compression and Poisson's Ratio of Rock Cores

Rock Type	Bore Hole No.	Depth (m)	Unconfined Compressive Strength (N/mm ²)
Charnokitik-gneiss	MB 1	24.49-25.00	65.66
Biotite rich gneiss	MB 3	22.00-22.38	38.52
Calk-gneiss	DT 1	19.45-19.85	12.99
Garnet rich biotite gneiss	MT 3	14.31-14.76	17.05
Quartzite	MT 2	32.56-33.00	35.37
Quartz rich feldspathic gneiss	MT 1	34.93-35.35	65.99

Reported By: 
R.M.K.R. Bandara / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By: 
A.A. Virajh Dias
Engineer In Charge


B.M.A.P. Mapa
Project Manager Laboratory
& Site Investigation Unit

Date : 12-02-2003.

Results:

2.3) Results of Ultra-Sonic Wave Velocity of Rock Cores

Rock Type	Bore Hole No.	Depth (m)	Pulse Travel Time Observed (μ s)	Pulse Velocity (km/s)
Charnokitik-gneiss	MB 1	24.49-25.00	15.8	6.8
Biotite rich gneiss	MB 3	22.00-22.38	16.2	6.0
Calk-gneiss	DT 1	19.45-19.85	49.5	2.2
Garnet rich biotite gneiss	MT 3	14.31-14.76	22.7	4.9
Quartzite	MT 2	32.56-33.00	26.3	4.1
Quartz rich feldspathic gneiss	MT 1	34.93-35.35	42.1	2.6

2.4) Results of Soundness Tests by Sodium Sulphate of Rock Samples


Rock Type	Sample No.	Bore Hole No. & Location	Soundness of Rock Sample (Loss in weight) %
Charnokitik formation	01	MB 1/16.00-16.15, MB 4/21.66-21.82m, MB 3/5.46-5.67m, CT 1/14.60-14.75m	3.72
Gneissic formation	02	MB 2/30.00-30.13m MB 3/47.20-47.37m, MB 1/39.42-39.55m, MB 4/9.28-9.44m,	8.18

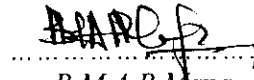
2.5) Results of Chemical (Alkali) Reactivity Test of Rock Samples

Rock Type	Bore Hole No.	Depth (m)	Quantity of Dissolved Silica (Sc) mmol/L	Quantity of Reduction in Alkalinity (Rc) mmol/L
Charnokitik-gneiss	MB 2	11.00-11.21	3.53	30
Garnetiferous biotite gneiss	CT 2	7.15-7.30	0.71	165

Reported By: 
R.M.K.R. Bandara / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By: 
A.A. Virajh Dias
Engineer In Charge


B.M.A.P. Mapa
Project Manager Laboratory
& Site Investigation Unit

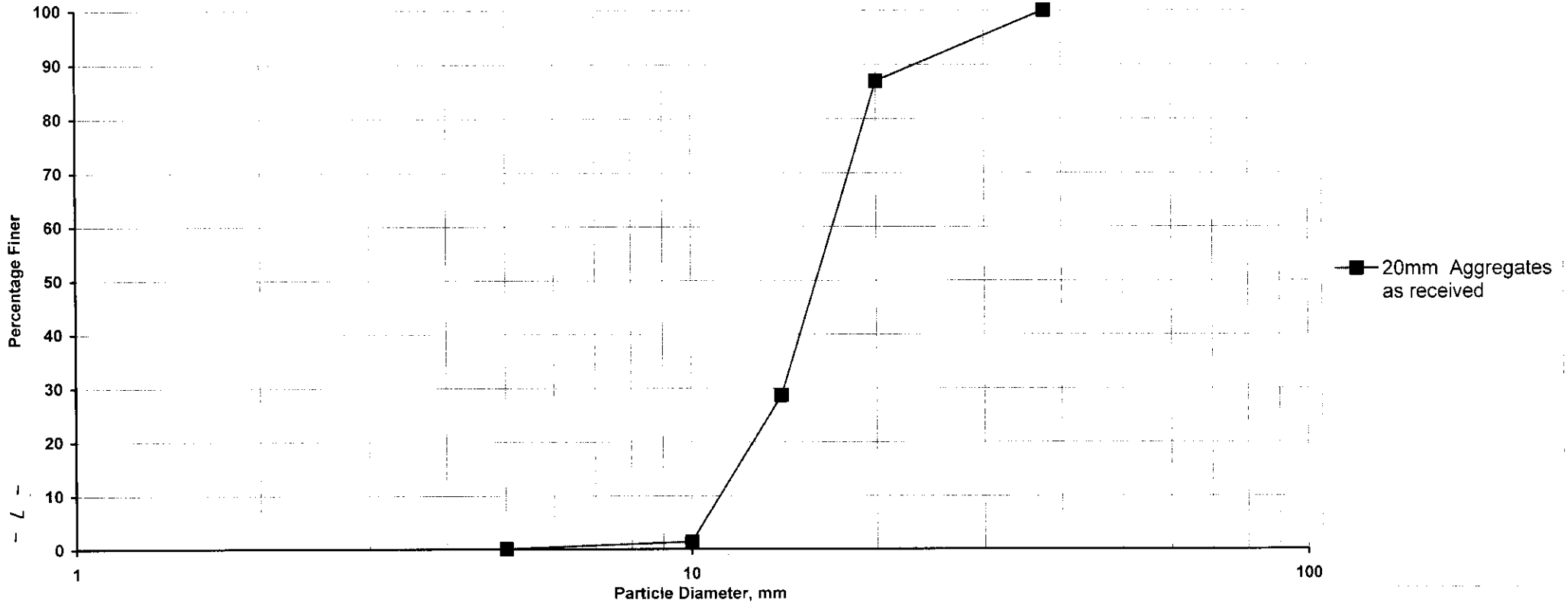
Date : 12-02-2003.

Particle Size Analysis Data (sieve analysis) -20mm Aggregates

Sample No:S1 mm	Mass Retained g	Percentage Retained (%)	Percentage Passing(%)
37.5	0.00	0.00	100.00
20	260.56	13.03	86.97
14	1,165.90	58.30	28.68
10	544.11	27.21	1.47
5	26.95	1.35	0.12
Pan	2.48	0.12	0.00
Sample Weight	2,000.00		



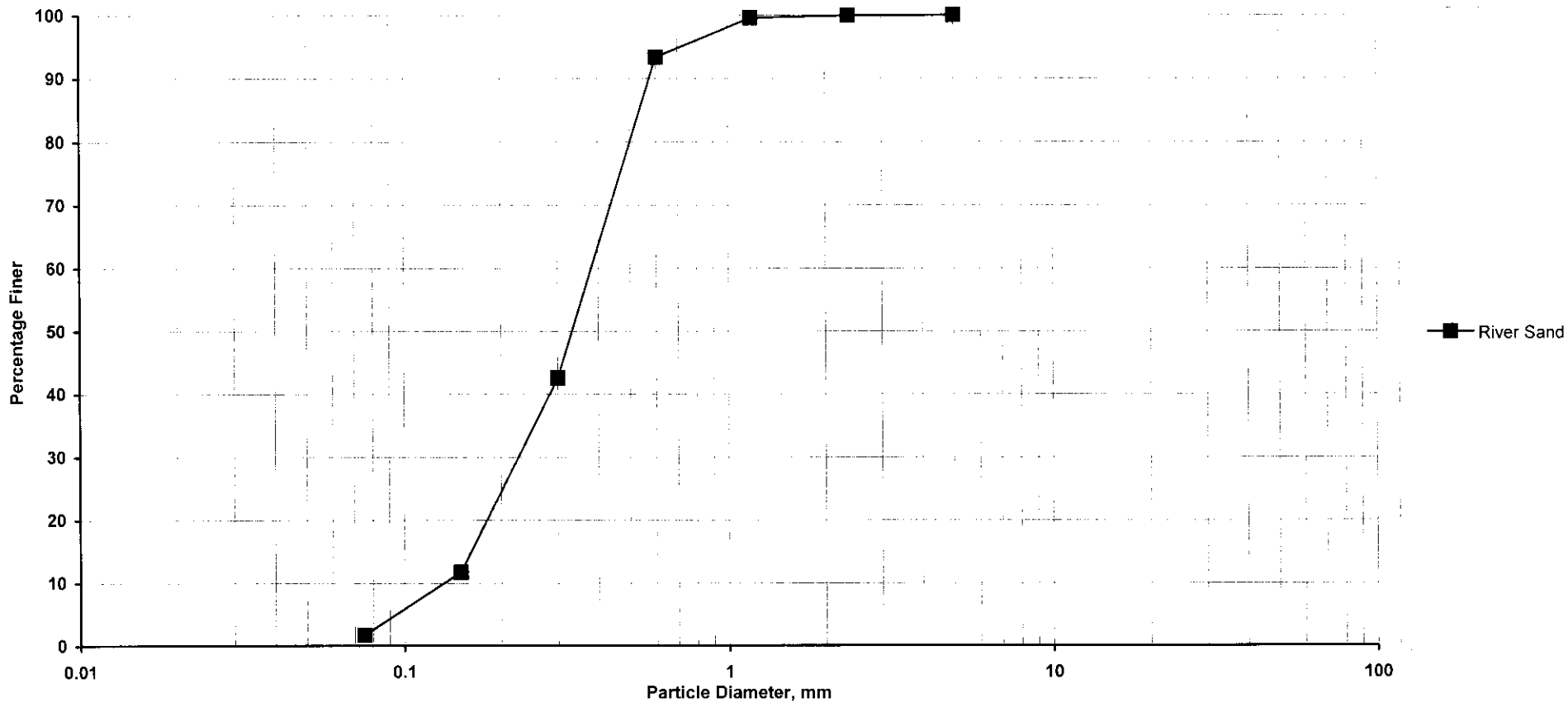
20mm Aggregates as received



PROJECT : Broadlands Hydropower Project							PARTICLE SIZE DISTRIBUTION CURVE BY SIEVE ANALYSIS		
Sample	Plot	Location of Source	Results					Date of Test	Job Ref.
			ϕ 60%	ϕ 30%	ϕ 10%	C_u	C_c		
A03008	■	TP-2	10.600	10.300	10.100	1.050	0.991	20-Jan-03	DRL/2/011
WMS/MGC Lab. Assistant Tested By	TSR Lab. Technician Checked By	Engineer Certified By	Specifications BS 882 : 1992		ENGINEERS & ARCHITECTS cecb Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.				

Particle Size Analysis Data (sieve analysis)- River Sand from Broadland

River Sand			
Sieve size mm	Mass Retained g	% Retained	% Passing
5	0.00	0.00	100.00
2.36	0.67	0.03	99.97
1.18	7.61	0.38	99.59
0.600	124.48	6.22	93.36
0.300	1,015.40	50.77	42.59
0.150	617.10	30.86	11.74
0.075	199.76	9.99	1.75
Pan	34.98	1.75	
Sample Weight	2000		



PROJECT : Broadlands Hydropower Project

PARTICLE SIZE DISTRIBUTION CURVE
BY SIEVE ANALYSIS

Sample	Plot	Source	Results					Date of Test	Test Code
			ϕ 60%	ϕ 30%	ϕ 10%	C_u	C_c		
A03009	■	River Sand	0.370	0.220	0.120	3.083	1.090	23-01-2003	DRL/2/011

WMS/MGC
Lab. Assistant Tested By

SR
Lab. Technician Checked By

RMKRB
Lab. Engineer Certified By

Specifications
BS 882 : Part 2: 1973

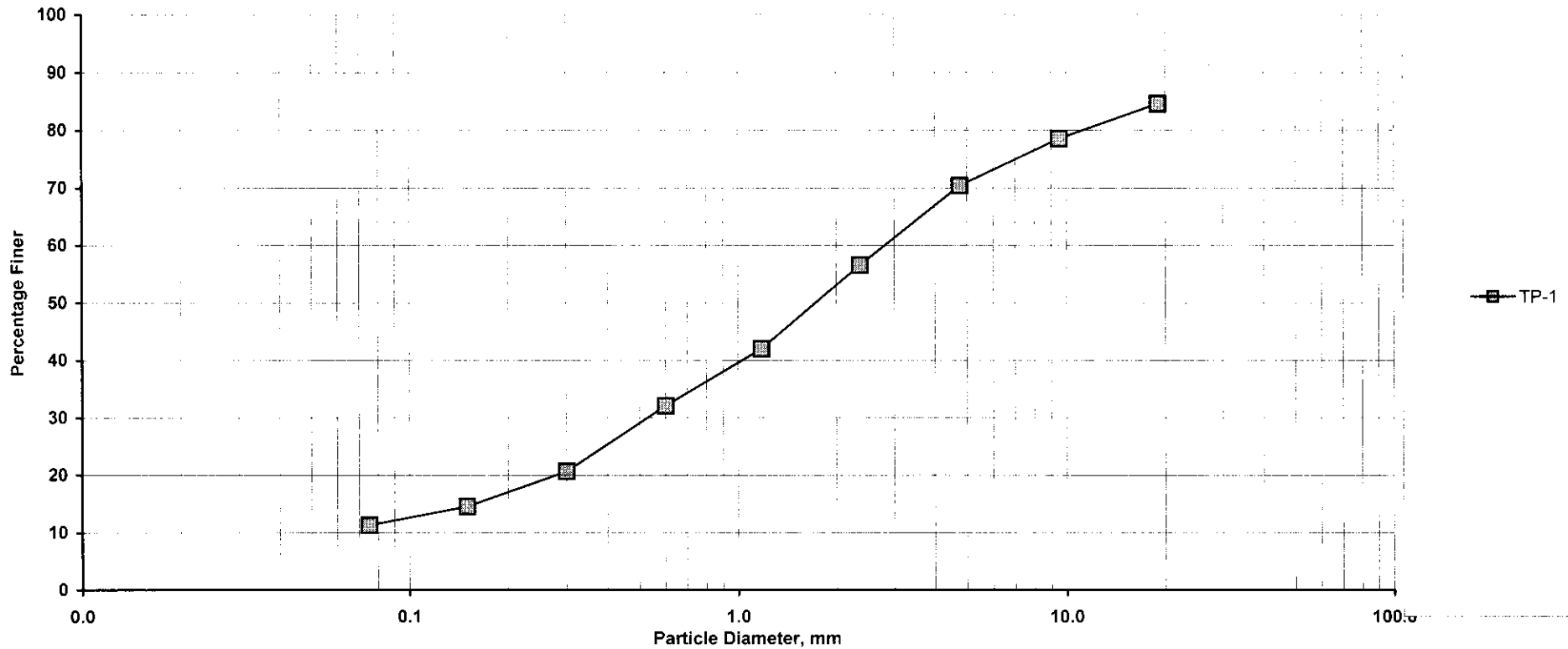
ENGINEERS & ARCHITECTS
cecb

Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05,
Sri Lanka.

Particle Size Analysis Data (sieve analysis)

TP-1			
Sieve size mm	Mass Retained g	% Retained	% Passing
50.0	0.00	0.00	100.00
37.5	204.89	7.21	92.79
28.0	92.87	3.27	89.53
19.0	139.85	4.92	84.61
9.5	172.11	6.05	78.55
4.75	233.86	8.23	70.33
2.36	392.39	13.80	56.53
1.18	414.20	14.57	41.96
0.600	280.20	9.86	32.10
0.300	325.49	11.45	20.65
0.150	174.64	6.14	14.51
0.075	91.00	3.20	11.31
Pan	759.19	26.70	
Sample Weight	2843.08		

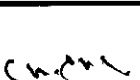
TP-1

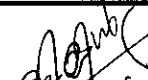



PROJECT : Broadlands Hydropower Project

PARTICLE SIZE DISTRIBUTION CURVE
BY SIEVE ANALYSIS

Sample	Plot	Source	Results					Date of Test	Job No.
			ϕ 60%	ϕ 30%	ϕ 10%	C_u	C_c		
S030033	■	TP-1	2.800	0.510	-	-	-	21-Jan-03	DRL/2/011


 WMS/MGC
 Lab. Assistant
 Tested By


 TSR
 Lab. Technician
 Checked By


 RMRKB
 Lab. Engineer
 Certified By

Specifications
ASTM D421 & D422

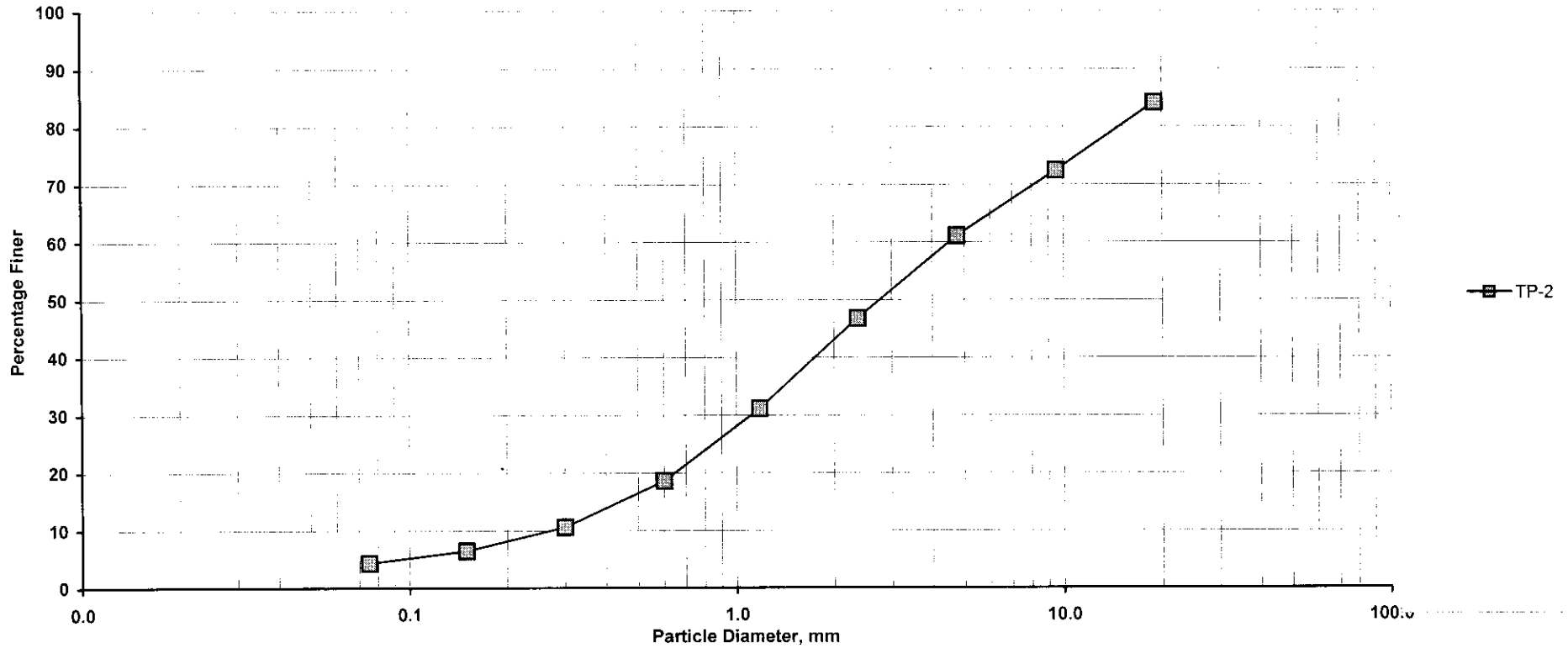
**ENGINEERS
& ARCHITECTS**
cecb

Laboratory & Site Investigation Unit
 Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
 No11, Jawatta Road, Colombo 05,
 Sri Lanka.

Particle Size Analysis Data (sieve analysis)

TP-2			
Sieve size mm	Mass Retained g	% Retained	% Passing
50.0	0.00	0.00	100.00
37.5	157.62	6.39	93.61
28.0	156.19	6.33	87.28
19.0	77.20	3.13	84.16
9.5	289.75	11.74	72.41
4.75	279.20	11.31	61.10
2.36	353.66	14.33	46.77
1.18	385.32	15.61	31.16
0.600	310.25	12.57	18.58
0.300	196.93	7.98	10.60
0.150	101.92	4.13	6.47
0.075	52.66	2.13	4.34
Pan	498.11	20.18	
Sample Weight	2467.8		

TP-2



- 13 -

PROJECT : Broadlands Hydropower Project

PARTICLE SIZE DISTRIBUTION CURVE
BY SIEVE ANALYSIS

Sample	Plot	Source	Results				Date of Test	Job No.	
			ϕ 60%	ϕ 30%	ϕ 10%	C_u			C_c
S030034	■	TP-2	4.300	1.100	0.280	15.357	1.005	21-Jan-03	DRL/2/011

WMS/ MGC
 Lab. Assistant
 Tested By

PSR
 Lab. Technician
 Checked By

RMKRB
 Lab. Engineer
 Certified By

Specifications
 ASTM D421 & D422

**ENGINEERS
& ARCHITECTS**
cecb

Laboratory & Site Investigation Unit
 Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
 No11, Jawatta Road, Colombo 05,
 Sri Lanka.

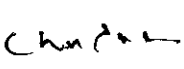
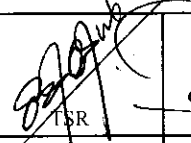

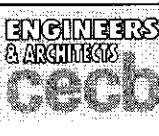
Sample Test Code A030009	SPECIFIC GRAVITY & WATER ABSORPTION OF FINE AGGREGATES	Our Reference CB/EPC/LAB/04DRI.
Date of Report 11-Feb-03	Specification No: ASTM C128	

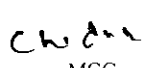
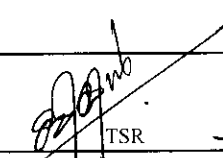
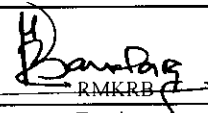
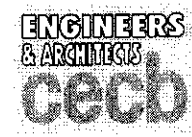
PROJECT : Broadlands Hydropower Project

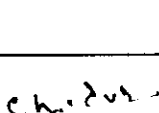
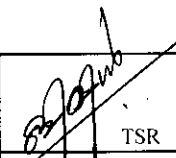

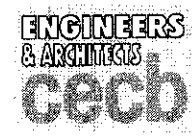
Location of the Sample	River sand
Date of Test	27-Jan-03

Sample No.			1	2	Average
Wt. in Air of Oven Dry Sample	(g)	A	495.4	496.6	
Wt. in Air of Saturated Surface Dry Sample	(g)	D	500.0	500.0	
Wt. of Picnometer Filled with Water	(g)	B	2,691.0	2,691.0	
Wt. of Picnometer Filled with Sample & Water to Calibration Mark	(g)	C	2997	2,994.6	
Bulk Specific Gravity	$\frac{A}{B + D - C}$		2.554	2.529	2.541
Bulk Specific Gravity (Saturated-Surface-Dry)	$\frac{D}{B + D - C}$		2.577	2.546	2.562
Apparent Specific Gravity	$\frac{A}{B + A - C}$		2.616	2.573	2.594
Absorption %	$\frac{D - A}{A} \times 100\%$		0.927	0.677	0.802

Remarks :

 MGC Lab. Assistant Tested By	 SR Lab. Technician Checked By	 RMIKRB Engineer Certified By	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
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Sample Test Code A03007	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
Date of Report 23/01/2003	Specification No: ASTM C127-77																																																					
PROJECT : Broadlands Hydropower Project																																																						
Location of the Sample		TP-1																																																				
Date of Test		21-01-2003																																																				
Size of Aggregates		20mm																																																				
<table border="1"> <thead> <tr> <th>Sample No.</th> <th></th> <th>1</th> <th>2</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>Rock Type</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Wt in Saturated Surface Dry (g)</td> <td>A</td> <td>582.2</td> <td>584.8</td> <td></td> </tr> <tr> <td>Wt in Air of Oven Dry Sample (g)</td> <td>B</td> <td>567.9</td> <td>569.6</td> <td></td> </tr> <tr> <td>Wt of Sample in Water (g)</td> <td>C</td> <td>351.5</td> <td>356.1</td> <td></td> </tr> <tr> <td>Bulk Specific Gravity</td> <td>$= \frac{B}{A - C}$</td> <td>2.462</td> <td>2.490</td> <td>2.476</td> </tr> <tr> <td>Bulk Specific Gravity (Saturated-Surface-Dry Basis)</td> <td>$= \frac{A}{A - C}$</td> <td>2.524</td> <td>2.557</td> <td>2.540</td> </tr> <tr> <td>Apparent Specific Gravity</td> <td>$= \frac{B}{B - C}$</td> <td>2.625</td> <td>2.668</td> <td>2.646</td> </tr> <tr> <td>Absorption %</td> <td>$= \frac{A - B}{B} * 100\%$</td> <td>2.520</td> <td>2.672</td> <td>2.596</td> </tr> <tr> <td colspan="5">Remarks :</td> </tr> </tbody> </table>					Sample No.		1	2	Average	Rock Type					Wt in Saturated Surface Dry (g)	A	582.2	584.8		Wt in Air of Oven Dry Sample (g)	B	567.9	569.6		Wt of Sample in Water (g)	C	351.5	356.1		Bulk Specific Gravity	$= \frac{B}{A - C}$	2.462	2.490	2.476	Bulk Specific Gravity (Saturated-Surface-Dry Basis)	$= \frac{A}{A - C}$	2.524	2.557	2.540	Apparent Specific Gravity	$= \frac{B}{B - C}$	2.625	2.668	2.646	Absorption %	$= \frac{A - B}{B} * 100\%$	2.520	2.672	2.596	Remarks :				
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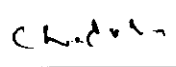
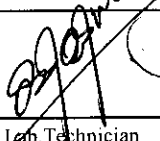
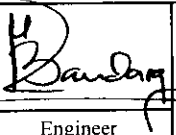
Sample Test Code A03008	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRI.																																																			
Date of Report 23/01/2003	Specification No:	ASTM C127-77																																																				
PROJECT : Broadlands Hydropower Project																																																						
Location of the Sample	TP-2																																																					
Date of Test	21-01-2003																																																					
Size of Aggregates	20mm																																																					
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Date of Test 21/01/2003	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.																																																					
Job Code DRL/2/011																																																						

Test code A030008	CLAY LUMPS AND FRIABLE PARTICLES IN AGGREGATES (Coarse Aggregates)	Our Reference CB/EPC/LAB/04/DRL
Date of Test 30-Jan-2003		Specification No: ASTM C 142

PROJECT : Broadlands Hydropower Project

Location Reference of the Sample :	TP2
Description :	Concrete Aggregates (Coarse)

Size of Particles Making Up Test Sample (mm)	Dry Weight of Test Sample (g)	Size of Sieve for Removing Residue of Clay Lumps and Friable Particles (mm)	Weight of Particles Retained on Designated Sieve (g)	Percentage of Clay Lumps & Friable Particles %
4.75-9.5	1237.3	2.36	1235.2	0.17
9.5-19.0	2493.5	4.75	2479.1	0.58
19.0-38.1	2378.1	4.75	2375.7	0.10
>38.1	-	4.75	-	-

			ENGINEERS & ARCHITECTS eeceb Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
Lab. Assistant Tested By	Lab. Technician Checked By	Engineer Certified By	

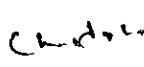
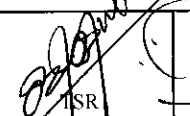


Test code A030009	CLAY LUMPS AND FRIABLE PARTICLES IN AGGREGATES (Fine Aggregates)	Our Reference CB/EPC/LAB/04/DRL
Date of Test 30-Jan-2003		Specification No: ASTM C 142

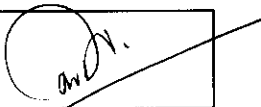
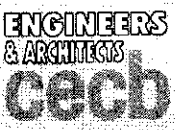
PROJECT : Broadlands Hydropower Project

Location Reference of the Sample : River sand

Size of Particles Making Up Test Sample (mm)	Dry Weight of Test Sample (g)	Size of Sieve for Removing Residue of Clay Lumps and Friable Particles (mm)	Weight of Particles Retained on Designated Sieve (g)
>1.18	54.38	0.85	39.426

Percentage of Clay Lumps and Friable Particles = 27.50 %

 MGC	 TSR	 RMKRB	 ENGINEERS & ARCHITECTS cecb Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
Lab. Assistant Tested By	Lab. Technician Checked By	Engineer Certified By	

Sample Test Code A03007	SOUNDNESS TEST OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL												
Date 30-Jan-2003	Specification No: ASTM C88														
PROJECT : Broadlands Hydropower Project															
Location of the Sample		TP-1													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Weight of Sample Passing 37.5mm and Retained on 19.1mm</td> <td style="width: 10%; text-align: center;">(g)</td> <td style="width: 30%; text-align: right;">1498.97</td> </tr> <tr> <td>Weight of Sample Retained on 19.1mm after test</td> <td style="text-align: center;">(g)</td> <td style="text-align: right;">1476.24</td> </tr> <tr> <td>Weight loss after test</td> <td style="text-align: center;">(g)</td> <td style="text-align: right;">22.73</td> </tr> <tr> <td>Soundness of Rock Sample (Loss in Weight)</td> <td style="text-align: center;">(%)</td> <td style="text-align: right;">1.52</td> </tr> </table>				Weight of Sample Passing 37.5mm and Retained on 19.1mm	(g)	1498.97	Weight of Sample Retained on 19.1mm after test	(g)	1476.24	Weight loss after test	(g)	22.73	Soundness of Rock Sample (Loss in Weight)	(%)	1.52
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Weight of Sample Retained on 19.1mm after test	(g)	1476.24													
Weight loss after test	(g)	22.73													
Soundness of Rock Sample (Loss in Weight)	(%)	1.52													
Solution Used	Sodium Sulphate														
No. of Cycles	5														
Tested at :	Engineering & Laboratory Services (Pvt) Ltd. Boralessgamuwa, Sri Lanka.														
 Engineer Certified By	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.														
Job No. DRL/2/011															

Sample Test Code A03008	SOUNDNESS TEST OF COARSE AGGREGATES	Our Reference CB/EPC/LAB/04DRL
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Date 30/Jan/2003	Specification No: ASTM C88	
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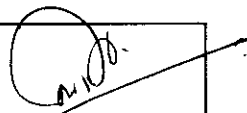
PROJECT : **Broadlands Hydropower Project**

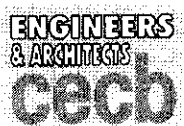
Location of the Sample	TP-2
-------------------------------	------

Weight of Sample Passing 19.1mm and Retained on 12.5mm	(g)	702.21
Weight of Sample Retained on 12.5mm after test	(g)	700.64
Weight loss after test	(g)	1.57
Soundness of Rock Sample (Loss in Weight)	(%)	0.22

Solution Used Sodium Sulphate
No. of Cycles 5

Tested at : Engineering & Laboratory Services (Pvt) Ltd.
Boralesgamuwa, Sri Lanka.


Engineer Certified By
Job No. DRL/2/011



Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05,
Sri Lanka.

Sample Test Code A03007	LOS ANGELES ABRASION TEST	Our Reference CB/EPC/LAB/04DRL
Date of Report 23-Jan-2003		Specification No: ASTM C131/76

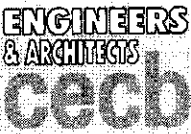
SUPPLIER: Broadlands Hydropower Project

Location Reference of the Sample	TP-1
Description of sample	19mm aggregates
Type of Fraction	19.0mm-9.5mm
Quarry Location	

Passing	Retained	Weight (g)
19.0mm	12.5mm	2500
12.5mm	9.5mm	2500
No. of steel spheres used		11 nos.

ITEM	100	500
	REVOLUTIONS	REVOLUTIONS
Wgt .of sample before (g)	5000.00	5000.00
Wgt. Of sample retained on 1.7mm sieve after test (g)	3890.80	1711.60
Wgt of sample passing 1.7mm sieve (g)	1109.20	3288.40
LOS ANGELES ABRASION VALUE	22.18%	65.77%

<i>Ch. d. u.</i> WMS/MGC/LM	<i>[Signature]</i> SR	<i>[Signature]</i> RMKRB
Lab.Assistant Tested By	Lab. Technician Checked BY	Engineer Certified BY

Date of Test 17-Jan-03		Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No. 11, Jawatta Road, Colombo 5, Sri Lanka.
Job Code DRL/2/011		

Sample Test Code A03008	LOS ANGELES ABRASION TEST	Our Reference CB/EPC/LAB/04DRL
Date of Report 23-Jan-2003		Specification No: ASTM C131/76

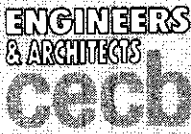
SUPPLIER: Broadlands Hydropower Project

Location Reference of the Sample	TP-2
Description of sample	19mm aggregates
Type of Fraction	19.0mm-9.5mm
Quarry Location	

Passing	Retained	Weight (g)
19.0mm	12.5mm	2500
12.5mm	9.5mm	2500
No. of steel spheres used		11 nos.

ITEM	100	500
	REVOLUTIONS	REVOLUTIONS
Wgt .of sample before (g)	5000.00	5000.00
Wgt. Of sample retained on 1.7mm sieve after test (g)	4569.50	3491.20
Wgt of sample passing 1.7mm sieve (g)	430.50	1508.80
LOS ANGELES ABRASION VALUE	8.61%	30.18%

<i>Ch. S. S.</i> WMS/MGC/UM	<i>[Signature]</i> SR	<i>[Signature]</i> RMKRD
Lab.Assistant Tested By	Lab. Technician Checked BY	Engineer Certified BY

Date of Test 17-Jan-03		Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No. 11, Jawatta Road, Colombo 5, Sri Lanka.
Job Code DRL/2/011		

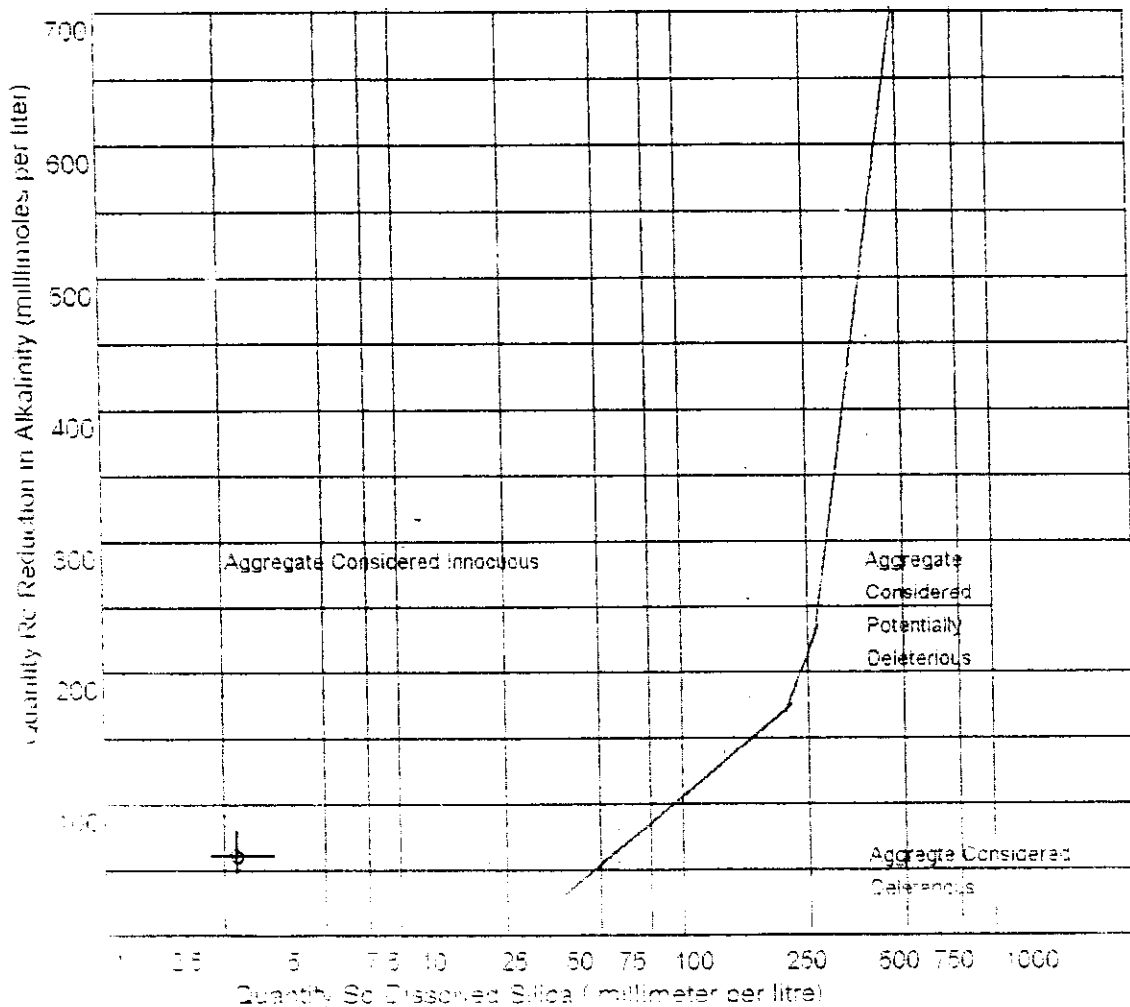
Sample Test Code A030007	POTENTIAL ALKALI-SILICA REACTIVITY OF AGGREGATES (CHEMICAL METHOD)	Our Reference CB/EPC/LAB/04DRL
Date 9-Feb-2003	Specification No: ASTM C-289	

PROJECT : Broadlands Hydropower Project

Type of Sample: **TP-1 (Coarse Aggregates)**

Scope This test method covers chemical determination of the potential reactivity of an aggregate with alkalis in portland cement concrete as indicated by the amount of reaction during 24h at 80C between 1N Sodium Hydroxide solution and aggregate that has been crushed and sieved to pass a 300mm sieve and be retained on a 150mm sieve.

Quantity of Dissolved Silica (Sc)	2.90	mmol/L
Quantity of Reduction in Alkalinity (Rc)	60.00	mmol/L



Engineer Certified By
Job No. DRL/2/011

Tested at : Engineering & Laboratory Services (Pvt) Ltd.
Boralessamuwa, Sri Lanka.



Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05.
Sri Lanka.

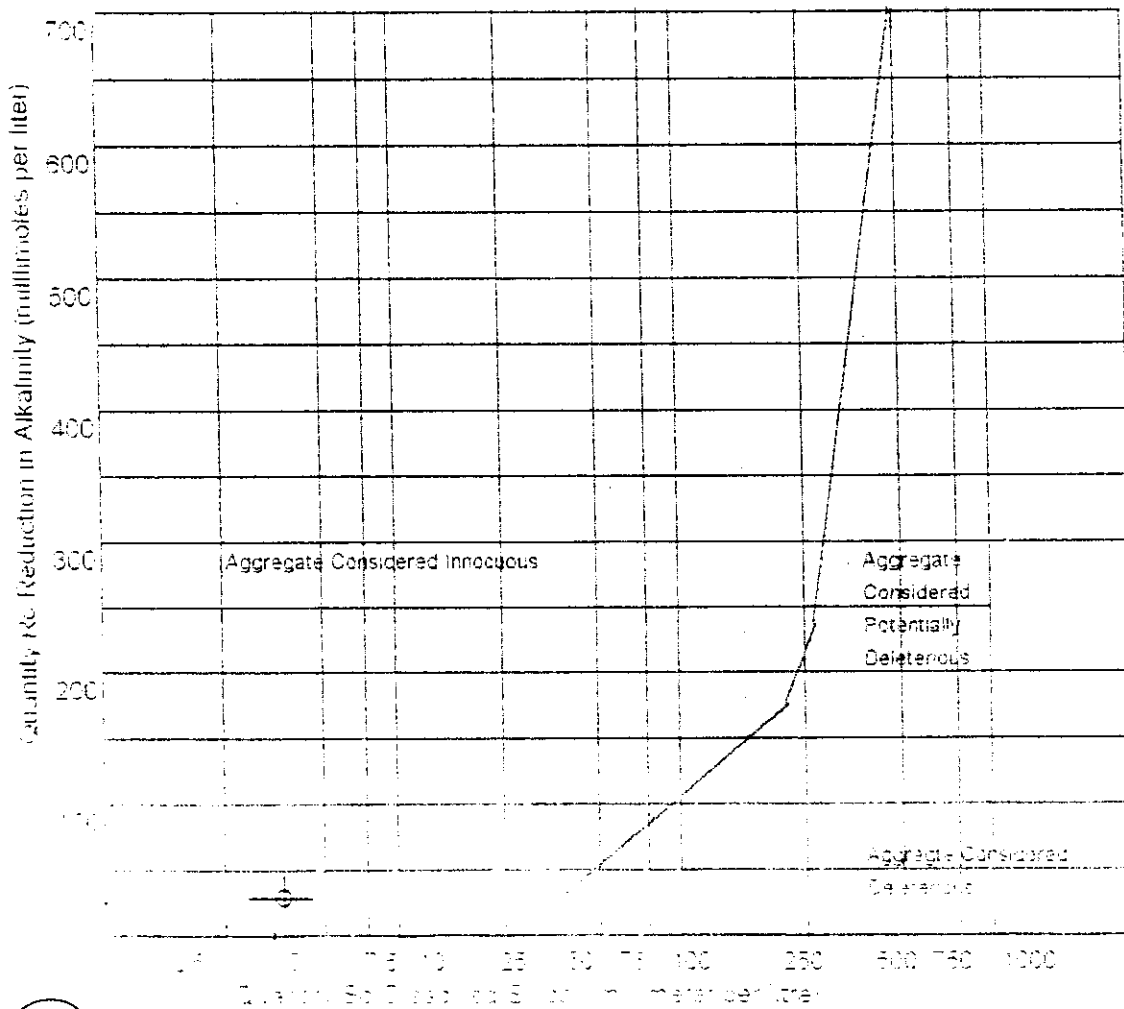
Sample Test Code A030008	POTENTIAL ALKALI-SILICA REACTIVITY OF AGGREGATES (CHEMICAL METHOD)	Our Reference CB/EPC/LAB/04DRL
Date 9-Feb-2003	Specification No: ASTM C-289	

PROJECT : Broadlands Hydropower Project

Type of Sample **TP-2 (Coarse Aggregates)**

Scope This test method covers chemical determination of the potential reactivity of an aggregate with alkalis in portland cement concrete as indicated by the amount of reaction during 24h at 80C between 1N Sodium Hydroxide solution and aggregate that has been crushed and sieved to pass a 300mm sieve and be retained on a 150mm sieve

Quantity of Dissolved Silica (So)	4.42	mmol/L
Quantity of Reduction in Alkalinity (Ro)	30.00	mmol/L



M.P.V.
Engineer
Certified By

Tested at : Engineering & Laboratory Services (Pvt) Ltd.
Boralesgamuwa, Sri Lanka.



Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05,
Sri Lanka.

Job No.
DRL/2/011

Sample Test Code A03016	SPECIFIC GRAVITY & WATER ABSORPTION OF ROCK CORES	Our Reference CB/EPC/LAB/04DRL
Date of Report 11-Feb-03	Specification No: ASTM C127	

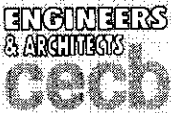
PROJECT : Broadlands Hydropower Project

Location of the Sample	MB 1/depth 24.49-25.00m
Rock Type	Charnokitik-gneiss
Particle Size	20-5 mm

Sample No.		1	2	Average
Wt in Saturated Surface Dry (g)	A	901.3	838.8	
Wt in Air of Oven Dry Sample (g)	B	900.8	837.7	
Wt of Sample in Water (g)	C	559.0	522.1	
Bulk Specific Gravity = $\frac{B}{A - C}$		2.632	2.645	2.638
Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$		2.633	2.648	2.641
Apparent Specific Gravity = $\frac{B}{B - C}$		2.635	2.654	2.645
Absorption % = $\frac{A - B}{B} * 100\%$		0.051	0.131	0.091

Remarks :

<i>Ch. D. L.</i> MGC	<i>[Signature]</i> TSR	<i>[Signature]</i> RMKRB
Lab. Assistant Tested By	Lab. Technician Checked By	Lab. Engineer Certified By

Date of Test 07-Feb-03	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
Job No. DRL/2/011	

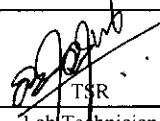
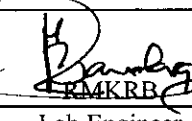
Sample Test Code A03017	SPECIFIC GRAVITY & WATER ABSORPTION OF ROCK CORES	Our Reference CB/EPC/LAB/04DRL
Date of Report 11-Feb-03	Specification No: ASTM C127	


PROJECT : Broadlands Hydropower Project

Location of the Sample	MB 3/depth 22.00-22.38m
Rock Type	Biotite rich gneiss
Particle Size	20-5 mm

Sample No.		1	2	Average
Wt in Saturated Surface Dry (g)	A	955.5	1,062.5	
Wt in Air of Oven Dry Sample (g)	B	955.2	1,062.1	
Wt of Sample in Water (g)	C	643.7	717.5	
Bulk Specific Gravity = $\frac{B}{A - C}$		3.064	3.079	3.071
Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$		3.064	3.080	3.072
Apparent Specific Gravity = $\frac{B}{B - C}$		3.066	3.082	3.074
Absorption % = $\frac{A - B}{B} * 100\%$		0.031	0.038	0.035

Remarks :

CHA... MGC	 TSR	 RMKRB
Lab. Assistant Tested By	Lab. Technician Checked By	Lab. Engineer Certified By

Date of Test 07-Feb-03	 ENGINEERS & ARCHITECTS CECB	Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
Job No. DRL/2/011		

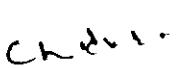

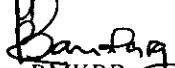
Sample Test Code A03018	SPECIFIC GRAVITY & WATER ABSORPTION OF ROCK CORES	Our Reference CB/EPC/LAB/04DRL
Date of Report 11-Feb-03	Specification No: ASTM C127	


PROJECT : Broadlands Hydropower Project

Location of the Sample	DT 1/depth 19.45-19.85m
Rock Type	Calk-gneiss
Particle Size	25-3 mm

Sample No.		1	2	Average
Wt in Saturated Surface Dry (g)	A	940.7	621.5	
Wt in Air of Oven Dry Sample (g)	B	935.5	614.9	
Wt of Sample in Water (g)	C	621.2	403.1	
Bulk Specific Gravity = $\frac{B}{A - C}$		2.928	2.815	2.871
Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$		2.944	2.845	2.895
Apparent Specific Gravity = $\frac{B}{B - C}$		2.976	2.903	2.939
Absorption % = $\frac{A - B}{B} * 100\%$		0.556	1.073	0.815

Remarks :

 MGC	 SR	 RMKRB
Lab. Assistant Tested By	Lab. Technician Checked By	Lab. Engineer Certified By

Date of Test 07-Feb-03	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05. Sri Lanka.
Job No. DRL/2/011	

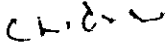
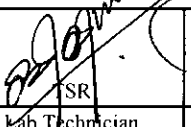

Sample Test Code A03019	SPECIFIC GRAVITY & WATER ABSORPTION OF ROCK CORES	Our Reference CB/EPC/LAB/04DRL
Date of Report 11-Feb-03	Specification No: ASTM C127	

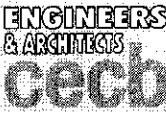
PROJECT : Broadlands Hydropower Project

Location of the Sample	MT 3/depth 14.31-14.76m
Rock Type	Garnet rich biotite gneiss
Particle Size	25-4 mm

Sample No.		1	2	Average
Wt in Saturated Surface Dry (g)	A	960.2	784.7	
Wt in Air of Oven Dry Sample (g)	B	959.8	784.1	
Wt of Sample in Water (g)	C	616.5	508.0	
Bulk Specific Gravity = $\frac{B}{A - C}$		2.793	2.834	2.813
Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$		2.794	2.836	2.815
Apparent Specific Gravity = $\frac{B}{B - C}$		2.796	2.840	2.818
Absorption % = $\frac{A - B}{B} * 100\%$		0.042	0.077	0.059

Remarks :

 MGC	 SR	 RMKRB
Lab. Assistant Tested By	Lab. Technician Checked By	Lab. Engineer Certified By

Date of Test 07-Feb-03	 ENGINEERS & ARCHITECTS cecb	Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
Job No. DRL/2/011		

Sample Test Code A03020	SPECIFIC GRAVITY & WATER ABSORPTION OF ROCK CORES	Our Reference CB/EPC/LAB/04DRL
Date of Report 11-Feb-03	Specification No: ASTM C127	


PROJECT : Broadlands Hydropower Project

Location of the Sample	MT 2/depth 32.56-33.00m
Rock Type	Quartzite
Particle Size	22-5 mm

Sample No.		1	2	Average
Wt in Saturated Surface Dry (g)	A	787.4	774.6	
Wt in Air of Oven Dry Sample (g)	B	787.1	774.1	
Wt of Sample in Water (g)	C	489.4	477.6	
Bulk Specific Gravity = $\frac{B}{A - C}$		2.642	2.606	2.624
Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$		2.643	2.608	2.625
Apparent Specific Gravity = $\frac{B}{B - C}$		2.644	2.611	2.628
Absorption % = $\frac{A - B}{B} * 100\%$		0.038	0.065	0.051

Remarks :

<i>Ch. d. L</i> MGC	<i>[Signature]</i> ISR	<i>[Signature]</i> RMKRB
Lab. Assistant Tested By	Lab. Technician Checked By	Lab. Engineer Certified By

Date of Test 07-Feb-03	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
Job No. DRL/2/011	

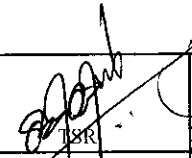
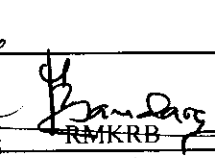

Sample Test Code A03021	SPECIFIC GRAVITY & WATER ABSORPTION OF ROCK CORES	Our Reference CB/EPC/LAB/04DRL
Date of Report 11-Feb-03	Specification No: ASTM C127	

PROJECT : Broadlands Hydropower Project

Location of the Sample	MT 1/depth 34.93-35.35m
Rock Type	Quartz rich feldspathic gneiss
Particle Size	25-5 mm

Sample No.		1	2	Average
Wt in Saturated Surface Dry (g)	A	854.8	765.0	
Wt in Air of Oven Dry Sample (g)	B	849.5	758.7	
Wt of Sample in Water (g)	C	523.4	473.2	
Bulk Specific Gravity = $\frac{B}{A - C}$		2.563	2.600	2.581
Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$		2.579	2.621	2.600
Apparent Specific Gravity = $\frac{B}{B - C}$		2.605	2.657	2.631
Absorption % = $\frac{A - B}{B} * 100\%$		0.624	0.830	0.727

Remarks :


Ch. M. C. M. MGC	 TSR	 RMKRB
Lab. Assistant Tested By	Lab. Technician Checked By	Lab. Engineer Certified By
Date of Test 07-Feb-03	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.	
Job No. DRL/2/011		

Sample Code A030010-15	COMPRESSION TEST ON ROCK SAMPLES	Our Reference CB/EPC/LAB/04DRL
Date of Report 3-Feb-2003		

PROJECT : Broadlands Hydropower Project

GEOLOGICAL NAME OF ROCK SAMPLE	BORE HOLE NO. & DEPTH (m)	DIAMETER (mm)				LENGTH OF SAMPLE (mm)				WEIGHT OF SAMPLE (g)	LOAD AT FAILURE (kN)	UNCONFINED COMPRESSIVE STRENGTH (N/mm ²)
		1	2	3	MEAN	1	2	3	MEAN			
Charnokitic gneiss	MB1/24.49-24.68 (S.No.2)	49.8	49.8	49.8	49.8	108.5	108.5	109.1	108.7	560.99	128.00	65.66
Biotite rich gneiss	MB3/22.00-22.15 (S.No.2)	54.5	54.5	54.6	54.5	98.6	98.6	98.8	98.7	718.2	90.00	38.52
Calk-gneiss	DT1/19.68-19.85 (S.No.2)	49.5	49.5	49.5	49.5	111.5	111.4	111.3	111.4	616.03	25.00	12.99
Garnet rich biotite gneiss	MT3/14.58-14.76 (S.No.1)	49.6	49.6	49.7	49.6	112.8	112.8	112.9	112.8	629.7	33.00	17.05
Quartzite	MT2/32.86-33.00 (S.No.2)	49.5	49.4	49.5	49.5	109.7	109.1	109.9	109.6	551.05	68.00	35.37
Quartz rich feldspathic gneiss	MT1/35.08-35.25 (S.No.2)	54.5	54.5	54.5	54.5	110.9	110.9	111.1	111.0	690.9	154.00	65.99

<i>C. H. M.</i> MGC	<i>[Signature]</i> TSR	<i>[Signature]</i> RMKRB
Lab. Assistant Tested By	Lab. Technician Checked By	Lab. Engineer Certified By


Date of Test 29-Jan-2003	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No. 11, Jawatta Road, Colombo 5, Sri Lanka.
Job Ref: DRL/2/011	

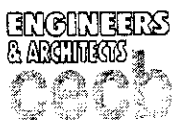
	DETERMINATION OF ULTRASONIC PULSE VELOCITY OF ROCK CORE SAMPLES	Our Reference CB/EPC/LAB/04DRL
Date of Report 23-Jan-2003	Specification No: ASTM D 2845-1983	

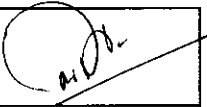
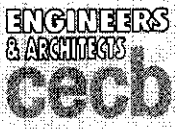
PROJECT : Broadlands Hydropower Project


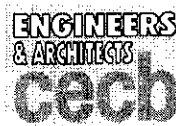
Serial No.	1	2	3	4	5	6
Bore hole No.	MB1	MB3	DT1	MT3	MT2	MT1
Depth of extraction	24.49-24.68	22.00-22.15	19.68-19.85	14.58-14.76	32.86-33.00	35.08-35.25
Length as received (mm)	108	98	110	112	108	110
Weight as received (g)	559.33	716.02	616.48	627.80	549.62	688.88
Oven dry weight (g)	559.03	715.75	613.31	627.59	549.12	688.29
Observed diameter (mm)	50	55	49	50	50	55
Density (kg/m ³)	2648	3103	2914	2886	2621	2685
Pulse travel time observed (μs)	15.8	16.2	49.5	22.7	26.3	42.1
Pulse velocity (km/s)	6.8	6.0	2.2	4.9	4.1	2.6
Water content (%) (% oven dry basis)	0.05	0.04	0.51	0.03	0.09	0.09

Tested at : National Building Research Organisation
 Colombo-05, Sri Lanka.


Engineer Certified By

		Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05. Sri Lanka.
Job No. DRL/2/011		

SOUNDNESS TEST OF COARSE AGGREGATES		Our Reference												
Date 30-Jan-2003	Specification No: ASTM C88	CB/EPC/LAB/04DRL												
PROJECT : Broadlands Hydropower Project														
Sample No.	1													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Weight of Sample Passing 9.5mm and Retained on 4.75mm</td> <td style="text-align: center; padding: 5px;">(g)</td> <td style="text-align: center; padding: 5px;">322.00</td> </tr> <tr> <td style="padding: 5px;">Weight of Sample Retained on 4.75mm after test</td> <td style="text-align: center; padding: 5px;">(g)</td> <td style="text-align: center; padding: 5px;">310.02</td> </tr> <tr> <td style="padding: 5px;">Weight loss after test</td> <td style="text-align: center; padding: 5px;">(g)</td> <td style="text-align: center; padding: 5px;">11.98</td> </tr> <tr> <td style="padding: 5px;">Soundness of Rock Sample (Loss in Weight)</td> <td style="text-align: center; padding: 5px;">(%)</td> <td style="text-align: center; padding: 5px;">3.72</td> </tr> </table>			Weight of Sample Passing 9.5mm and Retained on 4.75mm	(g)	322.00	Weight of Sample Retained on 4.75mm after test	(g)	310.02	Weight loss after test	(g)	11.98	Soundness of Rock Sample (Loss in Weight)	(%)	3.72
Weight of Sample Passing 9.5mm and Retained on 4.75mm	(g)	322.00												
Weight of Sample Retained on 4.75mm after test	(g)	310.02												
Weight loss after test	(g)	11.98												
Soundness of Rock Sample (Loss in Weight)	(%)	3.72												
Solution Used	Sodium Sulphate													
No. of Cycles	5													
Tested at :	Engineering & Laboratory Services (Pvt) Ltd. Boralesgamuwa, Sri Lanka.													
 Engineer Certified By	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.													
Job No. DRL/2/011														

SOUNDNESS TEST OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL												
Date 30/Jan/2003	Specification No: ASTM C88													
PROJECT : Broadlands Hydropower Project														
Sample No.	2													
<table border="1" style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="width: 60%;">Weight of Sample Passing 19.1mm and Retained on 12.5mm</td> <td style="width: 10%; text-align: center;">(g)</td> <td style="width: 30%; text-align: center;">998.00</td> </tr> <tr> <td>Weight of Sample Retained on 12.5mm after test</td> <td style="text-align: center;">(g)</td> <td style="text-align: center;">916.41</td> </tr> <tr> <td>Weight loss after test</td> <td style="text-align: center;">(g)</td> <td style="text-align: center;">81.59</td> </tr> <tr> <td>Soundness of Rock Sample (Loss in Weight)</td> <td style="text-align: center;">(%)</td> <td style="text-align: center;">8.18</td> </tr> </tbody> </table>			Weight of Sample Passing 19.1mm and Retained on 12.5mm	(g)	998.00	Weight of Sample Retained on 12.5mm after test	(g)	916.41	Weight loss after test	(g)	81.59	Soundness of Rock Sample (Loss in Weight)	(%)	8.18
Weight of Sample Passing 19.1mm and Retained on 12.5mm	(g)	998.00												
Weight of Sample Retained on 12.5mm after test	(g)	916.41												
Weight loss after test	(g)	81.59												
Soundness of Rock Sample (Loss in Weight)	(%)	8.18												
Solution Used	Sodium Sulphate													
No. of Cycles	5													
Tested at :	Engineering & Laboratory Services (Pvt) Ltd. Boralessgamuwa, Sri Lanka.													
 Engineer Certified By														
Job No. DRL/2/011	Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.													

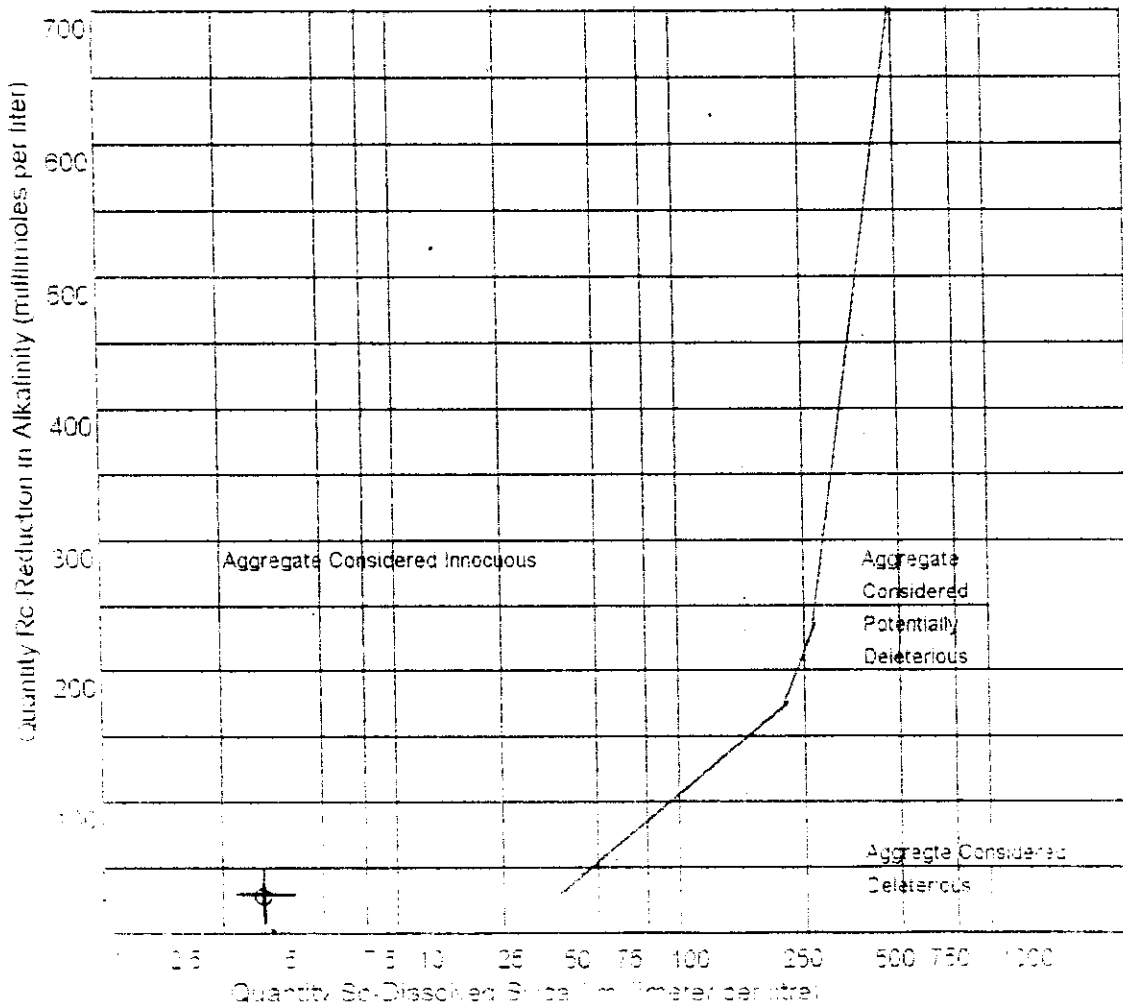
	POTENTIAL ALKALI-SILICA REACTIVITY OF AGGREGATES (CHEMICAL METHOD)	Our Reference CB/EPC/LAB/04DRL
Date 9-Feb-2003	Specification No: ASTM C-289	

PROJECT : Broadlands Hydropower Project

Type of Sample	Sample No.01 (Rock Core)
----------------	--------------------------

Scope This test method covers chemical determination of the potential reactivity of an aggregate with alkalis in portland cement concrete as indicated by the amount of reaction during 24h at 30C between 1N Sodium Hydroxide solution and aggregate that has been crushed and sieved to pass a 300mm sieve and be retained on a 150mm sieve

Quantity of Dissolved Silica (So)	3.53	mmol/L
Quantity of Reduction in Alkalinity (Rc)	30.00	mmol/L



(Signature)

Tested at : Engineering & Laboratory Services (Pvt) Ltd.
Boralesgamuwa, Sri Lanka.

Engineer
Certified By

**ENGINEERS
& ARCHITECTS
cecb**

Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05.
Sri Lanka.

Job No.
DRL/2/011

POTENTIAL ALKALI-SILICA REACTIVITY OF AGGREGATES (CHEMICAL METHOD)

Our Reference
CB/EPC/LAB/04DRL

Date
9-Feb-2003

Specification No: ASTM C-289

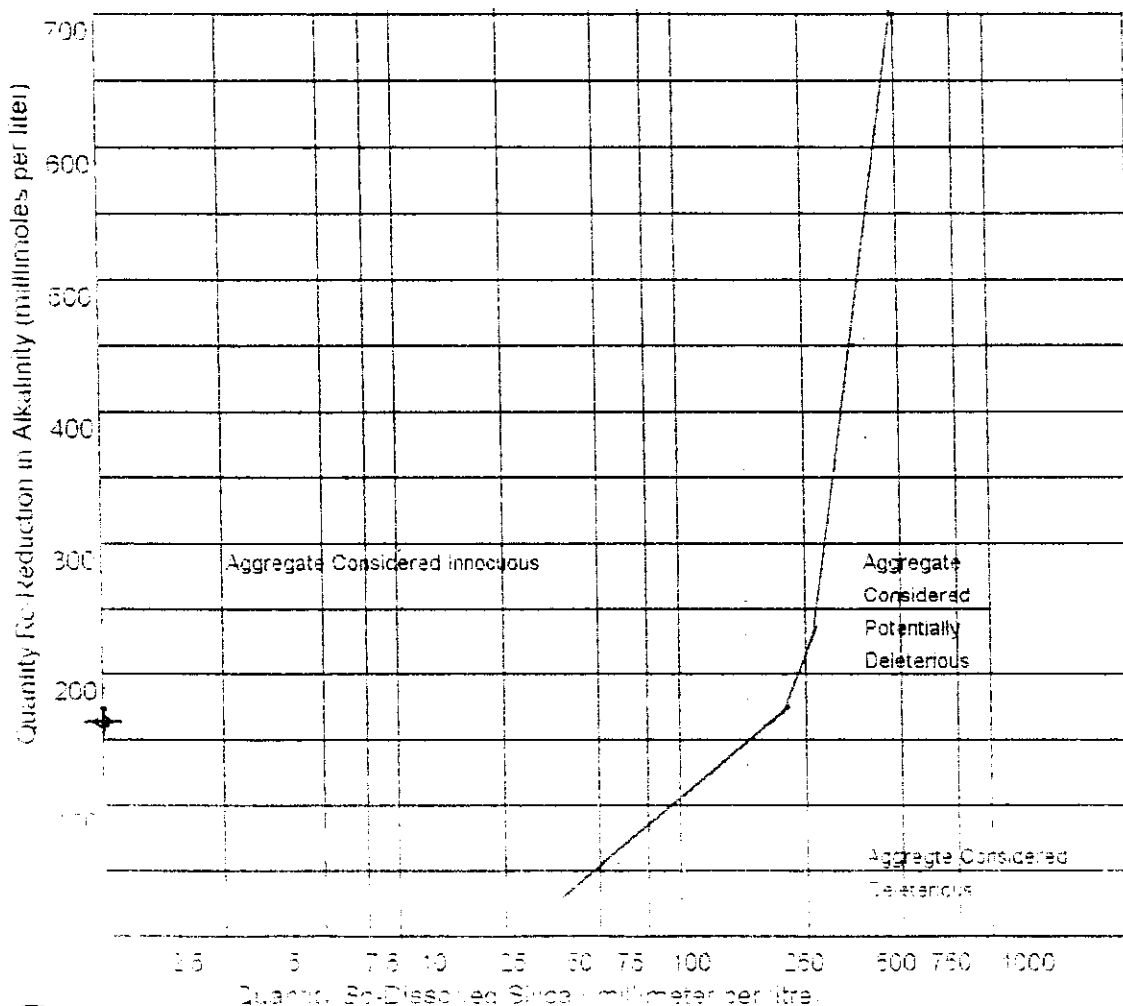
PROJECT : Broadlands Hydropower Project

Type of Sample

Sample No.02 (Rock Core)

Scope This test method covers chemical determination of the potential reactivity of an aggregate with alkalis in portland cement concrete as indicated by the amount of reaction during 24h at 80C between 1N Sodium Hydroxide solution and aggregate that has been crushed and sieved to pass a 300mm sieve and be retained on a 150mm sieve

Quantity of Dissolved Silica (Sc)	0.71	mmol/L
Quantity of Reduction in Alkalinity(Rc)	165.00	mmol/L



(Signature)
Engineer
Certified By

**Tested at : Engineering & Laboratory Services (Pvt) Ltd.
Boralessamuwa, Sri Lanka.**

Job No.
DRL/2/011



Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05.
Sri Lanka.



Fig 12 : Soundness by Sodium Sulphate - Test in Progress



Fig 13 : Clay Lumps and Friable Particles- Test in Progress

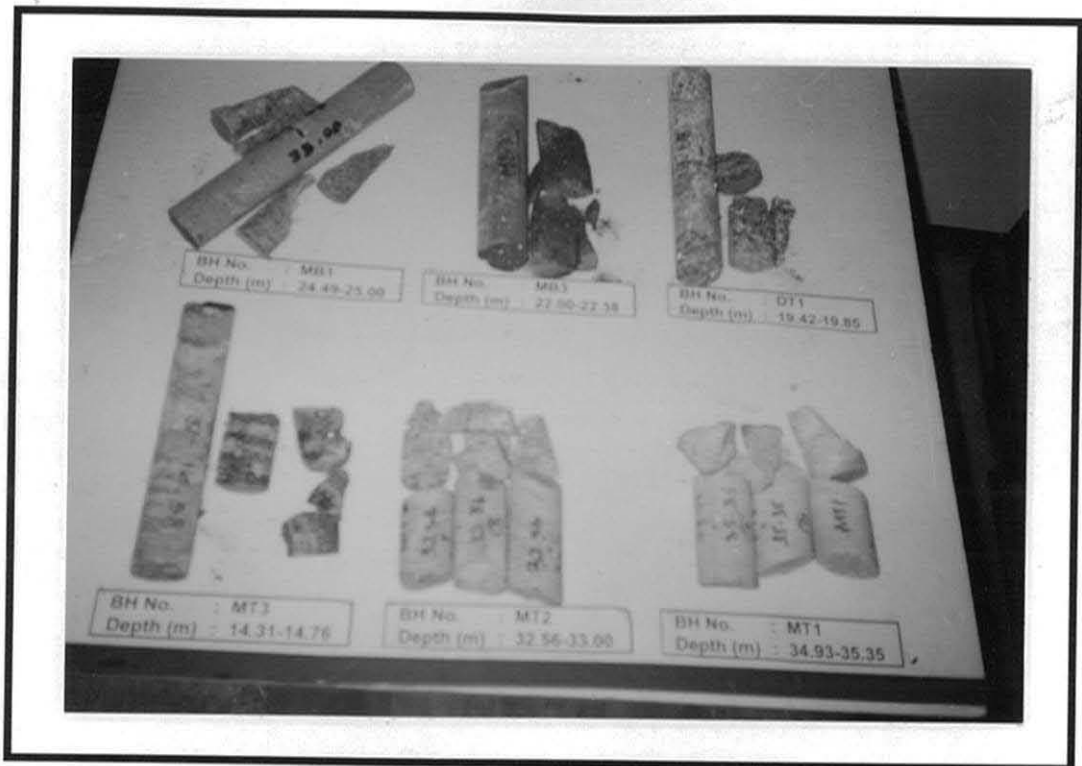


Fig 14 : Rock Core Samples Selected for Testing of Water Absorption and Specific Gravity , Unconfined Compressive Strength and Ultra Sonic Wave Velocity

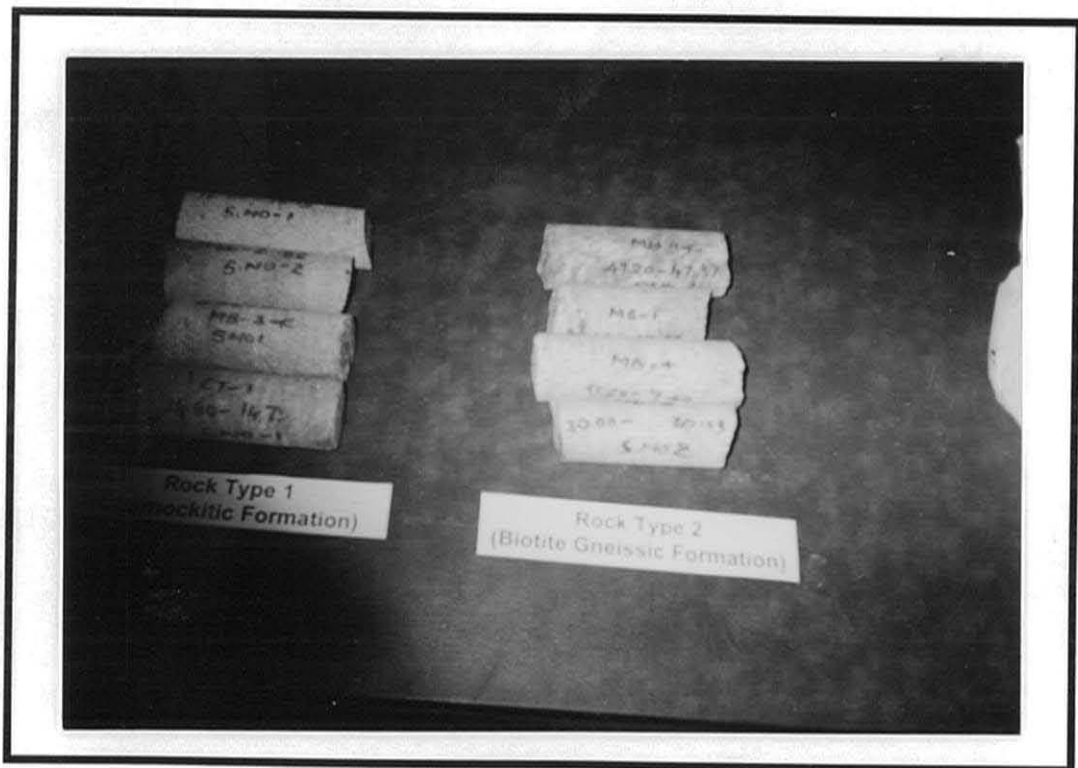


Fig 15 : : Rock Core Samples Selected for Testing of Soundness by Sodium Sulphate and Chemical (Alkali) Reactivity

Our Ref: CB/EPC/LAB/04C
TEST CERTIFICATE NO: **DRL/AT/2003386**

Issued By : Laboratory & Site Investigation Unit
 Engineering Procurement Construction Division
 CECB, No.11, Jawatte Road, Colombo 05.

Assured To : Jica Study Team
 Electric Power Development Co., Ltd
 Nippon Koel Co., Ltd.

Project : Broadlands Hydropower Project-Phase II

Job Requested : Testing of Aggregates & Rock samples from Broadlands Hydropower Project.

Job Ref : DRL/3/007

Tested for : 1) Concrete Aggregates (from test pit samples)

 1.1) Sieve Analysis of Aggregates
 1.2) Specific gravity and water absorption (Fine)
 1.3) Specific gravity and water absorption (Coarse)
 1.4) Clay lumps and friable particles in (Coarse & Fine) Aggregates
 1.5) Soundness tests by sodium sulfate
 1.6) Abrasion test of Coarse Aggregate by Los Angeles machine
 1.7) Chemical (Alkali) reactivity test

 2.) Rock (from drilling core samples)

 2.1) Water absorption and bulk specific gravity
 2.2) Unconfined compressive Strength of Rock Cores
 2.3) Ultra-sonic wave velocity
 2.4) Soundness tests by sodium sulfate
 2.5) Chemical (Alkali) reactivity test
 2.6) Abrasion test of Coarse Aggregate by Los Angeles machine

Results: As tabulated in pages 02-07.

Results:

1.1) Results of Sieve Analysis of Aggregates

Sample Description	Φ 60% (mm)	Φ 30% (mm)	Φ 10% (mm)	C _u	C _c
TP-3	1.100	0.420	0.160	6.875	1.002
TP-4	0.190	0.081	-	-	-

1.2) Results of Specific Gravity and Water Absorption of Fine Aggregates

Sample Description	Bulk Specific Gravity	Bulk Specific Gravity (SSD* Basis)	Apparent Specific Gravity	Water Absorption (%)
TP-3(Fine Aggregates)	2.286	2.376	2.511	3.92
TP-4(Fine Aggregates)	2.144	2.320	2.602	8.20

*SSD- Saturated-Surface-Dry Basis

1.3) Results of Specific Gravity and Water Absorption of Coarse Aggregates

Sample Description	Bulk Specific Gravity	Bulk Specific Gravity (SSD* Basis)	Apparent Specific Gravity	Water Absorption (%)
TP-3(Coarse Aggregates)	2.717	2.731	2.756	0.523


*SSD- Saturated-Surface-Dry Basis

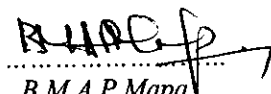
1.4) Results of Clay Lumps and Friable Particles in (Coarse & Fine) Aggregates

Sample Description	Particle Size (mm)	Percentage of Clay Lumps and Friable Particles (%)
TP-3(Coarse Aggregates)	4.75-9.5	13.71
	9.5-19.0	3.36
	19.0-38.1	3.25
	>38.1	1.72
TP-3(Fine Aggregates)	>1.18	5.84

Reported By: 
A.J. Emmanuel / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By: 
A.A. Prabh Dias
Engineer In Charge Laboratory


B.M.A.P. Mapa
Project Manager Laboratory

Date : 28-10-2003.

Results:

1.5) Results of Soundness Tests by Sodium Sulphate of Aggregates


Sample Description	Soundness of Aggregate sample (Loss in weight) %
TP-3(Coarse Aggregates)	10.1

1.6) Results of Loss Angeles Abrasion Test of Aggregates


Sample Description	Los Angeles Abrasion Value (%)	
	100 Revolutions	500 Revolutions
TP-3(Coarse Aggregates)	21.40	56.51

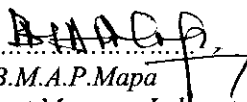
1.7) Results of Chemical (Alkali) Reactivity Test of Aggregates

Sample Description	Quantity of Dissolved Silica (Sc) mmol/L	Quantity of Reduction in Alkalinity (Rc) mmol/L
TP-3(Coarse Aggregates)	8.2	35.00

Reported By: 
A.J. Emmanuel / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By 
A.A. Virajh Dias
Engineer In Charge Laboratory


B.M.A.P. Mapa
Project Manager Laboratory

Date : 28-10-2003.

Results:

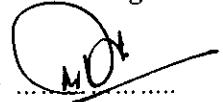
2.1) Results of Water Absorption and Bulk Specific Gravity of Rock Samples

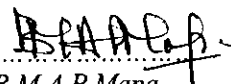
Bore Hole No.	Rock Type	Depth (m)	Bulk Specific Gravity	Bulk Specific Gravity (SSD* Basis)	Apparent Specific Gravity	Water Absorption (%)
MB-5	Charnokitic-gneiss	2.12-2.28	2.648	2.658	2.676	0.404
MB-5	Charnokitic-gneiss	2.26-3.45	2.650	2.658	2.673	0.326
MB-5	Charnokitic-gneiss	3.45-3.60	2.638	2.647	2.662	0.348
MB-5	Charnokitic-gneiss	5.00-5.59	2.658	2.667	2.681	0.334
MB-5	Quartz rich garnet biotite gneiss	22.00-22.18	2.603	2.629	2.673	1.011
MB-5	Quartz rich garnet biotite gneiss	22.18-22.32	2.607	2.633	2.678	1.023
MT-6	Quartz rich garnet biotite gneiss	39.34-39.68	2.795	2.809	2.833	0.472
MT-6	Quartz rich garnet biotite gneiss	39.48-39.68	2.684	2.697	2.719	0.474
MT-6	Quartz rich garnet biotite gneiss	39.68-39.82	2.832	2.846	2.872	0.500
MT-6	Quartz rich garnet biotite gneiss	39.40-39.98	2.690	2.702	2.724	0.461
MT-7	Biotite gneiss	46.18-46.31	3.042	3.052	3.074	0.341
MT-7	Biotite gneiss	46.31-46.41	3.064	3.071	3.087	0.242
MT-8	Biotite gneiss	56.20-56.40	2.865	2.870	2.881	0.195
MT-8	Biotite gneiss	56.40-56.60	2.661	2.667	2.676	0.208
TR-1	Biotite gneiss	10.16-10.49	2.662	2.685	2.725	0.877
TR-1	Biotite gneiss	18.38-18.83	3.058	3.080	3.125	0.705
BQ-2	Granitic gneiss	16.32-16.73	2.585	2.606	2.642	0.842
BQ-2	Granitic gneiss	18.00-18.39	2.582	2.606	2.644	0.913

*SSD- Saturated-Surface-Dry Basis

Reported By: 
A.J. Emmanuel / Laboratory Engineer

Checked By: 
S.S.J. Kodagoda / Coordinator - Testing and Analysis

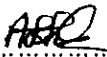
Certified By 
A.A. Virajh Dias
Engineer In Charge Laboratory


B.M.A.P. Mapa
Project Manager Laboratory

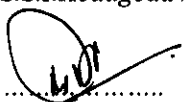
Date : 28-10-2003.


2.2) Results of Unconfined compressive Strength of Rock Cores

Bore Hole No.	Rock Type	Depth (m)	Unconfined Compressive Strength (N/mm ²)
MB-5	Charnokitic-gneiss	5.73-5.83	92.51
MB-5	Charnokitic-gneiss	9.00-9.10	74.87
MB-5	Charnokitic-gneiss	9.52-9.62	51.81
MB-5	Charnokitic-gneiss	22.00-22.38	136.13
MT-6	Quartz rich garnet biotite gneiss	39.00-39.10	85.21
MT-6	Quartz rich garnet biotite gneiss	39.46-39.56	48.90
MT-6	Quartz rich garnet biotite gneiss	39.58-39.68	55.90
MT-6	Quartz rich garnet biotite gneiss	39.68-39.78	63.05
MT-7	Biotite gneiss	29.64-29.75	70.42
MT-7	Quartz rich biotite gneiss	46.00-46.11	93.12
MT-8	Biotite gneiss	51.43-51.54	107.30
MT-8	Quartz rich biotite gneiss	74.76-74.86	69.86
TR-1	Biotite gneiss	10.00-10.15	69.95
TR-1	Biotite gneiss	18.90-19.00	42.02
BQ-1	Quartzo feldspathic gneiss	17.10-17.24	50.93
BQ-1	Quartzo feldspathic gneiss	17.39-17.75	54.69
BQ-1	Impure quartzite	20.60-22.75	26.88
BQ-2	Granitic gneiss	22.52-22.62	10.19
BQ-2	Granitic gneiss	22.62-22.72	55.31
BQ-2	Granitic gneiss	22.90-23.00	71.79

Reported By: 
A.J. Emmanuel / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By 
A.A. Virajh Dias
Engineer In Charge Laboratory


B.M.A.P. Mapa
Project Manager Laboratory

Date : 28-10-2003.

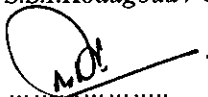
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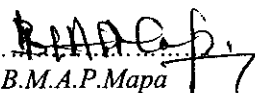
2.3) Results of Ultra-Sonic Wave Velocity of Rock Cores

Bore Hole No.	Depth (m)	Rock Type	Diameter (mm)	Length (mm)	Ultrasonic Pulse Velocity (km/s)
MB 5	5.73-5.83	Charnokitic-gneiss	49.80	99.92	6.891
MB 5	9.00-9.10	Charnokitic-gneiss	49.62	101.20	7.845
MB 5	9.52-9.62	Charnokitic-gneiss	49.72	101.28	7.558
MB 5	22.00-22.38	Charnokitic-gneiss	49.62	100.58	7.396
MT 6	39.00-39.10	Quartz rich garnet biotite gneiss	50.00	100.92	8.010
MT 6	39.46-39.56	Quartz rich garnet biotite gneiss	49.62	102.62	7.029
MT 6	39.58-39.68	Quartz rich garnet biotite gneiss	49.60	96.80	5.500
MT 6	39.68-39.78	Quartz rich garnet biotite gneiss	49.52	100.22	4.494
MT 7	29.64-29.75	Quartz rich biotite gneiss	54.72	111.00	6.000
MT 7	46.00-46.11	Biotite gneiss	54.40	111.80	7.260
MT 8	51.43-51.54	Biotite gneiss	54.30	111.10	7.032
MT 8	74.76-74.86	Quartz rich biotite gneiss	54.42	92.00	6.301
BQ 1	17.10-17.24	Quartzo feldspathic gneiss	54.42	114.20	6.880
BQ 1	17.39-17.50	Quartzo feldspathic gneiss	54.40	109.00	6.566
BQ 1	20.60-22.75	Impure quartzite	54.38	65.20	7.581
BQ 2	22.52-22.62	Granitic gneiss	49.80	100.20	3.976
BQ 2	22.62-22.72	Granitic gneiss	50.30	100.82	4.272
BQ 2	22.90-23.00	Granitic gneiss	49.96	101.54	3.982

Reported By: 
A.J. Emmanuel / Laboratory Engineer

Checked By: 
S.S.I. Kodagoda / Coordinator - Testing and Analysis

Certified By: 
A.A. Virajh Dias
Engineer In Charge Laboratory


B.M.A.P. Mapa
Project Manager Laboratory

Date : 28-10-2003.

Results:

2.4) Results of Soundness Tests by Sodium Sulphate of Rock Samples

Bore Hole No.	Rock Type	Soundness of Rock sample (Loss in weight) %
BQ-2	Granitic gneiss	0.4

2.5) Results of Chemical (Alkali) Reactivity Test of Rock Samples

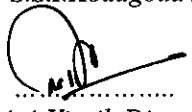
Bore Hole No.	Rock Type	Quantity of Dissolved Silica (Sc) mmol/L	Quantity of Reduction in Alkalinity (Rc) mmol/L
BQ-2	Granitic gneiss	2.57	26.00

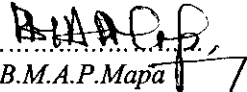
2.6) Results of Loss Angeles Abrasion Test of Aggregates

Bore Hole No.	Rock Type	Los Angeles Abrasion Value (%)	
		100 Revolutions	500 Revolutions
BQ-2	Granitic gneiss	12.21	48.04

Reported By: 
A.J. Emmanuel / Laboratory Engineer

Checked By: 
S.S.J. Kodagoda / Coordinator - Testing and Analysis

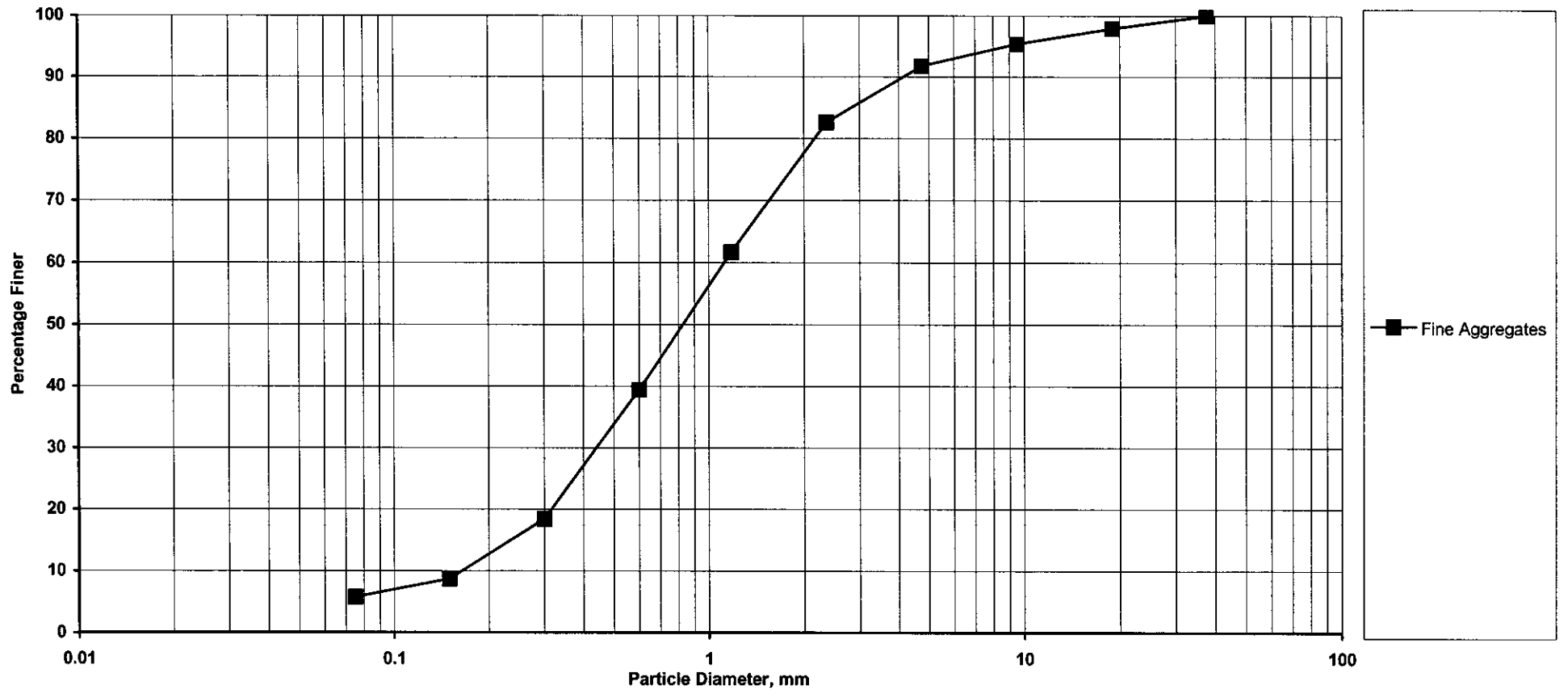
Certified By 
A.A. Virajh Dias
Engineer In Charge Laboratory


B.M.A.P. Mapa
Project Manager Laboratory

Date : 28-10-2003.

Particle Size Analysis Data (sieve analysis)- Fine Aggregates

TP-3			
Sieve size mm	Mass Retained g	% Retained	% Passing
37.5	0.00	0.00	100.00
19	33.82	2.07	97.93
9.5	41.14	2.52	95.41
4.75	59.34	3.63	91.77
2.36	149.33	9.15	82.63
1.18	341.74	20.93	61.69
0.6	362.99	22.24	39.46
0.3	343.42	21.04	18.42
0.15	158.75	9.72	8.70
0.075	47.67	2.92	5.78
Pan	94.30	5.78	
Sample Weight	1632.5		



PROJECT : Broadlands Hydropower Project-Phase II

PARTICLE SIZE DISTRIBUTION CURVE
BY SIEVE ANALYSIS

Sample	Plot	Source	Results					Date of Test	Test Code
			ϕ 60%	ϕ 30%	ϕ 10%	C_u	C_c		
A030074	■	TP-3	1.100	0.420	0.160	6.875	1.002	17/10/2003	DRL/3/007

CLC MGC Lab. Assistant Tested By	<i>[Signature]</i> ASRI Lab. Technician Checked By	<i>[Signature]</i> AJE Lab. Engineer Certified By
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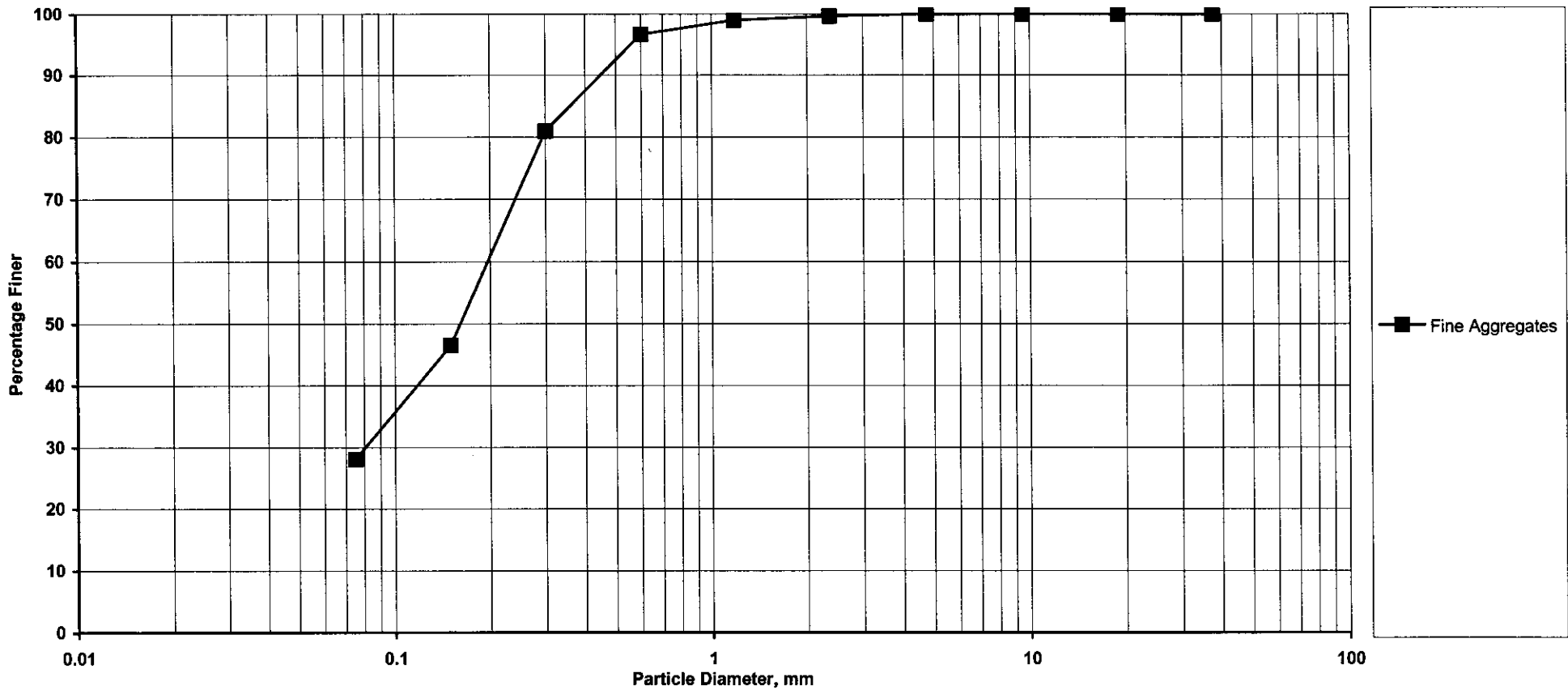
Specifications
BS 882 : Part 2: 1973



Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No11, Jawatta Road, Colombo 05,
Sri Lanka.

Particle Size Analysis Data (sieve analysis)- Fine Aggregates

TP-4			
Sieve size mm	Mass Retained g	% Retained	% Passing
37.5	0.00	0.00	100.00
19	0.00	0.00	100.00
9.5	0.00	0.00	100.00
4.75	0.00	0.00	100.00
2.36	3.88	0.32	99.68
1.18	8.22	0.69	98.99
0.6	27.83	2.32	96.67
0.3	187.81	15.68	80.99
0.15	412.02	34.40	46.58
0.075	221.50	18.49	28.09
Pan	336.44	28.09	
Sample Weight	1197.7		



PROJECT : Broadlands Hydropower Project-Phase II

PARTICLE SIZE DISTRIBUTION CURVE
BY SIEVE ANALYSIS

Sample	Plot	Source	Results					Date of Test	Test Code
			φ 60%	φ 30%	φ 10%	C _u	C _c		
A030075	■	TP-4	0.190	0.081	-	-	-	17/10/2003	DRL/3/007

MGC
 Lab. Assistant Tested By
 Lab. Technician Checked By
 Lab. Engineer Certified By

Specifications
 BS 882 : Part 2: 1973



Laboratory & Site Investigation Unit
 Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
 No11, Jawatta Road, Colombo 05,
 Sri Lanka.

Sample Test Code A030074	SPECIFIC GRAVITY & WATER ABSORPTION OF FINE AGGREGATES	Our Reference CB/EPC/LAB/04DRL
Date of Report 27-Oct-03	Specification No: ASTM C128	

PROJECT : Broadlands Hydropower Project-Phase II

Location of the Sample	TP-3(Fine Aggregates)
Date of Test	16-Oct-03

Sample No.			1	2	Average
Wt. in Air of Oven Dry Sample	(g)	A	480.8	481.5	
Wt. in Air of Saturated Surface Dry Sample	(g)	D	500.0	500.0	
Wt. of Picnometer Filled with Water	(g)	B	1,806.7	1,806.7	
Wt. of Picnometer Filled with Sample & Water to Calibration Mark	(g)	C	2092.1	2,100.2	
Bulk Specific Gravity	$\frac{A}{B + D - C}$		2.240	2.332	2.286
Bulk Specific Gravity (Saturated-Surface-Dry)	$\frac{D}{B + D - C}$		2.330	2.421	2.376
Apparent Specific Gravity	$\frac{A}{B + A - C}$		2.461	2.561	2.511
Absorption %	$\frac{D - A}{A} \cdot 100\%$		3.998	3.842	3.920

Remarks :

<i>CL. 2-4</i> MGC	<i>P. J. George</i> TSR	<i>AJE</i> AJE	ENGINEERS & ARCHITECTS cecb Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No11, Jawatta Road, Colombo 05, Sri Lanka.
Lab. Assistant Tested By	Lab. Technician Checked By	Engineer Certified By	

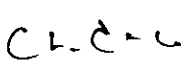
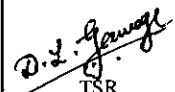

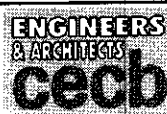
Sample Test Code A030075	SPECIFIC GRAVITY & WATER ABSORPTION OF FINE AGGREGATES	Our Reference CB/EPC/LAB/04DRL
Date of Report 27-Oct-03	Specification No: ASTM C128	

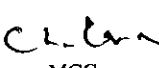
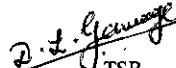

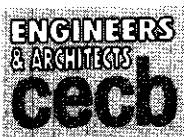
PROJECT : Broadlands Hydropower Project-Phase II

Location of the Sample	TP-4(Fine Aggregates)
Date of Test	16-Oct-03

Sample No.			1	2	Average
Wt. in Air of Oven Dry Sample	(g)	A	461.3	463.0	
Wt. in Air of Saturated Surface Dry Sample	(g)	D	500.0	500.0	
Wt. of Picnometer Filled with Water	(g)	B	1,806.7	1,806.7	
Wt. of Picnometer Filled with Sample & Water to Calibration Mark	(g)	C	2079.1	2,102.0	
Bulk Specific Gravity	$\frac{A}{B + D - C}$		2.027	2.262	2.144
Bulk Specific Gravity (Saturated-Surface-Dry)	$\frac{D}{B + D - C}$		2.197	2.443	2.320
Apparent Specific Gravity	$\frac{A}{B + A - C}$		2.442	2.761	2.602
Absorption %	$\frac{D - A}{A} \cdot 100\%$		8.401	7.994	8.197

Remarks :

 MGC	 TSR	 AJE	 ENGINEERS & ARCHITECTS cecb Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No11, Jawatta Road, Colombo 05, Sri Lanka.
Lab. Assistant Tested By	§ Lab. Technician Checked By	Engineer Certified By	

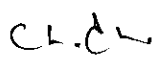
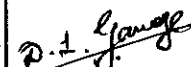


Sample Test Code A030074	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
Date of Report 17/Oct/2003	Specification No: ASTM C127-77																																																					
PROJECT : Broadlands Hydropower Project - Phase II																																																						
Location of the Sample		TP-3																																																				
Date of Test		26-Sep-03																																																				
Size of Aggregates		20mm																																																				
<table border="1"> <thead> <tr> <th>Sample No.</th> <th></th> <th>1</th> <th>2</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>Rock Type</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Wt in Saturated Surface Dry (g)</td> <td>A</td> <td>1,297.3</td> <td>1,295.6</td> <td></td> </tr> <tr> <td>Wt in Air of Oven Dry Sample (g)</td> <td>B</td> <td>1,291.3</td> <td>1,288.1</td> <td></td> </tr> <tr> <td>Wt of Sample in Water (g)</td> <td>C</td> <td>823.8</td> <td>819.8</td> <td></td> </tr> <tr> <td>Bulk Specific Gravity = $\frac{B}{A - C}$</td> <td></td> <td>2.727</td> <td>2.707</td> <td>2.717</td> </tr> <tr> <td>Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$</td> <td></td> <td>2.740</td> <td>2.723</td> <td>2.731</td> </tr> <tr> <td>Apparent Specific Gravity = $\frac{B}{B - C}$</td> <td></td> <td>2.762</td> <td>2.751</td> <td>2.756</td> </tr> <tr> <td>Absorption % = $\frac{A - B}{B} * 100\%$</td> <td></td> <td>0.465</td> <td>0.582</td> <td>0.523</td> </tr> <tr> <td colspan="5">Remarks :</td> </tr> </tbody> </table>					Sample No.		1	2	Average	Rock Type					Wt in Saturated Surface Dry (g)	A	1,297.3	1,295.6		Wt in Air of Oven Dry Sample (g)	B	1,291.3	1,288.1		Wt of Sample in Water (g)	C	823.8	819.8		Bulk Specific Gravity = $\frac{B}{A - C}$		2.727	2.707	2.717	Bulk Specific Gravity (Saturated-Surface-Dry Basis) = $\frac{A}{A - C}$		2.740	2.723	2.731	Apparent Specific Gravity = $\frac{B}{B - C}$		2.762	2.751	2.756	Absorption % = $\frac{A - B}{B} * 100\%$		0.465	0.582	0.523	Remarks :				
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		Lab.Assistant Tested By	Lab. Technician Checked By	Engineer Certified By																																																		
Job No. DRL/3/007	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.																																																					

Test code A030074	CLAY LUMPS AND FRIABLE PARTICLES IN AGGREGATES (Coarse Aggregates)	Our Reference CB/EPC/LAB/04/DRL
Date of Test 19/Oct/2003		Specification No: ASTM C 142

PROJECT : Broadlands Hydropower Project - Phase II

Location Reference of the Sample :	TP-3
Description :	Aggregates (Coarse)

Size of Particles Making Up Test Sample (mm)	Dry Weight of Test Sample (g)	Size of Sieve for Removing Residue of Clay Lumps and Friable Particles (mm)	Weight of Particles Retained on Designated Sieve (g)	Percentage of Clay Lumps & Friable Particles %
4.75-9.5	1200	2.36	1035.5	13.71
9.5-19.0	2200	4.75	2126.01	3.36
19.0-38.1	3200	4.75	3096.01	3.25
>38.1	3900	4.75	3833	1.72

 MGC	 TSR	 AJE	 Engineers & Architects cecb Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.
Lab. Assistant Tested By	Lab. Technician Checked By	Engineer Certified By	

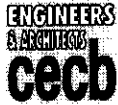
Test code A030074	CLAY LUMPS AND FRIABLE PARTICLES IN AGGREGATES (Fine Aggregates)	Our Reference CB/EPC/LAB/04/DRL
Date of Test 19/Oct/2003		Specification No: ASTM C 142

PROJECT : Broadlands Hydropower Project-Phase II

Location Reference of the Sample : TP-3 (Fine Aggregates)

Size of Particles Making Up Test Sample (mm)	Dry Weight of Test Sample (g)	Size of Sieve for Removing Residue of Clay Lumps and Friable Particles (mm)	Weight of Particles Retained on Designated Sieve (g)
>1.18	50	0.85	47.08

Percentage of Clay Lumps and Friable Particles = 5.84 %

<i>CK. D. V. L.</i> MGC	<i>D. J. Ranuge</i> TSR	<i>ABRO</i> AJE	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No11, Jawatta Road, Colombo 05, Sri Lanka.
Lab. Assistant Tested By	Lab. Technician Checked By	Engineer Certified By	

Sample Test Code A030074	LOS ANGELES ABRASION TEST	Our Reference CB/EPC/LAB/04DRL
Date of Report 23/Oct/2003		Specification No: ASTM C131/76

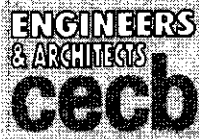
SUPPLIER: Broadlands Hydropower Project - Phase II

Location Reference of the Sample	TP-3
Description of sample	19mm aggregates
Type of Fraction	19.0mm-9.5mm

Passing	Retained	Weight (g)
19.0mm	12.5mm	2500
12.5mm	9.5mm	2500
No. of steel spheres used		11 nos.

ITEM	100	500
	REVOLUTIONS	REVOLUTIONS
Wgt. of sample before (g)	5000.00	5000.00
Wgt. Of sample retained on 1.7mm sieve after test (g)	3930.00	2174.70
Wgt of sample passing 1.7mm sieve (g)	1070.00	2825.30
LOS ANGELES ABRASION VALUE	21.40%	56.51%

C.L.P.W. MGC	<i>[Signature]</i> GR	<i>[Signature]</i> AJE
Lab Assistant Tested By	Lab. Technician Checked BY	Engineer Certified BY

Date of Test 26-Sep-03		Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No. 11, Jawatta Road, Colombo 5, Sri Lanka.
Job Code DRL/3/007		

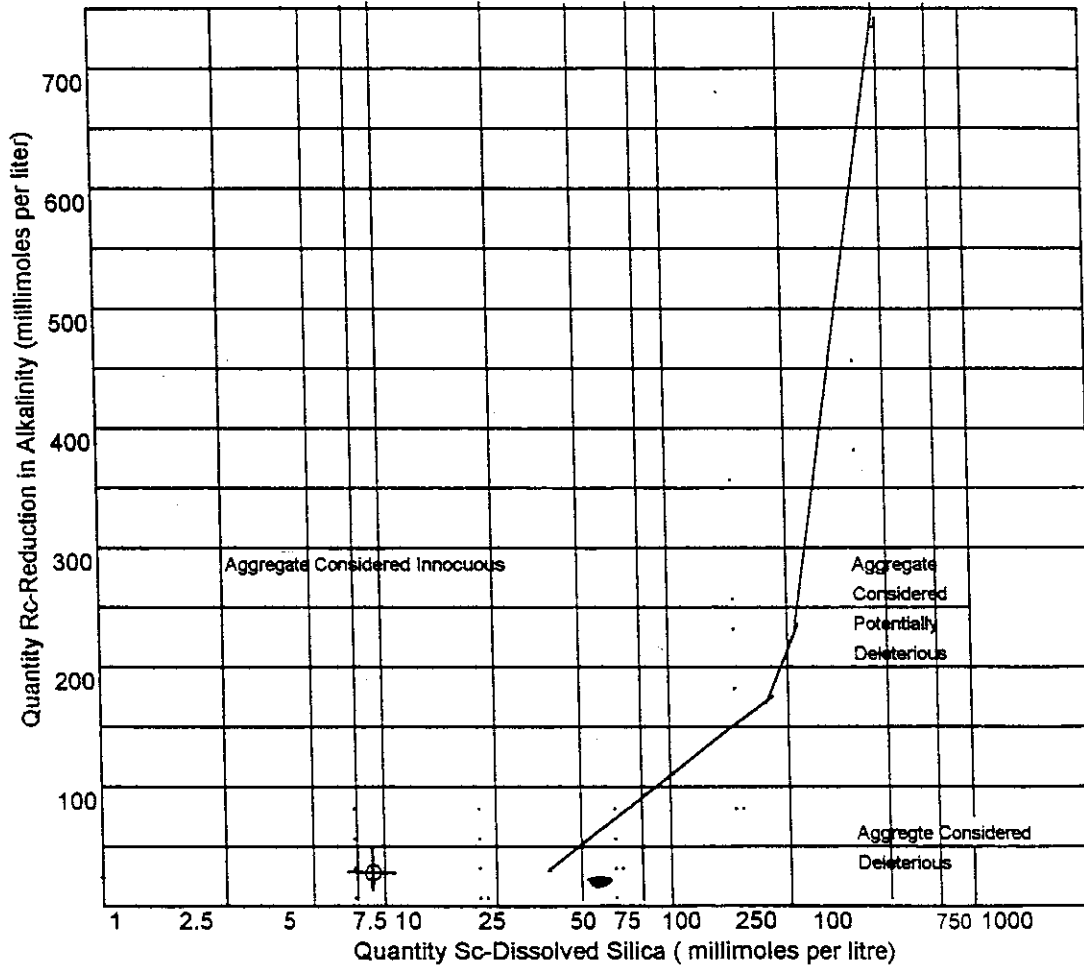
Sample Test Code A030074	POTENTIAL ALKALI-SILICA REACTIVITY OF AGGREGATES (CHEMICAL METHOD)	Our Reference CB/EPC/LAB/04DRL
Date 24/Oct/2003	Specification No: ASTM C-289	

PROJECT : **Broadlands Hydropower Project-Phase II**

Type of Sample TP 3(<50mm size Coarse aggregate)

Scope This test method covers chemical determination of the potential reactivity of an aggregate with alkalis in portland cement concrete as indicated by the amount of reaction during 24h at 80C between 1N Sodium Hydroxide solution and aggregate that has been crushed and sieved to pass a 300mm sieve and be retained on a 150 mm sieve.

Quantity of Dissolved Silica (Sc)	8.2	mmol/l
Quantity of Reduction in Alkalinity(Rc)	35.00	mmol/l




[Signature]
Engineer
Certified By

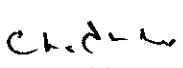
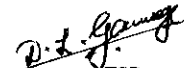
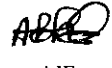
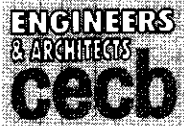
Tested at : Engineering & Laboratory Services (Pvt) Ltd.
 Boralesgamuwa, Sri Lanka.

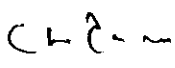
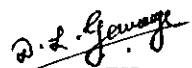
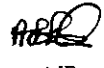
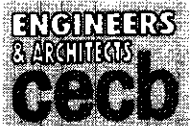
Job No.
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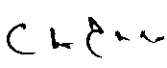
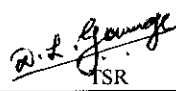
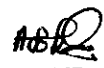
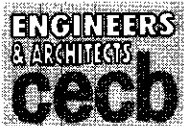


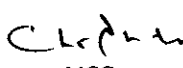
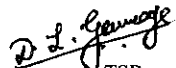
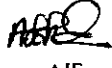
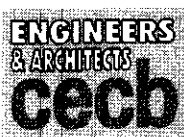
Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05,
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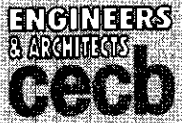
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Location of the Sample		MB-5/depth 2.12-2.28m																																																				
Date of Test		16-Oct-03																																																				
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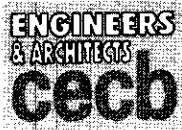
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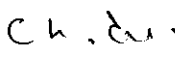
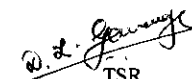

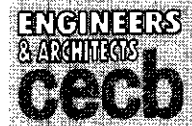
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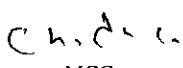
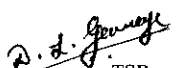

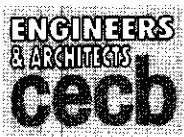
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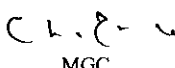

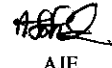
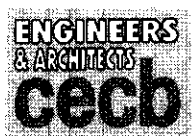
Sample Test Code A030078	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
Date of Report 17/Oct/2003	Specification No: ASTM C127-77																																																					
PROJECT : Broadlands Hydropower Project - Phase II																																																						
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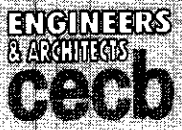
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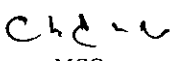


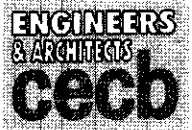
Sample Test Code A030079	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																		
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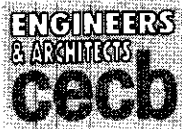
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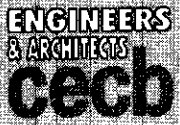
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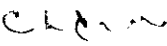



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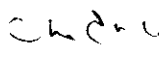


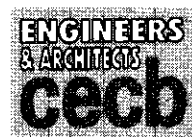
Sample Test Code A030080	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
Date of Report 17/Oct/2003	Specification No: ASTM C127-77																																																					
PROJECT : Broadlands Hydropower Project - Phase II																																																						
Location of the Sample		MT-7/depth 46.18-46.31m																																																				
Date of Test		16-Oct-03																																																				
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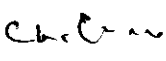


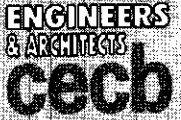
Sample Test Code A030080	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
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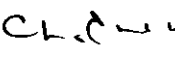

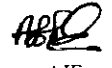
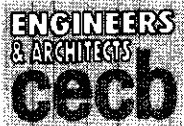
Sample Test Code A030081	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
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Sample Test Code A030081	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
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Sample Test Code A030116	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																														
Date of Report 28/Oct/2003	Specification No: ASTM C127-77																																
PROJECT : Broadlands Hydropower Project - Phase II																																	
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Job No. DRL/3/007	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.																																

Sample Test Code A030115	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
Date of Report 28/Oct/2003	Specification No: ASTM C127-77																																																					
PROJECT : Broadlands Hydropower Project - Phase II																																																						
Location of the Sample		TR-1/depth 18.38-18.83m																																																				
Date of Test		23-Oct-03																																																				
Size of Aggregates		20mm																																																				
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Job No. DRL/3/007	 ENGINEERS & ARCHITECTS cecb Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.																																																					

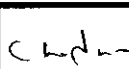


Sample Test Code A030076	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
Date of Report 17/Oct/2003	Specification No: ASTM C127-77																																																					
PROJECT : Broadlands Hydropower Project - Phase II																																																						
Location of the Sample		BQ-2/depth 16.32-16.73m																																																				
Date of Test		16-Oct-03																																																				
Size of Aggregates		20mm																																																				
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Job No. DRL/3/007	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.																																																					


Sample Test Code A030076	SPECIFIC GRAVITY & WATER ABSORPTION OF COARSE AGGREGATES		Our Reference CB/EPC/LAB/04DRL																																																			
Date of Report 17/Oct/2003	Specification No: ASTM C127-77																																																					
PROJECT : Broadlands Hydropower Project - Phase II																																																						
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Job No. DRL/3/007	 Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No 11, Jawatta Road, Colombo 05, Sri Lanka.																																																					

Sample Test Code A030097-0114, 117&118	COMPRESSION TEST ON ROCK SAMPLES (Soaked Samples)	Our Reference CB/EPC/LAB/04DRL
Date of Test 17-Oct-2003		

PROJECT : Broadlands Hydropower Project - Phase II

Geological Name of rock Sample	Bore Hole No. & Depth (m)	Diameter (mm)				Length of Sample (mm)				Weight of Sample Before Soaked (g)	Load at Failure (kN)	Unconfined Compressive Strength (N/mm ²)
		1	2	3	MEAN	1	2	3	MEAN			
Quartzo feldspathic gneiss	BQ-1(17.10-17.24)	54.5	54.2	54.2	54.3	114.0	113.6	113.9	113.8	751.20	117.93	50.93
Quartzo feldspathic gneiss	BQ-1(17.39-17.75)	54.2	54.2	54.9	54.4	108.6	108.7	109.2	108.8	700.50	127.28	54.69
Impure quartzite	BQ-1(20.60-22.75)	54.2	54.3	54.4	54.3	65.1	65.2	65.3	65.2	417.69	62.26	26.88
Granitic gneiss	BQ-2(22.52-22.62)	49.8	49.9	50.5	50.1	99.2	99.8	99.9	99.6	504.15	20.06	10.19
Granitic gneiss	BQ-2(22.62-22.72)	50.0	50.0	50.0	50.0	101.3	101.5	102.0	101.6	508.03	108.60	55.31
Granitic gneiss	BQ-2(22.90-23.00)	49.9	49.9	49.9	49.9	101.5	101.5	101.6	101.5	513.40	140.40	71.79
Charnokitic gneiss	MB-5(5.73-5.83)	50.0	50.0	50.1	50.0	101.0	102.0	102.0	101.7	516.17	181.89	92.51
Charnokitic gneiss	MB-5(9.00-9.10)	49.8	49.8	49.9	49.8	101.0	101.0	101.5	101.2	519.30	146.03	74.87
Charnokitic gneiss	MB-5(9.52-9.62)	49.1	49.5	49.6	49.4	101.2	101.5	101.6	101.4	519.32	99.29	51.81
Charnokitic gneiss	MB-5(22.00-22.38)	49.7	49.7	49.7	49.7	99.8	101.0	101.1	100.6	512.89	264.10	136.13
Quartz rich garnet biotite gneiss	MT-6(39.46-39.56)	49.2	49.5	49.5	49.4	102.1	102.4	102.8	102.4	560.59	93.72	48.90
Quartz rich garnet biotite gneiss	MT-6(39.00-39.10)	49.2	49.8	49.9	49.6	101.1	101.1	100.6	100.9	607.00	164.87	85.21
Quartz rich garnet biotite gneiss	MT-6(39.68-39.78)	49.5	49.6	49.6	49.6	110.0	110.0	110.3	110.1	514.38	121.67	63.05
Quartz rich garnet biotite gneiss	MT-6(39.58-39.68)	49.6	49.7	49.9	49.7	96.0	96.3	96.3	96.2	499.79	108.60	55.90
Biotite gneiss	MT-7(46.00-46.11)	54.5	54.6	54.7	54.6	111.7	111.7	111.5	111.6	796.30	218.03	93.12
Quartz rich biotite gneiss	MT-7(29.64-29.75)	54.4	54.6	54.8	54.6	110.8	111.4	111.9	111.4	685.60	164.87	70.42
Biotite gneiss	MT-8(51.43-51.54)	54.4	54.6	54.6	54.5	111.0	111.0	111.0	111.0	800.70	250.61	107.30
Quartz rich biotite gneiss	MT-8(74.76-74.86)	54.4	54.5	54.6	54.5	91.1	91.5	92.0	91.5	563.71	162.98	69.86
Biotite gneiss	TR-1(10.00-10.15)	54.6	54.4	54.4	54.5	110.8	110.9	110.8	110.8	693.50	162.98	69.95
Biotite gneiss	TR-1(18.90-19.00)	54.3	54.3	54.4	54.3	111.0	111.1	111.2	111.1	785.30	97.43	42.02

 MGC Lab. Assistant Tested By	 Lab. Technician Checked By	 AJE Lab. Engineer Certified By
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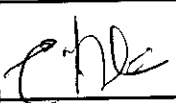
Date of Test 20-Oct-2003	 ENGINEERS & ARCHITECTS cecb	Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No. 11, Jawatta Road, Colombo 5, Sri Lanka.
Job No. DRL/3/007		

	DETERMINATION OF ULTRASONIC PULSE VELOCITY OF ROCK CORE SAMPLES	Our Reference CB/EPC/LAB/04DRL
Date of Report 23/Jan/2003	Specification No: ASTM D 2845-1983	

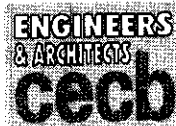
PROJECT : Broadlands Hydropower Project-Phase II

No.	Identification		Diameter (mm)	Length (mm)	Ultrasonic Pulse Velocity (km/s)
	Bore Hole No.	Depth (m)			
1	MB 5	5.73-5.83	49.80	99.92	6.891
2	MB 5	9.00-9.10	49.62	101.20	7.845
3	MB 5	9.52-9.62	49.72	101.28	7.558
4	MB 5	22.00-22.38	49.62	100.58	7.396
5	MT 6	39.00-39.10	50.00	100.92	8.010
6	MT 6	39.46-39.56	49.62	102.62	7.029
7	MT 6	39.58-39.68	49.60	96.80	5.500
8	MT 6	39.68-39.78	49.52	100.22	4.494
9	MT 7	29.64-29.75	54.72	111.00	6.000
10	MT 7	46.00-46.11	54.40	111.80	7.260
11	MT 8	51.43-51.54	54.30	111.10	7.032
12	MT 8	74.76-74.86	54.42	92.00	6.301
13	BQ 1	17.10-17.24	54.42	114.20	6.880
14	BQ 1	17.39-17.50	54.40	109.00	6.566
15	BQ 1	20.60-22.75	54.38	65.20	7.581
16	BQ 2	22.52-22.62	49.80	100.20	3.976
17	BQ 2	22.62-22.72	50.30	100.82	4.272
18	BQ 2	22.90-23.00	49.96	101.54	3.982

Tested at : University of Moratuwa
Department of Civil Engineering
Moratuwa, Sri Lanka
Ref : CE/GA/17/ST/2003/128


Engineer
Certified By

Job No.
DRL/3/007



Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05,
Sri Lanka.

**SOUNDNESS TEST
OF COARSE AGGREGATES**

Our Reference
CB/EPC/LAB/04DRL

Date
24/Oct/2003

Specification No: ASTM C 88-90

PROJECT : Broadlands Hydropower Project-Phase II

Type of Sample BQ 2(Coarse aggregates)


Sieve size (mm)	Grading of original sample %	Weight of test fraction before test	Percentage passing designated sieve after test	Weighted percentage loss
37.5-19.0	53.9	1500	0.10	0.1
19.0-9.5	42.9	1000	0.80	0.3

Total 0.4
Rounded off val 0
(to the nearest whole number)

Sieve Analysis

Test sieve (mm)	Mass Retained (g)	Cumulative Mass Retained (g)	Cumulative Percentage Retained	Passing Observed
37.5	-	-	-	-
25.0	1451	1451	44.67	55.33
19.0	301	1752	53.94	46.06
12.5	1017	2769	85.25	14.75
9.5	374	3143	96.77	3.23
4.75	85	3228	99.38	0.62
Pan	12	3240	99.75	0.25

Total mass of dry sample : 3248g


Engineer
Certified By

**Tested at National Building Research Organisation
Jawatte Road, Colombo 5.**



**Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU**

Job No.
DRL/3/007

No 11, Jawatta Road, Colombo 05,
Sri Lanka.

**POTENTIAL ALKALI-SILICA REACTIVITY
OF AGGREGATES (CHEMICAL METHOD)**

Our Reference
CB/EPC/LAB/04DRL

Date
24/Oct/2003

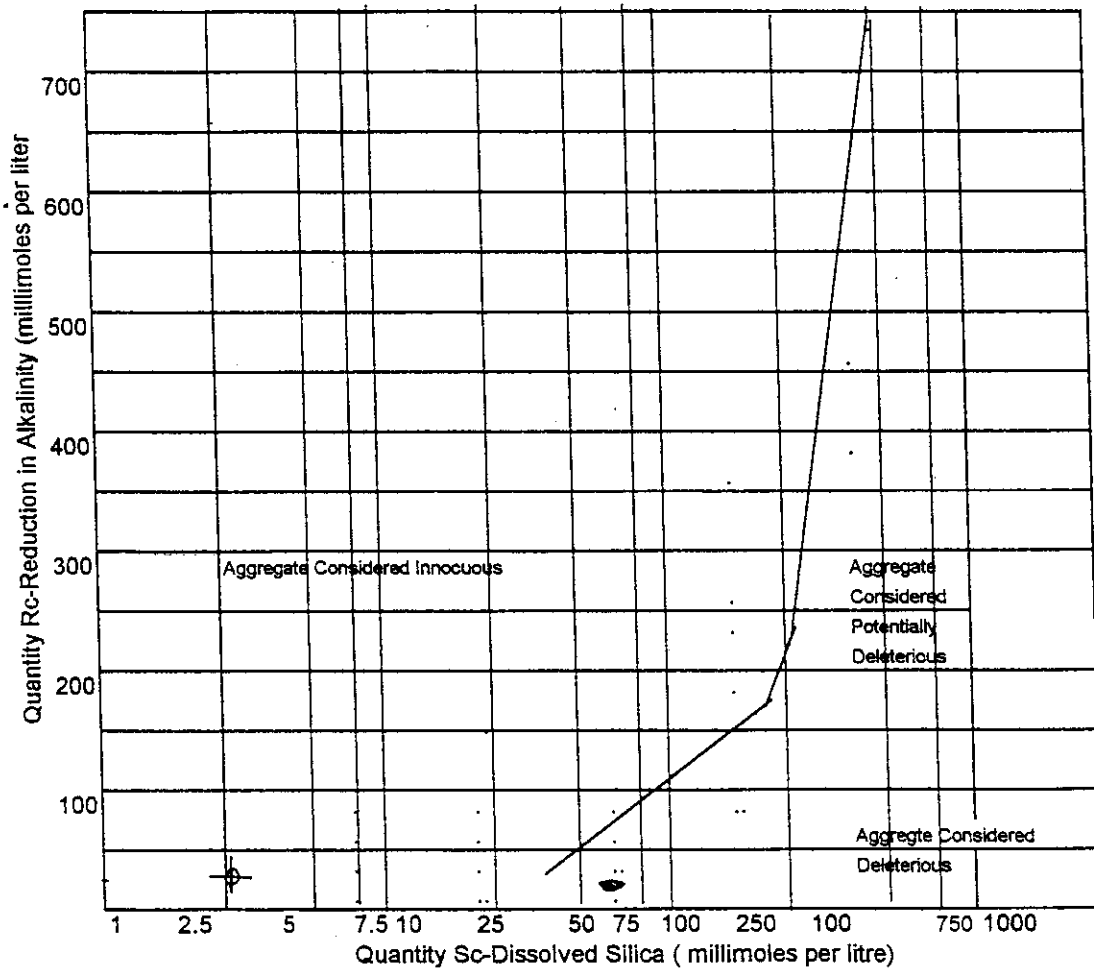
Specification No: ASTM C-289

PROJECT : **Broadlands Hydropower Project-Phase II**

Type of Sample BQ 2(<50mm size Coarse aggregate)

Scope This test method covers chemical determination of the potential reactivity of an aggregate with alkalis in portland cement concrete as indicated by the amount of reaction during 24h at 80C between 1N Sodium Hydroxide solution and aggregate that has been crushed and sieved to pass a 300mm sieve and be retained on a 150 mm sieve.

Quantity of Dissolved Silica (Sc)	2.57	mmol/l
Quantity of Reduction in Alkalinity(Rc)	26.00	mmol/l



[Signature]
Engineer
Certified By

Tested at : Engineering & Laboratory Services (Pvt) Ltd.
Boralesgamuwa, Sri Lanka.



Laboratory & Site Investigation Unit
Engineering Procurement Construction Division
CENTRAL ENGINEERING CONSULTANCY BUREAU
No 11, Jawatta Road, Colombo 05,
Sri Lanka.

Job No.
DRL/3/007

Sample Test Code A030076	LOS ANGELES ABRASION TEST	Our Reference CB/EPC/LAB/04DRL
Date of Report 23/Oct/2003		Specification No: ASTM C131/76

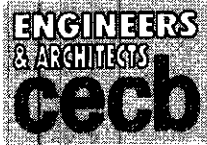
SUPPLIER: Broadlands Hydropower Project - Phase II

Location Reference of the Sample	BQ-2
Description of sample	19mm aggregates
Type of Fraction	19.0mm-9.5mm

Passing	Retained	Weight (g)
19.0mm	12.5mm	2500
12.5mm	9.5mm	2500
No. of steel spheres used		11 nos.

ITEM	100	500
	REVOLUTIONS	REVOLUTIONS
Wgt. of sample before (g)	5000.00	5000.00
Wgt. Of sample retained on 1.7mm sieve after test (g)	4389.30	2597.80
Wgt of sample passing 1.7mm sieve (g)	610.70	2402.20
LOS ANGELES ABRASION VALUE	12.21%	48.04%

<i>C. L. D. M.</i> MGC	<i>[Signature]</i> UTSP	<i>[Signature]</i> AJE
Lab. Assistant Tested By	Lab. Technician Checked BY	Engineer Certified BY

Date of Test 17-Oct-03		Laboratory & Site Investigation Unit Engineering Procurement Construction Division CENTRAL ENGINEERING CONSULTANCY BUREAU No. 11, Jawatta Road, Colombo 5, Sri Lanka.
Job Code DRL/3/007		



Photograph 7: Coarse and Fine Aggregate samples from TP4

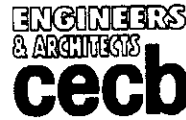


Photograph 8: Core samples used for testing 'specific gravity and water Absorption'



Photograph 9: Core samples used for testing 'unconfined compression' and 'ultra sound wave velocity'

TEST PIT LOG



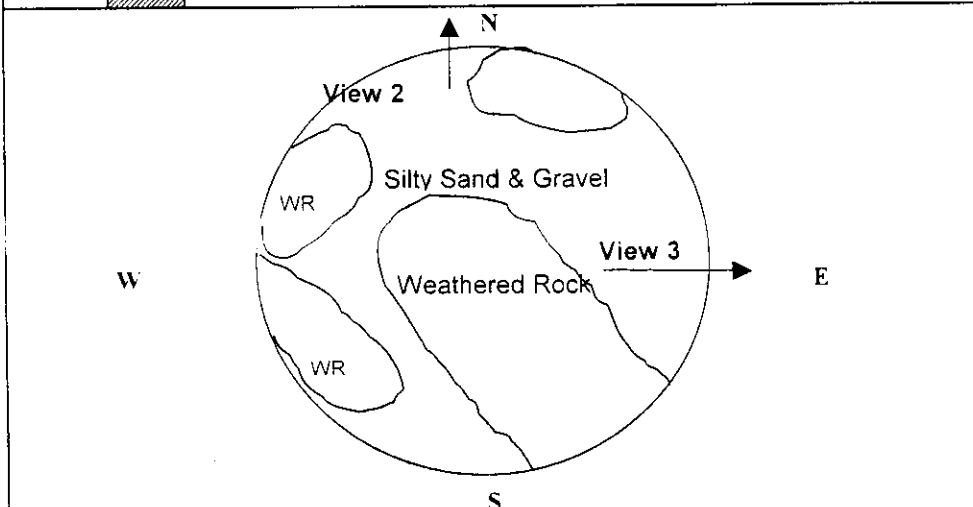
LABORATORY & SITE INVESTIGATION UNIT
CENTRAL ENGINEERING CONSULTANCY BUREAU

TEST PIT NO: **TP 1**

PROJECT : **Geotechnical Investigations for the Broadlands Hydropower Project**

Location:		Coordinates:	
as given : Kithulgala	Eastern E:	164535	Date Started: 11-Nov-02
Reduced level:	Northern N:	197920	Date Finished: 17/11/2002

Depth	Mosaic Log	Soil Profile of the Northern Direction	Description
0.55m			Relatively loose, yellowish brown and brown silty sand, sand mixture with some gravel; many roots
1.8m			Moderately decomposed sub angular and rounded 0.5m to 0.75m diameter boulders with gravel. Deposits seems to be old river bed deposit.
2.1m			Moderately decomposed large boulders embedded in soil; diameter exceeds 1.2m



Photographs

Fig 1- Back ground of TP 1
 Fig 2- TP1 - View 2
 Fig 3- TP1 - View 2
 Fig 4- TP1 - View 3

Legend:		Sand, sandy soil, silt etc. Gravel, sandy gravel including boulders Clayey sand, clay etc. Highly - moderately weathered rock boulder zone Fresh rock
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Logged by:	Checked by:
AAVD	BMAPM
SHEET NO : 1 of 2	

TEST PIT LOG



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CONSULTANCY BUREAU

TEST PIT NO: **TP 1**

PROJECT : Geotechnical Investigations for the Broadlands Hydropower Project

Location:		Coordinates:	
as given : Kithulgala	Eastern E:	164535	Date Started: 11-Nov-02
Reduced level:	Northern N:	197920	Date Finished: 17/11/2002

Depth	Mosaic Log	Soil Profile of the Eastern Direction	Description
0.55m			Relatively loose, yellowish brown and brown silty sand, sand mixture with some gravel; many roots
1.8m			Moderately decomposed sub angular and rounded 0.5m to 0.75m diameter boulders with gravel. Deposits seems to be old river bed deposit.
2.1m			Moderately decomposed large boulders embedded in soil; diameter exceeds 1.2m

		<p>Photographs</p> <p>Fig 1- Back ground of TP 1</p> <p>Fig. 2- TP1 - View 2</p> <p>Fig. 3- TP1 - View 2</p> <p>Fig. 4- TP1 - View 3</p>
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Legend: 	Sand, sandy soil, silt etc. Gravel, sandy gravel including boulders Clayey sand, clay etc. Highly / moderately weathered rock boulder zone Fresh rock	Logged by: AAVD	Checked by: BMAPM
	SHEET NO : 2 of 2		

TEST PIT LOG

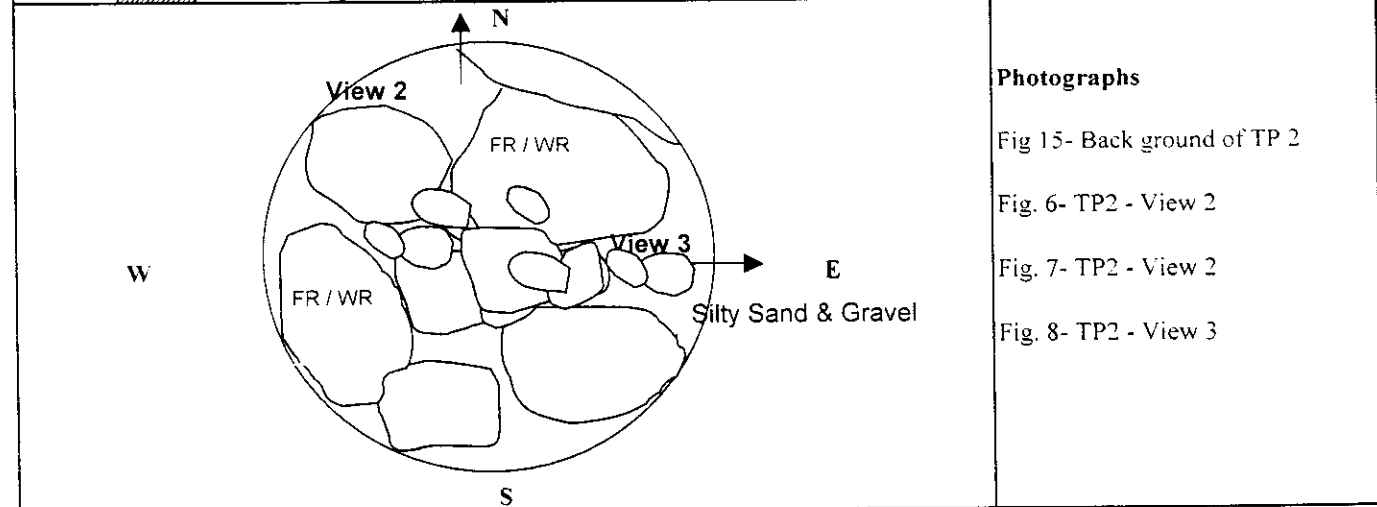
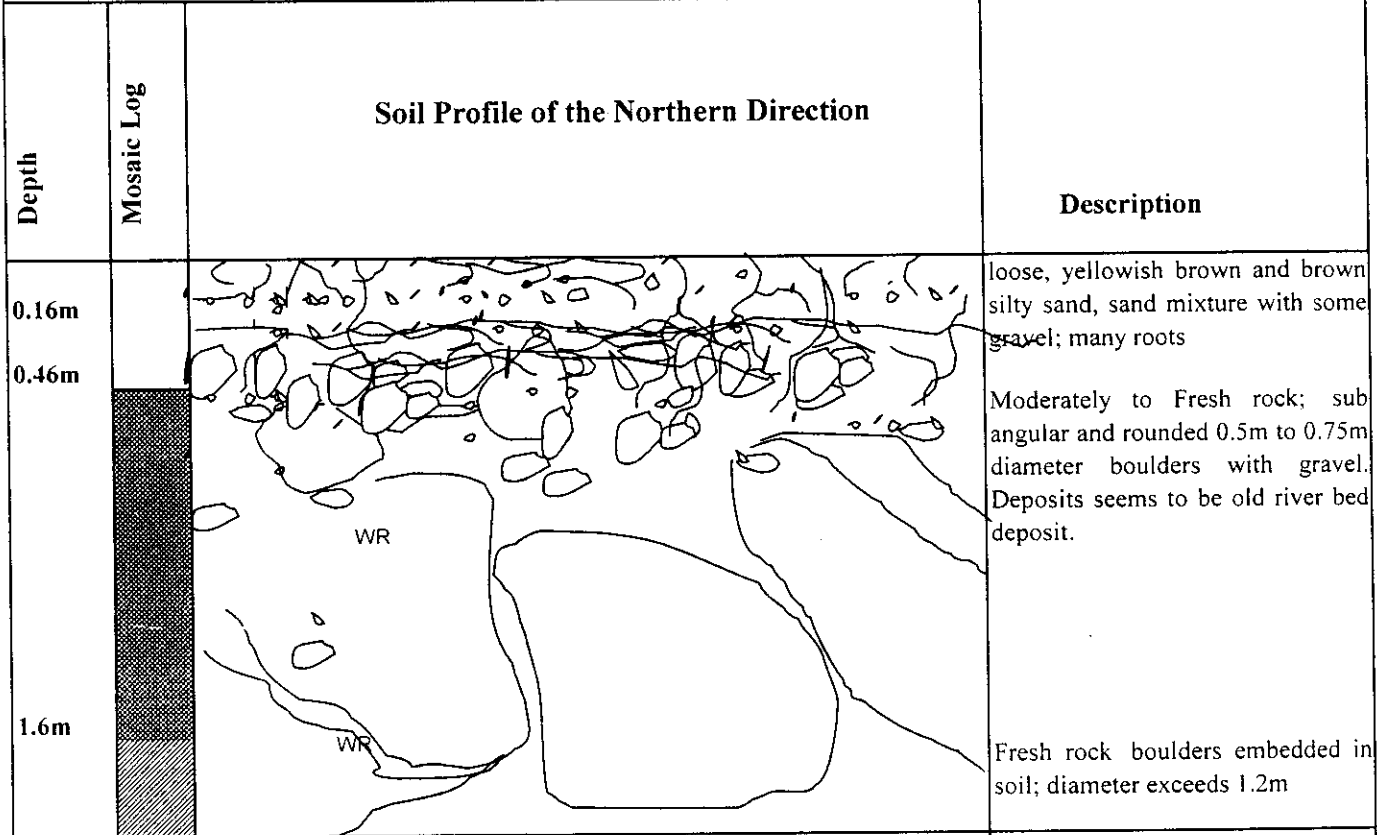


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TEST PIT NO: **TP 2**

PROJECT : **Geotechnical Investigations for the Broadlands Hydropower Project**

Location:		Coordinates:	
as given : Kithulgala	Eastern E:	164527	Date Started: 11-Nov-02
Reduced level:	Northern N:	197937	Date Finished: 17/11/2002



Legend: 	Logged by:	Checked by:
	AAVD	BMAPM
SHEET NO : 1 of 2		

TEST PIT LOG

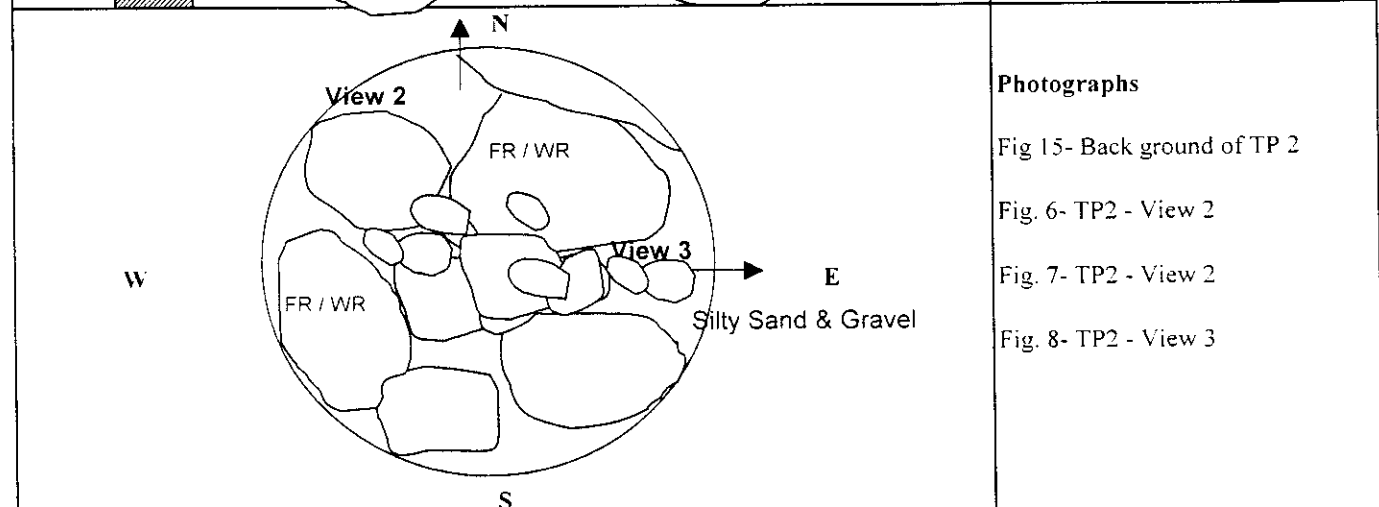
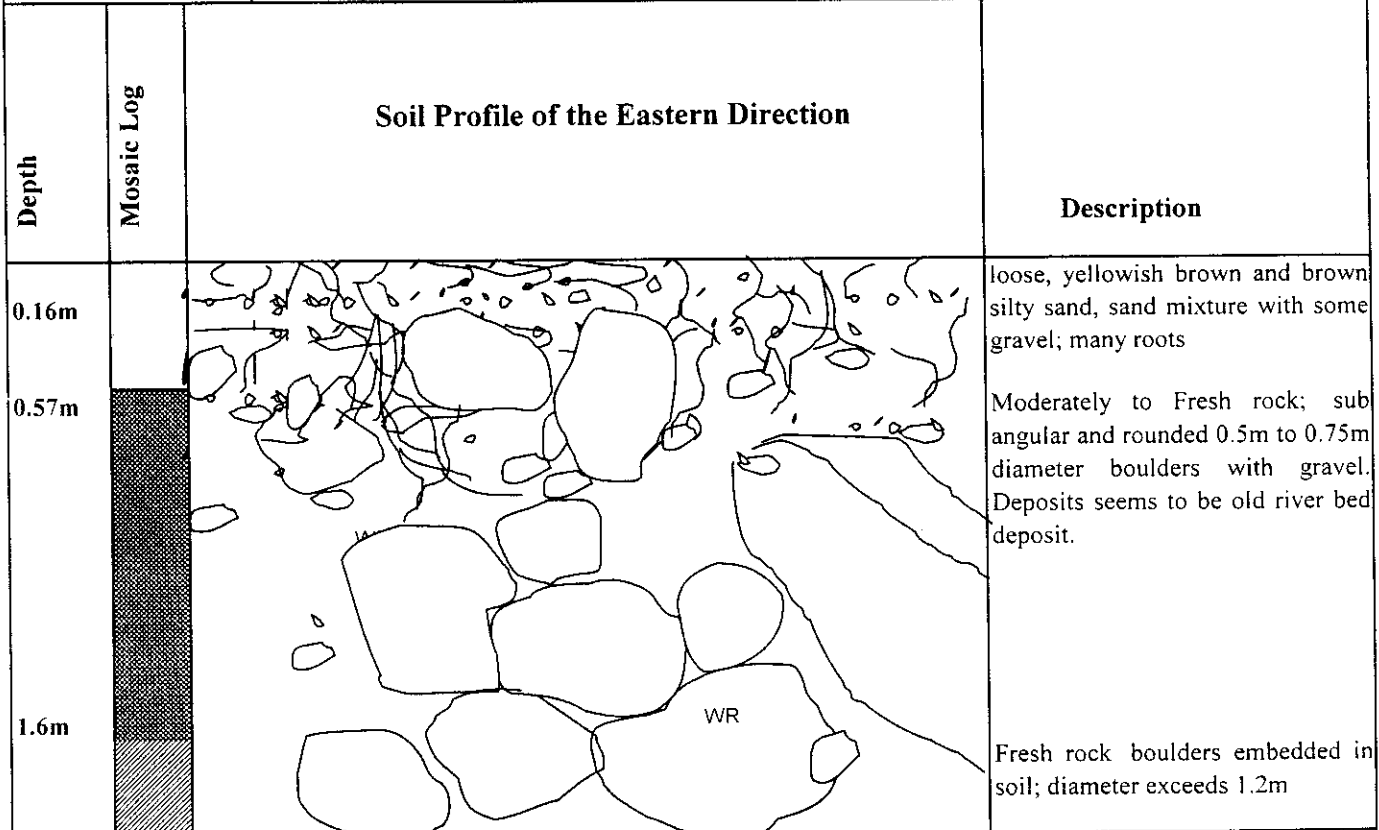


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TEST PIT NO: **TP 2**

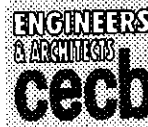
PROJECT : **Geotechnical Investigations for the Broadlands Hydropower Project**

Location:		Coordinates:	
as given ; Kitulgala	Eastern E:	164527	Date Started: 11-Nov-02
Reduced level:	Northern N:	197937	Date Finished: 17/11/2002



Legend:		Sand, sandy soil, silt etc.	Logged by:	Checked by:
		Gravel, sandy gravel including boulders	AAVD	BMAPM
		Clayey sand, clay etc.	SHEET NO : 2 of 2	
		Highly / moderately weathered rock boulder zone		
		Fresh rock		

TEST PIT LOG



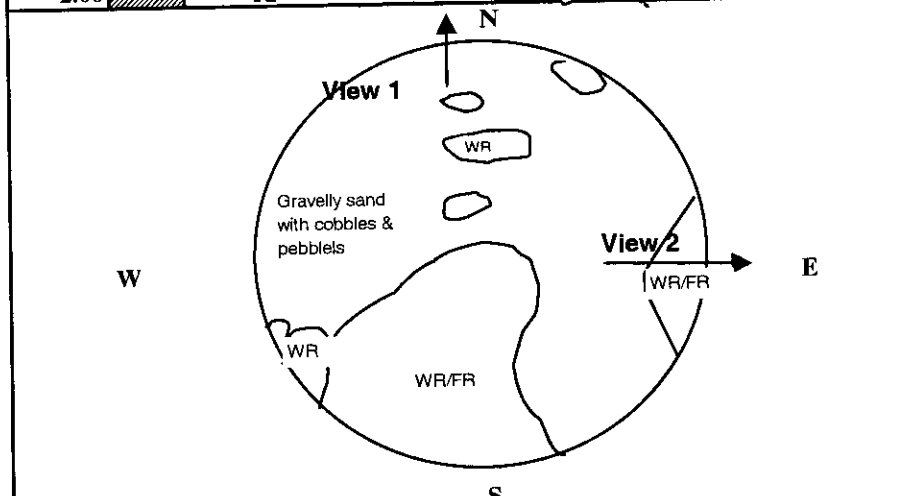
LABORATORY & SITE
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CENTRAL ENGINEERING
CONSULTANCY BUREAU

TEST PIT NO: **TP 3**

FEATURE / PROJECT : Geotechnical Investigations for the Broadlands Hydropower Project

Location:		Coordinates:		Date Started:	9-Sep-03
as given ; Kalugala		Eastern E:	164471.608m	Date Finished:	12-Sep-03
Reduced level:	105m	Northern N:	197932.447m		

Depth	Mosaic Log	Soil Profile of the Northern Direction	Description
0.32			Fine to medium grained yellowish brown sand (10% of coarse grains available)
0.45			Medium to coarse grained yellowish brown sand (high% of coarse grains & Quartz particles rich)
0.57			Fine to medium grained brown sand (5% of coarse grains and tree roots available)
1.01			Medium to coarse grained yellowish brown sand (high% of coarse grains & Quartz particles rich)
1.36			Fine to very coarse grained brown sand (high% of coarse grains & tree roots available)
1.50			Fine to medium grained brown sand (5% of coarse grains and tree roots available)
2.00			Fine to very coarse grained brown sand with gravels, cobbles, pebbles & tree roots available. (Fresh to moderately weathered boulders embeded in soil) (Max. diameter of boulder is 30 cm& angular shaped)



Photographs

Photograph -1- Back ground of TP 3

Photograph-2 TP3 - View 1

Photograph-3 TP3 - View 2

Legend: 	Sand, sandy soil, silt etc. Gravel, sandy gravel including boulders Clayey sand, clay etc. Highly / moderately weathered rock boulder zone Fresh rock	Logged by: RMLKR	Checked by: SRMS
	SHEET NO 1 of 2		

TEST PIT LOG



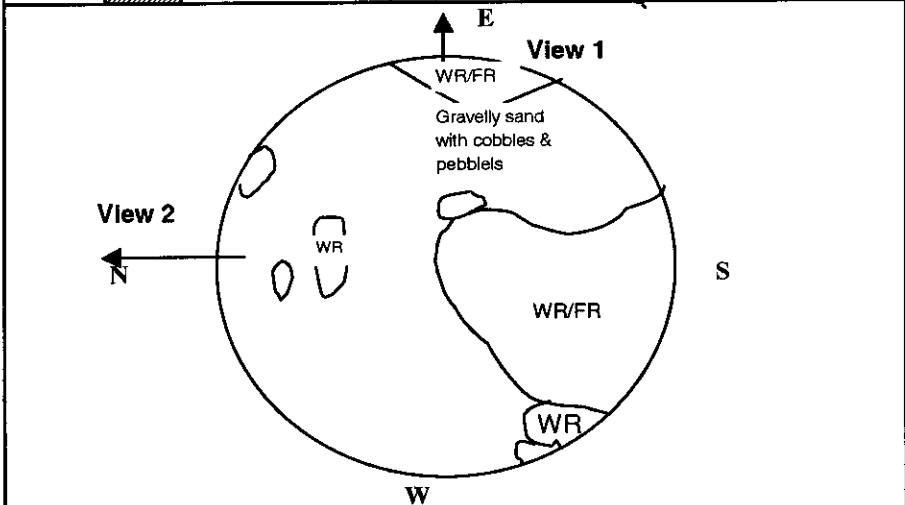
LABORATORY & SITE
INVESTIGATION UNIT
CENTRAL ENGINEERING
CONSULTANCY BUREAU

TEST PIT NO: **TP 3**

FEATURE / PROJECT : Geotechnical Investigations for the Broadlands Hydropower Project

Location:		Coordinates:		Date Started:	
as given ; Kalugala		Eastern E:	164471.608m	9-Sep-03	
Reduced level:	105m	Northern N:	197932.447m	Date Finished:	12-Sep-03

Depth	Mosaic Log	Soil Profile of the E-W Direction	Description
0.38			Fine to medium grained yellowish brown sand (10% of coarse grains available)
0.52			Medium to coarse grained yellowish brown sand (high% of coarse grains & Quartz particles rich)
1.01			Fine to medium grained brown sand (5% of coarse grains and tree roots available)
1.36			Fine to very coarse grained brown sand (high% of coarse grains & tree roots available)
1.75			Fine to medium grained brown sand (5% of coarse grains and tree roots available)
2.00			Fine to very coarse grained brown sand with gravels, cobbles, pebbles & tree roots available. (Fresh to moderately weathered boulders embedded in soil) (Max. diameter of boulder is 80 cm & angular shaped)



Photographs

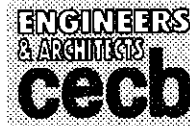
Photograph 1- Back ground of TP 3

Photograph-3 TP3 - View 1

Photograph-2 TP3 - View 2

Legend		Logged by:	Checked by:
		RMLKR	SRMS
		SHEET N 2 of 2	

TEST PIT LOG



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TEST PIT NO: **TP 4**

FEATURE / PROJECT : Geotechnical Investigations for the Broadlands Hydropower Project

Location:		Coordinates:			
as given ; Kalugala		Eastern E:	164335.926m	Date Started:	9-Sep-03
Reduced level:	103m	Northern N:	198024.552m	Date Finished:	12-Sep-03

Depth	Mosaic Log	Soil Profile of the Northern Direction	Description
0.20			Fine grained, brown, clayey silty sand with some organic matters
0.48			Medium grained light brown silty sand (High % of quartz grains & tree roots available)
0.63			Fine to medium grained yellowish red silty sand with some tree roots
0.85			Very fine to medium grained yellowish red silty sand with some tree roots
1.25			Fine to medium grained orange red silty sand with some tree roots
1.50			Fine grained, brown, clayey silt with some tree roots
1.90			Fine to medium grained brown silty sand with some tree roots
2.00			Fine grained, reddish brown, clayey silt (Deposit seems to be old river deposit)

	<p>Photographs</p> <p>Photograph 4- Back ground of TP 4</p> <p>Photograph 5- TP4 - View 1</p> <p>Photograph 6- TP4 - View 2</p>
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Legend: 	Logged by: RMLKR	Checked by: SRMS
	SHEET NO: 1 of 2	

TEST PIT LOG



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CONSULTANCY BUREAU

TEST PIT NO: **TP 4**

FEATURE / PROJECT : Geotechnical Investigations for the Broadlands Hydropower Project

Location:		Coordinates:			
as given ; Kalugala		Eastern E:	164335.926m	Date Started:	9-Sep-03
Reduced level:	103m	Northern N:	198024.552m	Date Finished:	12-Sep-03

Depth	Mosaic Log	Soil Profile of the E-W Direction	Description
0.20			Fine grained, brown, clayey silty sand with some organic matters
0.49			Medium grained light brown silty sand (High % of quartz grains & tree roots available)
0.62			Fine to medium grained yellowish red silty sand with some tree roots
0.83			Very fine to medium grained yellowish red silty sand with some tree roots
1.23			Fine to medium grained orange red silty sand with some tree roots
1.50			Fine grained, brown, clayey silt with some tree roots
1.85			Fine to medium grained brown silty sand with some tree roots
2.00			Fine grained, reddish brown, clayey silt (Deposit seems to be old river deposit)

	<p>Photographs</p> <p>Photograph 4- Back ground of TP 4</p> <p>Photograph 6- TP4 - View 1</p> <p>Photograph 5- TP4 - View 2</p>
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Legend: 	Sand, sandy soil, silt etc. Gravel, sandy gravel including boulders Clayey sand, clay etc. Highly / moderately weathered rock boulder zone Fresh rock	Logged by RMLKR	Checked by: SRMS
	SHEET NO : 2 of 2		



Fig 01 : Back ground of TP1



Fig 02 : TP 1 – View 1



Fig 04 : TP 1 - View 3



Fig 03 : TP 1 - View 2



Fig 05 : Back ground of TP 2

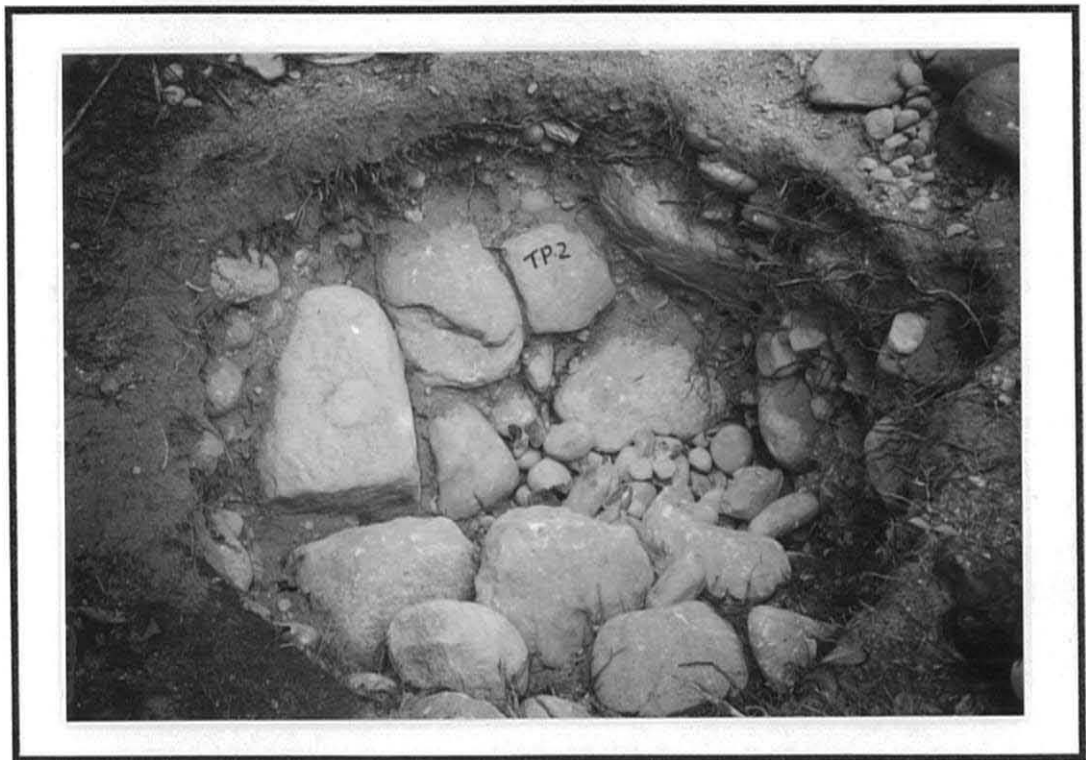


Fig 06 : TP 2 – View 2



Fig 08 : TP 2 - View 3



Fig 07 : TP 2 - View 2



Fig 09 : Coarse Aggregates from TP1



Fig 10 : Coarse Aggregates from TP2



Fig 11 : Collection of River Sand



Photograph 1: Back ground of TP3



Photograph 2: View of TP3 in N-S direction



Photograph 3: View of TP3 in E-W direction



Photograph 4: Back ground of TP4



Photograph 5: View of TP4 in N-S direction



Photograph 6: View of TP4 in E-W direction