PRAGATI
SURVEYORS PVT. LTD.

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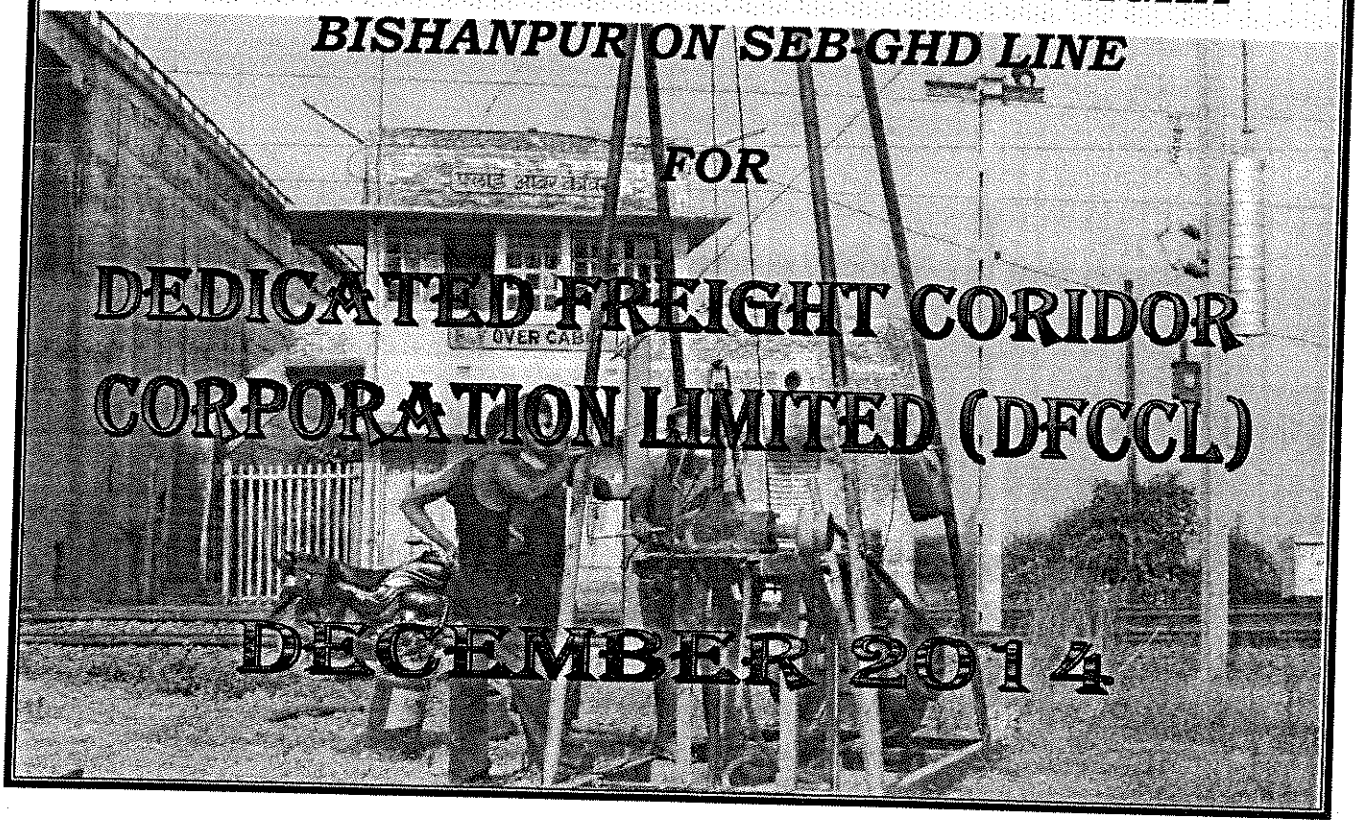
GEOTECHNICAL INVESTIGATION REPORT

FOR

CONDUCTING DETAIL ENGINEERING CONSTRUCTION SURVEY & ALLIED WORK OF SONE NAGAR YARD DFC ALIGNMENT WITH JUNCTION ARRANGEMENT AT CHIRAILA PATU ON GC LINE & BAGHA BISHANPUR ON SEB-GHD LINE

FOR



DEDICATED FREIGHT CORIDOR CORPORATION LIMITED (DFCCL)

DECEMBER 2014

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1.0 INTRODUCTION:

Dedicated Freight Corridor Corporation Limited (DFCCL) has proposed construction of ROB's at various locations at Sonenagar. DFCCL has appointed Pragati Surveyors Pvt.Ltd as consultant for performing topographic survey, geotechnical investigation, preparation of G.A.D. for ROB's along with preparation of schedule of quantities and tender documents works for proposed project by DFCCL vide work order no .MGS/EN/RFO-MGS.As part of the overall scope, it was decided to perform geotechnical investigation to decide foundation design parameters.

This report covers boreholes drilled at various locations along the alignment. Report is limited to defining the design parameters and specifying safe bearing capacity. It does not involve any specialist design for any subsurface component or visits by the consultant to confirm any of the design parameters.

2.0 SITE LOCATION:

The project area is located at Sonenagar. The investigated area is situated in Bihar. Project area is predominantly flat.

3.0 PROPOSED CONSTRUCTION:

It is proposed to construct ROB's at the site. It is anticipated that the structures will be constructed mainly from reinforced concrete. Geotechnical investigation was performed for following locations.

BORE HOLE NO.	LOCATION	CHAINAGE (Km)	DEPTH (MTR)
BH-1	BR-15	405/26	30
BH-1	ROB	408/2	30
BH-1	BR-4F	409/26	30
BH-1	BR- 524	546/26	30
BH-1	BR-528F	548/2	30
BH-1	BR-520	544/24	30
BH-1	BR-529F	548/26	30
BH-1	----	549/28	30

4.0 SCOPE OF SERVICES:

The limited scope of services as defined in work order consists of drilling and sampling in boreholes at Bridge locations and carrying out relevant laboratory tests on representative soil samples.

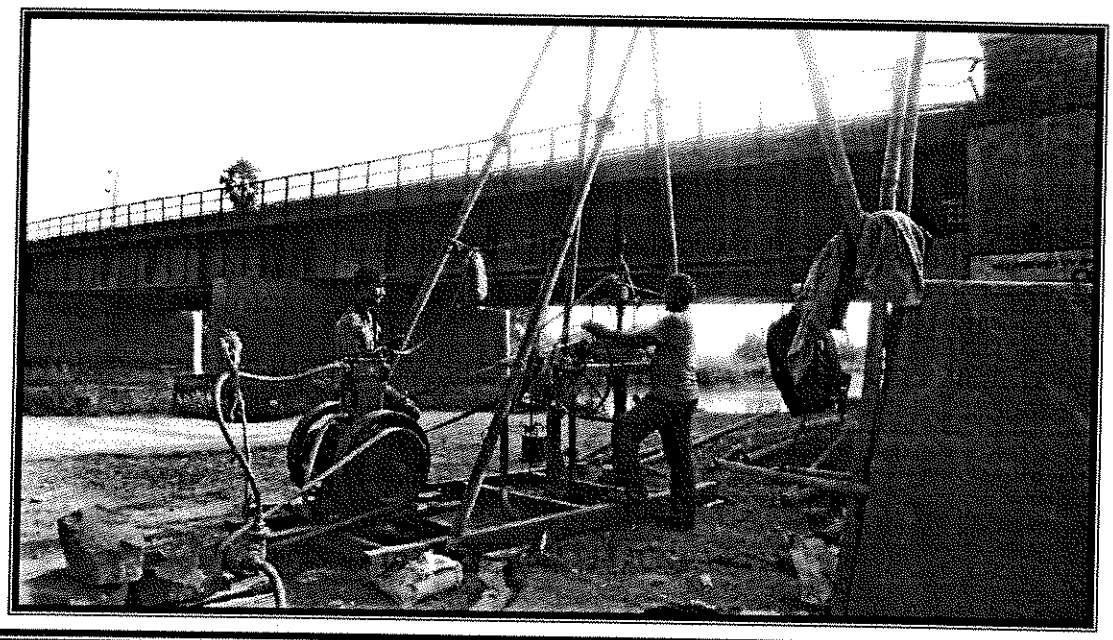
5.0 FIELD WORK:

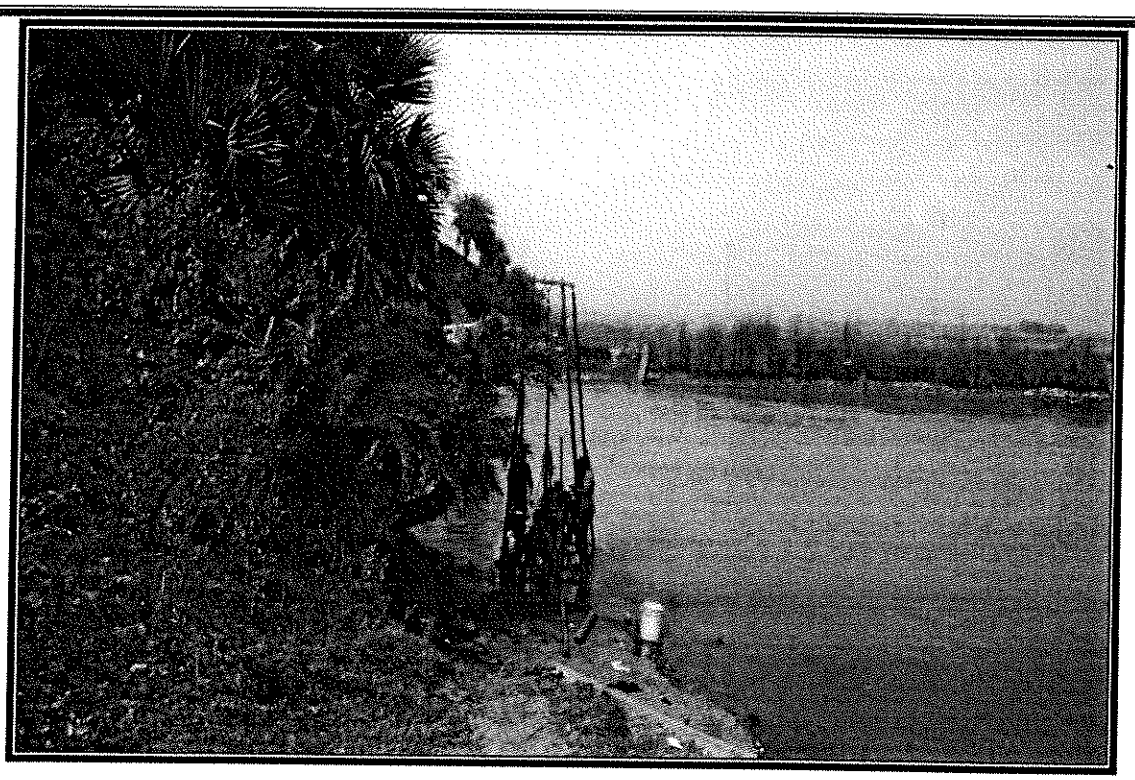
Drilling and sampling in soil was carried out using standard rotary drilling rig. This rig is coupled with diesel engine and has tripod and all drilling accessories. Borehole in soil was advanced using rotary drilling method. Water was circulated to cool the drilling bit. Ground water table was recorded after 24 hours of completion of drilling. Drilling rig deployed is suitable for and has arrangement for driving as well as extracting casing, boring drilling by mud circulation method, conducting Standard Penetration Test (SPT) collection of Undisturbed Soil Sample (UDS) and Disturbed or wash Soil Sample (DS).

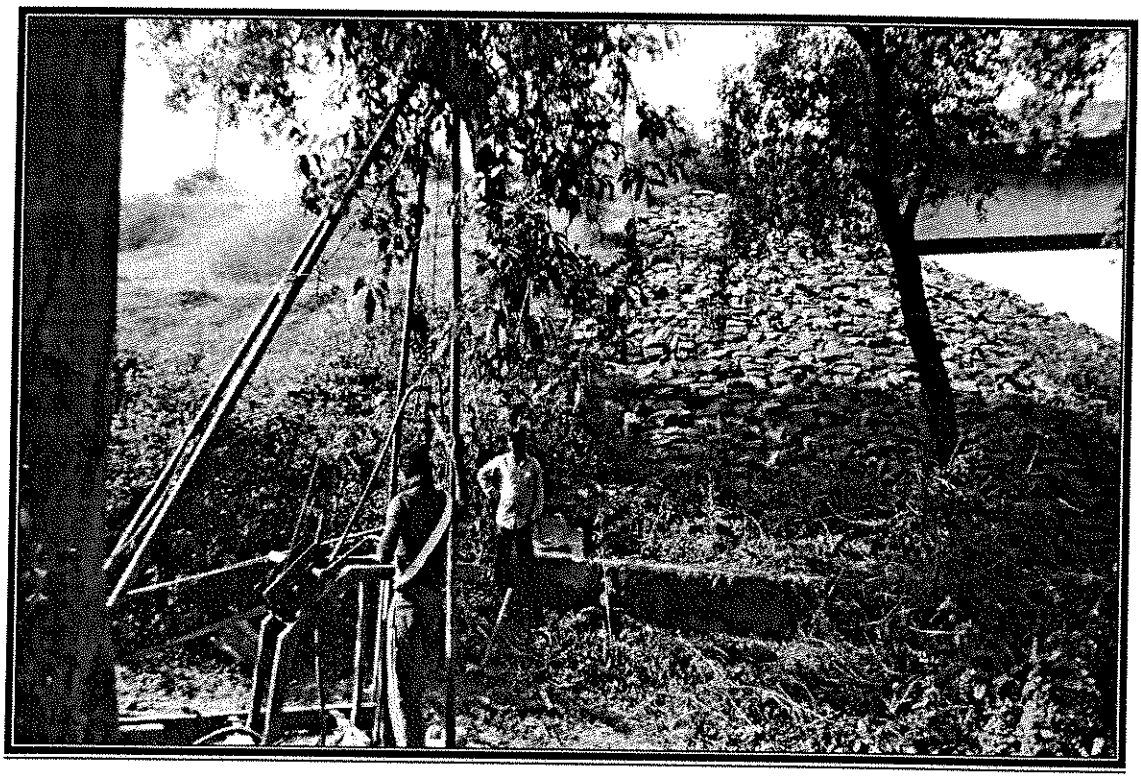
On completion of drilling, soil samples were packed in plastic containers with proper identification tags. Samples were numbered and kept in core boxes. Filed work was performed during the year 2014.

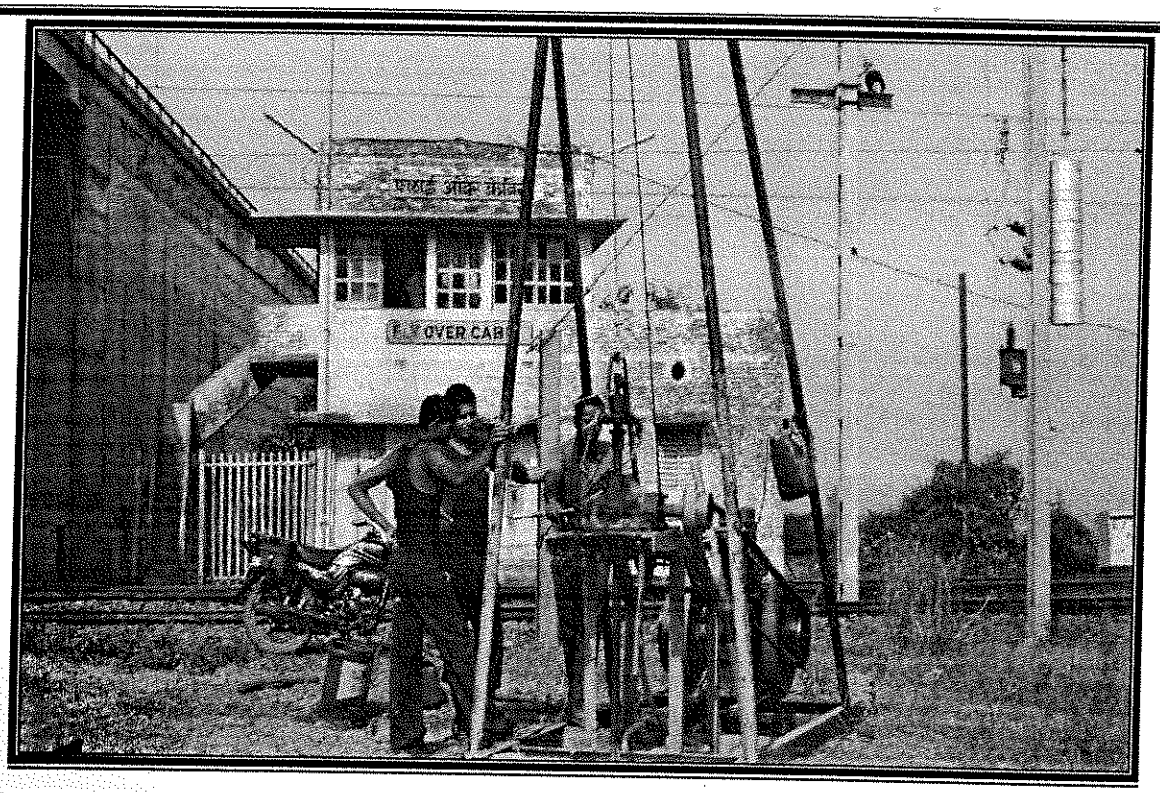
Representative of client indicated location of bore holes.

SITE PHOTOGRAPHS





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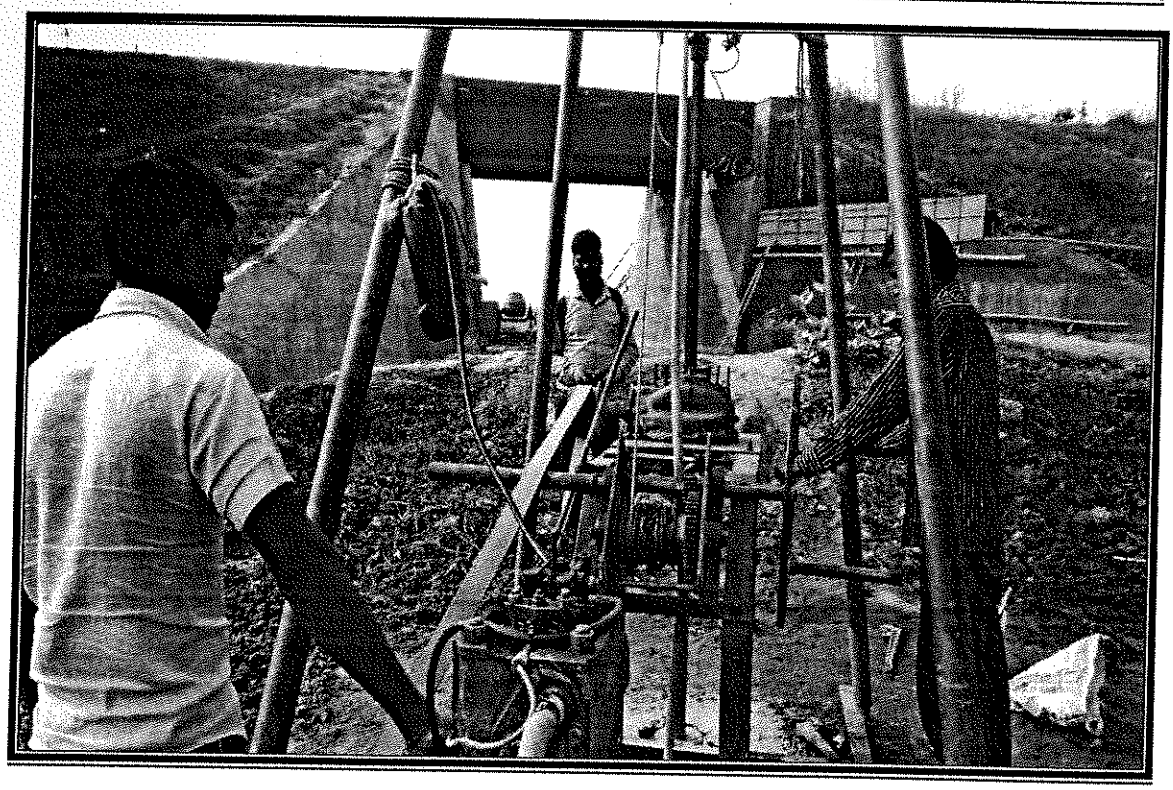

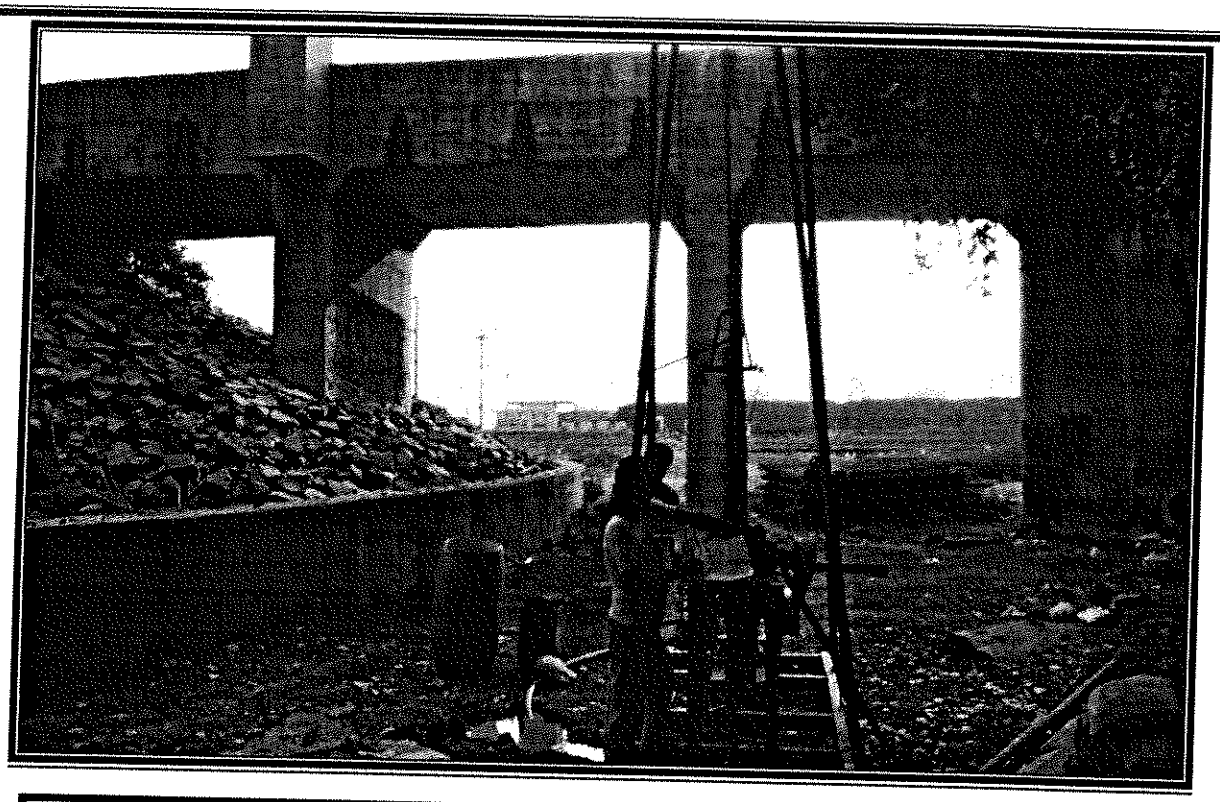

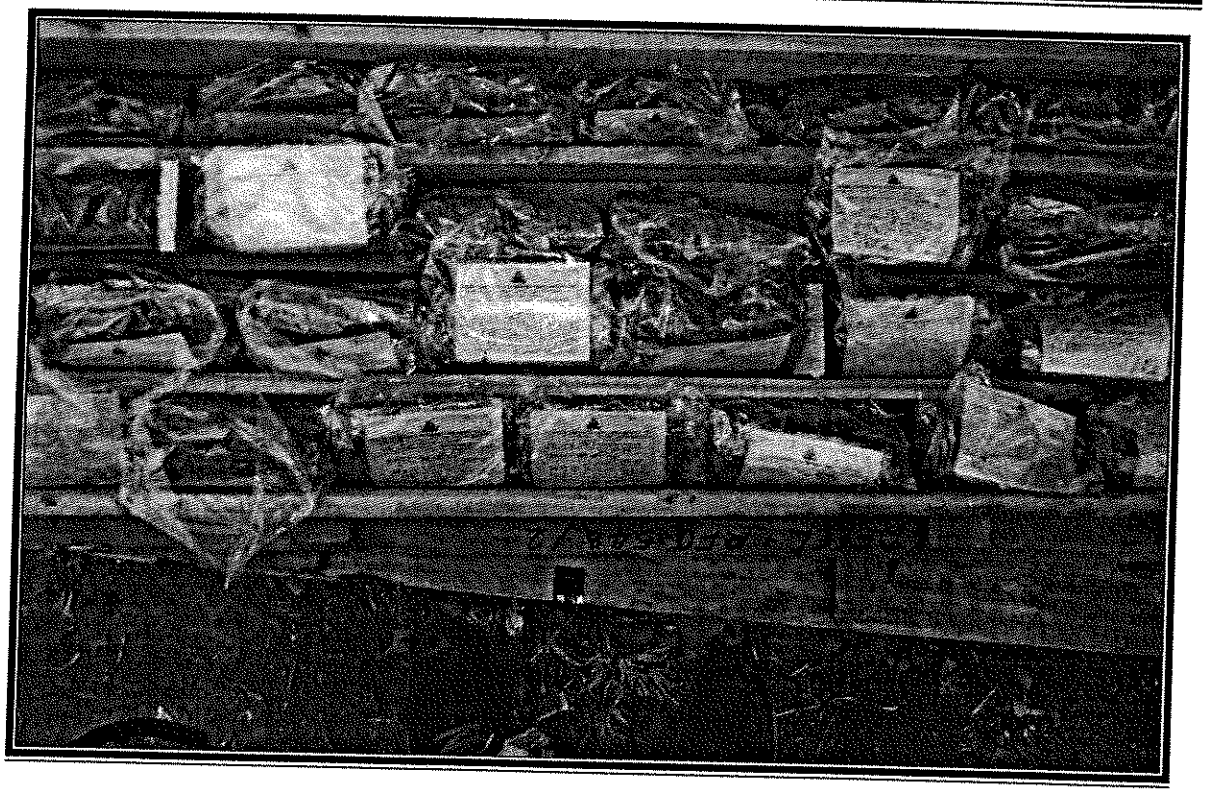

6.0 COLLECTING UDISTURBED SOIL SAMPLES (UDS)

Undisturbed soil samples (UDS) in "Shelby tubes" were collected in boreholes to conduct relevant laboratory testing. Type of sampler and method of sampling was selected to get minimum disturbance while extracting soil samples. UDS was collected using 75 mm ID sampler. It is required to collect extra length of sample for allowing collection of disturbed material at the top and length occupied by sample head and piston.

Before taking UDS, bottom of borehole was cleaned thoroughly. While sampling, net hydrostatic head at bottom of borehole was maintained to zero. Length of penetration of sampler was limited to 5 to 10 times diameter of sampler in cohesion-less soil and 10 to 15 times diameter of sampler in cohesive soil. Pulling out of sampler was carried out by turning one or two rounds. On removal both the ends of the sampler were closed with wax. Since recovery was UDS are not reported.

Reference to IS 2131 it is recommended to "push" and not "drive" the sampler during collection of sample. Shelby tubes are used to sample very soft to soft clays. It is noticed that whenever SPT N exceeds 10 it is difficult to push the sample. Even if it is driven recovery of sample is so low that required length of sample to perform shear tests is not available. Hence even though attempt was made to collect undisturbed sample using Shelby tube at depth exceeding 8m it is not shown in the bore logs as the recovery was low. It is mentioned in "Foundation Design Manual" by Dr. N. V. Nayak that "in clay with SPT N of 30 and above avoid sampling with Shelby tubes".

7.0 CODUCTING STANDARD PENETRATION TEST (SPT)

Standard Penetration Tests (SPT) were conducted in bore holes to obtain the 'N' values i.e. no. of blows of 63.5 kg hammer freely falling through 75 cm, required to penetrate 30 cm of SPT split spoon. This test was conducted as per IS-2131. SPT 'N' values are correlated with the relative density of non-cohesive soils and consistency of saturated cohesive soils. This test also collected samples in the

split spoon assembly, which are treated as disturbed samples. SPTs were taken @ 1.0 m to 1.50 m interval.

SPT 'N' values are co-related with relative density of non-cohesive stratum and with consistency of cohesive stratum. Co-relations are tabulated below.

CO-RELATION FOR SATURATED SAND/NON-PLASTIC SILT

Relative Density	Penetration Value
Very loose	0 to 4 Blows
Loose	4 to 10 Blows
Medium	10 to 30 Blows
Dense	30 to 50 Blows
Very Dense	50 and above

CO-RELATION FOR SATURATED CLAY/PLASTIC SILT

Consistency	Penetration Value (Blows/Ft)
Very Soft	0 to 2 Blows
Soft	2 to 4 Blows
Medium Stiff	4 to 8 Blows
Stiff	8 to 16 Blows
Very Stiff	16 to 32 Blows
Hard	32 and above

8.0 SUBSURFACE PROFILE

Subsurface profile consists of sandy clay with gravel and silty sand with varying consistency. Consistency of the soil improves with depth. Following table lists thickness of various layers (m) and corresponding range of SPT N. It is possible that the subsoil in filed may not be in the same order as mentioned below

Layer I: Sandy clay (SPT N =10-30)

Layer II: Sandy clay (SPT N> 30)

Layer III: Silty sand of dense consistency (SPT 30-50)

Layer IV: Silty Sand / clayey sand of vey dense consistency (SPT > 50)

Bore hole no	Layer I		Layer II		Layer III		Layer IV	
	Thik	N	Thik	N	Thik	N	Thik	N
BR 405/26								
BH1	20.0	17-28	-	-	10.0	25-31	-	-
BR 408/1								
BH1*	26.0	14-30	-	-	-	-	-	-
BR 409/26-28								
BH1	10.0	14-22	15.0	30-R	5.0	18-21	-	-
BR 524/26-547/2								
BH1	30.0	16-R	-	-	-	-	-	-
BR 548/2								
BH1	28	14-27	-	-	2.0	25-27	-	-
BR 520 (544/24)								
BH1	10.0	15.17	-	-	20.0	14-25	-	-
BR 529/F (548/26)								
BH1	19.5	14-22	-	-	10.5	18-24	-	-
BR 549/28-30								
BH1	10.0	15-22	--	-	20.0	16-23	-	-

*Black cotton soil up to 4m depth from ground surface

9.0 GROUND WATER LEVEL:

Water level was encountered in boreholes. Correct method to determine ground water table is to install standpipe piezometer and monitor over long period of time. Possibility of flooding the area during rainy season cannot be ruled out. Following table lists depth of ground water below the ground surface existing at the time of investigation.

LOCATION	WATER TABLE (m)
BR 405/26	
BH1	8.0
BR 408/2	
BH1	8.0
BR 409/26-28	
BH1	7.5
BR 524/26-547/2	
BH1	7.5
BR 548/2	
BH1	7.5
BR 520 (544/24)	
BH1	7.7
BR 529/F (548/26)	
BH1	8.1
BR 549/28-30	
BH1	7.5

10.0 LABORATORY TESTING:

On completion of drilling samples were sent to the laboratory for further testing. Samples were classified in the laboratory and representative samples were selected for testing. Following tests were performed.

Soil samples

- Mechanical analysis
- Liquid and plastic limit tests
-

11.0 PARAMETERS ADOPTED FOR DESIGN CALCULATIONS

Considering loads from superstructure, two alternate foundation recommendations are provided.

Alternate I: Bored cast in situ piles

Alternate II: Open raft foundations.

Based on review of borehole logs and lab test results following design parameters are selected for pile design on following considerations.

1. Design SPT 'N' value is selected as average N value of the stratum.

2. Angle of internal friction, ϕ for non cohesive stratum is calculated based on co-relation with SPT 'N'.

3. Cohesion is determined from standard correlations

(qu Kg/cm^2 =N/7.5 and C =qu/2 Hence C = N/15) Ref: Foundation Engineering Handbook by Dr. N. V. Nayak

4. Saturated density of each soil stratum is selected from standard reference.

5. Modulus of volume compressibility (mv) = 45*N (Ref Foundation Engineering by Tomlinson).

6. Ckd = Average cone resistance

Ckd = SPT N*40 (Ref IS 2911 part 1 sec 2)

12.0 FORMULAE USED

It is appropriate to adopt bored cast in situ piles installed by suitable method. Reverse mud circulation method seems to be appropriate method of installation. It is recommended to take necessary precautions during installation.

Formulae used are as follows

A. Open Foundations (raft foundation)

1. Bearing Capacity calculation from shear failure consideration

Ultimate bearing capacity = $qu = C N_C S_C + q (N_q - 1) S_q + 0.5 \gamma B N_\gamma S_\gamma$

Where, C = Cohesion and ϕ = angle of internal friction

N_q, N_γ bearing capacity factors based on ϕ

S_c, S_q, S_γ Shape factors based on ϕ

q = Overburden stress at the bottom of the foundation

γ = Unit weight of subsoil

B = Width of foundation.

2. Settlement of foundation

Settlement of cohesive less soil = (H/mv)*ΔP

Where mv = Coefficient of volume compressibility

H = Average cone resistance

Ckd = Layer thickness (2*B)

B = Width of foundation

ΔP = Incremental stress at mid depth

A. Pile foundation

Piles in Non-cohesive stratum

$$Q_u = A_p \left(\frac{1}{2} D_r N_r + P_D N_q \right) + \sum_{i}^{n} K P_{Di} \tan \delta A_{si}$$

Where,

Ap	:	Cross sectional area of pile toe
D	:	Pile Diameter
γ	:	Effective unit weight of soil at pile toe
PD	:	Effective overburden pressure at pile toe
Nγ, Nq	:	Bearing capacity factors depending on angle of internal friction
K	:	Coefficient of earth pressure

Piles in Cohesive Stratum

$$Q_u = A_p N_e C_p + \alpha \overline{C} A_s$$

Where,

Ap	:	Cross sectional area of pile toe
Ne	:	Bearing capacity factor usually taken as 9
Cp	:	Average cohesion at pile tip
α	:	Reduction factor (adhesion)

$\bar{c}$: Average cohesion throughout the pile length

As : Surface area of pile shaft

Longitudinal reinforcement steel rods shall be bent to 'L' shape at the bottom to provide clear cover of 75 mm on sides and bottom.

13.0 RECOMMENDATIONS

Alternate I: Pad foundations

Recommendations are based on following acceptable norms

- Foundations shall not fail in shear and minimum factor of safety will be 2.5
- Anticipated total settlement shall be less than 50mm for pad foundations with width not exceeding 5m and 75mm for width exceeding 5m.

Following tables provide safe bearing capacity to be adopted at bridge locations. It is presumed that minimum depth of foundation will be 2m below the ground surface existing at the time of investigation.

Location	Depth m	Foundation width	Net safe bearing capacity
BR 405/26	2.0	up to 5m	13T/m^2
	2.0	6m to 10m	15T/m^2
BR 408/2	Black cotton soil up to 4m depth		
	4.0	up to 5m	15T/m^2
	4.0	6m to 10m	17T/m^2
BR 409/26-28	2.0	up to 5m	13T/m^2
	2.0	6m to 10m	15T/m^2
BR 524/26-547/2	2.0	up to 5m	13T/m^2
	2.0	6m to 10m	15T/m^2
BR 548/2	2.0	up to 5m	13T/m^2
	2.0	6m to 10m	15T/m^2

BR 520 (544/24)	2.0	up to 5m	12T/m^2
	2.0	6m to 10m	14T/m^2
BR 529/F (548/26)	2.0	up to 5m	13T/m^2
	2.0	6m to 10m	15T/m^2
BR 549/28-30	2.0	up to 5m	12T/m^2
	2.0	6m to 10m	14T/m^2

Bottom of excavation for foundation may become loose due to movement of personnel and equipments hence where ever possible bottom of excavation shall be compacted to minimum 95% of proctor density prior to placement of PCC.

In case water is encountered dewatering system shall be in place to lower ground water level to minimum 60cm below bottom of excavation. Dewatering shall continue till sufficient dead weight is attained to counteract uplift force of water.

Alternate II: Bored cast in situ piles

Following table lists safe down ward capacity of 1m & 1.2m diameter bored cast in situ piles. Pile length considered below scour depth

Location	Pile dia	Pile length m	Pile capacity (T)	
			Vertical downwards	Uplift
BR405/26	1.0	15	100	60
		18	115	75
		21	240	95
	1.2	15	130	75
		18	150	90
		21	335	115
BR 408/2	1.0	15	95	50
		18	110	65
		21	130	80
	1.2	15	120	60
		18	145	80
		21	165	95

BR 409/26-28	1.0	15	145	60
		18	160	75
		21	175	85
	1.2	15	190	75
		18	210	90
		21	230	105
BR 524/26-547/2	1.0	15	95	55
		18	110	70
		21	125	80
	1.2	15	125	70
		18	140	85
		21	160	100
BR 548/2	1.0	15	95	55
		18	110	70
		21	125	80
	1.2	15	125	70
		18	140	85
		21	160	100
BR 520 (544/24)	1.0	15	165	75
		18	205	95
		21	250	125
	1.2	15	215	110
		18	240	130
		21	335	255
BR 529/F (548/26)	1.0	15	105	60
		18	120	75
		21	230	95
	1.2	15	130	40
		18	150	90
		21	305	165
BR 549/28-30	1.0	15	165	75
		18	205	95
		21	250	125
	1.2	15	215	110
		18	240	130
		21	335	255

Weight of pile not considered in uplift calculations.

Other quality control measured such as use of bentonite of proper grade and consistency, use of tremie during placement of concrete, collecting and testing of concrete cubes.

Structural capacity of pile shall be calculated and least of the two (geotechnical and structural capacity) shall be adopted.

14.0 IS CODES FOLLOWED

Field work was executed generally in accordance with IS specifications listed below:

a. IS-1892 : Code of practice for Subsurface Investigation of Foundations.

b. IS-1498 : Classification and Identification of soils for General Engineering Purposes.

c. IS-2131 : Method for Standard Penetration Test for Soils

d. IS-2132 : Code for practice for Thin Walled Tube Sampling of Soils.

Laboratory testing was executed generally in accordance with IS specifications listed below:

a. IS-1892 Part IV : Grain Size and Hydrometer Analysis.

b. IS-1498 Part III : Specific Gravity Test.

c. IS-2131 Part V : Liquid and Plastic Limit Test.

d. IS 2720 part : Direct Shear Test

e. IS 2720 Part XV : Consolidation Test

Notes:

Report is issued based on the subsoil condition revealed at the location of boreholes and laboratory tests performed on recovered samples. If during construction of foundations it is observed that sub soil conditions vary from those revealed during investigation it is essential that Monarch Surveyors & Engineering Consultants Private limited Pune shall be contacted so that on confirmation supplementary report shall be issued.

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Geotechnical Consultant

Calculations For Safe Bearing Capacity

Calculations are based on following assumptions:

Foundation width = 5m for Bearing capacity calculations

Foundation width = 5m for settlement calculations

Foundation depth = 2m below the existing ground surface

Foundation submerged condition considered (ground water at ground surface).

Unit weight of subsoil above ground water table =1.8 T /m^3

BR 405/26

Following subsoil profile is considered for calculations

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	Ckd T/m^2	mv m^2/T
0.0 to 20.0	Sandy clay	-	10	-	1000
20.0 to 30.0	Silty Sand	32	-	1000	-

Depth below the natural ground level

Shear Failure Criteria (IS 6403)

Ultimate bearing capacity = $qu = CNcScdcic + q(Nq - 1)Sqdqiq + 0.5\gamma BN\gamma S\gamma d\gamma i\gamma$

Cohesion (C) = 10 T / m^2 is considered and $\phi = 0^0$

Nc = 5.14, Nq = 1, Sc = 1.2,

dc = dq = dγ = ic = iq = iγ = 1

B = Width of foundation = 5m

d = Depth of foundation 2m below scour depth

qu = 5.14*10*1.2= 61.68 T/m^2

Factor safety = 2.5, qsafe = 61.68 / 2.5 = 24.67T/m^2

Settlement Criteria

Settlement of cohesive soil = (H/mv)*ΔP

Typically 8m x 5m foundation with stress intensity of 13 T/m^2 placed at 2m.

I) Stress calculation

A typical rectangle of size 4m x 2.5m (L x B) is considered and stress at the edge of the rectangle is calculated for stress intensity (P) of $13T/m^2$.

Depth From – to	Thick (m)	Depth (Z) up to mid height	L/Z	B/Z	Iz	ΔP=P* 4*Iz T/m^2
0 – 10m	10.0	5m	0.8	0.5	0.12	6.24

Depth considered below bottom of foundation

Settlement=(10000/1000)*6.24=62.4mm

Applying Hogg's correction factor of 0.8 and depth correction of 0.93 anticipated settlement = 46.23mm which is less than allowable value of 50mm for spread foundations.

BR 408/2

Following subsoil profile is considered for calculations

Depth (m)	Type of subsoil	ϕ°	C T/m^2	Ckd T/m^2	mv m^2/T
0.0 to 4.0	Black cotton soil	-	-	-	-
4.0 to 30.0	Sandy clay	-	12	-	1150

Depth below the natural ground level

Shear Failure Criteria (IS 6403)

Ultimate bearing capacity = qu = $CNcScdcic + q(Nq - 1)Sqdqiq + 0.5\gamma BN\gamma S\gamma d\gamma i\gamma$

Cohesion (C) = 12 T / m^2 is considered and $\phi = 0^0$

Nc = 5.14, Nq = 1, Sc = 1.2,

dc = dq = dγ = ic = iq = iγ = 1

B = Width of foundation = 5m

d = Depth of foundation 2m below scour depth

qu = 5.14*12*1.2= 74.02 T/m^2

Factor safety = 2.5, qsafe = 74.02 / 2.5 = 29.60T/m^2

Settlement Criteria

Settlement of cohesive soil = (H/mv)*ΔP

Typically 8m x 5m foundation with stress intensity of 15 T/m^2 placed at 2m.

I) Stress calculation

A typical rectangle of size 4m x 2.5m (L x B) is considered and stress at the edge of the rectangle is calculated for stress intensity (P) of 15T/m^2.

Depth From – to	**Thick (m)**	**Depth (Z) up to mid height**	**L/Z**	**B/Z**	**Iz**	**ΔP=P* 4*Iz T/m^2**
0 – 10m	10.0	5m	0.8	0.5	0.12	7.2

Depth considered below bottom of foundation

Settlement=(10000/1150)*7.2=62.61mm

Applying Hogg's correction factor of 0.8 and depth correction of 0.9 anticipated settlement = 45.08mm which is less than allowable value of 50mm for spread foundations.

BR 409/26-28

Following subsoil profile is considered for calculations

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	Ckd T/m^2	mv m^2/T
0.0 to 10.0	Sandy clay	-	10	-	1000
10.0 to 25.0	Sandy clay	-	25	-	2250

Depth below the natural ground level

Shear Failure Criteria (IS 6403)

Ultimate bearing capacity = qu = $CNcScdcic + q(Nq - 1)Sqdqiq + 0.5\gamma BN\gamma S\gamma d\gamma i\gamma$

Cohesion (C) = 10 T / m^2 is considered and $\phi = 0^0$

Nc = 5.14, Nq = 1, Sc = 1.2,

dc = dq = $d\gamma$ = ic = iq = $i\gamma$ = 1

B = Width of foundation = 5m

d = Depth of foundation 2m below scour depth

qu = 5.14*10*1.2= 61.68 T/m^2

Factor safety = 2.5, qsafe = 61.68 / 2.5 = 24.67T/m^2

Settlement Criteria

Settlement of cohesive soil = (H/mv)*ΔP

Typically 8m x 5m foundation with stress intensity of 15 T/m^2 placed at 2m.

I) Stress calculation

A typical rectangle of size 4m x 2.5m (L x B) is considered and stress at the edge of the rectangle is calculated for stress intensity (P) of 15T/m^2.

Depth From – to	Thick (m)	Depth (Z) up to mid height	L/Z	B/Z	Iz	$\Delta P=P*$ 4*Iz T/m^2
0 – 8m	8	4m	1	0.63	0.135	8.1
8 – 10m	2	9m	0.44	0.28	0.05	3.0

Depth considered below bottom of foundation

Settlement=(8000/1000)*8.1+(2000/2250)*3=64.8+2.67=67.47mm

Applying Hogg's correction factor of 0.8 and depth correction of 0.93 anticipated settlement = 49.65mm which is less than allowable value of 50mm for spread foundations.

Similar calculations can be performed for raft foundations and other locations.

BR 546/26-547/2

Following subsoil profile is considered for calculations

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	Ckd T/m^2	mv m^2/T
0.0 to 30.0	Sandy clay	-	10	-	1000

Depth below the natural ground level

Shear Failure Criteria (IS 6403)

Ultimate bearing capacity = $qu = CNcScdcic + q(Nq - 1)Sqdqiq + 0.5\gamma BN\gamma S\gamma d\gamma i\gamma$

Cohesion (C) = 10 T / m^2 is considered and $\phi = 0^0$

Nc = 5.14, Nq = 1, Sc = 1.2,

dc = dq = dγ = ic = iq = iγ = 1

B = Width of foundation = 5m

d = Depth of foundation 2m below scour depth

qu = 5.14*10*1.2= 61.68 T/m^2

Factor safety = 2.5, qsafe = 61.68 / 2.5 = 24.67T/m^2

Settlement Criteria

Settlement of cohesive soil = $(H/mv)*\Delta P$

Typically 8m x 5m foundation with stress intensity of 13 T/m^2 placed at 2m.

I) Stress calculation

A typical rectangle of size 4m x 2.5m (L x B) is considered and stress at the edge of the rectangle is calculated for stress intensity (P) of $13T/m^2$.

Depth From – to	Thick (m)	Depth (Z) up to mid height	L/Z	B/Z	Iz	$\Delta P=P*4*Iz$ T/m^2
0 – 10m	10.0	5m	0.8	0.5	0.12	6.24

Depth considered below bottom of foundation

Settlement=(10000/1000)*6.24=62.4mm

Applying Hogg's correction factor of 0.8 and depth correction of 0.93 anticipated settlement = 46.23mm which is less than allowable value of 50mm for spread foundations.

BR 548/26

Following subsoil profile is considered for calculations

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	Ckd T/m^2	mv m^2/T
0.0 to 28.0	Sandy clay	-	10	-	1000
28.0 to 30.0	Silty Sand	32	-	1000	-

Depth below the natural ground level

Shear Failure Criteria (IS 6403)

Ultimate bearing capacity = $qu = CNcScdcic + q(Nq - 1)Sqdqiq + 0.5\gamma BN\gamma S\gamma d\gamma i\gamma$

Cohesion (C) = 10 T / m^2 is considered and $\phi = 0^0$

Nc = 5.14, Nq = 1, Sc = 1.2,

dc = dq = dγ = ic = iq = iγ = 1

B = Width of foundation = 5m

d = Depth of foundation 2m below scour depth

qu = 5.14*10*1.2= 61.68 T/m^2

Factor safety = 2.5, qsafe = 61.68 / 2.5 = 24.67T/m^2

Settlement Criteria

Settlement of cohesive soil = (H/mv)*ΔP

Typically 8m x 5m foundation with stress intensity of 13 T/m^2 placed at 2m.

I) Stress calculation

A typical rectangle of size 4m x 2.5m (L x B) is considered and stress at the edge of the rectangle is calculated for stress intensity (P) of 13T/m^2.

Depth From – to	**Thick (m)**	**Depth (Z) up to mid height**	**L/Z**	**B/Z**	**Iz**	**ΔP=P* 4*Iz T/m^2**
0 – 10m	10.0	5m	0.8	0.5	0.12	6.24

Depth considered below bottom of foundation

Settlement=(10000/1000)*6.24=62.4mm

Applying Hogg's correction factor of 0.8 and depth correction of 0.93 anticipated settlement = 46.23mm which is less than allowable value of 50mm for spread foundations.

BR 520(544/24) & Br 549/28-30

Following subsoil profile is considered for calculations

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	Ckd T/m^2	mv m^2/T
0.0 to 10.0	Sandy clay	-	10	-	850
20.0 to 30.0	Silty Sand	30	-	800	-

Depth below the natural ground level

Shear Failure Criteria (IS 6403)

Ultimate bearing capacity = $qu = CNcScdcic + q(Nq - 1)Sqdqiq + 0.5\gamma BN\gamma S\gamma d\gamma i\gamma$

Cohesion (C) = 10 T / m^2 is considered and $\phi = 0^0$

Nc = 5.14, Nq = 1, Sc = 1.2,

$dc = dq = d\gamma = ic = iq = i\gamma = 1$

B = Width of foundation = 5m

d = Depth of foundation 2m below scour depth

$qu = 5.14*10*1.2 = 61.68\ T/m^2$

Factor safety = 2.5, qsafe = 61.68 / 2.5 = $24.67T/m^2$

Settlement Criteria

Settlement of cohesive soil = $(H/mv)*\Delta P$

Typically 8m x 5m foundation with stress intensity of 12 T/m^2 placed at 2m.

I) Stress calculation

A typical rectangle of size 4m x 2.5m (L x B) is considered and stress at the edge of the rectangle is calculated for stress intensity (P) of $12T/m^2$.

Depth From – to	Thick (m)	Depth (Z) up to mid height	L/Z	B/Z	Iz	$\Delta P = P*4*Iz$ T/m^2
0 – 8m	8	4m	1	0.63	0.135	6.48
8 – 10m	2	9m	0.44	0.28	0.05	2.4

Depth considered below bottom of foundation

Settlement=(8000/850)*6.48=60.99mm

Po2 = 2*0.8+9*0.8=8.8T/m2

C=1.5*800/8.8 = 136.36

Settlement = 2.303*(2000/136.36)*log(11.2/8.8)=3.54mm

Total settlement =64.53mm

Applying Hogg's correction factor of 0.8 and depth correction of 0.93 anticipated settlement = 48.01mm which is less than allowable value of 50mm for spread foundations.

BR 529F(548/26)

Following subsoil profile is considered for calculations

Depth (m)	**Type of subsoil**	**ϕ^o**	**C** T/m^2	**Ckd** T/m^2	**mv** m^2/T
0.0 to 19.5	Sandy clay	-	10	-	1000
19.5 to 30.0	Silty Sand	30	-	800	-

Depth below the natural ground level

Shear Failure Criteria (IS 6403)

Ultimate bearing capacity = qu = $CNcScdcic + q(Nq - 1)Sqdqiq + 0.5\gamma BN\gamma S\gamma d\gamma i\gamma$

Cohesion (C) = 10 T / m^2 is considered and $\phi = 0^0$

Nc = 5.14, Nq = 1, Sc = 1.2,

dc = dq = $d\gamma$ = ic = iq = $i\gamma$ = 1

B = Width of foundation = 5m

d = Depth of foundation 2m below scour depth

qu = 5.14*10*1.2= 61.68 T/m^2

Factor safety = 2.5, qsafe = 61.68 / 2.5 = 24.67T/m^2

Settlement Criteria

Settlement of cohesive soil = (H/mv)*ΔP

Typically 8m x 5m foundation with stress intensity of 13 T/m^2 placed at 2m. .

I) Stress calculation

A typical rectangle of size 4m x 2.5m (L x B) is considered and stress at the edge of the rectangle is calculated for stress intensity (P) of $13T/m^2$.

Depth From – to	**Thick (m)**	**Depth (Z) up to mid height**	**L/Z**	**B/Z**	**Iz**	**ΔP=P* 4*Iz T/m^2**
0 – 10m	10.0	5m	0.8	0.5	0.12	6.24

Depth considered below bottom of foundation

Settlement=(10000/1000)*6.24=62.4mm

Applying Hogg's correction factor of 0.8 and depth correction of 0.93 anticipated settlement = 46.23mm which is less than allowable value of 50mm for spread foundations.

Pile Capacity Calculations

BR 405/26

Following stratification considered for pile capacity calculation

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	α	$N\gamma$,	Nq
0.0 to 20.0	Sandy clay	-	10	0.41	-	-
20.0 to 30.0	Silty Sand	32	-	-	32.65	25

21m long 1m and 1.2m diameter bored cast in situ pile is considered.

Ground water level at ground surface.

Vertical downward Pile capacity

Ap: Cross sectional area of pile toe = $(\pi/4)*1*1 = 0.785m^2$

D: Pile diameter = 1000mm, pile length = 21m

PD: Effective overburden pressure at pile toe and as per IS code shall be limited to 20*D = 20m.

Overburden at pile toe = $0.8*20 = 16T/m^2$

$N\gamma$, Nq: Bearing capacity factors depending on angle of internal friction: K: Coefficient of earth pressure: 1

Friction developed from 0.0 to 20m =3.14159*1*20*10*0.41=257.6T

Over burden stress at 20m depth = $0.8*20 = 16T/m^2$

Over burden stress at 21m depth = $0.8*21 = 16.8T/m^2$

Average overburden from 20m to 21m= $16.4T/m^2$

Friction developed = 1*16.8*3.14159*1*1*tan32=32.93T

Total friction =257.6+32.93 =290.5T

Safe capacity = 290.5/2.5 =116.2T

End bearing =0.785*(0.5*0.8*32.65+16*25)=324.3T

Applying factor of safety of 2.5, safe vertical downward capacity = 324.3/2.5+116.2=245.9T say 240T

Safe uplift capacity: 95T (factor of safety 3).

BR 408/2

Following stratification considered for pile capacity calculation

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	α	Nγ,	Nq
0.0 to 4.0	-	-	-	-	-	-
4.0 to 30.0	Sandy clay	-	12	0.38	-	-

21m long 1m and 1.2m diameter bored cast in situ pile is considered.

Ground water level at ground surface.

Vertical downward Pile capacity

Ap: Cross sectional area of pile toe = $(\pi/4)*1*1 = 0.785m^2$

D: Pile diameter = 1000mm, pile length = 21m

Friction developed from 0.0 to 21m =3.14159*1*(21-4)*12*0.38=243.5T

Safe capacity = 243.5/2.5 =97.41T

End bearing =0.785*9*12=84.78T

Applying factor of safety of 2.5, safe vertical downward capacity = 84.78/2.5+97.41=131T say 130T

Safe uplift capacity: 80T (factor of safety 3).

BR 409/26-28

Following stratification considered for pile capacity calculation

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	α	Nγ,	Nq
0.0 to 10.0	Sandy clay	-	10	0.41	-	-
10.0 to 25.0	Sandy clay	-	25	0.25	-	-

21m long 1m and 1.2m diameter bored cast in situ pile is considered.

Ground water level at ground surface.

Vertical downward Pile capacity

Ap: Cross sectional area of pile toe = $(\pi/4)*1*1 = 0.785m^2$

D: Pile diameter = 1000mm, pile length = 21m

Friction developed from 0.0 to 21m =3.14159*1*10*10*0.41+3.14159*1*11*10*0.41=270.5T

Safe capacity = 270.5/2.5 =108.2T

End bearing =0.785*9*25=176.6T

Applying factor of safety of 2.5, safe vertical downward capacity = 176.6/2.5+108.2=178.84T say 175T

Safe uplift capacity: 85T (factor of safety 3).

BR 546/26-547/2, BR548/2

Following stratification considered for pile capacity calculation

Depth (m)	**Type of subsoil**	ϕ^o	**C** T/m^2	α	Nγ,	Nq
0.0 to 30.0	Sandy clay	-	10	0.41	-	-

21m long 1m and 1.2m diameter bored cast in situ pile is considered.

Ground water level at ground surface.

Vertical downward Pile capacity

Ap: Cross sectional area of pile toe = $(\pi/4)*1*1 = 0.785m^2$

D: Pile diameter = 1000mm, pile length = 21m

Friction developed from 0.0 to 21m =3.14159*1*(21)*10*0.38=250.7T

Safe capacity = 250.7/2.5 =100.28T

End bearing =0.785*9*10=70.65T

Applying factor of safety of 2.5, safe vertical downward capacity = 70.65/2.5+100.28=128.54T say 125T

Safe uplift capacity: 80T (factor of safety 3).

BR 520(544/24) & Br 549/28-30

Following stratification considered for pile capacity calculation

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	α	Nγ,	Nq
0.0 to 10.0	Sandy clay	-	10	0.41	-	-
10.0 to 30.0	Silty Sand	30	-	-	20	22.4

21m long 1m and 1.2m diameter bored cast in situ pile is considered.

Ground water level at ground surface.

Vertical downward Pile capacity

Ap: Cross sectional area of pile toe = $(\pi/4)*1*1 = 0.785m^2$

D: Pile diameter = 1000mm, pile length = 21m

PD: Effective overburden pressure at pile toe and as per IS code shall be limited to 20*D = 20m.

Overburden at pile toe = $0.8*20 = 16T/m^2$

Nγ, Nq: Bearing capacity factors depending on angle of internal friction: K: Coefficient of earth pressure: 1

Friction developed from 0.0 to 10m =3.14159*1*10*10*0.41=128.8T

Over burden stress at 10m depth = $0.8*10 = 8T/m^2$

Over burden stress at 21m depth = $0.8*21 = 16.8T/m^2$

Average overburden from 10m to 21m= $12.4T/m^2$

Friction developed = 1*12.4*3.14159*1*11*tan30=247.3T

Total friction =128.8+247.3 =376.1T

Safe capacity = 376.1/2.5 =150.44T

End bearing =0.785*(0.5*0.8*22.4+16*20)=258.2T

Applying factor of safety of 2.5, safe vertical downward capacity = 258.2/2.5+116.2=253.71T say 250T

Safe uplift capacity: 125T (factor of safety 3).

BR 529F(548/26)

Following stratification considered for pile capacity calculation

Depth (m)	Type of subsoil	ϕ^o	C T/m^2	α	Nγ,	Nq
0.0 to 19.5	Sandy clay	-	10	0.41	-	-
19.5 to 30.0	Silty Sand	30	-	-	20	22.4

21m long 1m and 1.2m diameter bored cast in situ pile is considered.

Ground water level at ground surface.

Vertical downward Pile capacity

Ap: Cross sectional area of pile toe = $(\pi/4)*1*1 = 0.785m^2$

D: Pile diameter = 1000mm, pile length = 21m

PD: Effective overburden pressure at pile toe and as per IS code shall be limited to 20*D = 20m.

Overburden at pile toe = $0.8*20 = 16T/m^2$

Nγ, Nq: Bearing capacity factors depending on angle of internal friction: K: Coefficient of earth pressure: 1

Friction developed from 0.0 to 19.5m =3.14159*1*19.5*10*0.41=251.2T

Over burden stress at 19.5m depth = $0.8*19.5 = 15.6T/m^2$

Over burden stress at 21m depth = $0.8*21 = 16.8T/m^2$

Average overburden from 19.5m to 21m= $16.2T/m^2$

Friction developed = 1*16.2*3.14159*1*1.5*tan30=44.05T

Total friction =251.2+44.05 =295.28T

Safe capacity = 295.28/2.5 =118.1T

End bearing =0.785*(0.5*0.8*20+16*22.4)=287.6T

Applying factor of safety of 2.5, safe vertical downward capacity = 287.6/2.5+118.1=233.13T say 230T

Safe uplift capacity: 95T (factor of safety 3).

BORE LOGS

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 15 (MN)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 14/11/2014 to19/11/2014
CHAINAGE(km.)	: 405/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 12.00m
GROUND W. T.	: 8.00m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
				0.00	DS-1								
				0.50									
1.00													
				1.50	SPT-1	5	8	9	11	17			
				2.10									
2.00													
3.00				3.00	SPT-2	7	11	13	15	24			
				3.60									
4.00													
				4.50	SPT-3	8	12	13	19	25			
			SANDY CLAY WITH GRAVELS	5.10									
5.00	150 mm Ø												
6.00				6.00	SPT-4	7	10	12	20	22			
				6.60									
7.00													
				7.50	SPT-5	6	11	11	18	22			
				8.10									
8.00													
9.00				9.00	SPT-6	9	13	14	23	27			
				9.60									
10.00				10.00									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR
BORE HOLE NO. : 15 (MN)	SHEET NO. : 3 OF 3
LOCATION : BRIDGE NO.1	DATE : 15/11/2014 to19/11/2014
CHAINAGE(km.) : 405/26	METHOD : ROTARY DRILLING
GROUND R. L. :	CASING : 100mm Ø 12.00m
GROUND W. T. : 8.00m	

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
21.00	150 mm Ø		SILTY SAND	21.00	SPT-14	8	12	13	22	25			
				21.60									
22.00				22.50	SPT-15	10	14	14	25	28			
				23.10									
23.00													
24.00				24.00	SPT-16	7	13	15	23	28			
				24.60									
25.00													
				25.50	SPT-17	11	15	16	26	31			
26.00				26.10									
				27.00	SPT-18	10	14	14	24	28			
27.00				27.60									
28.00				28.50	SPT-19	10	12	13	22	25			
				29.10									
29.00													
30.00				30.60	SPT-20	12	13	14	20	27			

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 15 (MN)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 15/11/2014 to19/11/2014
CHAINAGE(km.)	: 405/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 12.00m
GROUND W. T.	: 8.00m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
			SANDY CLAY WITH GRAVELS	10.50	SPT-7	8	11	14	20	25			
11.00				11.10									
				12.00	SPT-8	9	12	16	22	28			
12.00				12.60									
13.00	150 mm Ø			13.50	SPT-9	7	10	14	21	24			
				14.10									
14.00													
15.00				15.00	SPT-10	10	12	15	25	27			
				15.60									
16.00			SILTY SAND WITH GRAVELS										
				16.50	SPT-11	9	13	15	24	28			
17.00				17.10									
18.00				18.00	SPT-12	10	12	14	22	26			
				18.60									
19.00													
				19.50	SPT-13	8	11	13	20	24			
20.00				20.10									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 15 (MN)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 15/11/2014 to19/11/2014
CHAINAGE(km.)	: 405/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 12.00m
GROUND W. T.	: 8.00m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
			SANDY CLAY WITH GRAVELS	10.50	SPT-7	8	11	14	20	25			
11.00				11.10									
12.00				12.00	SPT-8	9	12	16	22	28			
13.00	150 mm Ø			12.60									
				13.50	SPT-9	7	10	14	21	24			
14.00				14.10									
15.00				15.00	SPT-10	10	12	15	25	27			
16.00			SILTY SAND WITH GRAVELS	15.60									
				16.50	SPT-11	9	13	15	24	28			
17.00				17.10									
18.00				18.00	SPT-12	10	12	14	22	26			
19.00				18.60									
				19.50	SPT-13	8	11	13	20	24			
20.00				20.10									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRAILA PATU & BAGHA BISHUNPUR		
BORE HOLE NO.	: ROR (MJ)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 09.11.2014 to 14.11.2014
CHAINAGE(km.)	: 408/2	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 12.00m
GROUND W. T.	: 8.M		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
1.00			BLACK COTTON SOIL	0.00	DS-1								
				0.50									
				1.50	SPT-1	4	6	8	10	14			
2.00				2.10									
				3.00	SPT-2	5	7	8	12	15			
3.00				3.60									
4.00				4.50	SPT-3	6	9	12	17	21			
5.00	150 mm Ø		SANDY CLAY WITH GRAVELS	5.10									
				6.00	SPT-4	7	10	14	19	24			
6.00				6.60									
7.00				7.50	SPT-5	6	9	15	17	24			
				8.10									
8.00				9.00	SPT-6	7	10	12	15	22			
9.00				9.60									
10.00				10.00									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: ROR (MJ)	SHEET NO.	: 3 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 09.11.2014 to 14.11.2014
CHAINAGE(km.)	: 408/2	METHOD	:
GROUND R. L.	:	CASING	: 100mm Ø 12.00m
GROUND W. T.	: 8.M		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
21.00	150 mm Ø		SANDY SILTY CLAY WITH GRAVELS	21.00	SPT-14	6	11	13	18	24			
				21.60									
22.00				22.50	SPT-15	10	13	15	21	28			
				23.10									
23.00													
24.00				24.00	SPT-16	9	13	14	20	27			
				24.60									
25.00				25.50	SPT-17	9	12	18	24	30			
				26.10									
26.00													
27.00			SANDY CLAY WITH GRAVELS	27.00	SPT-18	6	14	13	22	27			
				27.60									
28.00				28.50	SPT-19	7	11	14	25	25			
				29.10									
29.00													
30.00				30.60	SPT-20	8	10	18	23	28			

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: ROR (MJ)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 09.11.2014 to 14.11.2014
CHAINAGE(km.)	: 408/2	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 12.00m
GROUND W. T.	: 8.M		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
11.00	150 mm Ø		SANDY CLAY WITH GRAVELS	10.50	SPT-7	8	12	13	20	25			
12.00				11.10 / 12.00	SPT-8	5	11	13	18	24			
13.00				12.60 / 13.50	SPT-9	6	10	12	15	22			
14.00				14.10 / 15.00	SPT-10	6	11	11	13	22			
15.00				15.60 / 16.50	SPT-11	5	9	10	12	19			
16.00				17.10 / 18.00	SPT-12	7	9	2	16	21			
17.00				18.60 / 19.50	SPT-13	7	10		15	22			
18.00				20.10									
19.00													
20.00													

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 4F (MJ)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 01/11/2014 to 07/11/2014
CHAINAGE(km.)	: 409/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 12.00m
GROUND W. T.	: 8.00m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
1.00			snounish silty saw	0.00	DS-1								
				0.50									
2.00				1.50	SPT-1	12	50	-	-	R			
				1.75									
3.00				3.00	SPT-2	4	6	8	10	14			
				3.60									
4.00				4.50	SPT-3	4	5	9	8	14			
				5.10									
5.00	150 mm Ø		BROWNISH SANDY CLAY WITH GRAVELS										
6.00				6.00	SPT-4	5	8	10	12	18			
				6.60									
7.00				7.50	SPT-5	4	8	11	14	19			
				8.10									
8.00													
9.00				9.00	SPT-6	6	10	12	16	22			
				9.60									
10.00				10.00									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 4F (MJ)	SHEET NO.	: 3 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 09.11.2014 to 15.11.2014
CHAINAGE(km.)	: 409/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 13.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
21.00	150 mm Ø		SANDY SILTY CLAY WITH GRAVELS	21.00	SPT-14	7	12	21	32	33			
				21.60									
22.00				22.50	SPT-15	6	14	24	31	38			
				23.10									
23.00													
24.00				24.00	SPT-16	8	11	22	35	33			
				24.60									
25.00				25.50	SPT-17	5	9	12	16	21			
				26.10									
26.00													
27.00				27.00	SPT-18	5	8	12	17	20			
				27.60									
28.00			SILTY SAND WITH GRAVELS										
				28.50	SPT-19	6	8	10	13	18			
29.00				29.10									
30.00				30.60	SPT-20	5	7	12	15	19			

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 4F (MJ)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 10.11.2014 to 15.11.2014
CHAINAGE(km.)	: 409/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 13.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	CR %	RQD %	OTHER TESTS
				10.50	SPT-7	15	50	-	-	R			
11.00				10.77									
12.00				12.00	SPT-8	10	19	22		41			
13.00				12.50									
				13.50	SPT-9	22	51	-	-	R			
14.00			**silty sand**	13.72									
15.00	150 mm Ø			15.00	SPT-10	25	50	-	-	R			
16.00				15.20									
				16.50	SPT-11	21	50	-	-	R			
17.00				16.70									
18.00				18.00	SPT-12	23	51	-	-	R			
19.00				18.23									
				19.50	SPT-13	6	11	19	27	30			
20.00				20.10									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (RFO) 528(F-MJ)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 10.11.2014 to 15.11.2014
CHAINAGE(km.)	: 548/2	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 13.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
1.00	150 mm Ø		BROWNISH SANDY CLAY WITH GRAVELS	0.00	DS-1								
				0.50									
				1.50	SPT-1	4	6	8	9	14			
2.00				2.10									
3.00				3.00	SPT-2	5	8	9	12	17			
4.00				3.60									
				4.50	SPT-3	5	8	10	14	18			
5.00				5.10									
6.00				6.00	SPT-4	5	7	9	11	16			
7.00				6.60									
				7.50	SPT-5	6	9	12	16	21			
8.00				8.10									
9.00				9.00	SPT-6	6	8	11	14	19			
10.00				9.60									
				10.00									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (RFO) 528(F-MJ)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 10.11.2014 to 15.11.2014
CHAINAGE(km.)	: 548/2	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 13.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
11.00	150 mm Ø		BROWNISH SANDY CLAY WITH GRAVELS	10.50	SPT-7	6	9	12	16	21			
12.00				11.10 / 12.00	SPT-8	7	10	11	18	21			
13.00				12.60 / 13.50	SPT-9	5	9	10	13	19			
14.00				14.10									
15.00				15.00	SPT-10	5	8	12	15	20			
16.00				15.60 / 16.50	SPT-11	6	10	12	17	22			
17.00				17.10									
18.00				18.00	SPT-12	7	12	13	18	25			
19.00				18.60 / 19.50	SPT-13	7	11	12	17	23			
20.00				20.10									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (RFO) 528(F-MJ)	SHEET NO.	: 3 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 10.11.2014 to 15.11.2014
CHAINAGE(km.)	: 548/2	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 13.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N.	C R %	RQD %	OTHER TESTS
21.00				21.00	SPT-14	8	13	14	20	27			
				21.60									
22.00				22.50	SPT-15	6	10	16	21	26			
				23.10									
23.00			SANDY SILTY CLAY WITH GRAVELS										
24.00	150 mm Ø			24.00	SPT-16	8	14	15	23	29			
				24.60									
25.00				25.50	SPT-17	6	11	12	16	23			
				26.10									
26.00													
27.00				27.00	SPT-18	7	12	12	19	24			
				27.60									
28.00			SILTY SAND WITH GRAVELS										
				28.50	SPT-19	7	11	14	20	25			
29.00				29.10									
30.00				30.60	SPT-20	8	12	15	23	27			

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 520 (MJ)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 06/11/2014 to 11/11/2014
CHAINAGE(km.)	: 544/24	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 17.00m
GROUND W. T.	: 7.70m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
				0.00	DS-1								
				0.50									
1.00													
				1.50	SPT-1	5	8	9	17	17			
				2.10									
2.00													
				3.00	SPT-2	6	9	9	11	18			
3.00				3.60									
				4.50	SPT-3	5	7	10	11	17			
4.00													
				5.10									
5.00	150 mm Ø		BROWNISH SANDY CLAY WITH GRAVELS										
				6.00	SPT-4	6	9	10	14	19			
6.00				6.60									
				7.50	SPT-5	5	9	9	11	18			
7.00													
				8.10									
8.00													
				9.00	SPT-6	4	6	9	12	15			
9.00				9.60									
				10.00									
10.00													

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 520 (MJ)	SHEET NO.	: 3 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 06/11/2014 to 11/11/2014
CHAINAGE(km.)	: 544/24	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 17.00m
GROUND W. T.	: 7.70m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
21.00				21.00	SPT-14	4	6	10	13	16			
				21.60									
22.00				22.50	SPT-15	6	10	10	21	20			
				23.10									
23.00													
24.00	150 mm Ø			24.00	SPT-16	5	8	9	16	17			
				24.60									
25.00				25.50	SPT-17	5	7	12	15	19			
				26.10									
26.00			SILTY SAND										
27.00				27.00	SPT-18	7	10	13	17	23			
				27.60									
28.00				28.50	SPT-19	6	11	14	19	25			
				29.10									
29.00													
30.00				30.60	SPT-20	7	9	13	20	22			

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 520 (MJ)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 06/11/2014 to 11/11/2014
CHAINAGE(km.)	: 544/24	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 17.00m
GROUND W. T.	: 7.70m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
				10.50	SPT-7	4	6	9	12	15			
11.00				11.10									
12.00				12.00	SPT-8	5	7	7	11	14			
				12.60									
13.00				13.50	SPT-9	4	7	9	10	16			
	150 mm Ø			14.10									
14.00													
15.00				15.00	SPT-10	6	8	9	13	17			
				15.60									
16.00			SILTY SAND	16.50	SPT-11	5	7	10	13	17			
				17.10									
17.00													
18.00				18.00	SPT-12	5	8	7	13	15			
				18.60									
19.00				19.50	SPT-13	7	7	11	15	18			
				20.10									
20.00													

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 524 (MI)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 06/11/2014 to 11/11/2014
CHAINAGE(km.)	: 546/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 10.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
1.00	150 mm Ø		BROWNISH SANDY CLAY WITH GRAVELS	0.00	DS-1								
				0.50									
				1.50	SPT-1	12	50	-	-	R			
2.00				1.74									
3.00				3.00	SPT-2	5	7	9	12	16			
				3.60									
4.00				4.50	SPT-3	5	7	10	18	17			
				5.10									
5.00													
6.00				6.00	SPT-4	8	12	14	19	26			
				6.60									
7.00													
				7.50	SPT-5	7	13	15	20	28			
8.00				8.10									
9.00				9.00	SPT-6	6	12	14	18	26			
				9.60									
10.00				10.00									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 524 (MI)	SHEET NO.	: 3 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 06/11/2014 to 11/11/2014
CHAINAGE(km.)	: 546/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 10.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
21.00	150 mm Ø		SANDY CLAY WITH GRAVELS	21.00	SPT-14	5	9	10	15	19			
22.00				21.60 / 22.50	SPT-15	6	10	10	2	20			
23.00				23.10 / 24.00	SPT-16	7	1	13	18	24			
24.00				24.60 / 25.50	SPT-17	6	12	12	20	24			
25.00				26.10 / 27.00	SPT-18	8	10	12	18	22			
26.00				27.60 / 28.50	SPT-19	7	11	14	21	25			
27.00				29.10 / 30.60	SPT-20	7	13	15	22	28			
28.00													
29.00													
30.00													

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: 524 (MI)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 06/11/2014 to 11/11/2014
CHAINAGE(km.)	: 546/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 10.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
				10.50	SPT-7	5	9	13	15	22			
11.00				11.10									
12.00				12.00	SPT-8	6	10	13	19	23			
13.00	150 mm Ø			12.60									
				13.50	SPT-9	6	12	13	20	25			
14.00				14.10									
15.00				15.00	SPT-10	5	8	13	18	21			
16.00			SANDY CLAY WITH GRAVELS	15.60									
				16.50	SPT-11	5	7	10	16	17			
17.00				17.10									
18.00				18.00	SPT-12	4	8	9	13	16			
19.00				18.60									
				19.50	SPT-13	7'	10	12	19	22			
20.00				20.10									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (RFO) 529 F(MJ)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 15/11/2014 to19/11/2014
CHAINAGE(km.)	: 548/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 18.00m
GROUND W. T.	: 8.10m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
1.00	150 mm Ø		SANDY CLAY WITH GRAVELS	0.00	DS-1								
				0.50									
				1.50	SPT-1	3	6	8	9	14			
2.00				2.10									
3.00				3.00	SPT-2	4	6	9	10	15			
				3.60									
4.00				4.50	SPT-3	5	9	9	12	18			
				5.10									
5.00													
6.00				6.00	SPT-4	5	8	10	13	18			
				6.60									
7.00													
				7.50	SPT-5	6	8	11	16	19			
8.00				8.10									
9.00				9.00	SPT-6	6	8	12	15	20			
				9.60									
10.00				10.00									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (RFO) 528(F-MJ)	SHEET NO.	: 3 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 10.11.2014 to 15.11.2014
CHAINAGE(km.)	: 548/2	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 13.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
21.00				21.00	SPT-14	8	13	14	20	27			
				21.60									
22.00				22.50	SPT-15	6	10	16	21	26			
				23.10									
23.00			SANDY SILTY CLAY WITH GRAVELS										
24.00	150 mm Ø			24.00	SPT-16	8	14	15	23	29			
				24.60									
25.00				25.50	SPT-17	6	11	12	16	23			
				26.10									
26.00													
27.00				27.00	SPT-18	7	12	12	19	24			
				27.60									
28.00													
			SILTY SAND WITH GRAVELS	28.50	SPT-19	7	11	14	20	25			
29.00				29.10									
30.00				30.60	SPT-20	8	12	15	23	27			

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (RFO) 529 F(MJ)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 15/11/2014 to19/11/2014
CHAINAGE(km.)	: 548/26	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 18.00m
GROUND W. T.	: 8.10m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
			SANDY CLAY WITH GRAVELS	10.50	SPT-7	6	9	10	13	19			
11.00				11.10									
12.00				12.00	SPT-8	7	10	2	15	22			
13.00	150 mm Ø		SANDY CLAY WITH GRAVELS	12.60									
				13.50	SPT-9	7	9	12	18	21			
14.00				14.10									
15.00				15.00	SPT-10	6	10	10	16	20			
16.00				15.60									
				16.50	SPT-11	6	8	12	19	20			
17.00			SILTY SANDWITH GRAVELS	17.10									
18.00				18.00	SPT-12	5	9	10	18	19			
19.00				18.60									
				19.50	SPT-13	5	10	13	20	23			
20.00				20.10									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (MN)	SHEET NO.	: 1 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 16/11/2014 to 20/11/2014
CHAINAGE(km.)	: 549/28	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 16.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
1.00	150 mm Ø		SANDY CLAY WITH GRAVELS	0.00	DS-1								
				0.50									
				1.50	SPT-1	5	8	9	13	17			
2.00				2.10									
3.00				3.00	SPT-2	7	10	12	19	22			
				3.60									
4.00				4.50	SPT-3	5	7	8	10	15			
				5.10									
5.00				6.00	SPT-4	5	8	9	13	17			
6.00				6.60									
7.00				7.50	SPT-5	6	7	8	10	15			
				8.10									
8.00													
9.00				9.00	SPT-6	5	8	8	10	16			
				9.60									
10.00				10.00									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (MN)	SHEET NO.	: 3 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 16/11/2014 to 20/11/2014
CHAINAGE(km.)	: 549/28	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 16.00m
GROUND W. T.	: 7.50m		

DEPTH (m)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
21.00	150 mm Ø		SILTY SAND	21.00	SPT-14	5	9	11	19	20			
				21.60									
22.00				22.50	SPT-15	7	10	12	20	22			
				23.10									
23.00													
24.00				24.00	SPT-16	8	11	13	22	24			
				24.60									
25.00													
				25.50	SPT-17	5	8	9	13	17			
26.00				26.10									
				27.00	SPT-18	6	9	11	16	20			
27.00				27.60									
28.00				28.50	SPT-19	5	10	10	18	20			
				29.10									
29.00													
30.00				30.60	SPT-20	7	10	11	20	21			

BOREHOLE TERMINATED AT THE DEPTH OF 30.00M B.G.L.

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

CLIENT	: **DFCCL**		
PROJECT	: GEOTECHNICAL INVESTIGATION FOR PROPOSED BRIDGES BETWEEN CHIRALAPATU & BAGHA BISHANPUR		
BORE HOLE NO.	: (MN)	SHEET NO.	: 2 OF 3
LOCATION	: BRIDGE NO.1	DATE	: 16/11/2014 to 20/11/2014
CHAINAGE(km.)	: 549/28	METHOD	: ROTARY DRILLING
GROUND R. L.	:	CASING	: 100mm Ø 16.00m
GROUND W. T.	: 7.50m		

DEPTH (m.)	Ø B. HOLE	LOG.	STRATA DESCRIPTION	SAMPLE DEPTH (m)	SAMPLE TYPE	BLOWS/15cm 15	30	45	60	SPT N	C R %	RQD %	OTHER TESTS
				10.50	SPT-7	6	7	9	12	16			
11.00				11.10									
12.00				12.00	SPT-8	5	8	10	11	18			
13.00				12.60									
	150 mm Ø			13.50	SPT-9	6	9	10	13	19			
14.00				14.10									
15.00				15.00	SPT-10	5	8	12	15	20			
16.00			SILTY SANDWITH GRAVELS	15.60									
				16.50	SPT-11	4	7	11	16	18			
17.00				17.10									
18.00				18.00	SPT-12	6	9	12	20	21			
19.00				18.60									
				19.50	SPT-13	6	10	13	21	23			
20.00				20.10									

PRAGATI SURVEYORS PVT.LTD.	SCALE : 1:25	Checked.By :	Prepd.By:
	Project: ROB	Pradeep Dhanole	MAYA

GRAIN SIZE ANALYSIS

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-15

Chainage : 405/26 **Date** 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	1.50 - 2.10	SPT	-----	-----	-----	SC	4	57	17	22	17	5	12	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	6.00 - 6.60	SPT	-----	-----	-----	SC	9	59	14	18	12	4	8	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	9.00 - 9.60	SPT	-----	-----	-----	SC	7	52	18	23	19	7	12	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	13.50 - 14.10	SPT	-----	-----	-----	SC	11	51	17	21	16	5	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	18.00 - 18.60	SPT	-----	-----	-----	SC	17	52	15	16	11	3	8	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
-----> Combined Silt + Clay

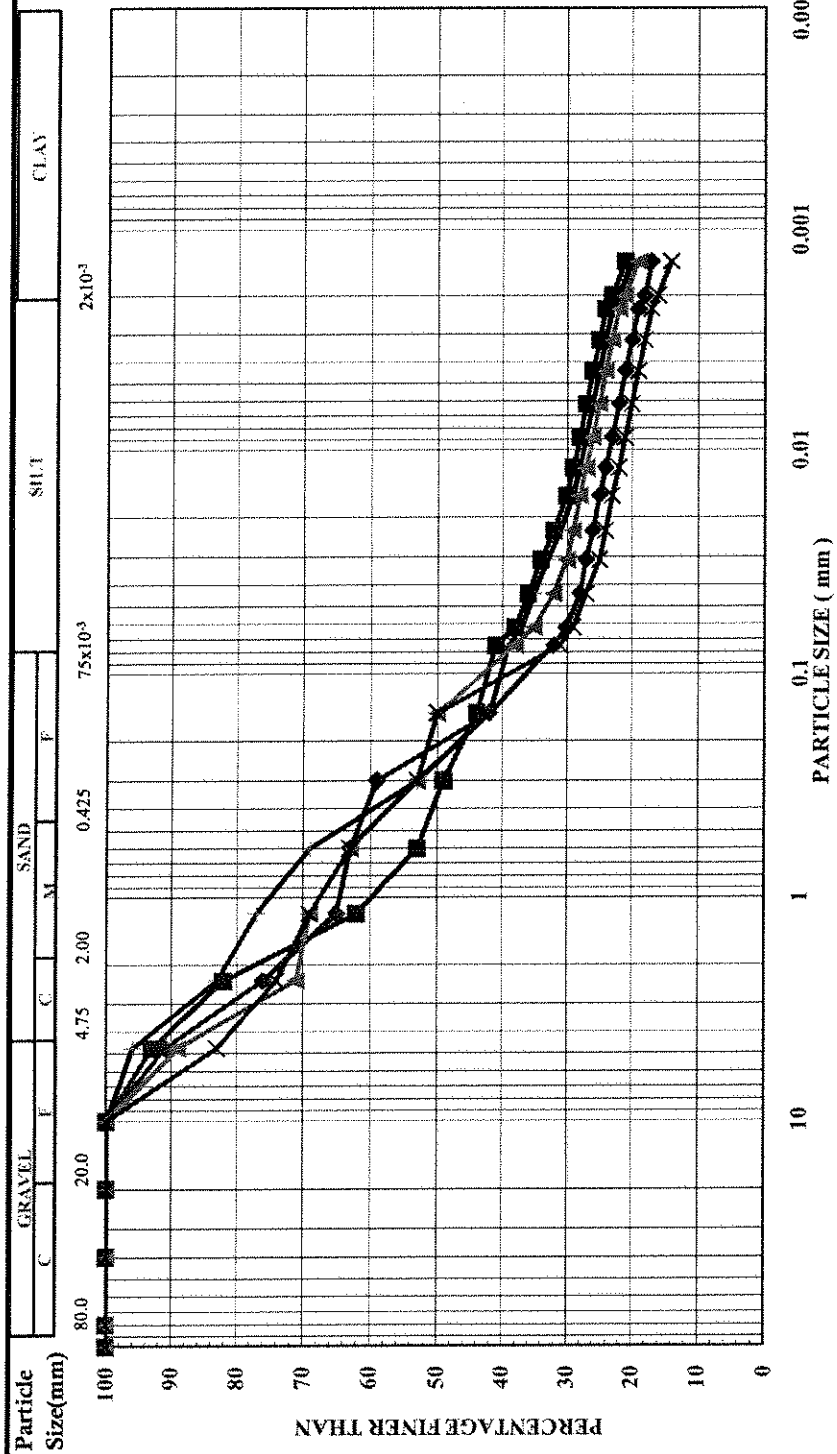
PRAGATI SURVEYORS PVT.LTD Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishannur Bihar

Bridge No. BR-15

Chainage : 405/26



Symbol	Bridge No.	Depth in m.	Classification (IS)	Gravel %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature $C_c = D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	1.50 - 2.10	SC	4	57	17	22	-----	-----	-----	-----	-----	17	5	12	SPT
■	BH - 01	6.00 - 6.60	SC	9	59	14	18	-----	-----	-----	-----	-----	12	4	8	SPT
▲	BH - 01	9.00 - 9.60	SC	7	52	18	23	-----	-----	-----	-----	-----	19	7	12	SPT
✱	BH - 01	13.50 - 14.10	SC	11	51	17	21	-----	-----	-----	-----	-----	16	5	11	SPT
◆	BH - 01	18.00 - 18.60	SC	17	52	15	16	-----	-----	-----	-----	-----	11	3	8	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : **G-402**

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-15

Chainage : 405/26 **Date** 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	21.00 - 21.60	DS	-----	-----	-----	SC	16	51	13	20	17	6	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	25.50 - 26.10	SPT	-----	-----	-----	SC	19	54	13	14	11	3	8	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SC	12	62	16	10	4	NON PLASTIC		-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD | **Job No.** G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar

Bridge No. BR-15

Chainage : 405/26

Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Grav el %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	21.00 - 21.60	SC	16	51	13	20	----	----	----	----	----	17	6	11	DS
■	BH - 01	25.50 - 26.10	SC	19	54	13	14	----	----	----	----	----	11	3	8	SPT
▲	BH - 01	30.00 - 30.60	SC	12	62	16	10	----	----	----	----	----	4	NON PLASTIC		SPT
✱																
◆																

PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. ROB

Chainage : 408/2

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	1.50 - 2.10	SPT	-----	-----	-----	CH	4	17	15	64	61	24	37	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	6.00 - 6.60	SPT	-----	-----	-----	SC	8	51	16	25	14	5	9	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	10.50 - 11.10	SPT	-----	-----	-----	SC	13	54	7	26	19	6	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	16.50 - 17.10	SPT	-----	-----	-----	SC	6	52	14	28	21	8	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	21.00 - 21.60	SPT	-----	-----	-----	SC	11	51	11	27	18	4	14	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
------> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD

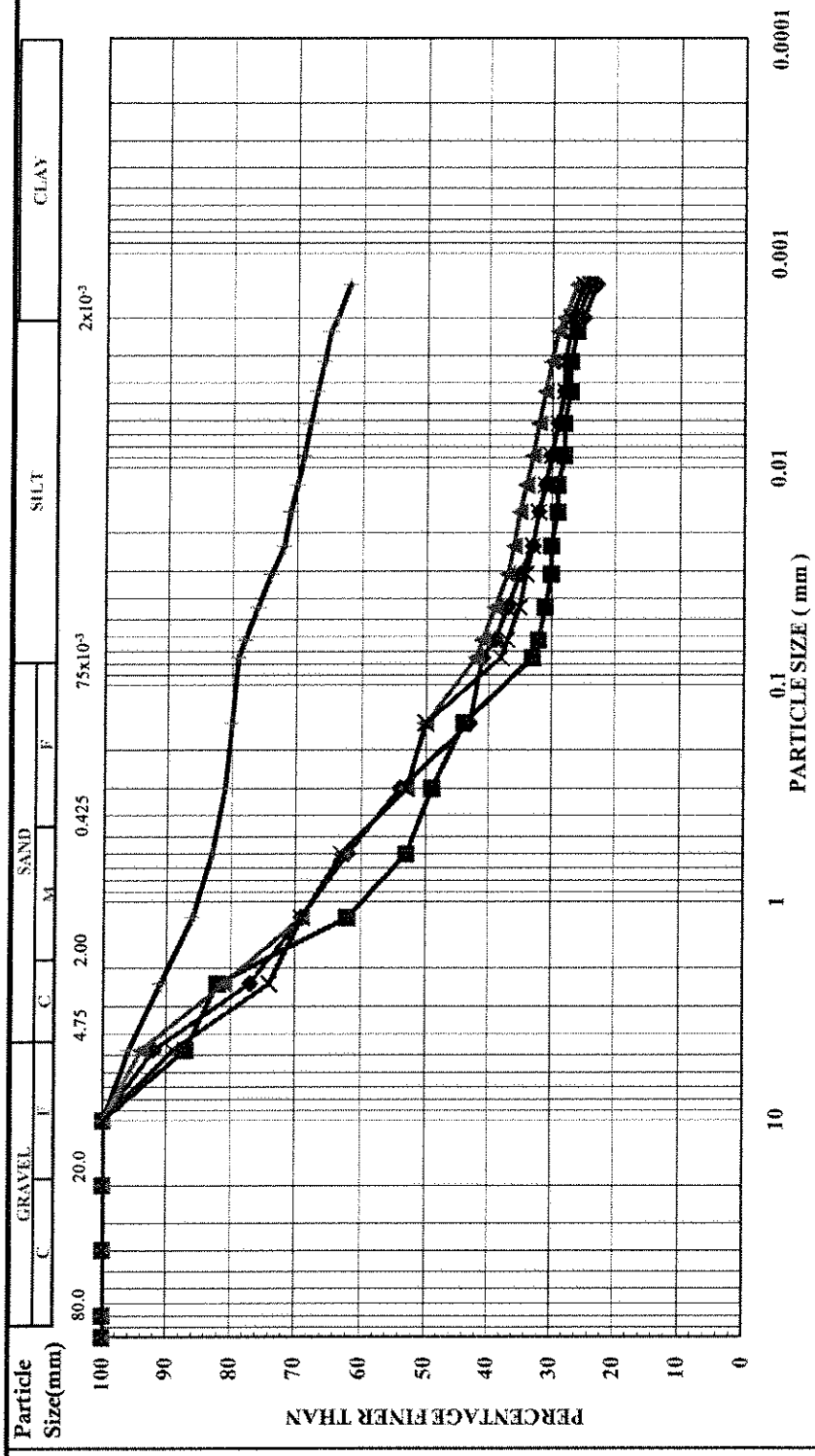
Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar

Bridge No. ROB

Chainage : 408/2



Symbol	Bridge No.	Depth in m.	Classification (IS)	Gravel %	Sand %	Silt %	Clay %	$f_{10\%}$ mm	$f_{30\%}$ mm	$f_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	1.50 - 2.10	CH	4	17	15	64	-----	-----	-----	-----	-----	61	24	37	SPT
■	BH - 01	6.00 - 6.60	SC	8	51	16	25	-----	-----	-----	-----	-----	14	5	9	SPT
▲	BH - 01	10.50 - 11.10	SC	13	54	7	26	-----	-----	-----	-----	-----	19	6	13	SPT
✱	BH - 01	16.50 - 17.10	SC	6	52	14	28	-----	-----	-----	-----	-----	21	8	13	SPT
◆	BH - 01	21.00 - 21.60	SC	11	51	11	27	-----	-----	-----	-----	-----	18	4	14	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. ROB

Chainage : 408/2 **Date** 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm^3		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm^2	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	24.00 - 24.60	DS	-----	-----	-----	SC	5	54	11	30	21	7	14	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	27.00 - 27.60	SPT	-----	-----	-----	SC	12	51	13	24	15	4	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SC	7	56	10	27	17	5	12	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
------> Combined Silt + Clay

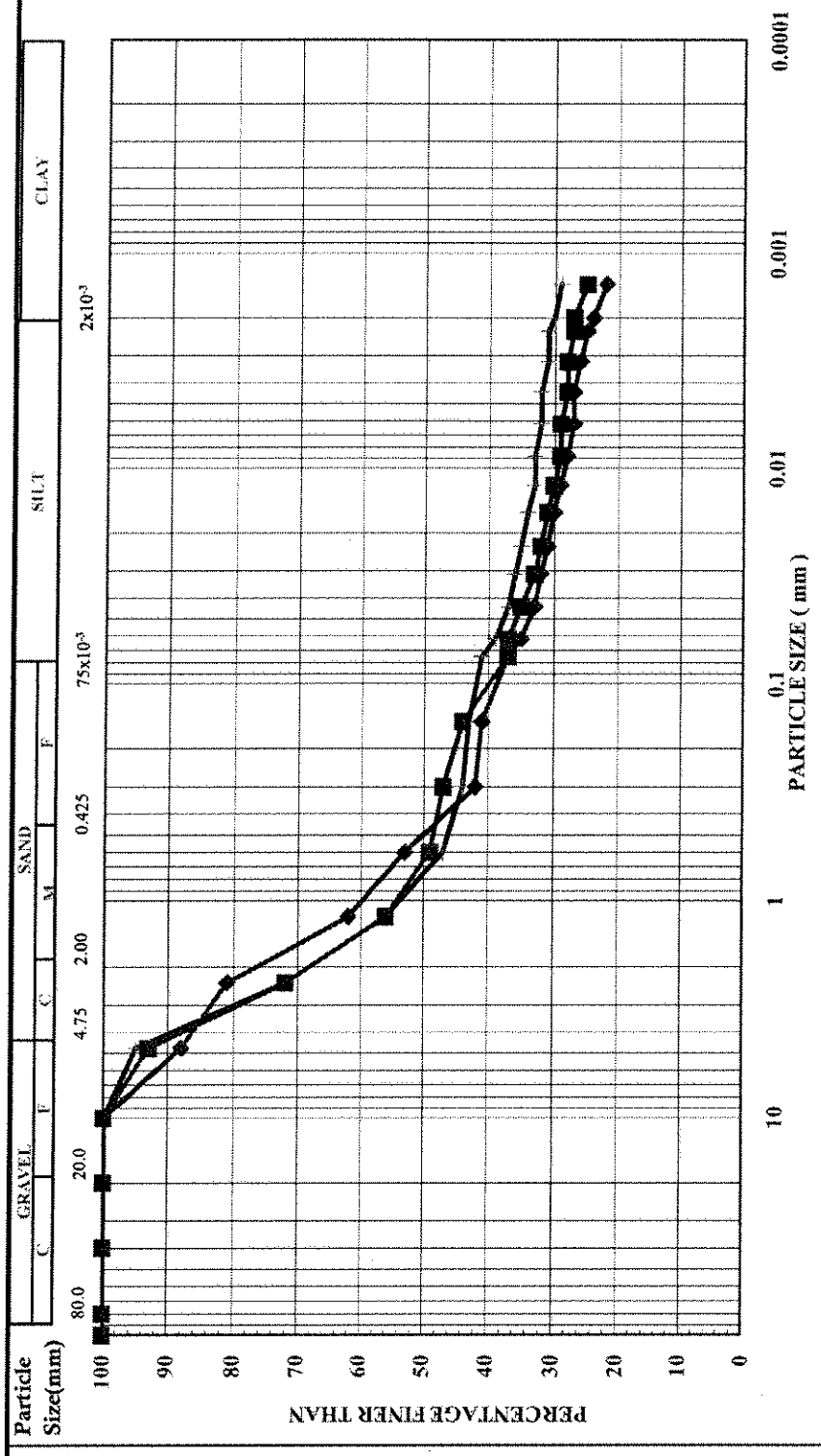
PRAGATI SURVEYORS PVT.LTD | **Job No.** G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. ROB

Chainage : 408/2



Symbol	Bridge No.	Depth in m.	Classification (IS)	Gravel %	Sand %	Silt %	Clay %	D_{10} % mm	D_{30} % mm	D_{60} % mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	24.00 - 24.60	SC	5	54	11	30	----	----	----	----	----	21	7	14	DS
■	BH - 01	27.00 - 27.60	SC	12	51	13	24	----	----	----	----	----	15	4	11	SPT
▲	BH - 01	30.00 - 30.60	SC	7	56	10	27	----	----	----	----	----	17	5	12	SPT
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PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-4 F

Chainage : 409/26 **Date** 12.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	1.50 - 1.75	DS	-----	-----	-----	SM	8	81	11		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	4.50 - 5.10	SPT	-----	-----	-----	SC	13	54	14	19	13	4	9	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	10.50- 10.77	SPT	-----	-----	-----	SM	7	81	12		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	13.50 - 13.72	SPT	-----	-----	-----	SM	11	78	11		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	18.00 - 18.23	SPT	-----	-----	-----	SC	4	84	12		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
-----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD **Job No.** G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar

Bridge No. BR-4 F

Chainage : 409/26

Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Grav el %	Sand %	Silt %	Clay %	$P_{10\%}$ mm	$P_{30\%}$ mm	$P_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
◆	BH - 01	1.50 - 1.75	SM	8	81	11		-----	-----	-----	-----	-----	-----	-----	-----	DS
■	BH - 01	4.50 - 5.10	SC	13	54	14	19	-----	-----	-----	-----	-----	13	4	9	SPT
▲	BH - 01	10.50- 10.77	SM	7	81	12		-----	-----	-----	-----	-----	-----	-----	-----	SPT
✱	BH - 01	13.50 - 13.72	SM	11	78	11		-----	-----	-----	-----	-----	-----	-----	-----	SPT
◆	BH - 01	18.00 - 18.23	SC	4	84	12		-----	-----	-----	-----	-----	-----	-----	-----	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-4 F

Chainage : 409/26 **Date** 12.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	21.00 - 21.60	DS	-----	-----	-----	SC	7	56	15	22	19	8	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	25.50 - 26.10	SPT	-----	-----	-----	SC	12	54	16	18	12	4	8	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SC	9	53	15	23	17	6	11	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSt : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
------> Combined Silt + Clay

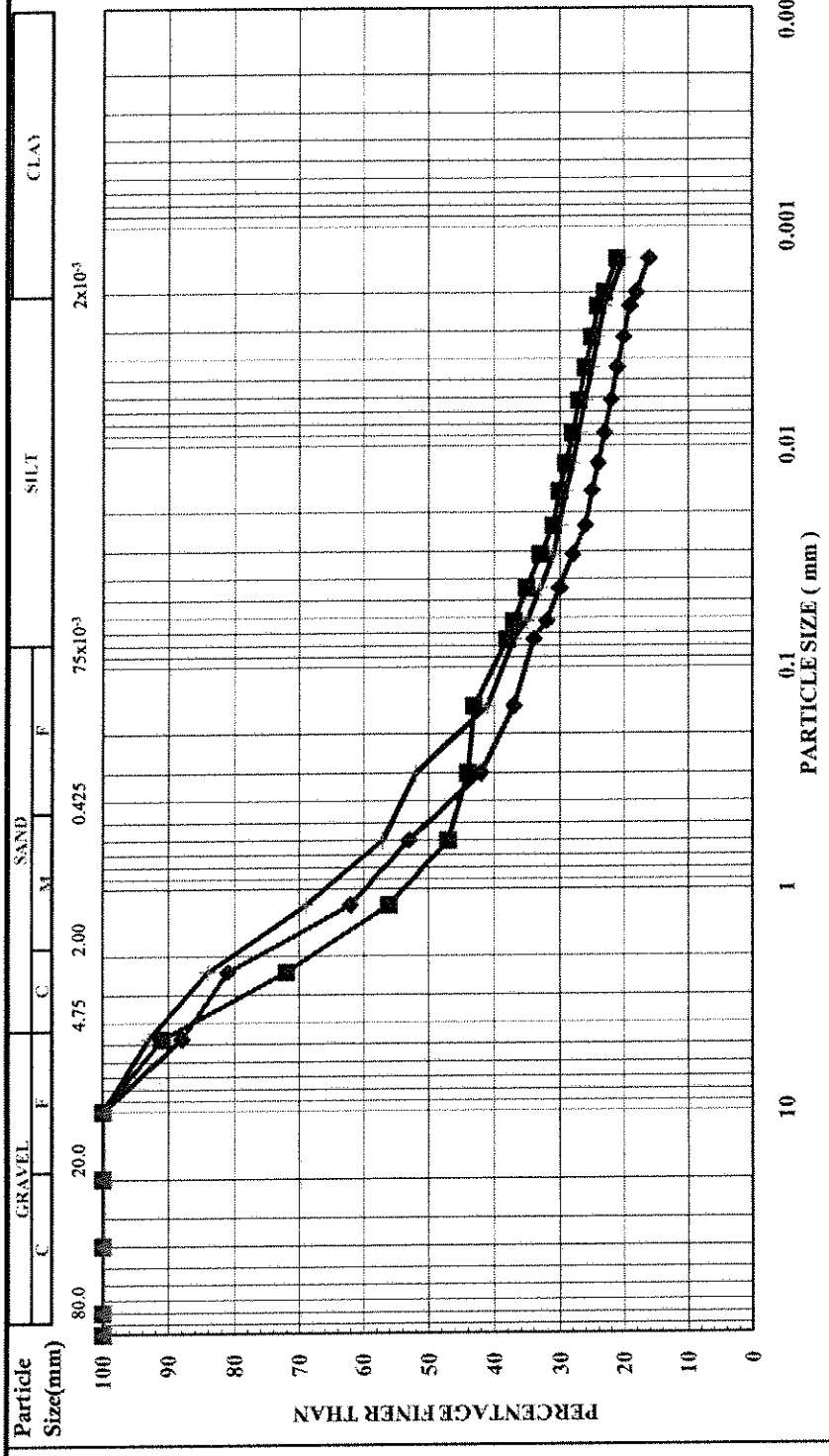
PRAGATI SURVEYORS PVT.LTD | **Job No.** G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar

Bridge No. BR-4 F

Chainage : 409/26



Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Grav el %	Sand %	Silt %	Clay %	$f_{10\%}$ mm	$f_{30\%}$ mm	$f_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	21.00 - 21.60	SC	7	56	15	22	-----	-----	-----	-----	-----	19	8	11	DS
■	BH - 01	25.50 - 26.10	SC	12	54	16	18	-----	-----	-----	-----	-----	12	4	8	SPT
▲	BH - 01	30.00 - 30.60	SC	9	53	15	23	-----	-----	-----	-----	-----	17	6	11	SPT
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PRAGATI SURVEYORS PVT.LTD

Job No. : **G-402**

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-520

Chainage : 544/24 **Date** 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	1.50 - 1.74	DS	-----	-----	-----	SC	9	50	10	31	19	8	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	6.00 - 6.60	SPT	-----	-----	-----	SC	6	57	11	26	23	10	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	10.50 - 11.10	SPT	-----	-----	-----	SC	11	56	12	21	15	5	10	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	15.00 - 15.60	SPT	-----	-----	-----	SC	8	55	15	22	18	6	12	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	16.50 - 17.10	SPT	-----	-----	-----	SC	17	50	13	20	16	5	11	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
-----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD **Job No.** G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project :	Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar
Bridge No.	BR-520
Chainage :	544/24

Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Grav el %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	1.50 - 1.74	SC	9	50	10	31	-----	-----	-----	-----	-----	19	8	11	DS
■	BH - 01	6.00 - 6.60	SC	6	57	11	26	-----	-----	-----	-----	-----	23	10	13	SPT
▲	BH - 01	10.50 - 11.10	SC	11	56	12	21	-----	-----	-----	-----	-----	15	5	10	SPT
✱	BH - 01	15.00 - 15.60	SC	8	55	15	22	-----	-----	-----	-----	-----	18	6	12	SPT
◆	BH - 01	16.50 - 17.10	SC	17	50	13	20	-----	-----	-----	-----	-----	16	5	11	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-520

Chainage : 544/24

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	22.50 - 23.10	DS	-----	-----	-----	SC	15	54	9	22	19	8	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	25.50 - 26.10	SPT	-----	-----	-----	SC	12	50	11	27	12	4	8	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SC	6	53	18	23	17	6	11	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
-----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD

Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar

Bridge No. BR-520

Chainage : 544/24

Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Grav el	Sand	Silt	Clay	$F_{10\%}$	$F_{30\%}$	$F_{60\%}$	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
				%	%	%	%	mm	mm	mm						
●	BH - 01	22.50 - 23.10	SC	15	54	9	22	-----	-----	-----	-----	-----	19	8	11	DS
■	BH - 01	25.50 - 26.10	SC	12	50	11	27	-----	-----	-----	-----	-----	12	4	8	SPT
▲	BH - 01	30.00 - 30.60	SC	6	53	18	23	-----	-----	-----	-----	-----	17	6	11	SPT
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PRAGATI SURVEYORS PVT.LTD

Job No. : G-4

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-524

Chainage : 546/26

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	1.50 - 1.74	DS	-----	-----	-----	SM	10	78	12		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	6.00 - 6.60	SPT	-----	-----	-----	SC	4	52	17	27	23	8	15	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	10.50 - 11.10	SPT	-----	-----	-----	SC	13	57	12	18	13	4	9	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	15.00 - 15.60	SPT	-----	-----	-----	SC	8	53	14	25	19	7	12	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	16.50 - 17.10	SPT	-----	-----	-----	SC	12	56	13	19	14	5	9	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
------> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD

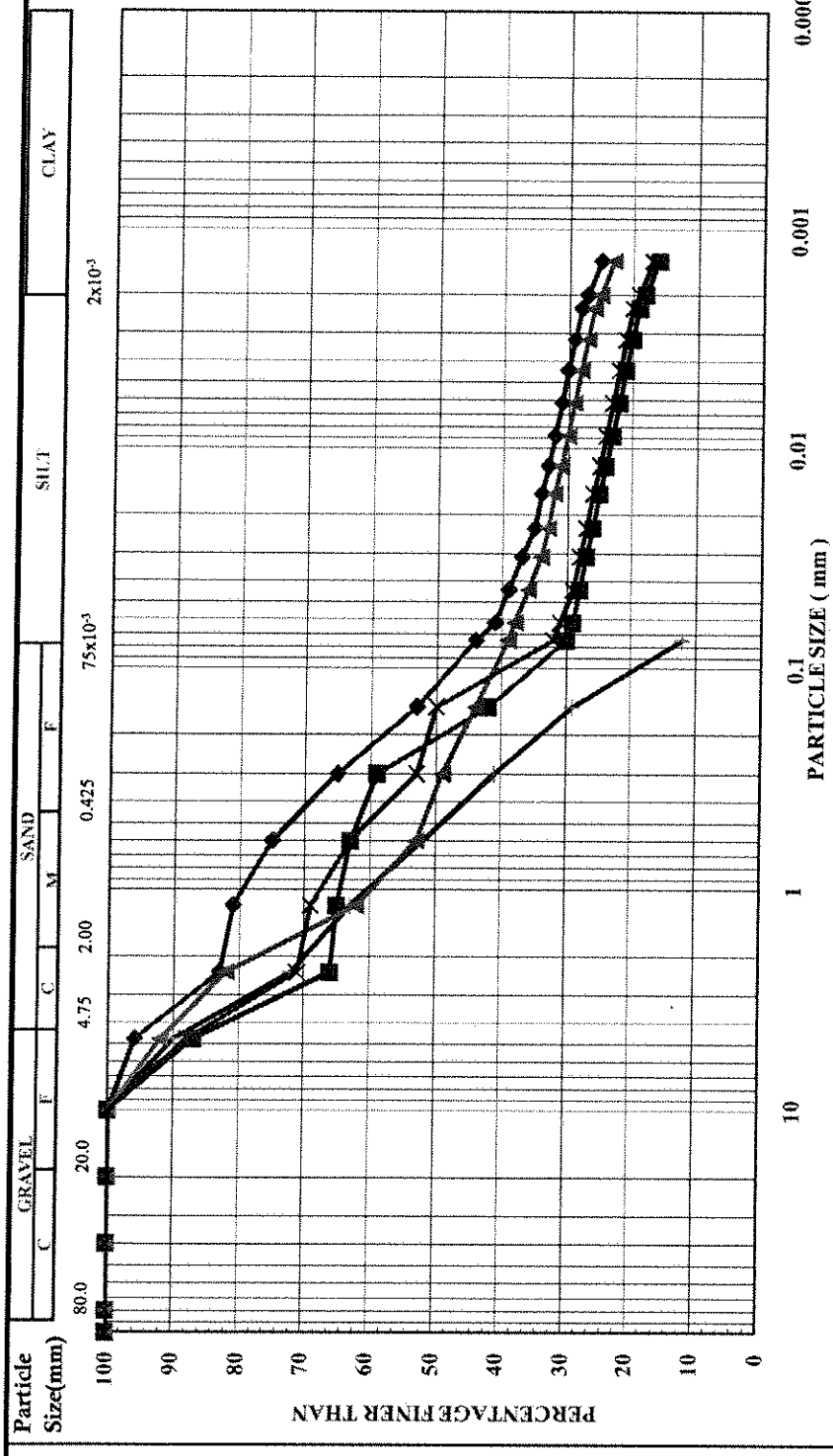
Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishannur Bihar

Bridge No. BR-524

Chainage : 546/26



Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Gravel %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	1.50 - 1.74	SM	10	78	12		-----	-----	-----	-----	-----	-----	-----	-----	DS
■	BH - 01	6.00 - 6.60	SC	4	52	17	27	-----	-----	-----	-----	-----	23	8	15	SPT
◀	BH - 01	10.50 - 11.10	SC	13	57	12	18	-----	-----	-----	-----	-----	13	4	9	SPT
✱	BH - 01	15.00 - 15.60	SC	8	53	14	25	-----	-----	-----	-----	-----	19	7	12	SPT
◆	BH - 01	16.50 - 17.10	SC	12	56	13	19	-----	-----	-----	-----	-----	14	5	9	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-524

Chainage : 546/26

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	22.50 - 23.10	DS	-----	-----	-----	SC	11	55	16	18	19	8	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	25.50 - 26.10	SPT	-----	-----	-----	SC	9	53	15	23	12	4	8	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SC	6	62	11	21	17	6	11	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
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SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

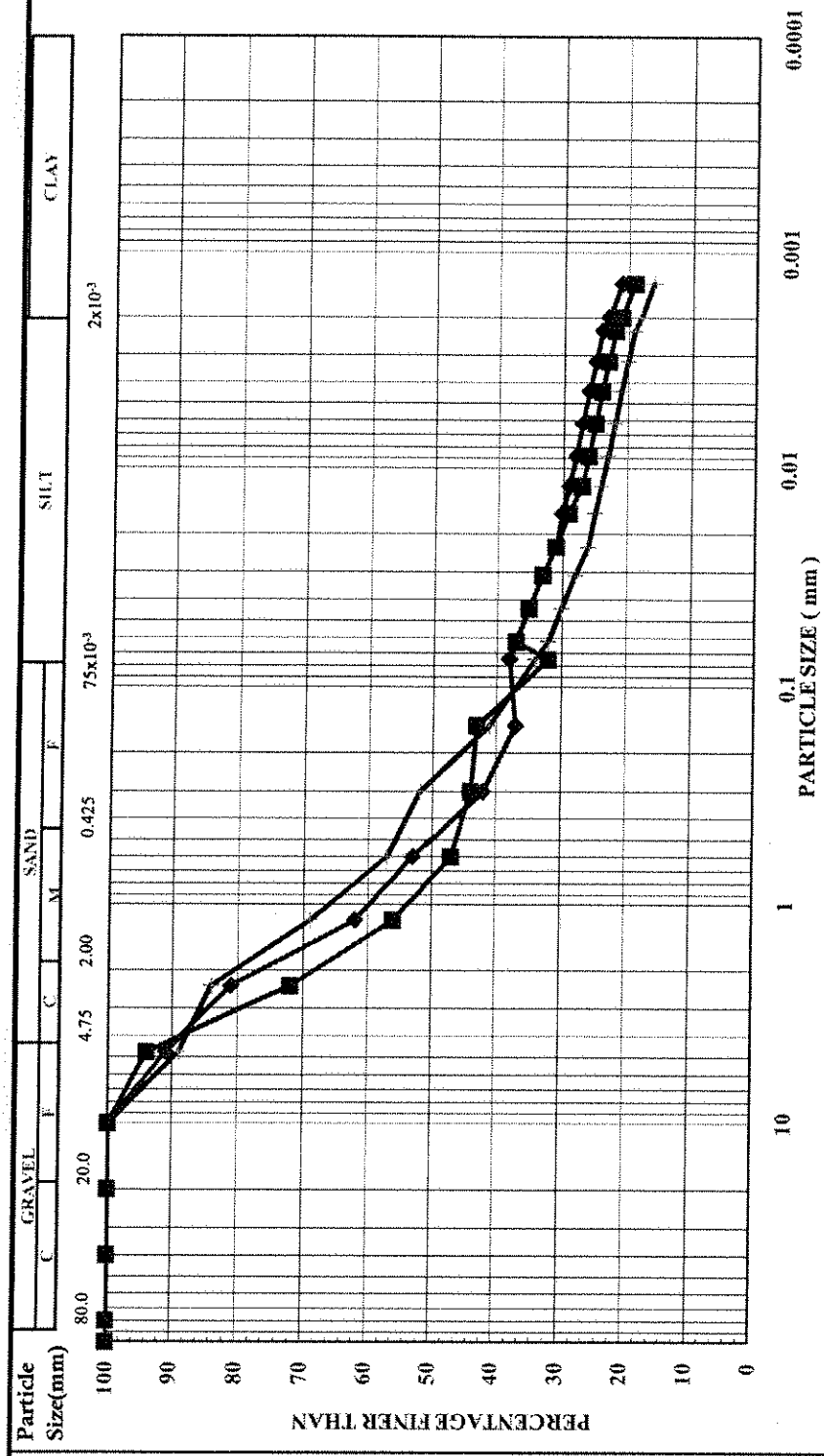
ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
-----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD

Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project :	Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar
Bridge No.	BR-524
Chainage :	546/26



Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Grav el	Sand	Silt	Clay	$F_{10\%}$	$F_{30\%}$	$F_{60\%}$	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
				%	%	%	%	mm	mm	mm						
●—●	BH - 01	22.50 - 23.10	SC	11	55	16	18	-----	-----	-----	-----	-----	19	8	11	DS
■—■	BH - 01	25.50 - 26.10	SC	9	53	15	23	-----	-----	-----	-----	-----	12	4	8	SPT
▲—▲	BH - 01	30.00 - 30.60	SC	6	62	11	21	-----	-----	-----	-----	-----	17	6	11	SPT
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PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-528 F

Chainage : 548/2 **Date** 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cr} (Lab)	Initial Void Ratio		
BH - 01	1.50 - 2.10	SPT	-----	-----	-----	SC	9	53	16	22	19	6	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	6.00 - 6.60	SPT	-----	-----	-----	SC	11	59	14	16	13	3	10	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	9.00 - 9.60	SPT	-----	-----	-----	SC	6	55	17	22	18	5	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	13.50 - 14.10	SPT	-----	-----	-----	SC	10	54	15	21	15	4	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	18.00 - 18.60	SPT	-----	-----	-----	SC	13	51	16	20	16	4	12	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
-----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD **Job No.** G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project :	Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar
Bridge No.	BR-528 F
Chainage :	548/2

Symbol	Bridge No.	Depth in m.	Classification (IS)	Gravel %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2 / (D_{60} * D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
◆	BH - 01	1.50 - 2.10	SC	9	53	16	22	-----	-----	-----	-----	-----	19	6	13	SPT
■	BH - 01	6.00 - 6.60	SC	11	59	14	16	-----	-----	-----	-----	-----	13	3	10	SPT
▲	BH - 01	9.00 - 9.60	SC	6	55	17	22	-----	-----	-----	-----	-----	18	5	13	SPT
✱	BH - 01	13.50 - 14.10	SC	10	54	15	21	-----	-----	-----	-----	-----	15	4	11	SPT
◆	BH - 01	18.00 - 18.60	SC	13	51	16	20	-----	-----	-----	-----	-----	16	4	12	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : **G-402**

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. BR-528 F

Chainage : 548/2

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	21.00 - 21.60	DS	-----	-----	-----	SC	13	53	14	20	17	6	11	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	25.50 - 26.10	SPT	-----	-----	-----	SC	18	51	15	16	11	3	8	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SC	19	54	17	10	6	NON PLASTIC		-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
------> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD

Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar

Bridge No. BR-528 F

Chainage : 548/2

Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Gravel %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
◆	BH - 01	21.00 - 21.60	SC	13	53	14	20	-----	-----	-----	-----	-----	17	6	11	DS
■	BH - 01	25.50 - 26.10	SC	18	51	15	16	-----	-----	-----	-----	-----	11	3	8	SPT
▲	BH - 01	30.00 - 30.60	SC	19	54	17	10	-----	-----	-----	-----	-----	6	NON PLASTIC		SPT
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PRAGATI SURVEYORS PVT.LTD

Job No. : **G-402**

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. ROB (529 F)

Chainage : 548/26

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	3.00 - 3.60	SPT	-----	-----	-----	SC	6	52	14	28	23	9	14	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	7.50 - 8.10	SPT	-----	-----	-----	SC	13	53	11	23	19	6	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	13.50 - 14.10	SPT	-----	-----	-----	SC	8	50	17	25	19	6	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	18.00 - 18.60	SPT	-----	-----	-----	SC	17	54	11	18	21	8	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	22.50 - 23.10	SPT	-----	-----	-----	SM	11	77	12		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

CHEM : Chemical Analysis
COMP : Compaction Test
DS : Direct Shear
K : Permeability Test
FSI : Free Swell Test

Tuu : Triaxial Test (Unconsolidated Undrained)
Tcu : Triaxial Test (Consolidated Undrained)
Tcd : Triaxial Test (Consolidated Drained)
NP : Non Plastic
SL : Shrikage Limit Test

SP : Swelling Pressure or Swelling Potential Test
SPT : Standard Penetration Test Sample
UDS : Undisturbed Soil Sample
VL : Laboratory Vane Shear Test
UC : Unconfined Compression Test

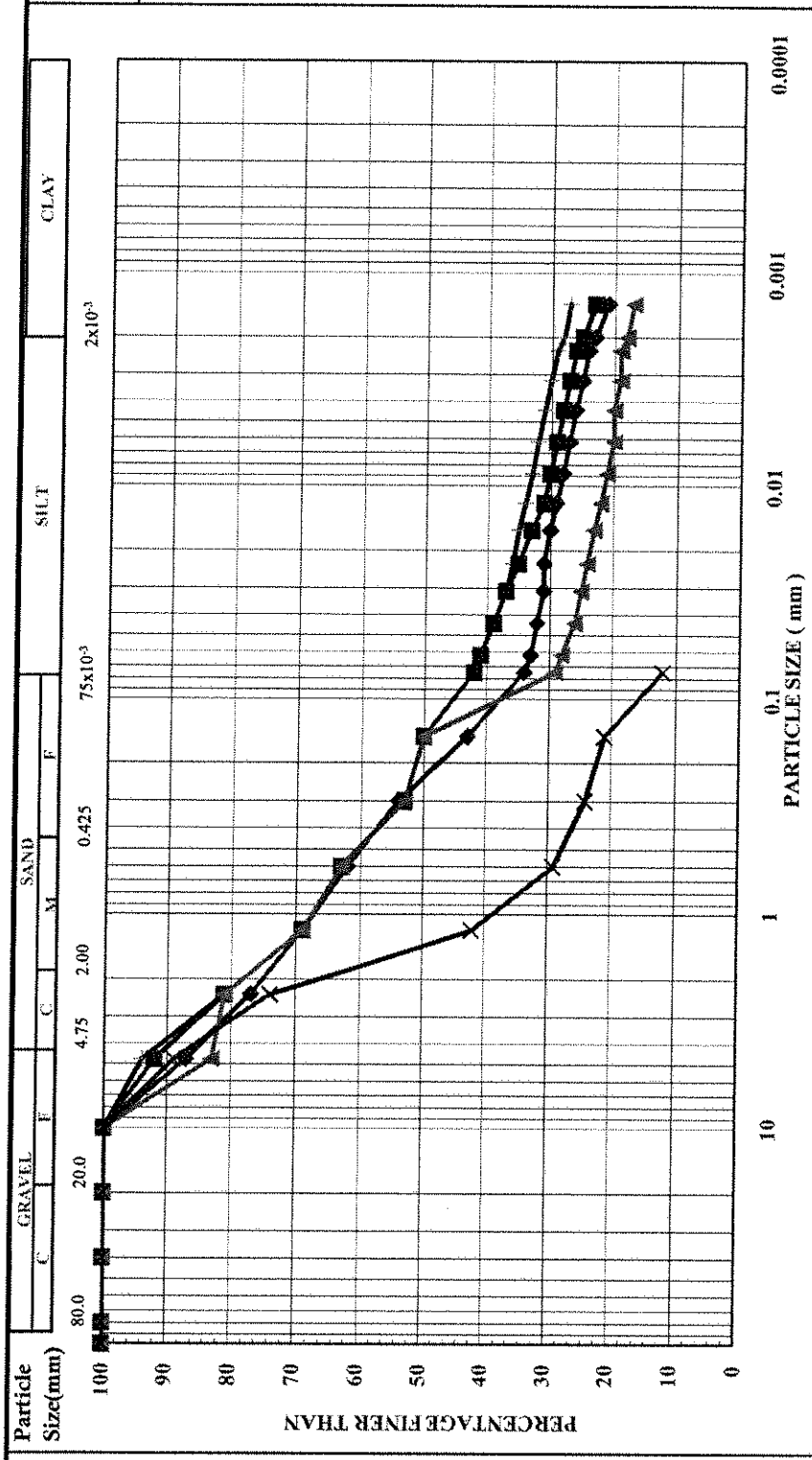
ϕ : Angle of Internal Friction
Cc : Undrained Cohesion
ϕ' : Effective Angle of Internal Friction
Cc' : Effective Cohesion
-----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD

Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project :	Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar
Bridge No.	ROB (529 F)
Chainage :	548/26



Symbol	Bridge No.	Depth in m.	Classification (IS)	Gravel %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	3.00 - 3.60	SC	6	52	14	28	-----	-----	-----	-----	-----	23	9	14	SPT
■	BH - 01	7.50 - 8.10	SC	13	53	11	23	-----	-----	-----	-----	-----	19	6	13	SPT
▲	BH - 01	13.50 - 14.10	SC	8	50	17	25	-----	-----	-----	-----	-----	19	6	13	SPT
✱	BH - 01	18.00 - 18.60	SC	17	54	11	18	-----	-----	-----	-----	-----	21	8	13	SPT
◆	BH - 01	22.50 - 23.10	SM	11	77	12		-----	-----	-----	-----	-----	-----	-----	-----	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. ROB (529 F)

Chainage : 548/26

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	25.50 - 26.10	DS	-----	-----	-----	SM	5	84	11		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	27.00 - 27.60	SPT	-----	-----	-----	SM	12	76	12		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SM	26	63	11		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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-----> Combined Silt + Clay

PRAGATI SURVEYORS PVT.LTD

Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project :	Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar
Bridge No.	ROB (529 F)
Chainage :	548/26

Symbol	Bridge No.	Depth in m.	Classification (IS)	Gravel %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	25.50 - 26.10	SM	5	84	11		----	----	----	-----	-----	-----	-----	-----	DS
■	BH - 01	27.00 - 27.60	SM	12	76	12		----	----	----	-----	-----	-----	-----	-----	SPT
◆	BH - 01	30.00 - 30.60	SM	26	63	11		----	----	----	-----	-----	-----	-----	-----	SPT
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PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. -----

Chainage : 549/28 **Date** 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	0.00 - 0.50	DS	-----	-----	-----	SC	9	57	13	21	23	9	14	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	6.00 - 6.60	SPT	-----	-----	-----	SC	6	55	13	26	19	6	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	13.50 - 14.10	SPT	-----	-----	-----	SC	7	51	17	25	19	6	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	18.00 - 18.60	SPT	-----	-----	-----	SC	14	57	10	19	21	8	13	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	22.50 - 23.10	SPT	-----	-----	-----	SM	18	71	11		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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PRAGATI SURVEYORS PVT.LTD **Job No.** G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur Bihar

Bridge No. -----

Chainage : 549/28

Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Gravel %	Sand %	Silt %	Clay %	$P_{10\%}$ mm	$P_{30\%}$ mm	$P_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature C_c $D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	0.00 - 0.50	SC	9	57	13	21	-----	-----	-----	-----	-----	23	9	14	DS
■	BH - 01	6.00 - 6.60	SC	6	55	13	26	-----	-----	-----	-----	-----	19	6	13	SPT
▲	BH - 01	13.50 - 14.10	SC	7	51	17	25	-----	-----	-----	-----	-----	19	6	13	SPT
✱	BH - 01	18.00 - 18.60	SC	14	57	10	19	-----	-----	-----	-----	-----	21	8	13	SPT
◆	BH - 01	22.50 - 23.10	SM	18	71	11		-----	-----	-----	-----	-----	-----	-----	-----	SPT

PRAGATI SURVEYORS PVT.LTD

Job No. : G-402

SOIL TEST DATA SHEET

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. ------

Chainage : 549/28

Date 13.12.2014

Bridge No.	Depth in m.	Sample Type UD / D	Density gm/ cm³		Natural Moisture Content, w %	Soil Classification (I.S)	Mechanical Analysis				Consistancy Limits			Direct Shear			Lab.CBR Test Unsoaked		Verical Consolidation		Specific Gravity	Remarks
			Wet Density	Dry Density			Gravel %	Sand %	Silt %	Clay %	Liquid %	Plastic %	Plasticity Index, I_p %	Type	Cohesion C_u kg/cm²	Degree ϕ	Penetration at 2.5 mm in %	Penetration at 5 mm in %	Comp. Index C_{cv} (Lab)	Initial Void Ratio		
BH - 01	25.50 - 26.10	DS	-----	-----	-----	SM	19	69	12		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	27.00 - 27.60	SPT	-----	-----	-----	SM	8	81	11		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BH - 01	30.00 - 30.60	SPT	-----	-----	-----	SM	17	71	12		-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

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PRAGATI SURVEYORS PVT.LTD

Job No. G-402

GRAIN SIZE DISTRIBUTION ANALYSIS

Project : Soil Investigation Work for Proposed Bridges between Chiraila Patu & Bagha Bishanpur,Bihar

Bridge No. -----

Chainage : 549/28

Symbol	Bridge No.	Depth in m.	Classifi-cation (IS)	Grav el %	Sand %	Silt %	Clay %	$F_{10\%}$ mm	$F_{30\%}$ mm	$F_{60\%}$ mm	Coeff. of Uniformity, $C_u = D_{60} / D_{10}$	Coeff. Of Curvature $C_c = D_{30}^2/(D_{60}*D_{10})$	Liquid Limit, W_l	Plastic Limit, W_p	Plasticity Index, I_p	Remarks
●	BH - 01	25.50 - 26.10	SM	19	69	12		-----	-----	-----	-----	-----	-----	-----	-----	DS
■	BH - 01	27.00 - 27.60	SM	8	81	11		-----	-----	-----	-----	-----	-----	-----	-----	SPT
▲	BH - 01	30.00 - 30.60	SM	17	71	12		-----	-----	-----	-----	-----	-----	-----	-----	SPT
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Job No. : G-402