



NEO GEOCONS

BELVEDERE

SOIL TEST

☎ : 28526186

GEO TECHNICAL CONSULTANTS

GEO – PHYSICAL INVESTIGATION
SOIL EXPLORATION & FOUNDATION DESIGN

"Vijay House"
21/1A, First Floor, Sydoji Lane,
Triplicane, Chennai – 600 005

Date: 13.03.2008

To

M/s. Akshaya Homes Private Limited,
22, Nehru Nagar, 2nd Street,
Adyar,
Chennai – 600 020

Sir,

Sub: Soil Investigation for the proposed construction of Multi Utility Residential – Commercial building "Belvedere" at Nandhivaram Oorapakkam in Chennai – Pile – requested – regarding;

Ref: 1) Your Work Order dated 30.07.2007
2) Our Job No: S.E.2389 dated 13.09.2007
3) Your Architect Letter (Mail) dated 22.02.2008
4) Our Letter (Mail) dated 22.02.2008
5) Telephonic Discussion to your Structural Consultant on 26.02.2008
6) Your Structural Consultant Letter (Mail) dated 27.02.2008
7) Our Letter dated 29.02.2008
8) Your Structural Consultant Letter (Mail) dated 06.03.2008

With reference to your structural consultant letter (Mail) dated 06.03.2008 and as requested by your structural consultant Mr. H.S. Surya Narayanan, we hereby furnish the load carrying capacity of End Bearing Bored cast-in-situ pile, for different diameter requested, as follows: -

Calculation of End Bearing Bored cast-in-situ pile (Alternate Suggestion)

For the proposed Multistoreyed framed structure with Ground + 13 floors, it is also suggested to provide End Bearing Bored cast-in-situ pile at a depth of 7.50m with the bottom 2.00m well socketed into the base rock (Partly weathered rock with irregular core pieces of silt stone / clay stone).

The Draft Code IS: 2911 (Part – I/Sec – 2) code of practice for design and construction of pile foundation, Part – I, Concrete Piles Sec – 2, Bored cast-in-situ piles,



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Sec revision shall be referred. The method suggested by Cole & Shroud for Bored piles in weathered rock is adopted.

The above method is reported to be more rational and widely used, for weathered rock where, in coring of samples, is not possible.

As per Cole & Shroud, the allowable pile load (Q_{ap}) is given by the equation.

$$Q_{ap} = \frac{C_u N_c \pi d^2}{F} + \frac{\alpha \cdot C_u \pi d L}{F_s}$$

Where

C_u = Shear strength below the base of pile (t/m^2)

N_c = Bearing capacity factor '9'

$\frac{\alpha}{F_s}$ = 0.30 (recommended value)

C_u = Average shear strength of rock in socketed length of pile (t/m^2)

D = Diameter of pile

L = Length of pile in the socketed portion

N_{obs} = 100 (taken for analysis)

Correlated value of C_u } = $80 t/m^2$ (As per fig 4. IS: 2911 (Part-I / Sec-2))

D = 0.45m

α = 0.30

τ_u = Average safe shear strength ($80 t/m^2$)

F = 3.0

Q_{ap} = $\frac{80 \times 9 \times \pi \times 0.45^2}{3} + \frac{0.3 \times 80 \times \pi \times 0.45 \times 2.00}{3}$

= $38.15 + 22.61 = 60.76t$ (or) 60t

The depth of pile shall be adopted as 7.50m below the existing ground level on partly weathered rock with irregular core pieces of silt stone / clay stone layer. The bottom 2.00m depth should be anchored (socketed) into the rock so as to allow



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development of tip-resistance. This method assumes that there is not contribution from side friction of pile above the socketed length. Depending upon the loadings in various columns, suitable grouping shall be selected and adopted.

RECOMMENDATIONS

1. For the proposed framed structure with Ground + 13 floors, it is also suggested to provide End Bearing Bored cast-in-situ pile at a depth of 7.50m below the existing ground level with the bottom 2.00m, well socketed into the base rock (Partly weathered rock with irregular core pieces of silt stone / clay stone) layer.
2. Safe loads are calculated for different diameter for Bored cast-in-situ piles, resting in the partly weathered rock with irregular core pieces of silt stone / clay stone layer is given in table.1. If the structural capacity of the pile is less than the safe load recommended, the structural capacity would govern the allowable load on piles. Settlement of the pile for the safe load recommended will be negligible since, the underlying layer below the pile toe is partly weathered rock with irregular core pieces of silt stone / clay stone layer.

Table – 1 Safe Loads on Piles

Diameter of pile (cm)	Safe load in compression (t)
45.00	60.00
60.00	98.00

3. Depending upon the loadings in various columns, suitable grouping of piles shall be proportioned and provided. Minimum two piles shall be provided for each column.
4. Pile load tests shall be carried out on representative piles to ascertain the load capacity now evaluated from the soil parameters. The lowest value shall be taken for the design.



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5. Before the installation of piles, SPT shall be carried out as per the stipulations contained in the IS: 2911 (Part – 1 / Sec – 2) – 1979.
6. Before the installation of piles, SPT shall be conducted at the termination level and the conformity SPT 'N' value to the presently obtained values shall be verified.
7. The safe load carrying capacity of the pile derived from the soil parameters as per IS: 2911 (Part – 1/Sec – 2) – 1979 is only tentative. The actual safe load carrying capacity of a pile has to be derived from test pile.
8. **Test Pile:** A pile which is selected for load testing and which is subsequently loaded for that purpose. The test pile may form a working pile itself if subjected to routine load test with up to one and a half times the safe load.
9. The installation of Bored cast-in-situ piles shall be carried out immediately on reaching the termination level of bore hole with out allowing any elapse of time. The bottom of the pile shall be cleaned thoroughly before concreting. This is very very important guideline to be followed during the installation of piles.
10. The installation of End Bearing Bored cast-in-situ pile shall be carried out as per the stipulations contained in the IS: 2911 (Part – 1 / Sec-2) – 1979.
11. Since the ground water table was encountered at a depth of 1.50m depth below the existing ground level, suitable dewatering arrangements should be adopted.



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12. For the proposed Multistoreyed framed structure, it is strongly recommended to adopt, any one of the suitable foundation as suggested by us, according to your requirements.
13. The different level of foundations should be avoided. In case if required, kindly follow the stipulations contained in the IS: 1904 – 1986.
14. The area explored is very vast. The entire recommendations as above are based on nine bore holes provided upto and within the hard stratum at the locations shown by the engineer-in-charge as per the terms of reference. The uniformity or otherwise of the soil delineation and strength profile over the entire site shall be verified during execution. If there are any variations, the same shall be reported to us through letter, for review and further advice.

We hope the above would clarify your requirements. If there are any further clarifications, the same shall be reported to us through letter, for review and further advice.

Thanking you,

Yours faithfully,
For NEO GEOCONS

T. G. Varanthy Kumar
MANAGING PARTNER

13/03/2008



TEST REPORT FOR WATER

Report No **SGS/CHN/MTL/0732/2012.**

Date: **11.05.2012**

Name of the Client : **M/s Akshaya Private Limited,**
Location : **G Squire, 46, Old Mahabalipuram Road, Chennai-600096**
Name of the Project : **Belvedere**
Sample Description : **Water Sample # 3, Open Well 4 (IN near 2BHK Tower)**
Tested as per : **APHA 21ST EDN :2005**
Sample Drawn By : **Client**
Date of Sampling : **02.05.2012**
Date of Testing : **03.05.2012 – 09.05.2012**
Lab Reference Number : **MTL/0355/2012**
Work Order Number : **Test Request letter By Client, Dated 02.05.2012**

Water – Suitability for Drinking

SL No.	Description	Results	Specified Limits As Per IS 10500 : 1991 (RA 1993)	
			Desirable	Permissible
1	APPERANCE Appearance when analysed Appearance After Filteratiron	Clear	-	-
2	Colour (Hazen Units)	10 Hazen	5	25
3	Odour	Unobjectionable	Unobjectionable	
4	PH @25 Degree Celsius	7.24	6.5 to 8.5	No Relax
5	Conductivity@ 25 Degree Celsius	1978 µmhos/cm	-	-
6	Turbidity as NTU	0.8 NTU	5	10
7	Total Dissolved Solids	1314 Mg/l	500Mg/l	2000Mg/l
8	Total Hardness as CaCo3	738 Mg/l	300Mg/l	600Mg/l
9	Carbonate Hardness as CaCO3	387 Mg/l	-	-
10	NON Carbonate Hardness as CaCO3	351 Mg/l	-	-
11	Phenolphthalein Alkalinity	NIL	-	-
12	Methyl Orange Alkalinity	387 Mg/l	200Mg/l	600Mg/l



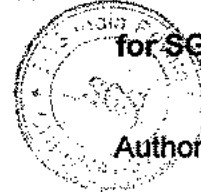
Water – Suitability for Drinking

SL No	Description	Results	Specified Limits As Per IS 10500 : 1991(RA 1993)	
			Desirable	Permissible
13	Calcium as Ca	149 Mg/l	75Mg/l	1000Mg/l
14	Magnesium as Mg	89 Mg/l	—	—
15	Chlorides as Cl	542 Mg/l	250Mg/l	1000Mg/l
16	Sulphate as So4	71 Mg/l	200Mg/l	400Mg/l
17	Iron as Fe	0.04	0.3Mg/l	1.0Mg/l
18	Total Silica as SIO2	22.40 Mg/l	—	—

Note: The above water sample Not Complies to Drinking water specification as per IS: 10500-1991(RA 1993) Amendment No.3 July 2010.

Notes:

- This Test reports should not be reproduced except in full, without written approval of laboratory.
- The results indicated above are based on the test carried out on the sample supplies by the client.
- Any query regarding the report must be reported immediately.



for SGS India Private Ltd.

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TEST REPORT FOR WATER

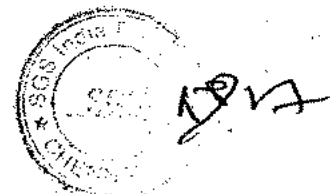
Report No SGS/CHN/MTL/0731/2012.

Date: 11.05.2012

Name of the Client : **M/s Akshaya Private Limited,**
Location : **G Squire, 46, Old Mahabalipuram Road, Chennai-600096**
Name of the Project : **Belvedere**
Sample Description : **Water Sample # 2, Open Well 3 (IN near Club House)**
Tested as per : **APHA 21ST EDN :2005**
Sample Drawn By : **Client**
Date of Sampling : **02.05.2012**
Date of Testing : **03.05.2012 – 09.05.2012**
Lab Reference Number : **MTL/0355/2012**
Work Order Number : **Test Request letter By Client, Dated 02.05.2012**

Water – Suitability for Drinking

SL No	Description	Results	Specified Limits As Per IS 10500 : 1991 (RA 1993)	
			Desirable	Permissible
1	APPERANCE Appearance when analysed Appearance After Filteratiron	Clear	-	-
2	Colour (Hazen Units)	10 Hazen	5	25
3	Odour	Unobjectionable	Unobjectionable	
4	PH @25 Degree Celsius	8.32	6.5 to 8.5	No Relax
5	Conductivity@ 25 Degree Celsius	2110 µmhos/cm	--	--
6	Turbidity as NTU	0.2 NTU	5	10
7	Total Dissolved Solids	1380 Mg/l	500Mg/l	2000Mg/l
8	Total Hardness as CaCo3	690 Mg/l	300Mg/l	600Mg/l
9	Carbonate Hardness as CaCO3	34 Mg/l	--	--
10	NON Carbonate Hardness as CaCO3	656 Mg/l	--	--
11	Phenolphthalein Alkalinity	4.90	--	--
12	Methyl Orange Alkalinity	34 Mg/l	200Mg/l	600Mg/l



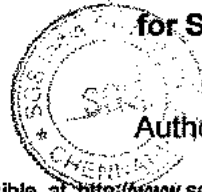
Water – Suitability for Drinking

Sl. No	Description	Results	Specified Limits As Per IS 10500:1991(RA 1993)	
			Desirable	Permissible
13	Calcium as Ca	180 Mg/l	75Mg/l	1000Mg/l
14	Magnesium as Mg	59 Mg/l	—	—
15	Chlorides as Cl	733 Mg/l	250Mg/l	1000Mg/l
16	Sulphate as So4	90 Mg/l	200Mg/l	400Mg/l
17	Iron as Fe	0.03	0.3Mg/l	1.0Mg/l
18	Total Silica as SiO2	9.99 Mg/l	—	—

Note: The above water sample Not Complies to Drinking water specification as per IS: 10500-1991(RA 1993) Amendment No.3 July 2010.

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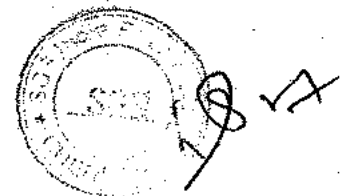
Report No SGS/CHN/MTL/0730/2012.

Date: 11.05.2012

Name of the Client : M/s Akshaya Private Limited,
 Location : G Squire, 46, Old Mahabalipuram Road, Chennai-600096
 Name of the Project : Belvedere
 Sample Description : Water Sample # 1, Open Well 2 (Back Side of 3 BHK Tower)
 Tested as per : APHA 21ST EDN :2005
 Sample Drawn By : Client
 Date of Sampling : 02.05.2012
 Date of Testing : 03.05.2012 – 09.05.2012
 Lab Reference Number : MTL/0354/2012
 Work Order Number : Test Request letter By Client, Dated 02.05.2012

Water – Suitability for Drinking

SL No	Description	Results	Specified Limits As Per IS 10500 : 1991 (RA 1993)	
			Desirable	Permissible
1	APPERANCE Appearance when analysed Appearance After Filteratiron	Clear	-	-
2	Colour (Hazen Units)	10 Hazen	5	25
3	Odour	Unobjectionable	Unobjectionable	
4	PH @25 Degree Celsius	7.06	6.5 to 8.5	No Relax
5	Conductivity@ 25 Degree Celsius	1860 µmhos/cm	-	-
6	Turbidity as NTU	0.1 NTU	5	10
7	Total Dissolved Solids	1244 Mg/l	500Mg/l	2000Mg/l
8	Total Hardness as CaCo3	779 Mg/l	300Mg/l	600Mg/l
9	Carbonate Hardness as CaCO3	358 Mg/l	-	-
10	NON Carbonate Hardness as CaCO3	421 Mg/l	-	-
11	Phenolphthalein Alkalinity	Nil	-	-
12	Methyl Orange Alkalinity	358 Mg/l	200Mg/l	600Mg/l



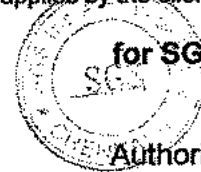
Water – Suitability for Drinking

SL No	Description	Results	Specified Limits As Per (S 10500 : 1991/RA 1993)	
			Desirable	Permissible
13	Calcium as Ca	180 Mg/l	75Mg/l	1000Mg/l
14	Magnesium as Mg	80 Mg/l	—	—
15	Chlorides as Cl	518 Mg/l	250Mg/l	1000Mg/l
16	Sulphate as So4	67 Mg/l	200Mg/l	400Mg/l
17	Iron as Fe	0.03	0.3Mg/l	1.0Mg/l
18	Total Silica as SiO2	24.13 Mg/l	—	—

Note: The above water sample Not Complies to Drinking water specification as per IS: 10500-1991(RA 1993) Amendment No.3 July 2010.

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TEST REPORT FOR PAVER BLOCKS

Report No: SGS/CHN/MTL/0733/2012.

Date: 11.05.2012

Name of the Client : M/s Akshaya Private Limited
Location : G Squire, 46, Old Mahabalipuram Road,
Chennai-600096
Name of the project : Belvedere
Description of sample : C.C, Paver Blocks
(Identification & Mark are specified by client).
Tested as per : IS 516-1959(RA 2004) & 15658-2006
Grade of the Concrete : Not Mentioned.
Thickness of specimen (mm) : 80
Condition of Specimen : Normal.
Date of Casting : Not mentioned
Date of Testing : 03.05.2012 – 05.05.2012
Lab Ref. no : MTL/0358/2012.
Age of specimen : Nil
Sample Drawn By : Client
Work Order Number : Test Request letter By Client, Dated 02.05.2012

Compressive Strength & Water Absorption of Paver Blocks

S / No	Description	Result
1	Average Compressive Strength, (N/mm ²)	34.57
2	Average Water Absorption, (%)	1.70 (Max 6 %)

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(Checked by)



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TEST REPORT

Report No. : CH:GL:2110046455

DATE : 07/10/2011

JOE No. : 1111815968

Control No.:2115051129

SAMPLE NOT DRAWN BY LABORATORY

SAMPLE SUBMITTED AND IDENTIFIED BY SUPPLIER AS : WATER

COMPANY NAME B.L.KASHYAP AND SONS LTD.
ADDRESS AKSHAYAHOMES THE BELVEDERE PROJECT,,
URAPAKKAM,NANDIVANAM,GST ROAD,
CITY CHENNAI-600202
SAMPLING METHOD N.A.
SAMPLE DESCRIPTION OPEN WELL WATER
SAMPLE QTY. 5L
SAMPLE NO 1
PROJECT AKSHYA PVT LTD., BELVEDERE SITE
URAPAKKAM
SAMPLE RECD ON 29/09/2011
TEST START DATE 29/09/2011
TEST END DATE 07/10/2011

TESTS	PROTOCOL	RESULT	REQUIREMENT/LIMIT	
			Desirable	Permissible
APPEARANCE	APHA 21 st EDN.:2005			
APPEARANCE AFTER FILTERATION		Clear		
APPEARANCE WHEN ANALYSED		Turbid		

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TEST REPORT

Report No. : CH:GL:2110046455

DATE : 07/10/2011

JOE No. : 1111815968

Control No.:2115051129

TESTS	PROTOCOL	RESULT	REQUIREMENT/LIMIT As per IS 10500:1991 [Reaff:1993]	
			Desirable	Permissible
MAGNESIUM as Mg	APHA 21 st EDN.:2005	106 mg/l	30 mg/l	100 mg/l
CHLORIDES as Cl	APHA 21 st EDN.:2005	470 mg/l	250 mg/l	1000 mg/l
SULPHATE as SO4	APHA 21 st EDN.:2005	95 mg/l	200 mg/l	400 mg/l
IRON as Fe	APHA 21 st EDN.:2005	0.45 mg/l	0.3 mg/l	1.0 mg/l
TOTAL SILICA as SiO2	APHA 21 st EDN.:2005	35.44 mg/l		

The above water sample does not comply to Drinking water specification as per IS: 10500 - 1991 (Reaff.1993) Amendment No.2,, against the above test for which the limit has been provided in the specification.

Desirable = desirable limit , Permissible = permissible limit

**** End of Report ****

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Page 3 of 3

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TEST REPORT

Report No. : CH:GL:2110034057

DATE : 01/08/2011

JOE No. : 1111812027

Control No.:2115038271

SAMPLE NOT DRAWN BY LABORATORY

SAMPLE SUBMITTED AND IDENTIFIED BY SUPPLIER AS : WATER

COMPANY NAME AKSHYA PRIVATE LTD
ADDRESS BELVEDERE SITE
CITY URAPAKKAM
A/C B.L.KASHYAP AND SONS LTD.
SAMPLING METHOD N.A.
SAMPLE DESCRIPTION WATER
SAMPLE QTY. 5L
SAMPLE FROM AKSHYA PVT LTD.,BELVEDERE SITE
OPEN WELL WATER,URAPAKKAM
SAMPLE RECD ON 23/07/2011
TEST START DATE 23/07/2011
TEST END DATE 01/08/2011

TESTS	PROTOCOL	RESULT	REQUIREMENT/LIMIT	
			Desirable	Permissible
Coliforms	IS 1622 : 1981(Reaff.2003)	Absent/100 ml	-	10 MPN
E.coli	IS 1622 : 1981(Reaff.2003)	Absent/100 ml	-	Absent
Faecal coliform	IS 1622 : 1981(Reaff.2003)	Absent/100 ml	-	Absent
APPEARANCE	APHA 21 st EDN.:2005		-	-

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TEST REPORT

Report No. : CH:GL:2110034057

DATE : 01/08/2011

JOE No. : 1111812027

Control No.:2115038271

TESTS	PROTOCOL	RESULT	REQUIREMENT/LIMIT As per IS 10500:1991 [Reaff:1993]	
			Desirable	Permissible
METHYL ORANGE ALKALINITY (as CaCO ₃)	APHA 21 st EDN.:2005	38 mg/l	200 mg/l	600 mg/l
CALCIUM as Ca	APHA 21 st EDN.:2005	207 mg/l	75 mg/l	200 mg/l
MAGNESIUM as Mg	APHA 21 st EDN.:2005	15 mg/l	30 mg/l	100 mg/l
CHLORIDES as Cl	APHA 21 st EDN.:2005	616 mg/l	250 mg/l	1000 mg/l
SULPHATE as SO ₄	APHA 21 st EDN.:2005	110 mg/l	200 mg/l	400 mg/l
IRON as Fe	APHA 21 st EDN.:2005	1.5 mg/l	0.3 mg/l	1.0 mg/l
TOTAL SILICA as SiO ₂	APHA 21 st EDN.:2005	4.59 mg/l		

The above water sample does not comply to Drinking water specification as per IS: 10500 - 1991 (Reaff.1993) Amendment No.2, against the above test for which the limit has been provided in the specification.

Desirable = desirable limit , Permissible = permissible limit

***** End of Report *****

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BELVEDERE
New Bore water no.1.

TEST REPORT

Report No. : CH:GL:8110017767

DATE : 13/06/2008

JOE No. : 811106572

Report Control No.:8115018236

SAMPLE NOT DRAWN BY LABORATORY

SAMPLE SUBMITTED AND IDENTIFIED BY SUPPLIER AS : WATER

COMPANY NAME AKSHYA HOMES
ADDRESS 22, 2ND STREET, NEHRU NAGAR
CITY CHENNAI-
SAMPLING METHOD N.A.
SAMPLE DESCRIPTION NEW BORE WATER NO.1
SAMPLE QTY. 2L
PROPOSED PROJECT "BELVEDERE" IN NANDHIVARAM VILLAGE AT SURVEY NO.
417/5,422/2A,423/1A1,423/1A2,423/1B,423/2B,423/3B1,
423/4A,424/1A,424/1B,424/2B,425/2,425/3,434/1,434/2

SAMPLE RECD ON 05-06-2008

TEST START DATE 05/06/2008

TEST END DATE 13/06/2008

TESTS	PROTOCOL	RESULT
CALCIUM HARDNESS [as CaCO ₃]	APHA 21 st EDN.:2005	480 mg/l
MAGNESIUM HARDNESS [as CaCO ₃]	APHA 21 st EDN.:2005	140 mg/l
COLOUR (HAZEN UNITS)	APHA 21 st EDN.:2005	5 Hazen [True Colour]
pH @ 25°C	APHA 21 st EDN.:2005	7.02
CONDUCTIVITY @ 25°C	APHA 21 st EDN.:2005	3150 µmhos/cm
TURBIDITY in NTU	APHA 21 st EDN.:2005	192 NTU
TOTAL DISSOLVED SOLIDS	APHA 21 st EDN.:2005	1922 mg/l
TOTAL HARDNESS AS CaCO ₃	APHA 21 st EDN.:2005	620 mg/l
PHENOLPHTHALEIN ALKALINITY (as CaCO ₃)	APHA 21 st EDN.:2005	NIL
METHYL ORANGE ALKALINITY (as CaCO ₃)	APHA 21 st EDN.:2005	371 mg/l

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TEST REPORT

Report No. : CH:GL:8110017767

DATE : 13/06/2008

JOE No. : 811106572

Report Control No.:8115018236

TESTS	PROTOCOL	RESULT
CHLORIDES as Cl	APHA 21 st EDN.:2005	689 mg/l
SULPHATE as SO ₄	APHA 21 st EDN.:2005	203 mg/l
IRON as Fe	APHA 21 st EDN.:2005	3 mg/l
T.S.S.	APHA 21 st EDN.:2005	160 mg/l
TOTAL SILICA as SiO ₂	APHA 21 st EDN.:2005	26 mg/l
SODIUM (as Na)	APHA 21 st EDN.:2005	201 mg/l

**** End of Report ****

per pro SGS India Private Ltd.


Authorised Signatory

S. SURESH KUMAR
MANAGER - ENVIRONMENT