

3. Ground survey report

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VISHWA BHUMI TECHNOLOGIES

PROJECT NO. 93

REPORT ON

**GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON
GANGA REJUVENATION PROJECT**

SUBMITTED TO

NJS CONSULTANTS CO. LTD

**1ST FLOOR, R.H. TOWER, THE MALL ROAD, CANTONMENT,
VARANASI**

☎ 011 – 43063950

📞 9910466066

✉ info@vishwabhumi.com

**1. Ramna STP
(Varanasi)**



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1.0 INTRODUCTION

M/s NJS CONSULTANTS CO. LTD has planned Geotechnical Survey for preparatory survey on Ganga rejuvenation project in Varanasi, India.

M/s VISHWA BHUMI TECHNOLOGIES has carried out the geotechnical survey.

2.0 BRIEF DESCRIPTION OF GEOLOGY AND TYPE OF STRUCTURE

Ramna is a Village in Chiragaon Tehsil in Varanasi District of Uttar Pradesh State, India having Coordinates 25°13'58"N 83°0'43"E. It belongs to Varanasi Division . Ramna is located 10 Km towards South from District head quarters Varanasi, 17 Km from Chiragaon and 319 Km from State capital Lucknow

This Place is in the border of the Varanasi District and Chandauli District. Chandauli District Chahniya is North towards this place.

3.0 SCOPE OF WORK

3.1 The scope of the geotechnical investigation work consisted of the following activities.

Carrying out the soil investigation by drilling two no. of 150 mm diameter boreholes of 20.0m depth below existing ground level or up to Refusal (N^o value > 100) whichever occurs earlier in all types of soil strata.

- a) At every 1.0m intervals standard penetration test shall be carried out in order to determine at load bearing capacity of different strata. If the N-value of 50 is encountered continues 5m. boring test can be stopped.
- b) Depth of each boring shall be 20 m or refusal. Refusal is defined as SPT value exceeding 100 blows for 30 cm penetration or 25 blows for 2.5 cm or less penetration.
- c) Collected samples are to be logged descriptively indicating the soil types and stratigraphic characteristics to evaluate the suitability for construction of the structure
- d) The depth of water table shall be measured from the surface of the boreholes. The level of the water shall be measured and recorded daily.



4.0 EXECUTION OF FIELD WORK

4.1 Location of boreholes: The client gave the location of two boreholes. These were marked on the ground and all the field tests were conducted in the presence of site engineer of the client.

4.2 Methodology:

- a) Making of Boreholes: The bore holes of 150mm diameter were made by shell & auger method up to 20 m depth respectively. All the borings were carried out as per IS: 1892 - 1979. The boreholes were terminated on meeting the specified depth. Following field tests / samplings were carried out during the progress of the bore holes.
b) Standard Penetration Test (SPT): SPT are conducted as per IS 2131. For this a standard split spoon sampler is driven at the bottom of the hole. The penetration resistance in terms of blows for 150mm penetration of the split spoon sampler is measured. The blows are impacted by a standard weight of 63.5kg falling through a height of 750 mm. The resistance is measured for 150 mm, 300 mm and 450 mm. The resistance of first 150 mm is ignored and the resistance of next 300 mm is recorded as standard penetration value 'N'
c) Undisturbed Soil Samples (UDS): The Undisturbed soil samples are collected at regular interval of 3.0m depth. The work was carried out according to IS 2132. For this an open drive tube sampler is pushed / driven into the soil strata at the bottom of the bore hole in progress. The diameter of the sampler is 100 mm. The sampler with the undisturbed soil sample inside is gently withdrawn. The sampler is cleaned externally, properly sealed with wax at both ends, labeled and transported to the laboratory for conducting tests.
d) Disturbed Soil Sample (DS): Disturbed soil samples are collected generally from the split spoon samples of SPT test. The samples is extracted from the sampler, packed, labeled and transported to the laboratory for testing
e) Summary of Boreholes

Table with 4 columns: Borehole No, Depth of overburden soil (m), Final depth (m), Water table depth Below EGL. (m). Rows include (BH-1) and (BH-2).



Layer wise Properties of encountered subsoil strata

BH-1

Table with 3 columns: Depth (m) From, To, Properties. Rows show soil properties at various depths for borehole BH-1.

BH-2

Table with 3 columns: Depth (m) From, To, Properties. Rows show soil properties at various depths for borehole BH-2.



5.0 LABORATORY TESTING

The relevant laboratory tests were conducted on representative subsoil samples in our well equipped laboratory as per relevant IS codes mentioned above.

- a) Dry density/Bulk Density as per IS: 2720, pt-IX, 1992
- b) Particle size analysis as per IS: 2720, pt-IV, 1985
- c) Atterberg's limits as per IS: 2720, pt-V, 1985
- d) Classification of soil as per IS: 1498, 1987
- e) Specific gravity of soil as per IS: 2720, pt-III, 1997
- f) Moisture content as per IS: 2720, pt-II, 1973

6.0 FINDINGS OF THE GEOTECHNICAL INVESTIGATION

Site Stratification

(BH-1)

The subsoil stratum from 0.0 to 1.0 m depth consists of Filled up, from 1.0 to 3.0 m depth consists of Silty Sand classified as SM, from 3.0 to 4.5 m depth consists of Sandy Silt classified as ML and from 4.5 to 20.0 m depth consists of Fine Sand classified as SP-SM.

(BH-2)

The subsoil stratum from 0.0 to 1.0 m depth consists of Filled up, from 1.0 to 1.5 m depth consists of Silty Sand classified as SM, from 1.5 to 4.5 m depth consists of Sandy Silt classified as ML, from 4.5 to 7.0 m depth consists of Fine Sand with clay traces classified as SP-SM and from 7.0 to 20.0 m depth consists of Fine Sand classified as SP-SM.

6.1 Ground Water: The ground water table was encountered at 16.0 m in BH-1 and 16.5 m in BH-2 up to the depth of exploration in the bore holes below existing ground level during boring activities at site.



7.0 PROPOSED FOUNDATIONS AND THEIR DEPTHS

Depending on the field and laboratory observations of subsoil strata, test results and the type of structures proposed at site, the types of foundations, depths and net safe bearing capacities recommended for design purposes are given in the following table. The net SBC/API in the following table are the lower of the values obtained from shear failure criterion as per IS: 6403 and settlement failure criterion as per IS 8009, Part-I. The permissible settlements are as below:-

- (a) Strip footings of width 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depth below existing ground surface.
- (b) Isolated footings of size 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depths below existing ground surface.
- (c) Raft footings of width 6.0m and above cast at 5.0 m, & 15.0 m depth below existing ground surface.



8.0 COMPUTATION OF SAFE /ALLOWABLE BEARING CAPACITY:

Shear and settlement failure criteria as per IS: 6403- 1981 , IS : 8009 (part-1) -1976 and IS: 1904-1986 have been considered to compute the safe allowable bearing capacity of underlying soil strata for isolated footings, Strip footings & Raft footings. The safe/allowable bearing capacity from both criteria is given as follows:

The net safe bearing capacity of sub-soil strata has been computed by considering Interpolated shear failure using the following equation for calculating the net ultimate bearing capacity ;

$$Q_{ns} = 2/3 c.N_c \cdot s_c \cdot d_c \cdot i_c + q(N_q - 1) \cdot s_q \cdot d_q \cdot i_q + 1/2 B \cdot \gamma \cdot N_\gamma \cdot s_\gamma \cdot d_\gamma \cdot i_\gamma \cdot W^2$$

.....for local shear

$$Q_{ns} = c.N_c \cdot s_c \cdot d_c \cdot i_c + q(N_q - 1) \cdot s_q \cdot d_q \cdot i_q + 1/2 B \cdot \gamma \cdot N_\gamma \cdot s_\gamma \cdot d_\gamma \cdot i_\gamma \cdot W^2$$

.....for general shear

$$Q_{ns} = \text{Local SBC} + \frac{\text{General SBC} - \text{Local SBC}}{0.75 - 0.55} \times (0.75 - e_0)$$

.....for interpolated SBC

The Factor of safety has been considered as 2.5

Shape factors have been taken as follows:-

- $s_c = s_q = s_\gamma = 1.0$ -for Strip footing
- $s_c = 1.3, s_q = 1.2, s_\gamma = 0.8$ -for Isolated footing
- $s_c = s_q = 1 + 0.2B/L = 1.2, s_\gamma = 1 - 0.4 B/L = 0.6$ -for Raft footing

Depth factors:

$$d_c = d_q = d_\gamma = 1.0 \quad \text{for shallow foundations}$$

Using the above equation and parameters, the following values of net safe bearing capacity have been computed:



(BH-1 & BH-2) Net Safe Bearing capacity (t/m²)

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net Safe Bearing capacity (t/m ²)		
			BH-1	BH-2	
5.0	Strip footings	2.0	18.67	18.91	
		3.0	19.49	19.73	
		4.0	20.30	20.56	
15.0	Isolated footings	2.0 x 2.0	21.76	22.03	
		3.0 x 3.0	22.41	22.69	
		4.0 x 4.0	23.06	23.35	
	Raft footings	≥6.0	23.38	23.68	
		Strip footings	2.0	253.01	257.87
			3.0	258.60	263.62
4.0	264.19		269.37		
Isolated footings	2.0 x 2.0	304.11	304.85		
	3.0 x 3.0	308.58	309.44		
	4.0 x 4.0	313.05	314.04		
	Raft footings	≥6.0	310.32	316.34	



8.1 SETTLEMENT FAILURE CRITERION:

The settlement of sandy layers below the foundation level and up to the zone of Influence are computed by using the chart of settlement V/s SPT 'N' given on page 17 of IS 8009.

For Isolated footings, Strip footings & Raft footing the zone of influence below the foundation depth is considered as 2.0B, where B is the width of foundation

The total permissible settlement for Strip footing = 60mm

The total permissible settlement for isolated footing = 50mm

The total permissible settlement for raft footing = 75mm:

The layer wise properties of the sub soil strata are as follows:

The depth wise SPT values of the subsoil strata (observed/corrected) are as below:-



BH-1

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	7.0	11.38	1.55
2.0	5.0	6.97	1.55
3.0	9.0	11.31	1.57
4.0	11.0	12.75	1.57
5.0	14.0	15.17	1.59
6.0	16.0	16.35	1.59
7.0	18.0	17.45	1.59
8.0	23.0	21.26	1.59
9.0	27.0	23.89	1.59
10.0	31.0	26.33	1.59
11.0	31.0	25.33	1.59
12.0	34.0	26.79	1.59
13.0	37.0	28.15	1.59
14.0	42.0	30.91	1.59
15.0	42.0	29.79	1.85
16.0	46.0	23.54	0.85
17.0	49.0	24.31	0.85
18.0	54.0	25.74	0.85
19.0	58.0	26.78	0.85
20.0	63.0	28.12	0.85



BH-2

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	4.0	6.52	1.53
2.0	7.0	9.76	1.56
3.0	6.0	7.55	1.56
4.0	10.0	11.61	1.56
5.0	14.0	15.18	1.61
6.0	16.0	16.34	1.61
7.0	29.0	27.89	1.84
8.0	35.0	31.89	1.84
9.0	31.0	26.89	1.84
10.0	34.0	28.17	1.84
11.0	36.0	28.57	1.84
12.0	41.0	31.25	1.84
13.0	46.0	33.74	1.84
14.0	38.0	26.86	1.84
15.0	41.0	27.98	1.84
16.0	45.0	29.68	1.84
17.0	50.0	23.74	0.84
18.0	47.0	22.54	0.84
19.0	50.0	23.26	0.84
20.0	55.0	24.59	0.84

The values of allowable pressure intensities computed based on the above selected soil parameters are shown below:-



(BH-1 & BH-2) (Allowable pressure intensity (t/m²))

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Allowable pressure intensity (t/m ²)	
			BH-1	BH-2
5.0	Strip footings	2.0	20.41	30.93
		3.0	21.13	29.41
		4.0	21.82	27.52
	Isolated footings	2.0 x 2.0	17.01	25.77
		3.0 x 3.0	17.61	24.51
		4.0 x 4.0	18.18	22.94
	Raft footings	≥6.0	28.30	31.12
15.0	Strip footings	2.0	30.61	29.13
		3.0	27.03	22.90
		4.0	25.21	22.06
	Isolated footings	2.0 x 2.0	25.51	24.27
		3.0 x 3.0	22.52	19.08
		4.0 x 4.0	21.01	18.38
	Raft footings	≥6.0	30.74	26.60



9.0 CONCLUSION WITH RECOMMENDATIONS:

On the basis of above Soil investigation the following recommendations are suggested:

9.1. The sub-soil strata met at this site consists of layers of Fine sand, Silty Sand and Medium Coarse Fine sand.

The subsoil strata are loose to medium dense.

9.2. On the basis of field & laboratory test results, the following values of the net safe bearing capacity for Strip, Isolated & Raft footings are to be considered .



(BH-1 & BH-2) (NET SAFE BEARING CAPACITY/ ALLOWABLE PRESSURE INTENSITY T/M2)

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net safe bearing capacity/ allowable pressure intensity t/m ²	
			BH-1	BH-2
5.0	Strip footings	2.0	18.67	18.91
		3.0	19.49	19.73
		4.0	20.30	20.56
	Isolated footings	2.0 x 2.0	17.01	22.03
		3.0 x 3.0	17.61	22.69
		4.0 x 4.0	18.18	22.94
	Raft footings	≥6.0	23.38	23.68
15.0	Strip footings	2.0	30.61	29.13
		3.0	27.03	22.90
		4.0	25.21	22.06
	Isolated footings	2.0 x 2.0	25.51	24.27
		3.0 x 3.0	22.52	19.08
		4.0 x 4.0	21.01	18.38
	Raft footings	≥6.0	30.74	26.6



10. CLOSURE

We appreciate the opportunity given to us to submit this report. This presented report is based on observations and tests on samples collected from the boreholes as decided by the client. In case any difference is noticed in the field subsoil strata and reported subsoil strata during excavation please contact us before proceeding with further construction.

For VISHWA BIHUMI TECHNOLOGIES

(DINESH BHARDWAJ)



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VBT		VISHWA BHUMI TECHNOLOGIES		PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.										Sheet No- 17			
N VALUES	DEPTH (M)	SAMPLE	DESCRIPTION OF SOIL	IS CLASSIFICATION	BH - 1 (RAMNA STP)				BORING DATE		TERMINAL DEPTH (m)				WATER TABLE		
									12/11/2015 to 13/11/2015		20.00				16.0m		
					GRAIN SIZE ANALYSIS				LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY/BULK DENSITY	MOISTURE CONTENT	SHEAR PARAMETER			
GRAVEL	SAND	SILT	CLAY	TEST TYPE	COHESION INTERCEPT (c)	ANGLE OF INTERNAL FRICTION (φ)	SPECIFIC GRAVITY										
					%	%	%	%	%	%	gm/cc	%		kg/cm ²	deg.		
	0.5	DS-1			Filledup												
7	1.0	SPT-1	Silty Sand	SM	0	78	32	0									
	1.5	UDS-1		SM	0	74	36	0	N	P		1.47/1.55	5.18	DST	0	27.0	2.63
5	2.0	SPT-2															
9	3.0	SPT-3	Sandy Silt	ML	0	39	55	6	22	19	3	1.45*/1.57*	6.53*	DST*	0*	27.5*	2.67*
11	4.0	SPT-4															
	4.5	UDS-2	Fine Sand	SPSM	0	54	16	0	N	P		1.49/1.59	6.38	DST	0	28.0	2.65
14	5.0	SPT-5															
16	6.0	SPT-6															
18	7.0	SPT-7		SPSM	0	83	17	0									
23	8.0	SPT-8															
27	9.0	SPT-9															
31	10.0	SPT-10		SPSM	0	86	14	0									
31	11.0	SPT-11															
34	12.0	SPT-12															

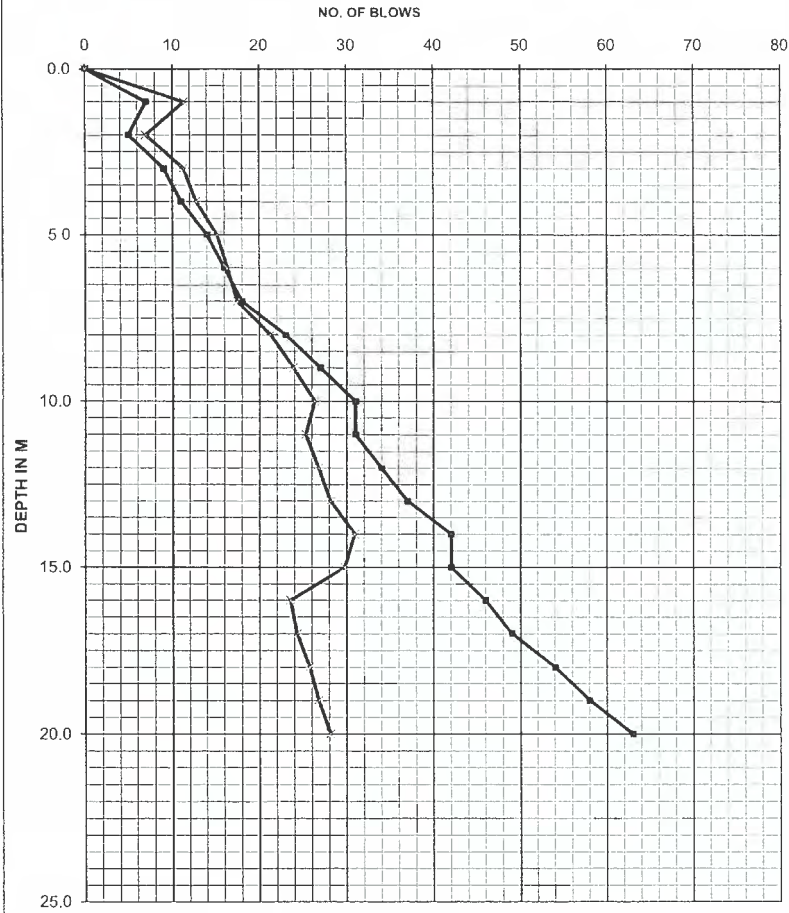
37	13.0	SPT-13	Fine Sand	SPSM	0	90	10	0									
42	14.0	SPT-14															
42	15.0	SPT-15		SPSM	0	92	8	0	N	P		1.69*/1.85*	9.49*	DST*	0*	32.0*	2.66*
46	16.0	SPT-16															
49	17.0	SPT-17															
54	18.0	SPT-18		SPSM	0	91	9	0									
58	19.0	SPT-19															
63	20.0	SPT-20		SPSM	0	89	11	0									

*Remoulded Sapnic

V3T		VISHWA BHUMI TECHNOLOGIES			PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.										Sheet No- 18			
N VALUES	DEPTH (m)	SAMPLE	DESCRIPTION OF SOIL	IS CLASSIFICATION	GRAIN SIZE ANALYSIS				LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY/BULK DENSITY	MOISTURE CONTENT	SHEAR PARAMETER				
					GRAVEL	SAND	SILT	CLAY						TEST TYPE	COHESION INTERCEPT (c)	ANGLE OF INTERNAL FRICTION (φ)	SPECIFIC GRAVITY	
					%	%	%	%	%	%	%	gm/cc	%					kg/cm ²
	0.5	DS-1			Filledup													
4	1.0	SPT-1	Silty Sand	SM	0	77	23	0	N	P		1.44*/1.53*	6.17*	DST*	0*	26.5*	2.65*	
	1.5	UDS-1	Sandy Silt	ML	0	41	55	4	21	19	2	1.46/1.56	6.70	DST	0	27.0	2.66	
7	2.0	SPT-2																
6	3.0	SPT-3		ML	0	44	51	5										
10	4.0	SPT-4																
	4.5	UDS-2	Fine Sand with Clay traces	SPSM	2	33	15	0	N	P		1.50/1.61	7.09	DST	0	28.0	2.65	
14	5.0	SPT-5																
16	6.0	SPT-6		SPSM	0	84	16	0										
29	7.0	SPT-7		SPSM	0	87	13	0										
35	8.0	SPT-8																
31	9.0	SPT-9																
34	10.0	SPT-10	SPSM	0	88	12	0											
36	11.0	SPT-11																
41	12.0	SPT-12																

46	13.0	SPT-13	Fine Sand	SPSM	0	93	7	0											
38	14.0	SPT-14																	
41	15.0	SPT-15		SPSM	0	90	10	0	N	P		1.67*/1.84*	10.17*	DST*	0*	32.5*	2.64*		
45	16.0	SPT-16																	
50	17.0	SPT-17																	
47	18.0	SPT-18	SPSM	0	92	8	0												
50	19.0	SPT-19																	
55	20.0	SPT-20	SPSM	0	91	9	0												

*Remoulded Sapmle

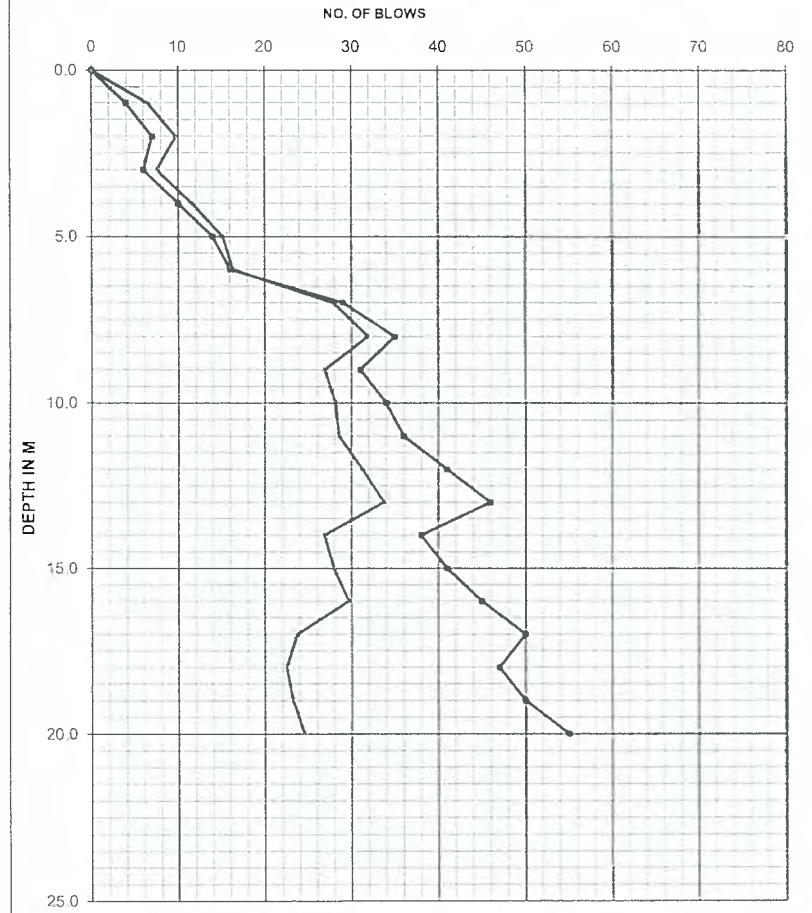


SPT CURVE

LEGEND	
Symbol	Notation
■	No
⊗	Nc

PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 1



SPT CURVE

LEGEND	
Symbol	Notation
■	No
⊗	Nc

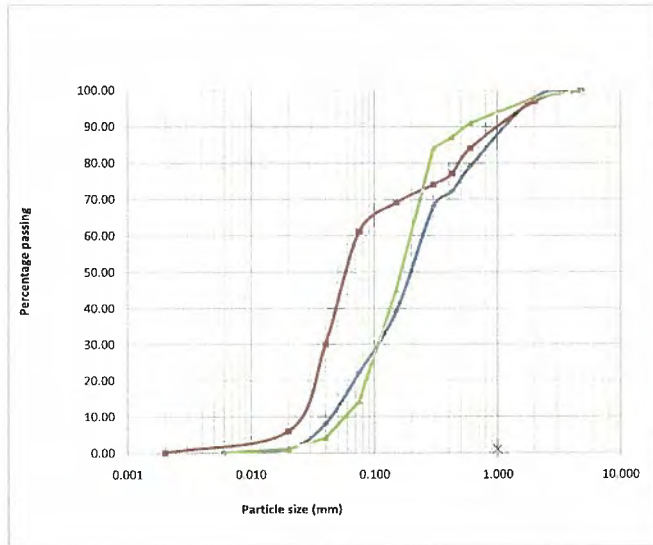
PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2

GRAIN SIZE ANALYSIS

PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 1

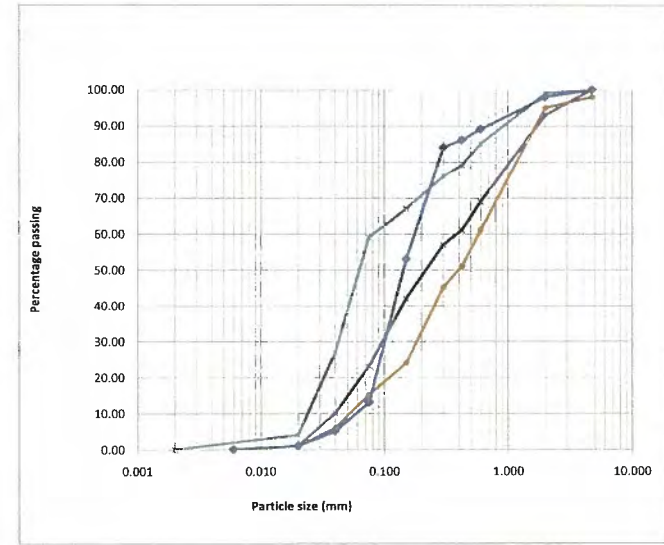


Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
—	Silty Sand (SM)	1.00	0	78	22	0
—	Sandy Silt (ML)	3.00	0	39	55	6
—	Fine Sand (SP-SM)	4.50	0	86	14	0

GRAIN SIZE ANALYSIS

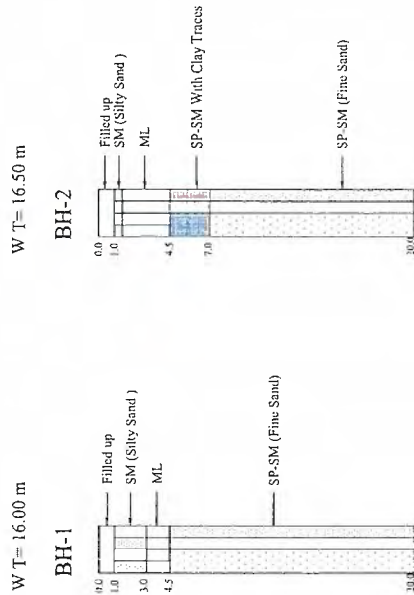
PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2



Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
—	Silty Sand (SM)	1.00	0	77	23	0
—	Silty Sand (ML)	1.50	0	41	55	4
—	Fine Sand with Clay traces (SP-SM)	4.50	2	83	15	0
—	Fine Sand (SP-SM)	7.00	0	87	13	0

LOCATION- RAMNA STP



SUB SOIL PROFILE

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT



(BH-1)

LOCATION:- RAMNA STP

SAMPLE CALCULATION

Type of Foundation – Raft footing
 Depth of Foundation –5.0m below EGL
 Size of Foundation– 6.0m x 6.0m (B=6.0 m)
 Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, $c = 0 \text{ kg/cm}^2$

Angle of Shear Resistance, $\phi = 28.0^\circ$

Effective Density

$\gamma = 1.59 \text{ gm/cc}$ for 4.50 to 15.00m depth below EGL

Water correction factor $w' = 0.50$

Overburden pressure $q = 500 \times 0.00159 = 0.795 \text{ kg/cm}^2$

$d_c = d_s = d_f = 1.00$

$i_c = i_q = i_\gamma = 1$

$S_c = 1.2 S_q = 1.2 \times 1 + 0.2 \Delta B/L = 1.2$, $S_\gamma = 1 - 0.4 \times B/L = 0.6$ for raft footing

Factor of Safety = 2.5

For Local Shear

$N_c = 14.45$, $N_q = 6.36$, $N_\gamma = 5.12$

$$Q_{n'} = [2/3 c N_c S_c d_c i_c + q(N_q - 1) s_q d_q i_q + 0.5 \gamma_{eff} B N_\gamma S_\gamma d_\gamma i_\gamma w'] / 2.5$$

$$= [2/3 \times 0 \times 14.45 \times 1.2 \times 1.0 + 0.795 \times (6.36 - 1) \times 1.2 \times 1.0 \times 1.0 + 0.5 \times 0.00159 \times 600 \times 5.12 \times 0.6 \times 1.0 \times 1.0 \times 0.50] / 2.5$$

$$= \{0 + 5.11344 + 0.732672\} / 2.5$$

$$= 2.33844 \text{ Kg/cm}^2 = 23.38 \text{ T/m}^2$$

2.0 SETTLEMENT CRITERIA (IS: 8009, Pt.I)

Average weighted N value at 5.0 m depth (below EGL) = 24.51, $w' = 0.50$

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of $1.0 \text{ Kg/cm}^2 = 26.5 \text{ mm}$

Hence for 75mm permissible settlement, net API = $75 / 26.5 = 2.830186 \text{ Kg/cm}^2 = 28.30 \text{ T/m}^2$

RECOMMENDATION:

LEAST FROM ABOVE VALUES OF NET SBC OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. 23.38 T/m^2 FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

(BH-2)

LOCATION:- RAMNA STP

SAMPLE CALCULATION

Type of Foundation – Raft footing
 Depth of Foundation – 5.0m below EGL
 Size of Foundation – 6.0m x 6.0m (B=6.0 m)
 Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, $c = 0 \text{ kg/cm}^2$

Angle of Shear Resistance, $\phi = 28.0^\circ$

Effective Density

$\gamma = 1.61 \text{ gm/cc}$ for 4.50 to 7.00m depth below EGL

Water correction factor $w' = 0.50$

Overburden pressure $q = 500 \times 0.00161 = 0.805 \text{ kg/cm}^2$

$d_c = d_q = d_f = 1.00$

$i_c = i_q = i_f = 1$

$S_c = 1.2$ $S_q = 1.2$ $1 + 0.2 \times B/L = 1.2$, $S_f = 1 - 0.4 \times B/L = 0.6$ For raft footing

Factor of Safety = 2.5

For Local Shear

$N_c = 14.45$, $N_q = 6.36$, $N_\gamma = 5.12$

$Q_{ns} = [2/3 c N_c \cdot S_c \cdot d_c \cdot i_c + q(N_q - 1) \cdot s_q \cdot d_q \cdot i_q + 0.5 \gamma_{eff} \cdot B \cdot N_\gamma \cdot S_\gamma \cdot d_\gamma \cdot i_\gamma \cdot w'] / 2.5$

$$= [2/3 \times 0 \times 14.45 \times 1 \times 2 \times 1.0 + 0.805 \times (6.36 - 1) \times 1.2 \times 1.0 \times 1.0 + 0.5 \times 0.00161 \times 600 \times 5.12 \times 0.6 \times 1.0 \times 1.0 \times 0.50] / 2.5$$

$$= [0 + 5.17776 + 0.741888] / 2.5$$

$$= 2.36785 \text{ Kg/cm}^2 = 23.68 \text{ T/m}^2$$

2.0 SETTLEMENT CRITERIA (IS: 8009,Pt.I)

Average weighted N value at 5.0 m depth (below EGL) = 27.75, $w' = 0.50$

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of 1.0 Kg/cm² = 24.1 mm

Hence for 75mm permissible settlement, net API = $75 / 24.10 = 3.112033 \text{ Kg/cm}^2$
 = 31.12 T/m^2

RECOMMENDATION:

LEAST FROM ABOVE VALUES OF NET SBC OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. **23.68 T/m²** FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

PHOTOGRAPHS

BH- 1 RAMNA STP



BH- 2 RAMNA STP



BOREHOLE DESIGNATION	ACTUAL TEST LOCATION COORDINATE
BH-1	LATITUDE: 25 15 00'N LONGITUDE: 81 00' E





VISHWA BHUMI TECHNOLOGIES

PROJECT NO. 93

REPORT ON

**GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON
GANGA REJUVENATION PROJECT**

SUBMITTED TO

NJS CONSULTANTS CO. LTD

**1ST FLOOR, R.H. TOWER, THE MALL ROAD, CANTONMENT,
VARANASI**

■ 011 – 43063950

☎ 9910466066

✉ info@vishwabhumi.com

2. Ghazipur STP



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1.0 INTRODUCTION

M/s NJS CONSULTANTS CO. LTD has planned Geotechnical Survey for preparatory survey on Ganga rejuvenation project in Varanasi, India.

M/s VISHWA BHUMI TECHNOLOGIES has carried out the geotechnical survey.

2.0 BRIEF DESCRIPTION OF GEOLOGY AND TYPE OF STRUCTURE

Ghazipur (Previously spelled Ghazeeপুর, Gauspur, and Ghazipur), is a city and municipal corporation in the state of Uttar Pradesh, India. Ghazipur city is the administrative headquarters of the Ghazipur district, one of the four districts that form the Varanasi division of Uttar Pradesh. The city of Ghazipur also constitutes one of the five distinct tehsils, or subdivisions, of the Ghazipur district.

It lies close to the Uttar Pradesh-Bihar border, about 80 kilometres (50 mi) east of Varanasi and 50 kilometres (31 mi) from Buxar, the entry point to Bihar state.

It is located at 25.58°N 83.57°E. It has an average elevation of 62 metres (203 feet).

3.0 SCOPE OF WORK

3.1 The scope of the geotechnical investigation work consisted of the following activities.

Carrying out the soil investigation by drilling two no. of 150 mm diameter boreholes of 20.0m depth below existing ground level or up to Refusal ('N' value > 100) whichever occurs earlier in all types of soil strata.

- a) At every 1.0m intervals standard penetration test shall be carried out in order to determine at load bearing capacity of different strata. If the N-value of 50 is encountered continues 5m, boring test can be stopped.
- b) Depth of each boring shall be 20 m or refusal. Refusal is defined as SPT value exceeding 100 blows for 30 cm penetration or 25 blows for 2.5 cm or less penetration.
- c) Collected samples are to be logged descriptively indicating the soil types and stratigraphic characteristics to evaluate the suitability for construction of the structure
- d) The depth of water table shall be measured from the surface of the boreholes. The level of the water shall be measured and recorded daily

**4.0 EXECUTION OF FIELD WORK**

4.1 Location of boreholes: The client gave the location of two boreholes. These were marked on the ground and all the field tests were conducted in the presence of site engineer of the client.

4.2 Methodology:

- a) **Making of Boreholes:** The bore holes of 150mm diameter were made by shell & auger method up to 20 m depth respectively. All the borings were carried out as per IS: 1892 - 1979. The boreholes were terminated on meeting the specified depth. Following field tests / samplings were carried out during the progress of the bore holes.
- b) **Standard Penetration Test (SPT):** SPT are conducted as per IS 2131. For this a standard split spoon sampler is driven at the bottom of the hole. The penetration resistance in terms of blows for 150mm penetration of the split spoon sampler is measured. The blows are impacted by a standard weight of 63.5kg falling through a height of 750 mm. The resistance is measured for 150 mm, 300 mm and 450 mm. The resistance of first 150 mm is ignored and the resistance of next 300 mm is recorded as standard penetration value 'N'
- c) **Undisturbed Soil Samples (UDS):** The Undisturbed soil samples are collected at regular interval of 3.0m depth. The work was carried out according to IS 2132. For this an open drive tube sampler is pushed / driven into the soil strata at the bottom of the bore hole in progress. The diameter of the sampler is 100 mm. The sampler with the undisturbed soil sample inside is gently withdrawn. The sampler is cleaned externally, properly sealed with wax at both ends, labeled and transported to the laboratory for conducting tests.
- d) **Disturbed Soil Sample (DS):** Disturbed soil samples are collected generally from the split spoon samples of SPT test. The samples is extracted from the sampler, packed, labeled and transported to the laboratory for testing
- e) **Summary of Boreholes**

Borehole No	Depth of overburden soil (m)	Final depth (m)	Water table depth Below EGL. (m)
(BH-1)	20.0	20.0	7.0
(BH-2)	20.0	20.0	4.5

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT

**Layer wise Properties of encountered subsoil strata****BH-1**

Depth (m)		Properties
From	To	
0.0	1.0	Filledup
1.0	1.5	$\gamma_{eff} = 1.61 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 28.5^\circ$
1.5	3.0	$\gamma_{eff} = 1.62 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 30.0^\circ$
3.0	4.0	$\gamma_{eff} = 1.69 \text{ gm/cc}, C = 0.300 \text{ kg/cm}^2, \Phi = 12.0^\circ$
4.0	4.5	$\gamma_{eff} = 1.71 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 30.5^\circ$
4.5	7.0	$\gamma_{eff} = 1.77 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 31.0^\circ$
7.0	10.0	$\gamma_{eff} = 0.77 \text{ gm/cc}, C = 0 \text{ kg/cm}^2, \Phi = 31.0^\circ$
10.0	20.0	$\gamma_{eff} = 0.95 \text{ gm/cc}, C = 0.800 \text{ kg/cm}^2, \Phi = 8.0^\circ$

BH-2

Depth (m)		Properties
From	To	
0.0	1.0	Filledup
1.0	3.0	$\gamma_{eff} = 1.62 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 28.5^\circ$
3.0	4.0	$\gamma_{eff} = 1.73 \text{ gm/cc}, C = 0.300 \text{ kg/cm}^2, \Phi = 13.0^\circ$
4.0	4.5	$\gamma_{eff} = 1.80 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 30.0^\circ$
4.5	7.0	$\gamma_{eff} = 0.80 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 30.0^\circ$
7.0	14.0	$\gamma_{eff} = 0.86 \text{ gm/cc}, C = 0.810 \text{ kg/cm}^2, \Phi = 6.0^\circ$
14.0	17.0	$\gamma_{eff} = 0.94 \text{ gm/cc}, C = 0.600 \text{ kg/cm}^2, \Phi = 10.0^\circ$
17.0	20.0	$\gamma_{eff} = 0.98 \text{ gm/cc}, C = 0.960 \text{ kg/cm}^2, \Phi = 7.0^\circ$

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT



5.0 LABORATORY TESTING

The relevant laboratory tests were conducted on representative subsoil samples in our well equipped laboratory as per relevant IS codes mentioned above.

- a) Dry density/Bulk Density as per IS: 2720, pt-IX, 1992
- b) Particle size analysis as per IS: 2720, pt-IV, 1985
- c) Atterberg's limits as per IS: 2720, pt-V, 1985
- d) Classification of soil as per IS: 1498, 1987
- e) Specific gravity of soil as per IS: 2720, pt-III, 1997
- f) Moisture content as per IS: 2720, pt-II, 1973

6.0 FINDINGS OF THE GEOTECHNICAL INVESTIGATION

Site Stratification

(BH-1)

The subsoil stratum from 0.0 to 1.0 m depth consists of Filled up, from 1.0 to 1.5 m depth consists of Sandy Silt classified as ML, from 1.5 to 3.0 m depth consists of Poorly graded Gravel classified as GP, from 3.0 to 4.0 m depth consists of Sandy Silt with Clay classified as ML-CL, from 4.0 to 4.5 m depth consists of Silty Sand classified as SM, from 4.5 to 10.0 m depth consists of Sandy Silt classified as ML and from 10.0 to 20.0 m depth consists of Clay with medium Plasticity classified as CI.

(BH-2)

The subsoil stratum from 0.0 to 1.0 m depth consists of Filled up, from 1.0 to 3.0 m depth consists of Silty Sand classified as SM, from 3.0 to 4.0 m depth consists of Sandy Silt with Clay classified as ML-CL, from 4.0 to 7.0m depth consists of Sandy Silt classified as ML, from 7.0 to 14.0 m depth consists of Clay with medium Plasticity classified as CI, from 14.0 to 17.0 m depth consists of Clay with low Plasticity classified as CL and from 17.0 to 20.0 m depth consists of Clay with medium Plasticity classified as CI.



6.1 Ground Water: The ground water table was encountered at 7.0 m in BH-1 and 4.5 m in BH-2 up to the depth of exploration in the bore holes below existing ground level during boring activities at site

7.0 PROPOSED FOUNDATIONS AND THEIR DEPTHS

Depending on the field and laboratory observations of subsoil strata, test results and the type of structures proposed at site, the types of foundations, depths and net safe bearing capacities recommended for design purposes are given in the following table. The net SBC/API in the following table are the lower of the values obtained from shear failure criterion as per IS: 6403 and settlement failure criterion as per IS 8009, Part-I. The permissible settlements are as below:-

- (a) Strip footings of width 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depth below existing ground surface.
- (b) Isolated footings of size 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depths below existing ground surface.
- (c) Raft footings of width 5.0m and above cast at 5.0 m, & 15.0 m depth below existing ground surface.



8.0 COMPUTATION OF SAFE /ALLOWABLE BEARING CAPACITY:

Shear and settlement failure criteria as per IS: 6403- 1981 , IS : 8009 (part-1) -1976 and IS: 1904-1986 have been considered to compute the safe allowable bearing capacity of underlying soil strata for isolated footings, Strip footings & Raft footings. The safe/allowable bearing capacity from both criteria is given as follows:
The net safe bearing capacity of sub-soil strata has been computed by considering Interpolated shear failure using the following equation for calculating the net ultimate bearing capacity ;

$$Q_{ns} = 2/3 c.N_c s_c d_c i_c + q(N_q - 1).s_q d_q i_q + 1/2 B .\gamma .N_\gamma s_\gamma d_\gamma i_\gamma .W'$$

.....for local shear

$$Q_{ns} = c.N_c s_c d_c i_c + q(N_q - 1).s_q d_q i_q + 1/2 B .\gamma .N_\gamma s_\gamma d_\gamma i_\gamma .W'$$

.....for general shear

$$Q_{ns} = \text{Local SBC} + \left(\frac{\text{General SBC} - \text{Local SBC}}{0.75 - 0.55} \right) \times (0.75 - e_0)$$

.....for interpolated SBC

The Factor of safety has been considered as 2.5

Shape factors have been taken as follows:-

$s_c = s_q = s_\gamma = 1.0$ -for Strip footing
 $s_c = 1.3, s_q = 1.2, s_\gamma = 0.8$ -for Isolated footing
 $s_c = s_q = 1 + 0.2B/L = 1.2, s_\gamma = 1 - 0.4 B/L = 0.6$ -for Raft footing

Depth factors:

$d_c = d_q = d_\gamma = 1.0$ for shallow foundations

Using the above equation and parameters, the following values of net safe bearing capacity have been computed:



(BH-1 & BH-2)Net Safe Bearing capacity (t/m²)

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net Safe Bearing capacity (t/m ²)	
			BH-1	BH-2
5.0	Strip footings	2.0	54.55	48.63
		3.0	57.64	49.98
		4.0	60.73	51.33
	Isolated footings	2.0 x 2.0	62.99	57.28
		3.0 x 3.0	65.46	58.36
		4.0 x 4.0	67.93	59.44
	Raft footings	≥6.0	69.16	58.95
15.0	Strip footings	2.0	30.41	25.49
		3.0	30.49	25.61
		4.0	30.58	25.72
	Isolated footings	2.0 x 2.0	38.80	32.46
		3.0 x 3.0	38.87	32.55
		4.0 x 4.0	38.94	32.64
	Raft footings	≥6.0	36.58	30.73



8.1 SETTLEMENT FAILURE CRITERION:

The settlement of sandy layers below the foundation level and up to the zone of Influence are computed by using the chart of settlement V/s SPT 'N' given on page 17 of IS 8009.

For Isolated footings, Strip footings & Raft footing the zone of influence below the foundation depth is considered as 2.0B, where B is the width of foundation

The total permissible settlement for Strip footing = 60mm

The total permissible settlement for isolated footing = 50mm

The total permissible settlement for raft footing = 75mm:

The layer wise properties of the sub soil strata are as follows:

The depth wise SPT values of the subsoil strata (observed/corrected) are as below: -



BH-1

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	11.0	17.74	1.61
2.0	13.0	17.94	1.62
3.0	16.0	19.82	1.69
4.0	19.0	21.65	1.71
5.0	23.0	24.38	1.77
6.0	28.0	27.89	1.77
7.0	29.0	21.59	0.77
8.0	32.0	22.68	0.77
9.0	40.0	26.05	0.77
10.0	44.0	27.37	0.95
11.0	50.0	29.51	0.95
12.0	42.0	25.54	0.95
13.0	46.0	26.79	0.95
14.0	54.0	29.64	0.95
15.0	60.0	31.56	0.95
16.0	64.0	32.62	0.95
17.0	34.0	20.57	0.95
18.0	49.0	25.95	0.95
19.0	55.0	27.81	0.95
20.0	61.0	29.59	0.95



BH-2

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	13.0	20.94	1.62
2.0	17.0	23.44	1.62
3.0	22.0	27.18	1.73
4.0	26.0	29.44	1.80
5.0	26.0	21.73	0.80
6.0	22.0	19.17	0.80
7.0	29.0	22.41	0.86
8.0	34.0	24.48	0.86
9.0	36.0	24.99	0.86
10.0	44.0	28.32	0.86
11.0	41.0	26.41	0.86
12.0	47.0	28.67	0.86
13.0	51.0	29.94	0.86
14.0	60.0	33.27	0.94
15.0	60.0	32.67	0.94
16.0	63.0	33.34	0.94
17.0	67.0	34.36	0.98
18.0	73.0	36.12	0.98
19.0	64.0	32.06	0.98
20.0	63.0	31.18	0.98

The values of allowable pressure intensities computed based on the above selected soil parameters are shown below :-



(BH-1 & BH-2) (Allowable pressure intensity (t/m²))

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Allowable pressure intensity (t/m ²)	
			BH-1	BH-2
5.0	Strip footings	2.0	27.78	30.00
		3.0	26.67	26.09
		4.0	25.32	21.43
	Isolated footings	2.0 x 2.0	23.15	25.00
		3.0 x 3.0	22.22	21.74
		4.0 x 4.0	21.10	17.86
	Raft footings	≥6.0	30.86	32.61
15.0	Strip footings	2.0	32.61	37.50
		3.0	30.00	32.97
		4.0	28.85	31.58
	Isolated footings	2.0 x 2.0	27.17	31.25
		3.0 x 3.0	25.00	27.47
		4.0 x 4.0	24.04	26.32
	Raft footings	≥6.0	31.25	37.88



9.0 CONCLUSION WITH RECOMMENDATIONS:

On the basis of above Soil investigation the following recommendations are suggested:

9.1. The sub-soil strata met at this site consists of layers of Fine sand, Silty Sand and Medium Coarse Fine sand.

The subsoil strata are loose to medium dense.

9.2. On the basis of field & laboratory test results, the following values of the net safe bearing capacity for Strip, Isolated & Raft footings are to be considered .



(BH-1 & BH-2) (NET SAFE BEARING CAPACITY/ ALLOWABLE PRESSURE INTENSITY T/M2))

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net safe bearing capacity/ allowable pressure intensity t/m ²	
			BH-1	BH-2
5.0	Strip footings	2.0	27.78	30.00
		3.0	26.67	26.09
		4.0	25.32	21.45
	Isolated footings	2.0 x 2.0	23.15	25.00
		3.0 x 3.0	22.22	21.74
		4.0 x 4.0	21.10	17.86
	Raft footings	≥6.0	30.86	32.61
15.0	Strip footings	2.0	30.41	25.49
		3.0	30.00	25.61
		4.0	28.85	25.72
	Isolated footings	2.0 x 2.0	27.17	31.25
		3.0 x 3.0	25.00	27.47
		4.0 x 4.0	24.04	26.32
	Raft footings	≥6.0	31.25	30.73



10. CLOSURE

We appreciate the opportunity given to us to submit this report. This presented report is based on observations and tests on samples collected from the boreholes as decided by the client. In case any difference is noticed in the field subsoil strata and reported subsoil strata during excavation please contact us before proceeding with further construction.

For **VISHWA BHUMI TECHNOLOGIES**

(DINESH BHARDWAJ)



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VISHWA BHUMI TECHNOLOGIES		PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.											Sheet No- 17								
N VALUES	DEPTH (M)	SAMPLE	DESCRIPTION OF SOIL	IS CLASSIFICATION	GRAIN SIZE ANALYSIS				LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY/BULK DENSITY	MOISTURE CONTENT	SHEAR PARAMETER							
					BH - 1 (GHAZIPUR CITY)									BORING DATE		TERMINAL DEPTH (m)		WATER TABLE			
					GRAVEL	SAND	SILT	CLAY						20/11/2012 to 21/11/2012		20.00		7.0m			
%	%	%	%	%	%	%	%	TEST TYPE	COHESION INTERCEPT (c)	ANGLE OF INTERNAL FRICTION (φ)	SPECIFIC GRAVITY										
Filledup													kg/cm ²	deg							
	0.5	DS-1																			
11	1.0	SPT-1	Sandy Silt	ML	2	40	56	2	21	19	2	1.51*/6.75*	1.61*	DST*	0*	28.5*	2.64*				
	1.5	UDS-1	Poorly graded Gravel	GP	36	23	41	0	N	P		1.52/6.35	1.62	DST	0	30.0	2.62				
13	2.0	SPT-2																			
16	3.0	SPT-3	Sandy Silt with Clay	ML-CL	1	33	55	11	28	23	5	1.56*/8.18*	1.69*	UUT*	0.300*	12.0*	2.66*				
19	4.0	SPT-4	Silty Sand	SM	2	60	38	0	N	P		1.59*/7.85*	1.71*	DST*	0*	30.5*	2.63*				
	4.5	UDS-2	Sandy Silt	ML	0	42	53	5	24	20	4	1.61/9.70	1.77	DST	0	31.0	2.65				
23	5.0	SPT-5																			
28	6.0	SPT-6			ML	0	44	50	6												
29	7.0	SPT-7																			
32	8.0	SPT-8																			
40	9.0	SPT-9			ML	1	40	54	5												
44	10.0	SPT-10		CL	2	34	58	16													
50	11.0	SPT-11																			
42	12.0	SPT-12		CL	0	22	59	19													

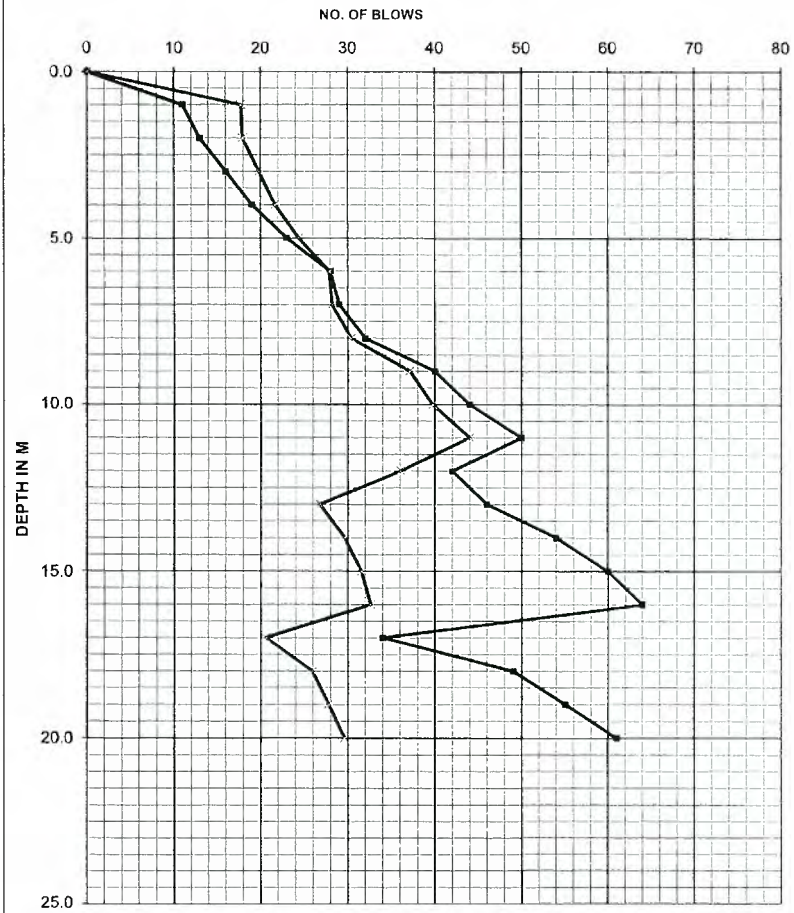
46	13.0	SPT-13	Clay with medium Plasticity														
54	14.0	SPT-14															
60	15.0	SPT-15		CL	3	19	55	21	33	21	12	1.72*/13.14*	1.95*	UUT*	0.800*	8.0*	2.68*
64	16.0	SPT-16															
34	17.0	SPT-17		CL	2	18	57	23									
49	18.0	SPT-18															
55	19.0	SPT-19															
61	20.0	SPT-20		CL	7	18	53	22									

*Remoulded Sample

V		VISHWA BHUMI TECHNOLOGIES			PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.										Sheet No- 18			
N° VALUES	DEPTH (M)	SAMPLE	DESCRIPTION OF SOIL	IS CLASSIFICATION	BH - 2 (GRAZIPUR CITY)				BORING DATE 22/11/2015 to 23/11/2015		TERMINAL DEPTH (m) 20.00				WATER TABLE 4.50m			
					GRAIN SIZE ANALYSIS				LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY BULK DENSITY	MOISTURE CONTENT	SHEAR PARAMETER				
					GRAVEL	SAND	SILT	CLAY						TEST TYPE	COHESION INTERCEPT (c)	ANGLE OF INTERNAL FRICTION (φ)	SPECIFIC GRAVITY	
%	%	%	%	%	%	%	%	gm/cc	%	kg/cm ²	deg							
	0.5	DS-1			Filledup													
13	1.0	SPT-1	Silty Sand	SM	2	57	41	0	N	P		1.53*/1.62*	6.18*	DST*	0*	28.5*	2.62*	
	1.5	UDS-1		SM	6	55	39	0										
17	2.0	SPT-2																
22	3.0	SPT-3	Sandy Silt with Clay	ML-CL	3	36	51	10	26	19	7	1.61*/1.73*	7.51*	UUT*	0.300*	13.0*	2.65*	
26	4.0	SPT-4	Sandy Silt	ML	0	41	54	5										
	4.5	UDS-2		ML	1	43	52	4	22	19	2	1.63*/1.80	10.20	DST	0	30.0	2.64	
26	5.0	SPT-5																
22	6.0	SPT-6		ML	0	39	55	6										
29	7.0	SPT-7	Clay with medium Plasticity	CI	3	20	58	19										
	7.5	UDS-3		CI	0	22	57	21	34	19	15	1.65*/1.86*	12.68*	UUT*	0.810*	6.0*	2.67*	
34	8.0	SPT-8																
36	9.0	SPT-9		CI	0	24	59	17										
44	10.0	SPT-10																
41	11.0	SPT-11		CI	2	21	61	16										

47	12.0	SPT-12															
51	13.0	SPT-13		CI	0	18	60	22									
51	14.0	SPT-14	Clay with low Plasticity	CL	6	28	53	13									
60	15.0	SPT-15		CL	0	29	57	14	30	21	9	1.72*/1.94*	13.05*	UUT*	0.600*	10.0*	2.68*
63	16.0	SPT-16															
67	17.0	SPT-17	Clay with medium Plasticity	CI	0	17	61	22	35	18	17	1.73*/1.98*	14.64*	UUT*	0.950*	7.0*	2.69*
73	18.0	SPT-18															
64	19.0	SPT-19															
63	20.0	SPT-20		CI	1	22	57	20									

*Remoulded Sample

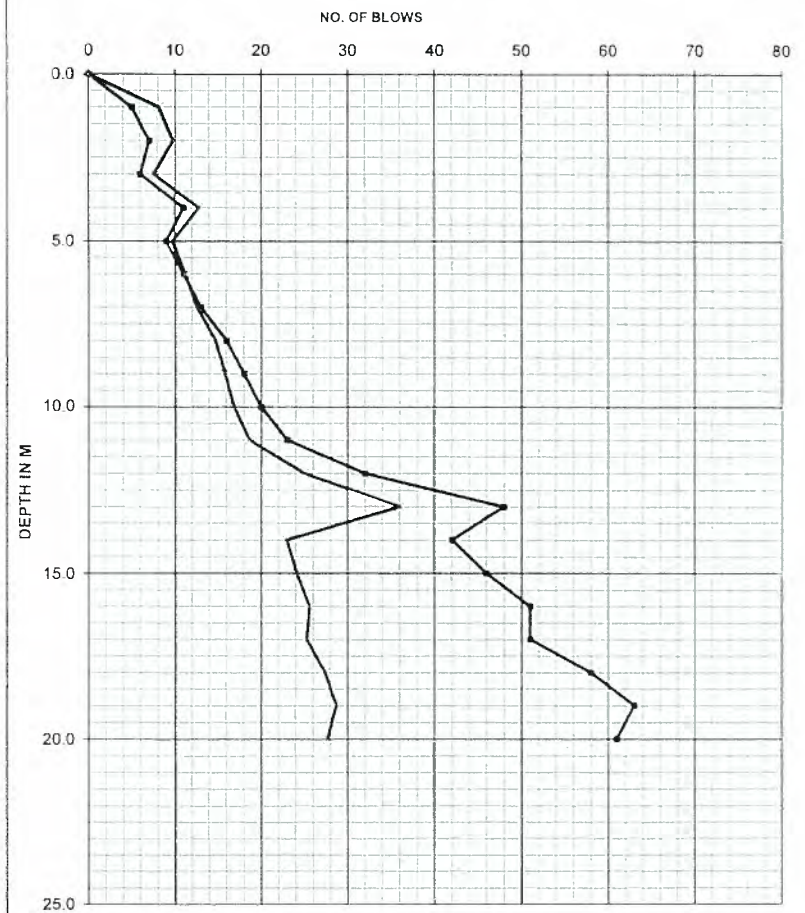


SPT CURVE

LEGEND	
Symbol	Notation
■	No
⊗	Nc

PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 1



SPT CURVE

LEGEND	
Symbol	Notation
■	No
⊗	Nc

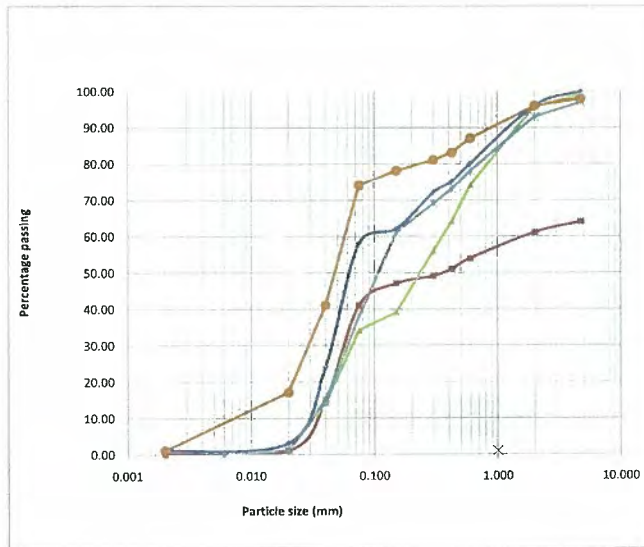
PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2

GRAIN SIZE ANALYSIS

PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 1

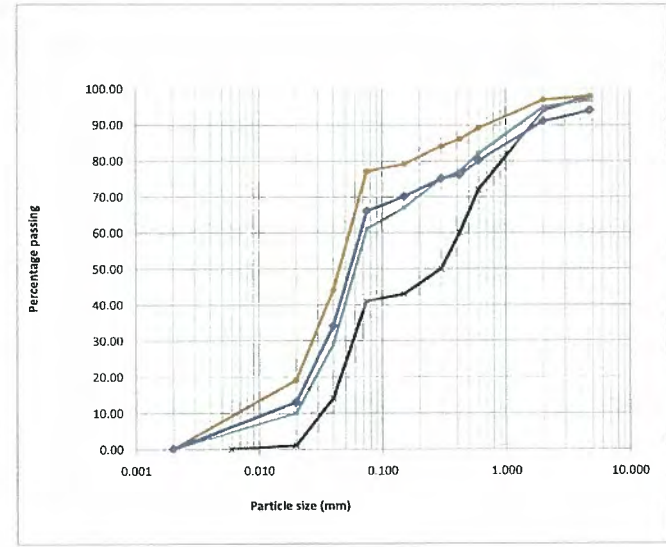


Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
—	Sandy Silt (ML)	1.00	2	40	56	2
—	Poorly graded Gravel (GP)	1.50	36	23	41	0
—	Sandy Silt with Clay (ML-CL)	3.00	1	33	55	11
—	Silty Sand (SM)	4.00	2	68	38	0
—	Clay with medium Plasticity (CI)	10.00	2	24	58	16

GRAIN SIZE ANALYSIS

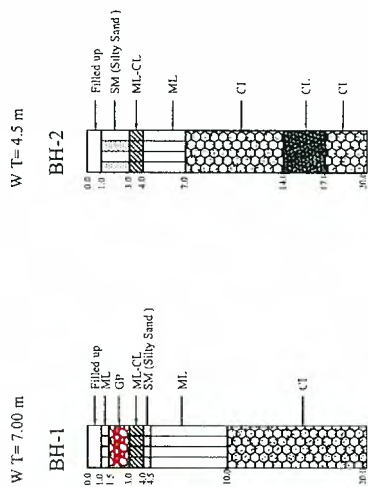
PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2



Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
—	Silty Sand (SM)	1.00	2	57	41	0
—	Silty Sand with Clay (ML-CL)	3.00	3	36	51	10
—	Clay with medium Plasticity (CI)	7.00	3	20	58	19
—	Clay with low Plasticity (CL)	14.00	6	28	53	13

LOCATION - GHAZIPUR CITY



SUB SOIL PROFILE

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT

(BH-1)

LOCATION:-GHAZIPUR CITY

SAMPLE CALCULATION

Type of Foundation – Raft footing
 Depth of Foundation –5.0m below EGL
 Size of Foundation– 6.0mx6.0m (B=6.0 m)
 Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, $c = 0 \text{ kg/cm}^2$

Angle of Shear Resistance, $\phi = 31.0^\circ$

Effective Density

$\gamma = 1.77 \text{ gm/cc}$ for 4.50 to 10.00m depth below EGL

Water correction factor $w' = 0.820$

Overburden pressure $q = 500 \times 0.00177 = 0.885 \text{ kg/cm}^2$

$d_c = d_q = d_\gamma = 1.00$

$i_c = i_q = i_\gamma = 1$

$S_c = 1.2$ $S_q = 1.2$ $1 + 0.2 \times B/L = 1.2$ $S_\gamma = 1 - 0.4 \times B/L = 0.6$ for raft footing

Factor of Safety = 2.5

For Local Shear

$N_c = 16.93$, $N_q = 7.95$, $N_\gamma = 7.36$

$$Q_{ns} = [2/3 cN_c \cdot S_c \cdot d_c \cdot i_c + q(N_q - 1) \cdot s_q \cdot d_q \cdot i_q + 0.5 \gamma_{eff} \cdot B \cdot N_\gamma \cdot S_\gamma \cdot d_\gamma \cdot i_\gamma \cdot w'] / 2.5$$

$$= [2/3 \times 0 \times 16.93 \times 1.2 \times 1.0 + 0.885 \times (7.95 - 1) \times 1.2 \times 1.0 \times 1.0 + 0.5 \times 0.00177 \times 600 \times 7.36 \times 0.6 \times 1.0 \times 1.0 \times 0.50] / 2.5$$

$$= [0 + 7.3809 + 1.172448] / 2.5$$

$$= 3.4213392 \text{ Kg/cm}^2 = 34.21 \text{ T/m}^2$$

For General Shear

$N_c = 33.34$, $N_q = 21.38$, $N_\gamma = 27.53$

$$Q_{ns} = [cN_c \cdot S_c \cdot d_c \cdot i_c + q(N_q - 1) \cdot s_q \cdot d_q \cdot i_q + 0.5 \gamma_{eff} \cdot B \cdot N_\gamma \cdot S_\gamma \cdot d_\gamma \cdot i_\gamma \cdot w'] / 2.5$$

$$= [0 \times 33.34 \times 1.2 \times 1.0 + 0.885 \times (21.38 - 1) \times 1.2 \times 1.0 \times 1.0 + 0.5 \times 0.00177 \times 600 \times 27.53 \times 0.6 \times 1.0 \times 1.0 \times 0.50] / 2.5$$

$$= [0 + 21.64356 + 4.385529] / 2.5$$

$$= 10.41163.56 \text{ Kg/cm}^2 = 104.12 \text{ T/m}^2$$

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.



$$\text{Interpolated SBC} = \text{Local SBS} + \frac{(\text{General SBC} - \text{Local SBC}) \times (0.75 - e_o)}{(0.75 - 0.55)}$$

$$= 34.21 + \frac{(104.12 - 34.21) \times (0.10)}{0.2}$$

$$= 34.21 + \frac{(69.91) \times (0.10)}{0.2}$$

$$= 69.16 \text{ T/m}^2$$

2.0 SETTLEMENT CRITERIA (IS: 8009,Pt.1)

Average weighted N value at 5.0 m depth (below EGL) = 26.82, w' = 0.50

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of 1.0 Kg/cm² = 24.30 mm

Hence for 75mm permissible settlement, net API = $75 / 24.30 = 3.08641 \text{ Kg/cm}^2$
= 30.86 T/m²

RECOMMENDATION:

LEAST FROM ABOVE VALUES OF NET SBC OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. **30.86 T/m²** FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.



(BH-2)

LOCATION:- GHAZIPUR CITY

SAMPLE CALCULATION

Type of Foundation – Raft footing

Depth of Foundation – 5.0m below EGL

Size of Foundation – 6.0m x 6.0m (B=6.0 m)

Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, c = 0kg/cm²

Angle of Shear Resistance, φ = 30.0°

Effective Density

γ = 0.80 gm/cc for 4.50 to 7.00m depth below EGL

Water correction factor w' = 0.50

Overburden pressure q = 0.850 kg/cm²

d_c = d_q = d_y = 1.00

i_c = i_q = i_y = 1

S_c = 1.2 S_q = 1.2 (1 + 0.2 x B/L) = 1.2, S_γ = 1 - 0.4 x B/L = 0.6

..... For raft footing

Factor of Safety = 2.5

For Local Shear

N_c = 15.16, N_q = 6.63, N_γ = 5.66

$$Q_{ns} = [2/3 c N_c . S_c . d_c . i_c + q(N_q - 1) . s_q . d_q . i_q + 0.5 \gamma_{eff} . B . N_\gamma . S_\gamma . d_\gamma . i_\gamma . w'] / 2.5$$

$$= [2/3 \times 0 \times 15.16 \times 1.2 \times 1.0 + 0.850 \times (6.63 - 1) \times 1.2 \times 1.0 \times 1.0 + 0.5 \times 0.00080 \times 600 \times 5.66 \times 0.6 \times 1.0 \times 1.0 \times 0.50] / 2.5$$

$$= [0 + 5.7426 + 0.40752] / 2.5$$

$$= 2.460048 \text{ Kg/cm}^2 = 24.60 \text{ T/m}^2$$

For General Shear

N_c = 30.14, N_q = 18.40, N_γ = 22.40

$$Q_{ns} = [c N_c . S_c . d_c . i_c + q(N_q - 1) . s_q . d_q . i_q + 0.5 \gamma_{eff} . B . N_\gamma . S_\gamma . d_\gamma . i_\gamma . w'] / 2.5$$

$$= [0 \times 30.24 \times 1.2 \times 1.0 + 0.850 \times (18.40 - 1) \times 1.2 \times 1.0 \times 1.0 + 0.5 \times 0.00080 \times 600 \times 22.40 \times 0.6 \times 1.0 \times 1.0 \times 0.50] / 2.5$$

$$= [0 + 17.748 + 1.6128] / 2.5$$

$$= 7.74432 \text{ Kg/cm}^2 = 77.44 \text{ T/m}^2$$

$$\text{Interpolated SBC} = \text{Local SBS} + \frac{(\text{General SBC} - \text{Local SBC}) \times (0.75 - e_0)}{(0.75 - 0.55)}$$

$$= 24.60 + \frac{(77.44 - 24.60) \times (0.13)}{0.2}$$

$$= 24.60 + \frac{(52.84) \times (0.13)}{0.2}$$

$$= 98.95 \text{ T/m}^2$$

2.0 SETTLEMENT CRITERIA (IS: 8009,Pt.I)

Average weighted N value at 5.0 m depth (below EGL) = 28.17, $w' = 0.50$

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of 1.0 Kg/cm² = 23.0 mm

Hence for 75mm permissible settlement, net API = $75 / 23.0 = 3.26086 \text{ Kg/cm}^2$
 $= 32.61 \text{ T/m}^2$

RECOMMENDATION:

LEAST FROM ABOVE VALUES OF NET SBC OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. **32.61 T/m²** FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.

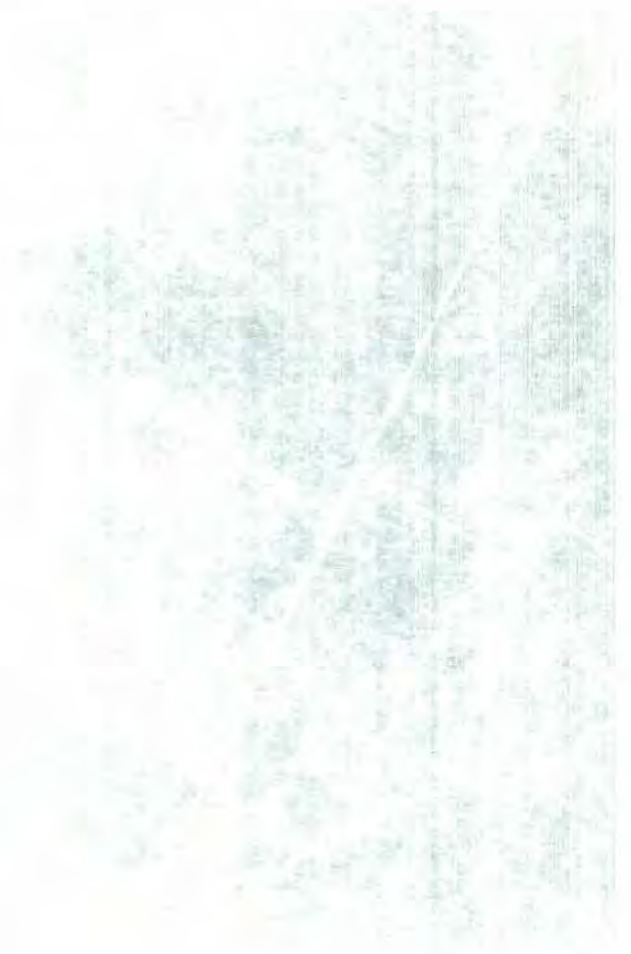
PHOTOGRAPHS

BH- 1 GHAZIPUR CITY



BH- 2 GHAZIPUR CITY







VISHWA BHUMI TECHNOLOGIES

PROJECT NO. 93

REPORT ON

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON
GANGA REJUVENATION PROJECT

SUBMITTED TO

NJS CONSULTANTS CO. LTD

1ST FLOOR, R.H. TOWER, THE MALL ROAD, CANTONMENT,
VARANASI

■ 011 – 43063950

☎ 9910466066

✉ info@vishwabhumi.com

3. Ramnagar STP

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**1.0 INTRODUCTION**

M/s NJS CONSULTANTS CO. LTD has planned Geotechnical Survey for preparatory survey on Ganga rejuvenation project in Varanasi, India.

M/s VISHWA BHUMI TECHNOLOGIES has carried out the geotechnical survey.

2.0 BRIEF DESCRIPTION OF GEOLOGY AND TYPE OF STRUCTURE

Ramnagar is a city and a municipal board in Varanasi district in the Indian state of Uttar Pradesh having Coordinates 25.28°N 83.03°E. Ramnagar has a fort known as Ramnagar Fort which is still the residence of King of Varanasi (Banaras).

Recently Ramnagar has emerged as a favorite spot for shooting movies because of the scenic location of the Ramnagar Fort near the Ganges. Chokher Bali is one of the popular movies shot here.

Soils found in the region are sandy and clayey in texture and consists of gravels or kankars.

3.0 SCOPE OF WORK

3.1 The scope of the geotechnical investigation work consisted of the following activities.

Carrying out the soil investigation by drilling two no. of 150 mm diameter boreholes of 20.0m depth below existing ground level or up to Refusal ('N' value > 100) whichever occurs earlier in all types of soil strata.

- At every 1.0m intervals standard penetration test shall be carried out in order to determine at load bearing capacity of different strata. If the N-value of 50 is encountered continues 5m, boring test can be stopped.
- Depth of each boring shall be 20 m or refusal. Refusal is defined as SPT value exceeding 100 blows for 30 cm penetration or 25 blows for 2.5 cm or less penetration.
- Collected samples are to be logged descriptively indicating the soil types and stratigraphic characteristics to evaluate the suitability for construction of the structure.
- The depth of water table shall be measured from the surface of the boreholes. The level of the water shall be measured and recorded daily.



4.0 EXECUTION OF FIELD WORK

4.1 Location of boreholes: The client gave the location of two boreholes. These were marked on the ground and all the field tests were conducted in the presence of site engineer of the client.

4.2 Methodology:

- a) Making of Boreholes: The bore holes of 150mm diameter were made by shell & auger method up to 20 m depth respectively. All the borings were carried out as per IS: 1892 - 1979. The boreholes were terminated on meeting the specified depth. Following field tests / samplings were carried out during the progress of the bore holes.
b) Standard Penetration Test (SPT): SPT are conducted as per IS 2131. For this a standard split spoon sampler is driven at the bottom of the hole. The penetration resistance in terms of blows for 150mm penetration of the split spoon sampler is measured. The blows are impacted by a standard weight of 63.5kg falling through a height of 750 mm. The resistance is measured for 150 mm, 300 mm and 450 mm. The resistance of first 150 mm is ignored and the resistance of next 300 mm is recorded as standard penetration value 'N'
c) Undisturbed Soil Samples (UDS): The Undisturbed soil samples are collected at regular interval of 3.0m depth. The work was carried out according to IS 2132. For this an open drive tube sampler is pushed / driven into the soil strata at the bottom of the bore hole in progress. The diameter of the sampler is 100 mm. The sampler with the undisturbed soil sample inside is gently withdrawn. The sampler is cleaned externally, properly sealed with wax at both ends, labeled and transported to the laboratory for conducting tests.
d) Disturbed Soil Sample (DS): Disturbed soil samples are collected generally from the split spoon samples of SPT test. The samples is extracted from the sampler, packed, labeled and transported to the laboratory for testing.
e) Summary of Boreholes

Table with 4 columns: Borehole No, Depth of overburden soil (m), Final depth (m), Water table depth Below EGL. (m). Rows for BH-1 and BH-2.

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT



Layer wise Properties of encountered subsoil strata

BH-1

Table with 3 columns: Depth (m) From, To, Properties. Rows for BH-1 from 0.0 to 20.0m depth.

BH-2

Table with 3 columns: Depth (m) From, To, Properties. Rows for BH-2 from 0.0 to 20.0m depth.

5.0 LABORATORY TESTING

The relevant laboratory tests were conducted on representative subsoil samples in our well equipped laboratory as per relevant IS codes mentioned above.

- a) Dry density/Bulk Density as per IS: 2720, pt-IX, 1992
b) Particle size analysis as per IS: 2720, pt-IV, 1985
c) Atterberg's limits as per IS: 2720, pt-V, 1985
d) Classification of soil as per IS: 1498, 1987
e) Specific gravity of soil as per IS: 2720, pt-III, 1997
f) Moisture content as per IS: 2720, pt-II, 1973

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT



6.0 FINDINGS OF THE GEOTECHNICAL INVESTIGATION

Site Stratification

(BH-1)

The subsoil stratum from 0.0 to 2.0m depth consists of Filledup, from 2.0 to 7.0m depth consists of Silty Sand classified as SM, from 7.0 to 7.5.0m depth consists of Sandy Silt classified as ML, from 7.5 to 10.0m depth consists of Fine Sand classified as SP-SM, from 10.0 to 11.0m depth consists of Sandy Silt with Clay classified as ML-CL and from 11.0 to 20.0m depth consists of Fine Sand classified as SP-SM.

(BH-2)

The subsoil stratum from 0.0 to 1.0m depth consists of Filledup, from 1.0 to 3.0m depth consists of Silty Sand classified as SM, from 3.0 to 6.0m depth consists of Sandy Silt classified as ML and from 6.0 to 20.0m depth consists of Fine Sand classified as SP-SM.

6.1 Ground Water: The ground water table was encountered at 16.5m in BH-1 and 15.0m in BH-2 upto the depth of exploration in the bore holes below existing ground level during boring activities at site.

7.0 PROPOSED FOUNDATIONS AND THEIR DEPTHS

Depending on the field and laboratory observations of subsoil strata, test results and the type of structures proposed at site, the types of foundations, depths and net safe bearing capacities recommended for design purposes are given in the following table. The net SBC/API in the following table are the lower of the values obtained from shear failure criterion as per IS: 6403 and settlement failure criterion as per IS 8009, Part-I. The permissible settlements are as below:-

- (a) Strip footings of width 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depth below existing ground surface.
(b) Isolated footings of size 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depths below existing ground surface.
(c) Raft footings of width 6.0m and above cast at 5.0 m, & 15.0 m depth below existing ground surface.



8.0 COMPUTATION OF SAFE /ALLOWABLE BEARING CAPACITY:

Shear and settlement failure criteria as per IS: 6403- 1981 , IS : 8009 (part-1) -1976 and IS: 1904-1986 have been considered to compute the safe allowable bearing capacity of underlying soil strata for isolated footings, Strip footings & Raft footings. The safe/allowable bearing capacity from both criteria is given as follows:

The net safe bearing capacity of sub-soil strata has been computed by considering Interpolated shear failure using the following equation for calculating the net ultimate bearing capacity:

Qns = 2/3 c.Nc . sc . dc . iq + q(Nc'-1).sq.dq.iq + 1/2 B .gamma .Ny' .sy.dy.iy.W'
.....for local shear

Qns = c.Nc . sc . dc . iq + q(Nc'-1).sq.dq.iq + 1/2 B .gamma .Ny' .sy.dy.iy.W'
.....for general shear

Qns = Local SBC + (General SBC - Local SBC) / (0.75 - 0.55) * N (0.75 - e0)
.....for interpolated SBC

The Factor of safety has been considered as 2.5

Shape factors have been taken as follows:-

sc = sq = s1 = 1.0 -for Strip footing

sc = 1.3, sq = 1.2, s1 = 0.8 -for Isolated footing

sc = sq = 1 - 0.2B/L = 1.2, s1 = 1 - 0.4 B/L = 0.6 -for Raft footing

Depth factors:

dc = dq = d1 = 1.0 for shallow foundations

Using the above equation and parameters, the following values of net safe bearing capacity have been computed:

(BH-1 & BH-2) Net Safe Bearing capacity (t/m²)



Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net Safe Bearing capacity (t/m ²)	
			BH-1	BH-2
5.0	Strip footings	2.0	16.62	21.49
		3.0	17.37	22.54
		4.0	18.11	23.58
	Isolated footings	2.0 x 2.0	19.35	24.96
		3.0 x 3.0	19.95	25.79
		4.0 x 4.0	20.55	26.63
	Raft footings	≥6.0	20.84	27.05
15.0	Strip footings	2.0	276.21	242.51
		3.0	282.44	247.85
		4.0	288.67	253.18
	Isolated footings	2.0 x 2.0	326.47	286.75
		3.0 x 3.0	331.45	291.02
		4.0 x 4.0	336.43	295.28
	Raft footings	≥6.0	184.34	172.41

**8.1 SETTLEMENT FAILURE CRITERION:**

The settlement of sandy layers below the foundation level and up to the zone of Influence are computed by using the chart of settlement V/s SPT 'N' given on page 17 of IS 8009.

For Isolated footings, Strip footings & Raft footing the zone of influence below the foundation depth is considered as 2.0B, where B is the width of foundation

The total permissible settlement for Strip footing = 60mm

The total permissible settlement for isolated footing = 50mm

The total permissible settlement for raft footing = 75mm:

The layer wise properties of the sub soil strata are as follows:

The depth wise SPT values of the subsoil strata (observed/corrected) are as below: -

**BH-1**

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	5	8.09	1.58
2.0	7	9.71	1.58
3.0	9	11.26	1.58
4.0	11	12.71	1.58
5.0	13	14.05	1.58
6.0	18	18.35	1.58
7.0	19	18.33	1.69
8.0	23	21.10	1.70
9.0	27	23.65	1.70
10.0	31	25.97	1.76
11.0	36	28.86	1.86
12.0	36	27.69	1.86
13.0	40	29.58	1.86
14.0	44	31.34	1.86
15.0	50	34.35	1.86
16.0	55	36.50	1.86
17.0	50	23.83	0.86
18.0	52	24.23	0.86
19.0	56	25.24	0.86
20.0	60	26.23	0.86

**GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA
REJUVENATION PROJECT**

**BH-2**

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	4.0	6.53	1.52
2.0	7.0	9.80	1.52
3.0	11.0	13.80	1.66
4.0	15.0	17.30	1.66
5.0	16.0	17.21	1.66
6.0	14.0	14.09	1.84
7.0	16.0	15.19	1.84
8.0	18.0	16.21	1.84
9.0	16.0	13.73	1.84
10.0	19.0	15.58	1.84
11.0	22.0	17.29	1.84
12.0	28.0	21.15	1.84
13.0	33.0	23.99	1.84
14.0	37.0	25.94	1.84
15.0	44.0	22.68	0.84
16.0	45.0	22.78	0.84
17.0	48.0	23.54	0.84
18.0	52.0	24.61	0.84
19.0	55.0	25.33	0.84
20.0	59.0	26.34	0.84

The values of allowable pressure intensities computed based on the above selected soil parameters are shown below :-

**GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA
REJUVENATION PROJECT**



(BH-1 & BH-2) (Allowable pressure intensity (t/m²))

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Allowable pressure intensity (t/m ²)	
			BH-1	BH-2
5.0	Strip footings	2.0	20.98	16.30
		3.0	21.43	15.71
		4.0	22.90	17.54
	Isolated footings	2.0 x 2.0	17.48	13.59
		3.0 x 3.0	17.85	13.09
		4.0 x 4.0	19.08	14.62
15.0	Strip footings	≥6.0	25.34	23.29
		2.0	31.57	24.79
		3.0	29.7	25.21
	Isolated footings	4.0	28.85	25.42
		2.0 x 2.0	26.32	20.33
		3.0 x 3.0	24.75	21.01
	Raft footings	4.0 x 4.0	24.04	21.19
		≥6.0	33.63	31.65



9.0 CONCLUSION WITH RECOMMENDATIONS:

On the basis of above Soil investigation the following recommendations are suggested:

9.1. The sub-soil strata met at this site consists of layers of Fine sand, Silty Sand and Medium Coarse Fine sand.

The subsoil strata are loose to medium dense.

9.2. On the basis of field & laboratory test results, the following values of the net safe bearing capacity for Strip, Isolated & Raft footings are to be considered .



(BH-1 & BH-2) (NET SAFE BEARING CAPACITY/ ALLOWABLE PRESSURE INTENSITY T/M2)

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net safe bearing capacity/ allowable pressure intensity t/m ²	
			BH-1	BH-2
5.0	Strip footings	2.0	16.62	16.30
		3.0	17.37	15.71
		4.0	18.11	17.54
	Isolated footings	2.0 x 2.0	17.48	13.59
		3.0 x 3.0	17.85	13.09
		4.0 x 4.0	19.08	14.62
	Raft footings	≥6.0	20.84	23.29
15.0	Strip footings	2.0	31.57	24.79
		3.0	29.70	25.21
		4.0	28.85	25.42
	Isolated footings	2.0 x 2.0	26.32	20.33
		3.0 x 3.0	24.75	21.01
		4.0 x 4.0	24.04	21.19
	Raft footings	≥6.0	33.63	31.65



10. CLOSURE

We appreciate the opportunity given to us to submit this report. This presented report is based on observations and tests on samples collected from the boreholes as decided by the client. In case any difference is noticed in the field subsoil strata and reported subsoil strata during excavation please contact us before proceeding with further construction.

For VISHWA BHUMI TECHNOLOGIES

(DINESH BHARDWAJ)



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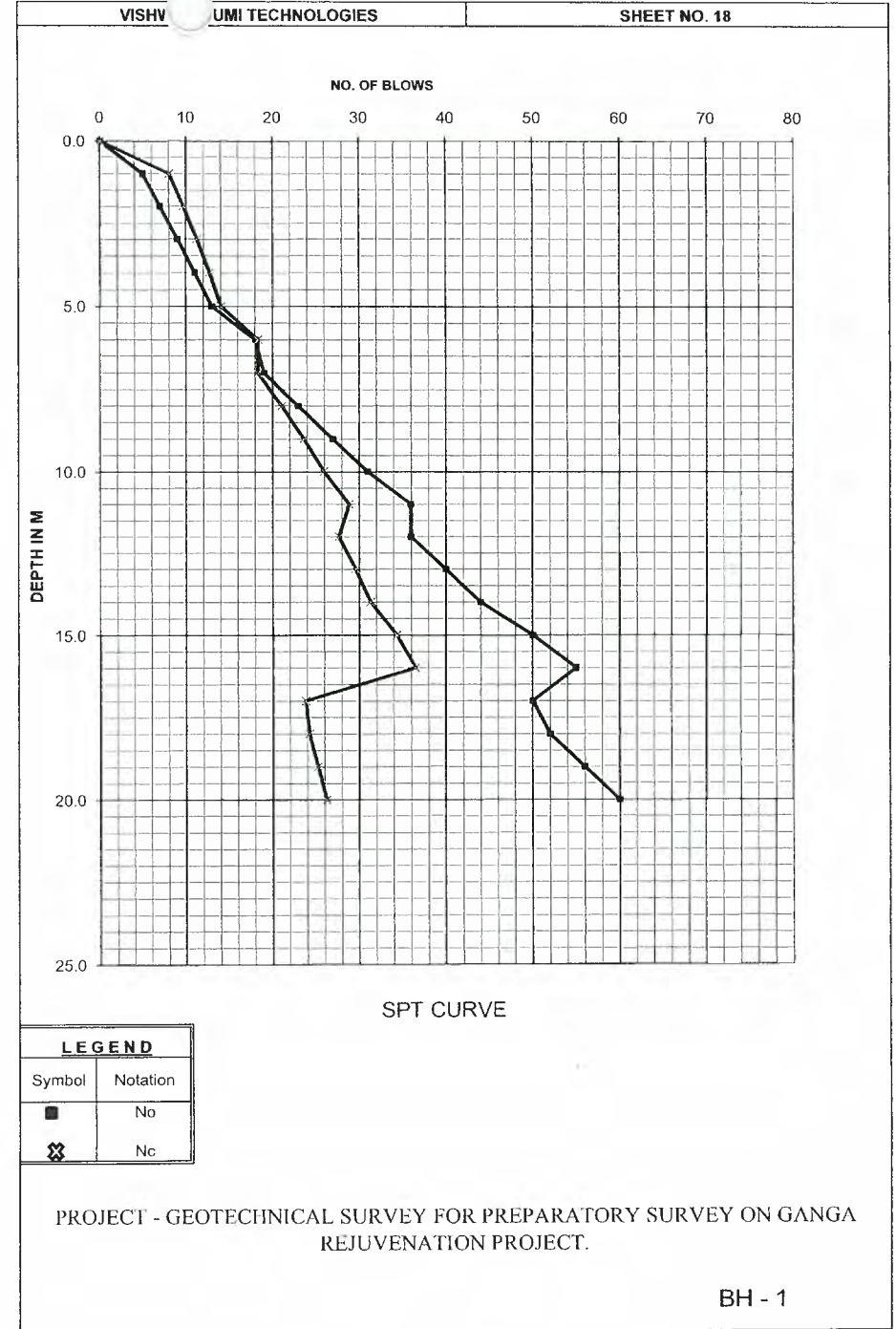
7.0 SITE LOCATION PLAN

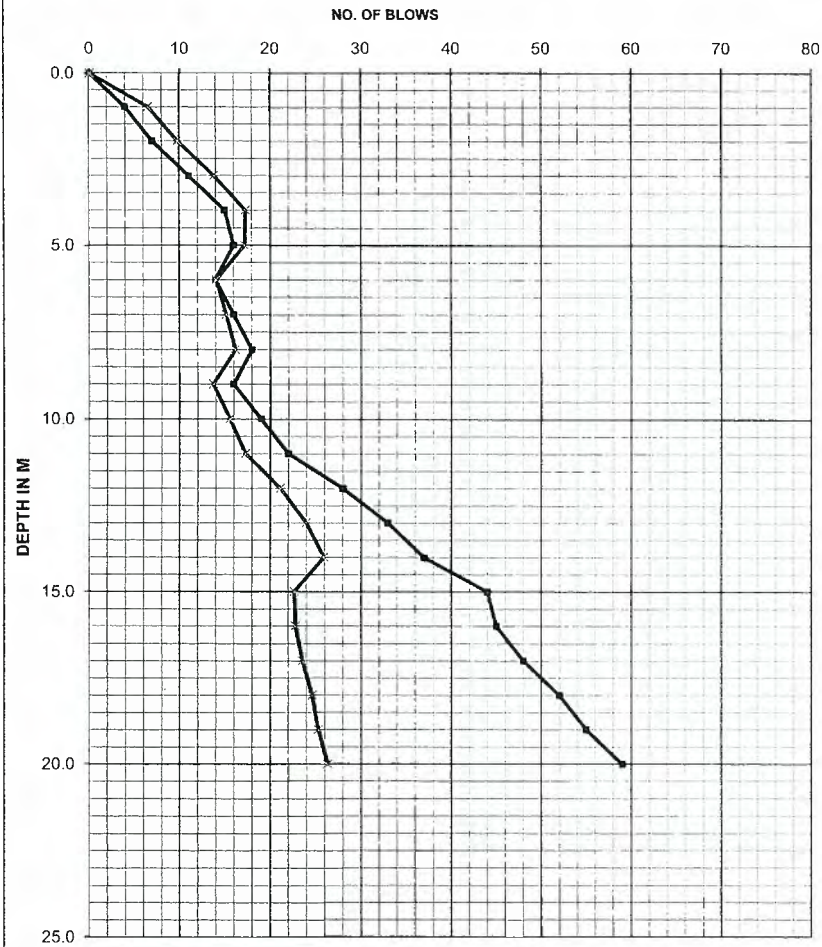
27-28

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT

N	DEPTH VALUES (M)	SAMPLE	DESCRIPTION OF SOIL	IS CLASSIFICATION	PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.										Sheet No- 16			
					BR - 1					TERMINAL DEPTH (m)					WATER TABLE		16.50m	
					GRAIN SIZE ANALYSIS					BORING DATE					TEST TYPE		16.50m	
					GRAVEL	SAND	SILT	CLAY	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRY/BULK DENSITY	MOISTURE CONTENT	COHESION	INTERCEPT	ANGLE OF INTERNAL FRICTION	SPECIFIC GRAVITY	
%	%	%	%	%	%	%	gm/cc	%	kg/cm ²	deg.								
	0.5	DS-1																
5	1.0	SPT-1																
7	2.0	SPT-2																
9	3.0	SPT-3																
11	4.0	SPT-4																
	4.5	UDS-2	Silty Sand	SM	0	67	33	0	N	P		1.51 / 1.58	4.63	0	DST	27.0	2.64	
13	5.0	SPT-5																
18	6.0	SPT-6																
19	7.0	SPT-7	Sandy Silt	ML	0	55	40	5	19	16	3	1.59* / 1.69*	6.19*	0*	DST*	27.5*	2.63*	
	7.5	UDS-3		SFSM	0	86	14	0	N	P		1.61 / 1.70	5.72	0	DST	28.5	2.65	
23	8.0	SPT-8	Fine Sand	SFSM	0	89	11	0										
27	9.0	SPT-9		SFSM	0	89	11	0										
31	10.0	SPT-10	Sandy Silt with Clay	ML-CL	0	38	54	8	24	19	5	1.65* / 1.76*	7.31*	0.4*	UUT*	13*	2.67*	
	10.5	UDS-4																
36	11.0	SPT-11		SFSM	0	89	11	0										

33	13.0	SPT-13	Fine Sand								SPSM	0	90	10	0												
		13.5	UDSS																								
37	14.0	SPT-14	Fine Sand								SPSM	0	87	13	0	N	P			1.68*/1.84*	9.29*	DST**	0*	32.0*	2.66*		
44	15.0	SPT-15	Fine Sand								SPSM	0	89	11	0												
45	16.0	SPT-16	Fine Sand																								
48	17.0	SPT-17	Fine Sand																								
52	18.0	SPT-18	Fine Sand								SPSM	0	89	11	0												
55	19.0	SPT-19	Fine Sand																								
59	20.0	SPT-20	Fine Sand								SPSM	2	88	10	0												





SPT CURVE

LEGEND	
Symbol	Notation
■	No
⊗	Nc

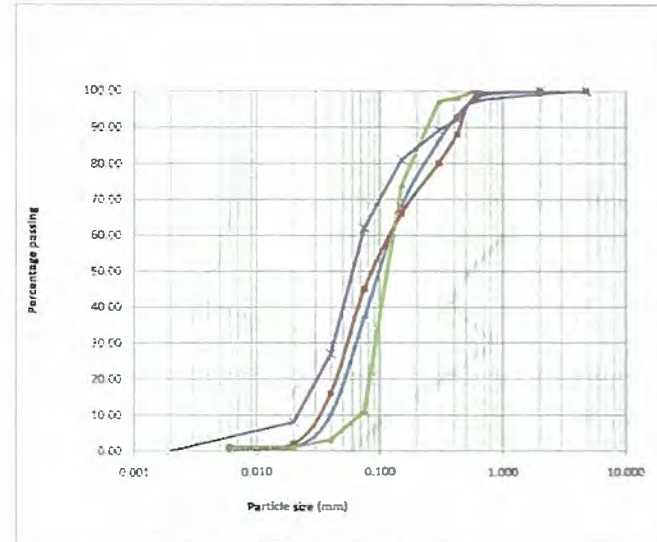
PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2

GRAIN SIZE ANALYSIS

PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 1

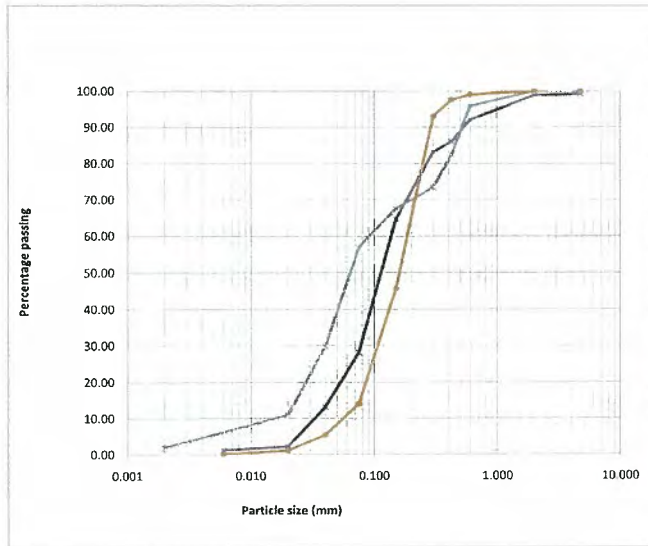


Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
— (Blue)	Silty Sand (SM)	2.00	0	62	37	0
— (Red)	Sandy Silt (ML)	7.00	0	55	40	5
— (Green)	Fine Sand (SP - SM)	9.00	0	89	11	0
— (Black)	Sandy Silt with Clay (ML-CL)	10.00	0	42	54	5

GRAIN SIZE ANALYSIS

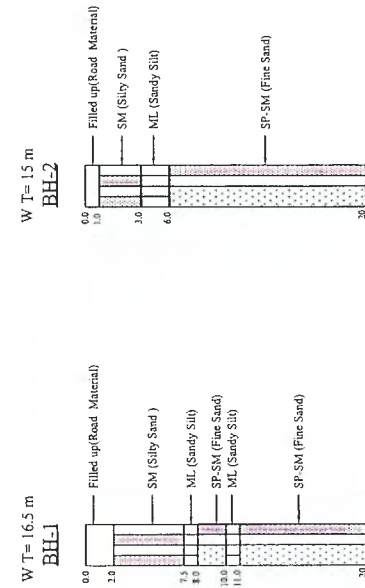
PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2



Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
—	Silty Sand (SM)	1.00	0	71	29	0
—	Silty Sand with Clay (ML)	4.00	0	43	55	2
—	Fine Sand (SP/SM)	8.00	0	86	14	0

Location - Ramnagar



SUB SOIL PROFILE



(BH-1)

LOCATION:-RAMNAGAR

SAMPLE CALCULATION

Type of Foundation – Raft footing
Depth of Foundation –5.0m below EGL
Size of Foundation– 6.0mx6.0m (B=6.0 m)
Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, c = 0kg/cm²

Angle of Shear Resistance, φ = 27.0°

Effective Density

γ = 1.58 gm/cc for 2.00 to 7.00m depth below EGL

Water correction factor w' = 0.50

Overburden pressure q = 500x0.00158 = 0.790 kg/cm²

d_c = d_q = d_γ = 1.00

i_c = i_q = i_γ = 1

S_c = 1.2 S_q = 1.2 [1 + 0.2xB/L] = 1.2, S_γ = 1 - 0.4xB/L = 0.6 for raft footing

Factor of Safety = 2.5

For Local Shear

N_c = 13.88, N_q = 5.79, N_γ = 4.71

Q_ns = [2/3 cN_c.S_c.d_c.i_c + q(N_q - 1).s_q.d_q.i_q + 0.5 γ_eff.B.N_γ.S_γ.d_γ.i_γ.w'] / 2.5

= [2/3x0x13.88x1.2x1.0+0.790x(5.79-1)x1.2x1.0x1.0+0.5x0.00158x600x4.71x0.6x1.0x1.0x0.50]/2.5

= [0+4.54+0.669762]/2.5

= 2.08390 Kg/cm² = 20.84 T/m²

2.0 SETTLEMENT CRITERIA (IS: 8009,Pt.I)

Average weighted N value at 3.0 m depth (below EGL) = 26.63, w' = 0.50

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of 1.0 Kg/cm2 = 24.40 mm

Hence for 75mm permissible settlement, net API = 75 / 24.40 = 3.07377 Kg/cm² = 30.74 T/m²

RECOMMENDATION:

LEAST FROM ABOVE VALUES OF NET STRESS COEFFICIENT OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. 20.84 T/m² FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.



(BH-2)

LOCATION:-RAMNAGAR

SAMPLE CALCULATION

Type of Foundation – Raft footing
Depth of Foundation –5.0m below EGL
Size of Foundation– 6.0mx6.0m (B=6.0 m)
Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, c = 0kg/cm²

Angle of Shear Resistance, φ = 27.0°

Effective Density

γ = 1.58 gm/cc for 3.00 to 6.00m depth below EGL

Water correction factor w' = 0.50

Overburden pressure q = 500x0.00152 = 0.760 kg/cm²

d_c = d_q = d_γ = 1.00

i_c = i_q = i_γ = 1

S_c = 1.2 S_q = 1.2 [1 + 0.2xB/L] = 1.2, S_γ = 1 - 0.4xB/L = 0.6 for raft footing

Factor of Safety = 2.5

For Local Shear

N_c = 13.88, N_q = 5.79, N_γ = 4.71

Q_ns = [2/3 cN_c.S_c.d_c.i_c + q(N_q - 1).s_q.d_q.i_q + 0.5 γ_eff.B.N_γ.S_γ.d_γ.i_γ.w'] / 2.5

= [2/3x0x13.88x1.2x1.0+0.760x(5.79-1)x1.2x1.0x1.0+0.5x0.00152x600x4.71x0.6x1.0x1.0x0.50]/2.5

= [0+4.37+0.644]/2.5

= 2.0050 Kg/cm² = 20.05 T/m²

For General Shear

N_c = 24.09, N_q = 13.76, N_γ = 15.49

Q_ns = [cN_c.S_c.d_c.i_c + q(N_q - 1).s_q.d_q.i_q + 0.5 γ_eff.B.N_γ.S_γ.d_γ.i_γ.w'] / 2.5

= [0x24.09x1.2x1.0+0.760x(13.76-1)x1.2x1.0x1.0+0.5x0.00152x600x15.49x0.6x1.0x1.0x0.50]/2.5

= [0+11.6371+2.1190]/2.5

= 5.50244 Kg/cm² = 55.02 T/m²

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

$$\text{Interpolated SBC} = \text{Local SBS} + \frac{(\text{General SBC} - \text{Local SBC}) \times (0.75 - e_0)}{(0.75 - 0.55)}$$

$$= 20.05 + \frac{(55.02 - 20.05) \times (0.04)}{0.2}$$

$$= 20.05 + \frac{(55.02 - 20.05) \times (0.04)}{0.2}$$

$$= 27.05 \text{ T/m}^2$$

2.0 SETTLEMENT CRITERIA (IS: 8009, Pt.1)

Average weighted N value at 3.0 m depth (below EGL) = 19.35, $w' = 0.50$

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of 1.0 Kg/cm² = 32.2 mm

Hence for 75mm permissible settlement, net API = $75 / 32.2 = 2.329192 \text{ Kg/cm}^2$
 $= 23.29 \text{ T/m}^2$

RECOMMENDATION:

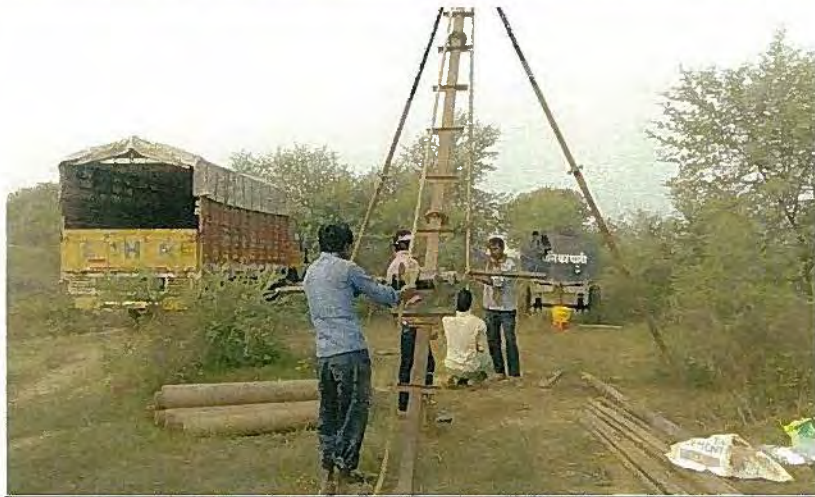
LEAST FROM ABOVE VALUES OF NET SBC OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. **23.29 T/m²** FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.

SITE PHOTOGRAPHS

BH- 1 RAMNAGAR



BH- 2 RAMNAGAR



BOREHOLE DESIGNATION	ACTUAL TEST LOCATION COORDINATES
BH-1	LAITUDE
	LONGITUDE





VISHWA BHUMI TECHNOLOGIES

PROJECT NO. 93

REPORT ON

**GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON
GANGA REJUVENATION PROJECT**

SUBMITTED TO

NJS CONSULTANTS CO. LTD

**1ST FLOOR, R.H. TOWER, THE MALL ROAD, CANTONMENT,
VARANASI**

■ 011 – 43063950

📞 9910466066

✉ info@vishwabhumi.com

4. Chunar STP



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1.0 INTRODUCTION

M/s NJS CONSULTANTS CO. LTD has planned Geotechnical Survey for preparatory survey on Ganga rejuvenation project in Varanasi, India.

M/s VISHWA BHUMI TECHNOLOGIES has carried out the geotechnical survey.

2.0 BRIEF DESCRIPTION OF GEOLOGY AND TYPE OF STRUCTURE

Chunar, located in Mirzapur District of Uttar Pradesh state, India, is an ancient town. The town of Chunar is situated on the south side of the Ganges about 17 miles in a straight direction south – west from Banaras having Co - ordinates 25.13°N 82.9°E. It is connected to Varanasi, the ancient and pilgrimage city also well known as Kashi or Benaras, by roads and rails. Chunar is well known for its pottery work, especially clay toys.

3.0 SCOPE OF WORK

3.1 The scope of the geotechnical investigation work consisted of the following activities.

Carrying out the soil investigation by drilling two no. of 150 mm diameter boreholes of 20.0m depth below existing ground level or up to Refusal ('N' value > 100) whichever occurs earlier in all types of soil strata.

- a) At every 1.0m intervals standard penetration test shall be carried out in order to determine at load bearing capacity of different strata. If the N-value of 50 is encountered continues 5m, boring test can be stopped.
- b) Depth of each boring shall be 20 m or refusal. Refusal is defined as SPT value exceeding 100 blows for 30 cm penetration or 25 blows for 2.5 cm or less penetration.
- c) Collected samples are to be logged descriptively indicating the soil types and stratigraphic characteristics to evaluate the suitability for construction of the structure.
- d) The depth of water table shall be measured from the surface of the boreholes. The level of the water shall be measured and recorded daily.



4.0 EXECUTION OF FIELD WORK

4.1 Location of boreholes: The client gave the location of two boreholes. These were marked on the ground and all the field tests were conducted in the presence of site engineer of the client.

4.2 Methodology:

- a) **Making of Boreholes:** The bore holes of 150mm diameter were made by shell & auger method up to 20 m depth respectively. All the borings were carried out as per IS: 1892 - 1979. The boreholes were terminated on meeting the specified depth. Following field tests / samplings were carried out during the progress of the bore holes.
- b) **Standard Penetration Test (SPT):** SPT are conducted as per IS 2131. For this a standard split spoon sampler is driven at the bottom of the hole. The penetration resistance in terms of blows for 150mm penetration of the split spoon sampler is measured. The blows are impacted by a standard weight of 63.5kg falling through a height of 750 mm. The resistance is measured for 150 mm, 300 mm and 450 mm. The resistance of first 150 mm is ignored and the resistance of next 300 mm is recorded as standard penetration value 'N'
- c) **Undisturbed Soil Samples (UDS):** The Undisturbed soil samples are collected at regular interval of 3.0m depth. The work was carried out according to IS 2132. For this an open drive tube sampler is pushed / driven into the soil strata at the bottom of the bore hole in progress. The diameter of the sampler is 100 mm. The sampler with the undisturbed soil sample inside is gently withdrawn. The sampler is cleaned externally, properly sealed with wax at both ends, labeled and transported to the laboratory for conducting tests.
- d) **Disturbed Soil Sample (DS):** Disturbed soil samples are collected generally from the split spoon samples of SPT test. The samples is extracted from the sampler, packed, labeled and transported to the laboratory for testing
- e) **Summary of Boreholes**

Borehole No	Depth of overburden soil (m)	Final depth (m)	Water table depth Below EGL. (m)
(BH-1)	20.0	20.0	13.80
(BH-2)	20.0	20.0	14.00



Layer wise Properties of encountered subsoil strata

BH-1

Depth (m)		Properties
From	To	
0.0	1.0	Filledup
1.0	4.5	$\gamma_{eff} = 1.53 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 26.5^\circ$
4.5	13	$\gamma_{eff} = 1.64 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 28.0^\circ$
13	13.8	$\gamma_{eff} = 1.90 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 34.0^\circ$
13.8	20	$\gamma_{eff} = 0.90 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 34.0^\circ$

BH-2

Depth (m)		Properties
From	To	
0.0	1.0	Filledup
1.0	5.0	$\gamma_{eff} = 1.55 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 27.5^\circ$
5.0	13.0	$\gamma_{eff} = 1.64 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 29.0^\circ$
13.0	14.0	$\gamma_{eff} = 1.92 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 32.5^\circ$
14.0	20.0	$\gamma_{eff} = 0.92 \text{ gm/cc}, C = 0.0 \text{ kg/cm}^2, \Phi = 32.5^\circ$

5.0 LABORATORY TESTING

The relevant laboratory tests were conducted on representative subsoil samples in our well equipped laboratory as per relevant IS codes mentioned above.

- a) Dry density/Bulk Density as per IS: 2720, pt-IX, 1992
- b) Particle size analysis as per IS: 2720, pt-IV, 1985
- c) Atterberg's limits as per IS: 2720, pt-V, 1985
- d) Classification of soil as per IS: 1498, 1987
- e) Specific gravity of soil as per IS: 2720, pt-III, 1997
- f) Moisture content as per IS: 2720, pt-II, 1973



6.0 FINDINGS OF THE GEOTECHNICAL INVESTIGATION

Site Stratification

(BH-1)

The subsoil stratum from 0.0 to 1.0 m depth consists of Filled up, from 1.0 to 4.5 m depth consists of Silty Sand classified as SM, from 4.5 to 13.0 m depth consists of Sandy Silt classified as ML, from 13.0 to 20.0m depth consists of Fine Sand classified as SP-SM.

(BH-2)

The subsoil stratum from 0.0 to 1.0m depth consists of Filled up, from 1.0 to 5.0m depth consists of Silty Sand classified as SM, from 5.0 to 13.0m depth consists of Sandy Silt classified as ML and from 13.0 to 20.0m depth consists of Fine Sand classified as SP-SM.

6.1 Ground Water: The ground water table was encountered at 13.8m in BH-1 and 14.0m in BH-2 upto the depth of exploration in the bore holes below existing ground level during boring activities at site.

7.0 PROPOSED FOUNDATIONS AND THEIR DEPTHS

Depending on the field and laboratory observations of subsoil strata, test results and the type of structures proposed at site, the types of foundations, depths and net safe bearing capacities recommended for design purposes are given in the following table. The net SBC/API in the following table are the lower of the values obtained from shear failure criterion as per IS: 6403 and settlement failure criterion as per IS 8009, Part-I. The permissible settlements are as below:-

- (a) Strip footings of width 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depth below existing ground surface.
(b) Isolated footings of size 2.0, 3.0 & 4.0m cast at 5.0 & 15.0m depths below existing ground surface.
(c) Raft footings of width 6.0m and above cast at 5.0 m, & 15.0 m depth below existing ground surface.



8.0 COMPUTATION OF SAFE /ALLOWABLE BEARING CAPACITY:

Shear and settlement failure criteria as per IS: 6403- 1981 , IS : 8009 (part-1) -1976 and IS: 1904-1986 have been considered to compute the safe allowable bearing capacity of underlying soil strata for isolated footings, Strip footings & Raft footings. The safe/allowable bearing capacity from both criteria is given as follows:

The net safe bearing capacity of sub-soil strata has been computed by considering Interpolated shear failure using the following equation for calculating the net ultimate bearing capacity :

Q_u = 2/3 c.N_c s_c d_c i_c + q(N_q - 1).s_q.d_q.i_q + 1/2 B .gamma .N_gamma .s_gamma.d_gamma.i_gamma.W'
.....for local shear

Q_u = c.N_c s_c d_c i_c + q(N_q - 1).s_q.d_q.i_q + 1/2 B .gamma .N_gamma .s_gamma.d_gamma.i_gamma.W'
.....for general shear

Q_ns = Local SBC - (General SBC - Local SBC) X (0.75 - e0) / (0.75 - 0.55)
.....for interpolated SBC

The Factor of safety has been considered as 2.5

Shape factors have been taken as follows:-

- s_c = s_q = s_gamma = 1.0 -for Strip footing
s_c = 1.3, s_q = 1.2, s_gamma = 0.8 -for Isolated footing
s_c = s_q = 1 + 0.2B/L = 1.2, s_gamma = 1 + 0.4 B/L = 0.6 -for Raft footing

Depth factors:

d_c = d_q = d_gamma = 1.0 for shallow foundations

Using the above equation and parameters, the following values of net safe bearing capacity have been computed:



(BH-1 & BH-2) Net Safe Bearing capacity (t/m²)

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net Safe Bearing capacity (t/m ²)		
			BH-1	BH-2	
5.0	Strip footings	2.0	19.26	20.32	
		3.0	20.10	21.25	
		4.0	20.94	22.18	
	Isolated footings	2.0 x 2.0	22.44	23.64	
		3.0 x 3.0	23.11	24.39	
		4.0 x 4.0	23.78	25.13	
	Raft footings	≥6.0	24.12	25.50	
	15.0	Strip footings	2.0	314.93	272.81
			3.0	318.49	275.80
4.0			322.06	278.80	
Isolated footings		2.0 x 2.0	375.06	324.97	
		3.0 x 3.0	377.91	327.37	
		4.0 x 4.0	380.77	329.77	
Raft footings		≥6.0	377.28	330.96	



8.1 SETTLEMENT FAILURE CRITERION:

The settlement of sandy layers below the foundation level and up to the zone of Influence are computed by using the chart of settlement V/s SPT 'N' given on page 17 of IS 8009.

For Isolated footings, Strip footings & Raft footing the zone of influence below the foundation depth is considered as 2.0B, where B is the width of foundation

The total permissible settlement for Strip footing = 60mm

The total permissible settlement for isolated footing = 50mm

The total permissible settlement for raft footing = 75mm:

The layer wise properties of the sub soil strata are as follows:

The depth wise SPT values of the subsoil strata (observed/corrected) are as below: -

**BH-1**

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	5.0	8.15	1.53
2.0	7.0	9.78	1.53
3.0	9.0	11.36	1.53
4.0	11.0	12.83	1.53
5.0	10.0	10.87	1.64
6.0	9.0	9.20	1.64
7.0	12.0	11.62	1.64
8.0	13.0	11.99	1.64
9.0	15.0	13.23	1.64
10.0	19.0	16.06	1.64
11.0	28.0	22.76	1.64
12.0	36.0	28.19	1.64
13.0	45.0	24.77	0.90
14.0	49.0	25.95	0.90
15.0	52.0	26.72	0.90
16.0	48.0	24.91	0.90
17.0	52.0	26.03	0.90
18.0	57.0	27.46	0.90
19.0	61.0	28.49	0.90
20.0	64.0	29.15	0.90

**BH-2**

Depth below existing ground level (m)	SPT Values Observed	SPT Values Corrected	Effective Density (gm/cc)
1.0	5.0	8.13	1.55
2.0	7.0	9.75	1.55
3.0	6.0	7.55	1.55
4.0	11.0	12.78	1.55
5.0	9.0	9.75	1.64
6.0	11.0	11.22	1.64
7.0	13.0	12.56	1.64
8.0	16.0	14.72	1.64
9.0	18.0	15.84	1.64
10.0	20.0	16.88	1.64
11.0	23.0	18.66	1.64
12.0	32.0	25.01	1.64
13.0	48.0	35.99	1.92
14.0	42.0	22.95	0.92
15.0	46.0	24.11	0.92
16.0	51.0	25.58	0.92
17.0	51.0	25.26	0.92
18.0	58.0	27.35	0.92
19.0	63.0	28.69	0.92
20.0	61.0	27.67	0.92

The values of allowable pressure intensities computed based on the above selected soil parameters are shown below :-



(BH-1 & BH-2) (Allowable pressure intensity (t/m²))

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Allowable pressure intensity (t/m ²)		
			BH-1	BH-2	
5.0	Strip footings	2.0	14.63	14.02	
		3.0	15.00	14.78	
		4.0	15.78	17.39	
	Isolated footings	2.0 x 2.0	12.20	11.68	
		3.0 x 3.0	12.50	12.32	
		4.0 x 4.0	13.16	14.49	
15.0	Raft footings	≥6.0	22.72	23.73	
		Strip footings	2.0	31.57	30.93
			3.0	30.61	29.70
4.0	28.57		29.27		
	Isolated footings	2.0 x 2.0	26.32	25.77	
		3.0 x 3.0	25.51	24.75	
		4.0 x 4.0	23.81	24.39	
	Raft footings	≥6.0	30.00	30.99	



9.0 CONCLUSION WITH RECOMMENDATIONS:

On the basis of above Soil investigation the following recommendations are suggested:

9.1. The sub-soil strata met at this site consists of layers of Fine sand, Silty Sand and Medium Coarse Fine sand.

The subsoil strata are loose to medium dense.

9.2. On the basis of field & laboratory test results, the following values of the net safe bearing capacity for Strip, Isolated & Raft footings are to be considered .



(BH-1 & BH-2) (NET SAFE BEARING CAPACITY/ ALLOWABLE PRESSURE INTENSITY T/M2)

Depth of foundation Below existing ground Surface/ depth Below (m)	Type of Foundation	Size / Width of foundation (m)	Net safe bearing capacity/ allowable pressure intensity t/m ²	
			BH-1	BH-2
5.0	Strip footings	2.0	14.63	14.02
		3.0	15.00	14.78
		4.0	15.78	17.39
	Isolated footings	2.0 x 2.0	12.20	11.68
		3.0 x 3.0	12.50	12.32
		4.0 x 4.0	13.16	14.49
	Raft footings	≥6.0	22.72	23.73
15.0	Strip footings	2.0	31.57	30.93
		3.0	30.61	29.70
		4.0	28.57	29.27
	Isolated footings	2.0 x 2.0	26.32	25.77
		3.0 x 3.0	25.51	24.75
		4.0 x 4.0	23.81	24.39
	Raft footings	≥6.0	30.00	30.99



10. CLOSURE

We appreciate the opportunity given to us to submit this report. This presented report is based on observations and tests on samples collected from the boreholes as decided by the client. In case any difference is noticed in the field subsoil strata and reported subsoil strata during excavation please contact us before proceeding with further construction.

For VISHWA BHUMI TECHNOLOGIES

(DINESH BHARDWAJ)



TABLE INDEX

2.0 BORE LOG TABLES	PAGE NO. 16 - 17
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FIGURE INDEX

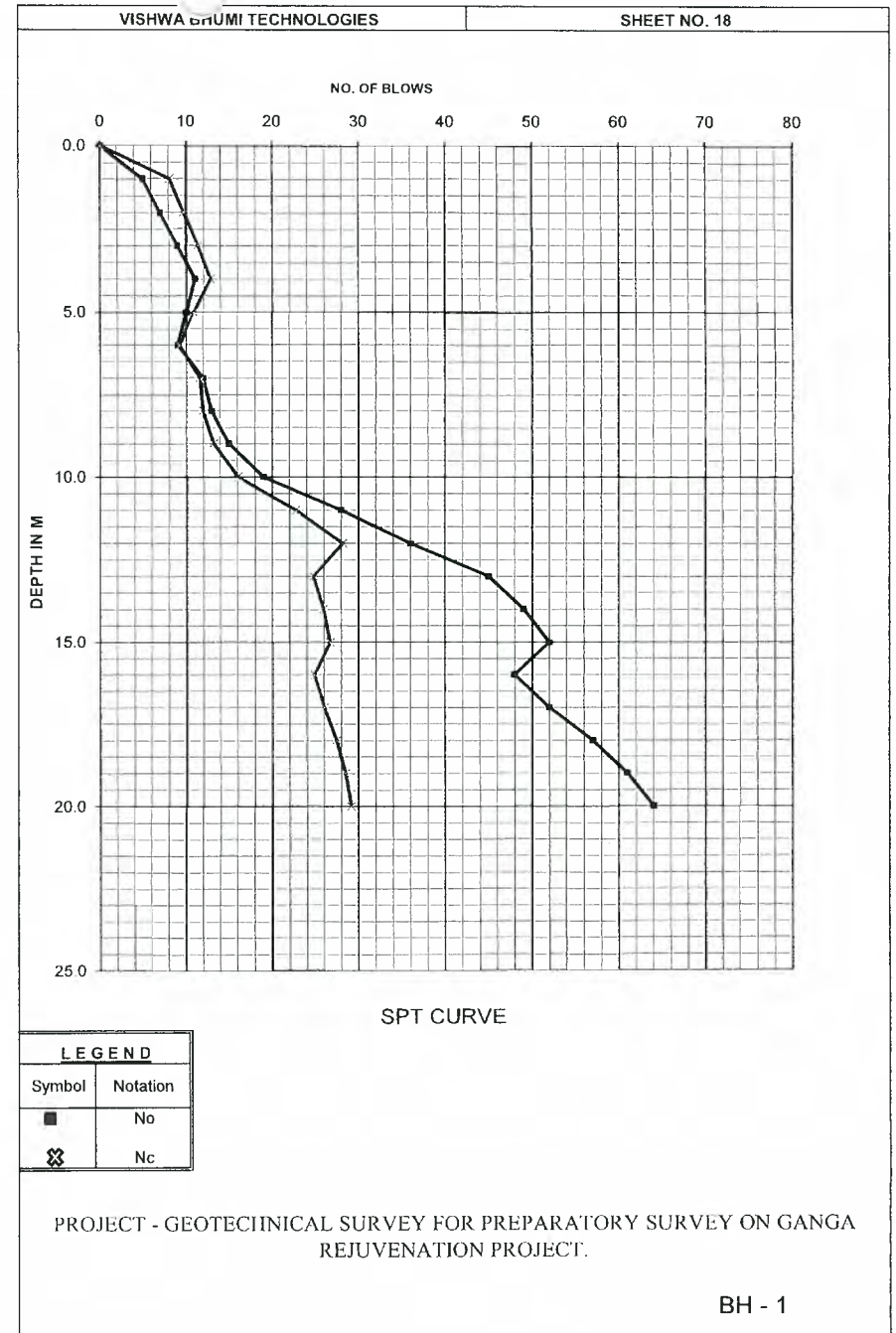
1.0 SPT CURVES	18-19
2.0 GRAIN SIZE ANALYSIS	20-21
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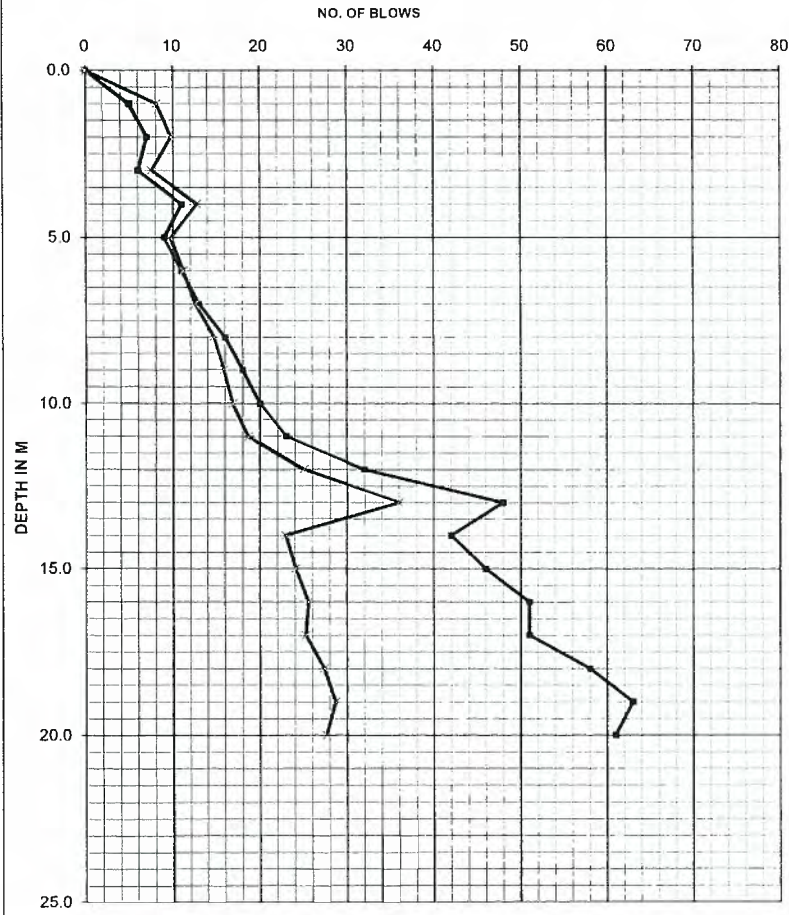
GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT

N VALUES	DEPTH (M)	SAMPLE	DESCRIPTION OF SOIL	IS CLASSIFICATION	PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.										WATER TABLE 13.80m	Sheet No- 16		
					BH -1 (CHUNAB)				BORING DATE 16/11/2015 to 17/11/2015				TERMINAL DEPTH (m) 20.00				SHEAR PARAMETER	
					GRAVEL	SAND	SILT	CLAY	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	DRYBULK DENSITY	MOISTURE CONTENT	TEST TYPE			COHESION INTERCEPT (c)	ANGLE OF INTERNAL FRICTION (φ)
%	%	%	%	%	%	%	gm/cc	%	%	kg/cm ²	deg.							
	0.5	DS-1																
5	1.0	SPT-1		SM	0	79	21	0										
	1.5	UFS-1		SM	0	72	28	0	N	P		1.45/1.53	5.30		DST	0	26.5	2.63
7	2.0	SFT-2	Silty Sand															
9	3.0	SPT-3		SM	0	75	25	0										
11	4.0	SPT-4																
	4.5	UDS-2		ML	0	46	52	2	22	19	3	1.50/1.64	9.11		DST	0	28.0	2.67
10	5.0	SPT-5																
9	6.0	SPT-6																
12	7.0	SPT-7		ML	0	39	56	5										
13	8.0	SPT-8	Sandy Silt															
15	9.0	SPT-9																
19	10.0	SPT-10		ML	0	42	55	3										
28	11.0	SPT-11																
36	12.0	SPT-12		ML	0	40	56	4										

42	14.0	SPT-14	Fine Sand										SPSM	0	91	9	0	N	P		1.69*1.92*	13.48*	DST*	0*	32.5*	2.65*	
46	15.0	SPT-15																									
51	16.0	SPT-16																									
51	17.0	SPT-17											SPSM	0	89	11	0										
58	18.0	SPT-18																									
63	19.0	SPT-19																									
61	20.0	SPT-20											SPSM	0	92	8	0										

*Remoulded Sample



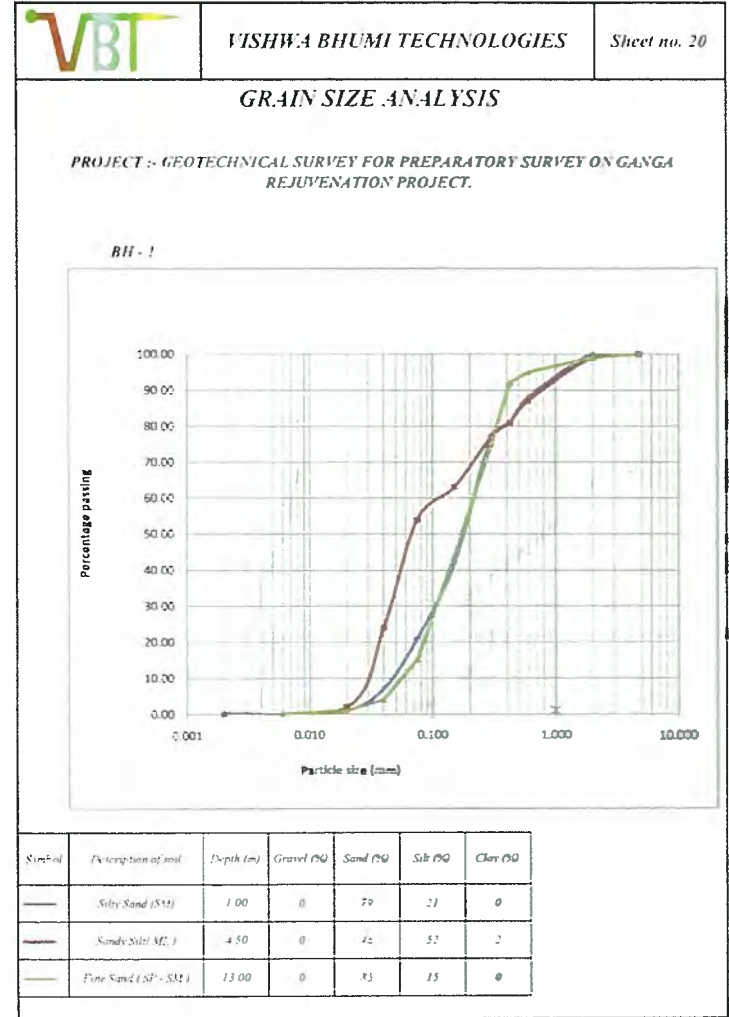


SPT CURVE

LEGEND	
Symbol	Notation
■	No
⊗	Nc

PROJECT - GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2

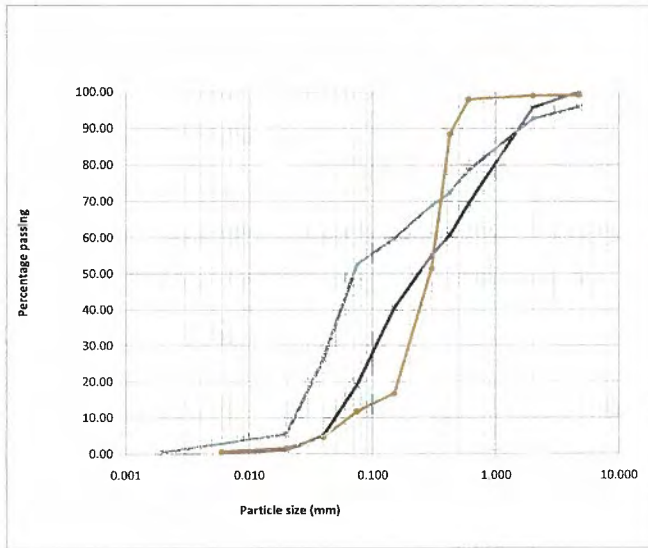


Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
—	Silty Sand (SM)	1.00	0	79	21	0
—	Sandy Silt (ML)	4.50	0	45	55	0
—	Fine Sand (SP - SM)	13.00	0	33	67	0

GRAIN SIZE ANALYSIS

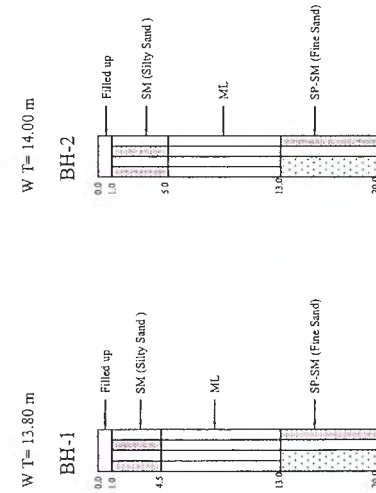
PROJECT :- GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

BH - 2



Symbol	Description of soil	Depth (m)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
—	Silty Sand (SM)	1.00	0	81	19	0
—	Silty Sand with Clay (ML)	5.00	4	43	51	2
—	Fine Sand (SPSM)	13.00	0	88	12	0

LOCATION - CHUNAR



SUB SOIL PROFILE



(BH-1)

LOCATION:-CHUNAR

SAMPLE CALCULATION

Type of Foundation – Raft footing
Depth of Foundation –5.0m below EGL
Size of Foundation– 6.0mx6.0m (B=6.0 m)
Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, c = 0kg/cm²

Angle of Shear Resistance, φ = 28.0°

Effective Density

γ = 1.58 gm/cc for 4.50 to 13.00m depth below EGL

Water correction factor w' = 0.50

Overburden pressure q = 500x0.00164 = 0.790 kg/cm²

dc = dq = dy = 1.00

ic = iq = iy = 1

Sc = 1.2 Sq = 1.2 1+0.2xB/L = 1.2, Sy = 1-0.4xB/L = 0.6 for raft footing

Factor of Safety = 2.5

For Local Shear

Nc = 14.45, Nq = 6.36, Ny = 5.12

Qns = [2/3 cNc.Sc.dc.ic + q(Nq - 1).sq.dq.iq + 0.5 γeff.B.Ny.Sy.dy.iy.w'] / 2.5

= [2/3x0x14.45x1.2x1.0+0.820x(6.36-1)x1.2x1.0x1.0+0.5x0.00164x600x5.12x0.6x1.0x1.0x0.50] / 2.5

= [0+5.27424+0.755712] / 2.5

= 2.41198 Kg/cm² = 24.12 T/m²

2.0 SETTLEMENT CRITERIA (IS: 8009,Pt.I)

Average weighted N value at 5.0 m depth (below EGL) = 20.12, w' = 0.50

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of 1.0 Kg/cm2 = 33.0 mm

Hence for 75mm permissible settlement, net API = 75 / 33.0 = 2.272 Kg/cm² = 22.72 T/m²

RECOMMENDATION:

LEAST FROM ABOVE VALUES OF NETS BE OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. 22.72 T/m² FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.



(BH-2)

LOCATION:-CHUNAR

SAMPLE CALCULATION

Type of Foundation – Raft footing
Depth of Foundation –5.0m below EGL
Size of Foundation– 6.0mx6.0m (B=6.0 m)
Allowable Settlement S = 75 mm

1.0 SHEAR FAILURE CRITERIA (REF. IS: 6403)

Average soil data

Cohesion, c = 0kg/cm²

Angle of Shear Resistance, φ = 29.0°

Effective Density

γ = 1.64 gm/cc for 5.00 to 13.00m depth below EGL

Water correction factor w' = 0.50

Overburden pressure q = 500x0.00164 = 0.820 kg/cm²

dc = dq = dy = 1.00

ic = iq = iy = 1

Sc = 1.2 Sq = 1.2 1+0.2xB/L = 1.2, Sy = 1-0.4xB/L = 0.6 For raft footing

Factor of Safety = 2.5

For Local Shear

Nc = 15.16, Nq = 6.63, Ny = 5.66

Qns = [2/3 cNc.Sc.dc.ic + q(Nq - 1).sq.dq.iq + 0.5 γeff.B.Ny.Sy.dy.iy.w'] / 2.5

= [2/3x0x15.16x1.2x1.0+0.820x(6.63-1)x1.2x1.0x1.0+0.5x0.00164x600x5.66x0.6x1.0x1.0x0.50] / 2.5

= [0+5.5399+0.835416] / 2.5

= 2.55013 Kg/cm² = 25.50 T/m²

2.0 SETTLEMENT CRITERIA (IS: 8009,Pt.I)

Average weighted N value at 5.0 m depth (below EGL) = 20.73, w' = 0.50

Influence Zone is considered 2B below foundation level.

From Chart N vs settlement given on page 17 of IS: 8009 (Part 1-1978)

Corrected Settlement at a load of 1.0 Kg/cm2 = 31.6 mm

Hence for 75mm permissible settlement, net API = 75 / 31.6 = 2.3734 Kg/cm² = 23.73 T/m²

RECOMMENDATION:

LEAST FROM ABOVE VALUES OF NETS BE OBTAINED FROM SHEAR FAILURE CRITERIA AND SETTLEMENT FAILURE CRITERIA i.e. 23.73 T/m² FOR 75 MM SETTLEMENT MAY BE ADOPTED FOR DESIGN PURPOSES.

GEOTECHNICAL SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT.

PHOTOGRAPHS

BH- 1 CHUNAR



BH- 2 CHUNAR





BOREHOLE DESIGNATION	ACTUAL TEST LOCATION COORDINATES	
	LATITUDE	LONGITUDE
BH-1	25° 8.183' N	82° 53.377' E



BOREHOLE DESIGNATION	ACTUAL TEST LOCATION COORDINATES	
	LATITUDE	LONGITUDE
BH-2	25° 8.200' N	82° 53.297' E

4. Topography / route survey report

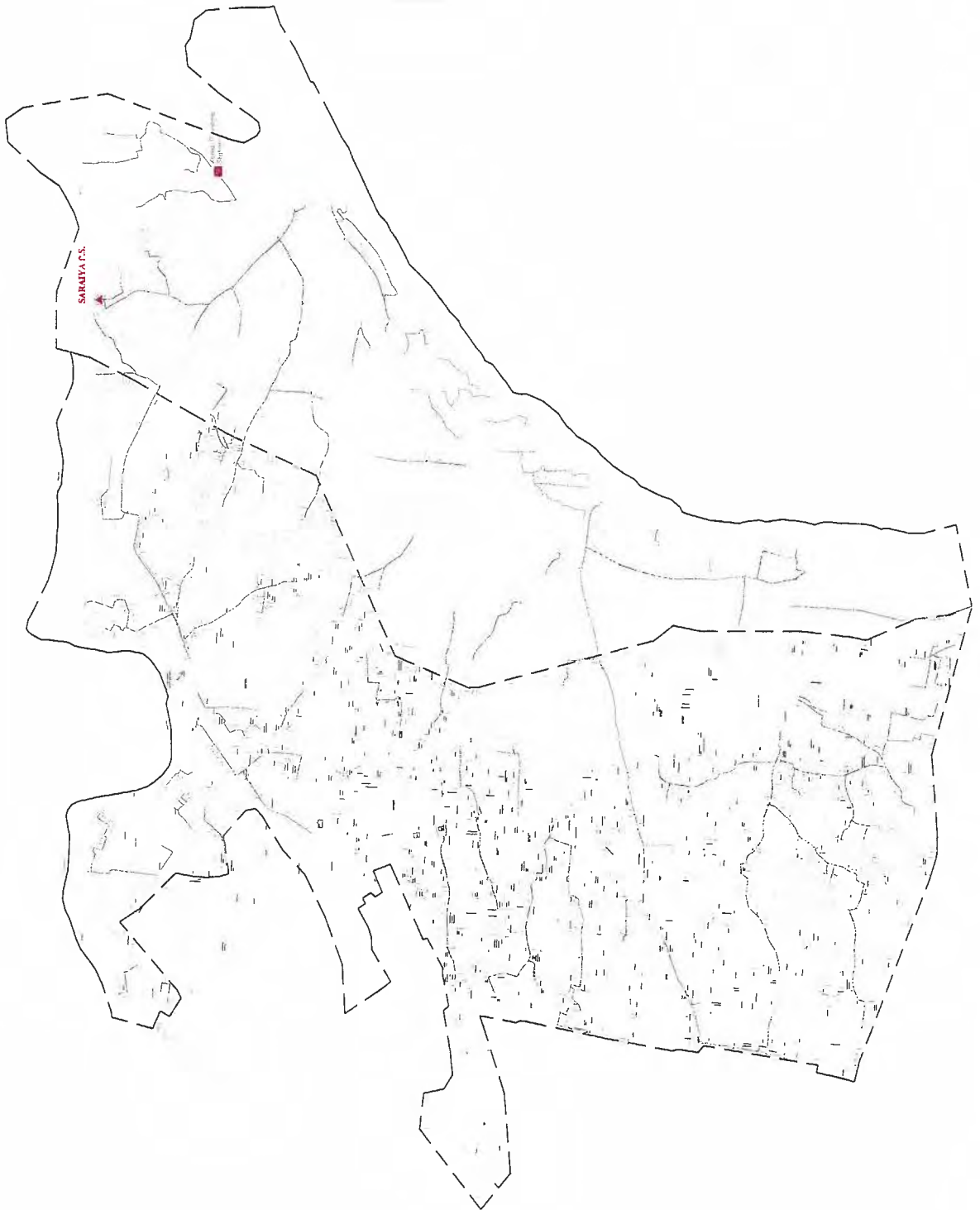
TABLE OF CONTENTS

1. District I & II (Varanasi)
2. District III (Varanasi)
3. Ramna STP (Varanasi)
4. Mirzapur
5. Vindhyachal (Mirzapur)
6. Ghazipur
7. Ramnagar
8. Chunar
9. Saidpur

1. District I & II (Varanasi)

LIST OF BANCH MARKS ESTABLISHED AT SITE

VARANASI DISTT-I & II:-					
TBM FOR ROUTE SURVEY = TBM 74.743 M TRANSFERED FROM STP BHAGWANPUR, VARANASI (74.969 M).					
SL. NO.	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (12)	700279.04	2799480.6	80.255	PLINTH OF TEMPLE SUDAMAPUR COLONY
2	TBM (13)	699969.616	2799588.32	81.130	PLINTH OF PUMP HOUSE SUDAMAPUR COLONY
3	TBM (14)	700272.405	2800822.62	80.410	TOP OF CIRCLE SIGRA CHAURAHA
4	TBM (15)	700223.345	2801452.54	80.110	TOP OF CENTRAL VERGE SAJAN CHAURAHA
5	TBM (16)	700477.662	2802342.86	79.300	TOP OF CIRCLE MALDAHIYA CHAURAHA.
6	TBM (17)	700655.485	2802884.98	75.860	FOUNDATION OF JUNCTION BOX TELIYA BAGHA TIRAHA.
7	TBM (18)	700815.119	2803368.49	76.885	PLINTH OF TEMPLE CHOKA GHAT
8	TBM (19)	700509.545	2803047.82	75.485	FOUNDATION OF FLYOVER PIEAR CHOKA GHAT
9	TBM (20)	700884.799	2802767.43	75.160	PLINTH OF TEMPLE TELIYA BAGH CHAURAHA.
10	TBM (21)	701580.95	2803497.15	76.090	PLINTH OF PUMP HOUSE O.H.T. CHOKA GHAT
11	TBM (22)	702267.459	2803820.61	76.850	PLINTH OF GUARD ROOM CITY CROSSING.
12	TBM (23)	703118.445	2803603.43	75.195	PLINTH OF BUILDING STEP SHELPUTTRI CHOMUHANI.
13	TBM (24)	703619.879	2804030.51	75.295	PLINTH OF TEMPLE NEAR POLICE STATION SARAIYA.
14	TBM (25)	703785.047	2803122.35	78.870	TOP OF TEMPLE WAL KAZZAKPURA CHOWK
15	TBM (26)	704130.001	2802802.75	76.860	TOP OF CULVERT BHADAU CHUNGI.
16	TBM (27)	704308.714	2802692.52	77.525	PLINTH OF POLICE BOOTH RAJGHAT ROAD.
17	TBM (28)	701284.314	2800633.54	76.460	PLINTH OF BOUNDARY WALL GATE LAKSHA T-POINT.
18	TBM (29)	701892.079	2800741.12	76.105	TOP OF CIRCLE CHURCH CHAURAHA.
19	TBM (30)	702027.027	2800709	76.000	TOP OF CIRCLE GODOLIA CHAURAHA.
20	TBM (31)	701807.47	2799286.75	76.975	FOUNDATION OF SIGNAGE BOARD.
21	TBM (32)	701595.863	2798898.64	76.195	TOP OF CIRCLE RAVINDRAPURI CHAURAHA
22	TBM (33)	701641.269	2798046.08	78.548	TOP OF CULVERT ASSI NALAH
23	TBM (36)	704124.415	2802348.92	84.330	PLINTH OF TEMPLE TELIYA BAGH CHAURAHA.
24	TBM (37)	703349.217	2801942.57	75.710	PLINTH OF GATE MACHHODARI PARK.
25	TBM (39)	702388.222	2801006.74	86.995	FOUNDATION OF SIGNAGE BOARD MANIKA GHAT.
26	TBM (40)	702616.407	2801788.91	76.365	PLINTH OF STATUTE MEDAGINI CHAURAHA.
27	TBM (41)	700277.105	2803287.66	77.92	TOP OF CIRCLE NADESHAR.
28	TBM (42)	699783.3	2803628.04	79.115	PLINTH OF TEMPLE NEAR HOTEL GATEWAY.
29	TBM (43)	699836.652	2804094.66	77.045	PLINTH OF DHARAMSHALA JADID BAZAR VARUNA.
30	BM-6	700499.505	2800436.37	78.775	TOP OF CIRCLE RATH YATRA CHAURAHA.
31	TBM (44)	698648.221	2799929.94	80.845	TOP OF WELL MAHMOOR GANJ CHAURAHA.



VARUNA RIVER

VARUNA BRIDGE

MARSHAN KENDRA

NADESAR

RAJA BAZAR

TAJ HOTEL GANGES

ACCESS

LAXMI NAGAR



LEGEND	
	BOUNDARY
	ROAD
	WALL
	FENCE
	WATER BODY
	TREE
	BUILDING
	WELL
	ELECTRICITY POLE
	DRAINAGE
	BOUNDARY MARKER

CLIENT: M.J.S. PUNJAB I. SARDARSHAH, LUDHIANA

TITLE: SURVEY AND RECONSTRUCTION OF THE CANAL SYSTEM FOR THE PUNJAB I. SARDARSHAH, LUDHIANA

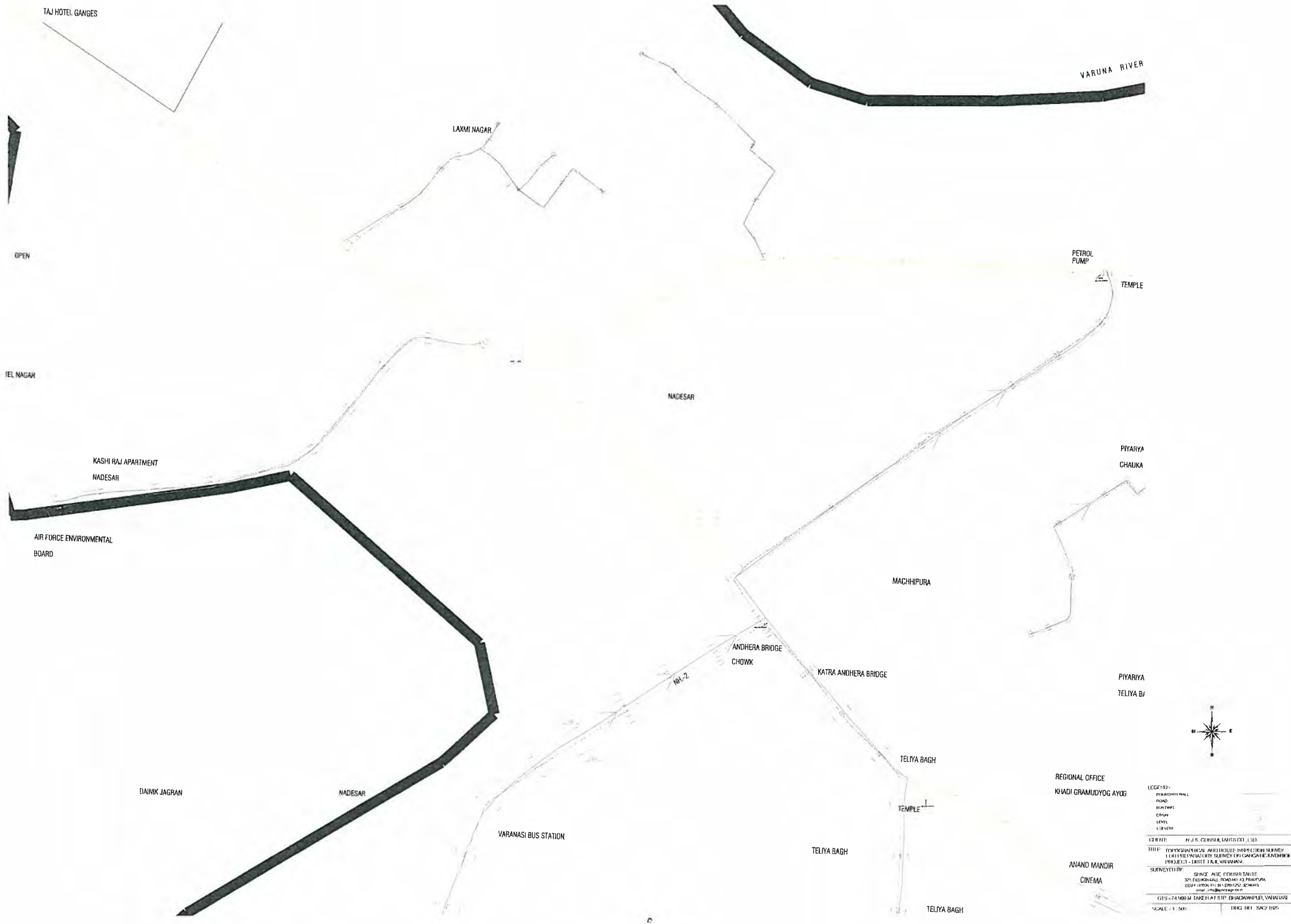
SCALE: AS SHOWN IN THE DRAWING

DATE: 15/01/2018

PROJECT: CANAL SYSTEM RECONSTRUCTION

NO. OF SHEETS: 10

SHEET NO.: 10



TAJ HOTEL GANGES

VARUNA RIVER

LAXMI NAGAR

OPEN

PETROL PUMP

TEMPLE

TEL NAGAR

NADESAR

KASHI RAJ APARTMENT

PIYARIYA

NADESAR

CHAIKA

AIR FORCE ENVIRONMENTAL BOARD

MACHHIPURA

PIYARIYA

TELIYA B.

ANDHERA BRIDGE CHOWK

KATRA ANDHERA BRIDGE

TELIYA BAGH

DANK JAGRAN

NADESAR

VARANASI BUS STATION

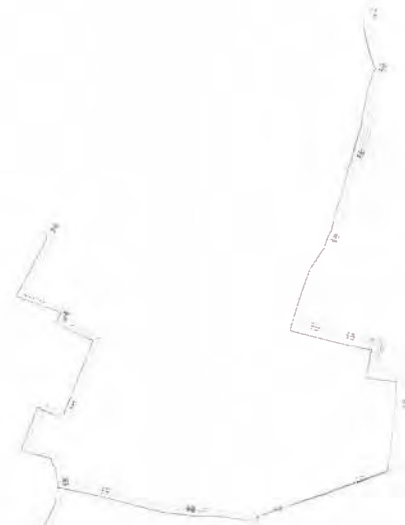
TELIYA BAGH

TEMPLE

REGIONAL OFFICE
KHANDI GRAMUDYOG AYOJ

LOGO	REGIONAL OFFICE
PROJECT	ENVIRONMENTAL ASSESSMENT AND MONITORING SURVEY
CLIENT	STATE GOVT. UP
DATE	2014
SCALE	1:5000





OFFICE OF JOINT
COMMISSIONER
EXCISE

GAZI SAADULLAH PUR

O.H.T.
PUMP HOUSE

TEMPLE

NH-2



LEGEND

[Symbol]	BOUNDARY
[Symbol]	ROAD
[Symbol]	RAILWAY
[Symbol]	TEMPLE
[Symbol]	WATER
[Symbol]	SETBACK

TO BE NOTED 1:10,000 SCALE (APPROX.)

TITLE BOUNDARY MAP OF THE AREA SURROUNDING THE OFFICE OF JOINT COMMISSIONER EXCISE, GAZI SAADULLAH PUR, DISTRICT - (F.S.T. 15), UNDAWARA

DATE OF SURVEY 1974

BY S. S. SINGH, S.D.O. UNDAWARA

SCALE 1:10,000

DATE 1974



OPEN POND



PETROL PUMP

CHOWKI CHUNGI



LEGEND -
 HOUSING WALL
 ROAD
 BOUNDARY
 MARK
 LEVEL
 CHANGE

CLIENT - H.J.S. CYBERNETICS CO., LTD
 TITLE - SURVEY AND INSPECTION SURVEY FOR PRELIMINARY SURVEY OF THE ABOVE PROJECT - EXT. 1 & 2
 SURVEYED BY - SIVAS, A/E CONSULTANTS
 S.P. HASANALI, S.M. 100-01 BANGALURU
 DATE LATEST P.M. 01/08/2015
 P.M. HASANALI
 C/S - 74/003 M. 100/01/13/10 - BANGALURU, KARNATAKA
 SCALE - 1:500 | DRAWING NO. 100/2/1005

SARAIYA P.S.



LEGEND
--- BOUNDARY
--- ROAD
--- CANAL
--- FENCE
--- WIRE
--- ELEVATION

SCALE 1:1000

TITLE: SURVEY OF SARAIYA P.S. FOR THE YEAR 1950
BY: SURVEYOR GENERAL, PUNJAB
DATE: 15/11/50

NO. 100

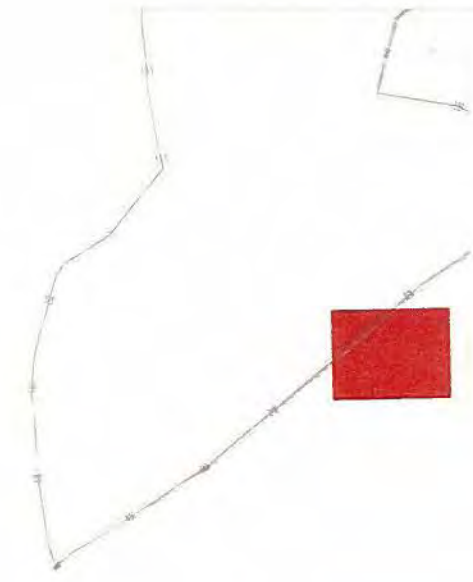


LEGEND -
 BOUNDARY WALL
 ROAD
 BURNING
 DRAIN
 LEVEL
 PLANTER

CLIENT: J.J.S. CONSTR. TAMBORÉ, LTD.
 TITLE: TERCER ANÁLISIS Y DISEÑO DE OBRAS DE RECONSTRUCCIÓN PARA PREPARATORY SURVEY (R.C.) CASAS DE BARRIO DE
 SUBJECT: CASAS DE BARRIO DE

SURVEYED BY: RAFAEL ACEVEDO
 200 TACIONAL, PUNTO #2 BELLESA
 (CALLE ALBA 111) BELLESA, BOGOTÁ
 COLOMBIA

CTS=24.000 M TACS N AT 50% DE ANCHO DE VENTANA
 SCALE: 1:500 | ERIC INC. 2022 1105



LEGENDA:
 - BOUNDARY
 - ROAD
 - CANAL
 - STREAM
 - FENCE
 - OTHER

SCALE: 1:500

DATE: 10/10/2010

PROJECT: 10/10/2010

DESIGNER: 10/10/2010

CHECKER: 10/10/2010

APPROVED: 10/10/2010

10/10/2010



(LEGENDA)
 BUKAN DARI PETA
 BUKAN DARI
 DUNIA
 LEVEL
 DUNIA

CHART: H.J.C. CONSULTANTS LTD.
 TITLE: TINGKATAN BACAAN DAN LAIN-LAIN BUKAN DARI PETA
 FOR THE PARISH OF SUNBEY, JAWA BARU, INDONESIA
 (REKOR C1 - 1831) 1:1, 1/100000

SURVEYED BY: SIVAGE CONSULTANTS
 DR. PACHANAN, INDIAN ARMY
 COLONEL (RETIRED) (1952-2000)
 (1952-2000) (1952-2000)
 (1952-2000) (1952-2000)
 SCALE: 1:100 | PROJ. NO: 1831/1000



LEGIEND

-	
-	
-	
-	
-	

CLIENT M. S. CYRILLE SAUMONTS S.RO

OBJET ETUDE D'AMENAGEMENT, AVEC PROJET DE TRACÉ ET DE LAISSEZ-PASSER DE LA LIGNE D'ENERGIE HAUTE TENSION (L.H.T.) ET DE LA LIGNE D'ENERGIE BASSE TENSION (L.B.T.) AU LIEU DIT 'LA CHAPELLE' COMMUNE DE 'LA CHAPELLE' (DEPT. DE LA SEINE-SAINT-DENIS).

PROJETANT M. S. CYRILLE SAUMONTS S.RO
10 AVENUE DE LA SEINE-SAINT-DENIS
93000 LA CHAPELLE
TEL : 01 48 85 34 34
E-MAIL : info@cs-sro.fr

DATE DE MISE A JOUR 02/10/2024
ETAT D'AVANCEMENT 001/001

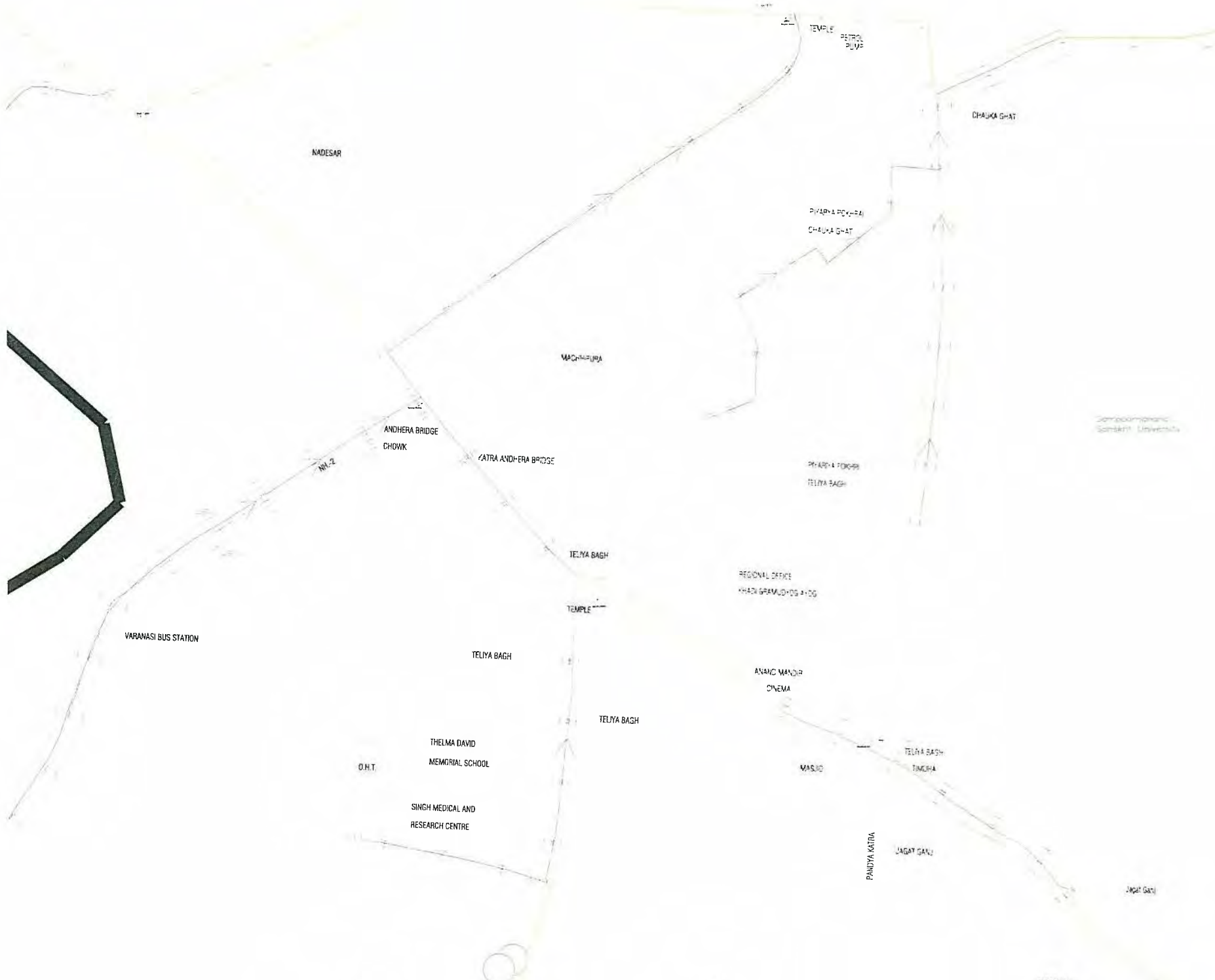


LEGEND:
 INTERNATIONAL
 ROAD
 BUREAU
 STATE
 DISTRICT
 CHAWK

CLIENT: H.J.S CONSULTANTS CO., LTD.
 TITLE: SURVEY OF THE AREA FOR THE PROPOSED SURVEY
 PROJECT - DIST. T.A. VADWANA.

SURVEYED BY: S.M. J. S. SURVEYORS
 32, P. S. ROAD, P. S. ROAD, P. S. ROAD
 DIST. T.A. VADWANA.

CTS-74000 N. TANEHAT SHI. BHAWARHAR, VADWANA
 SCALE - 1 : 500



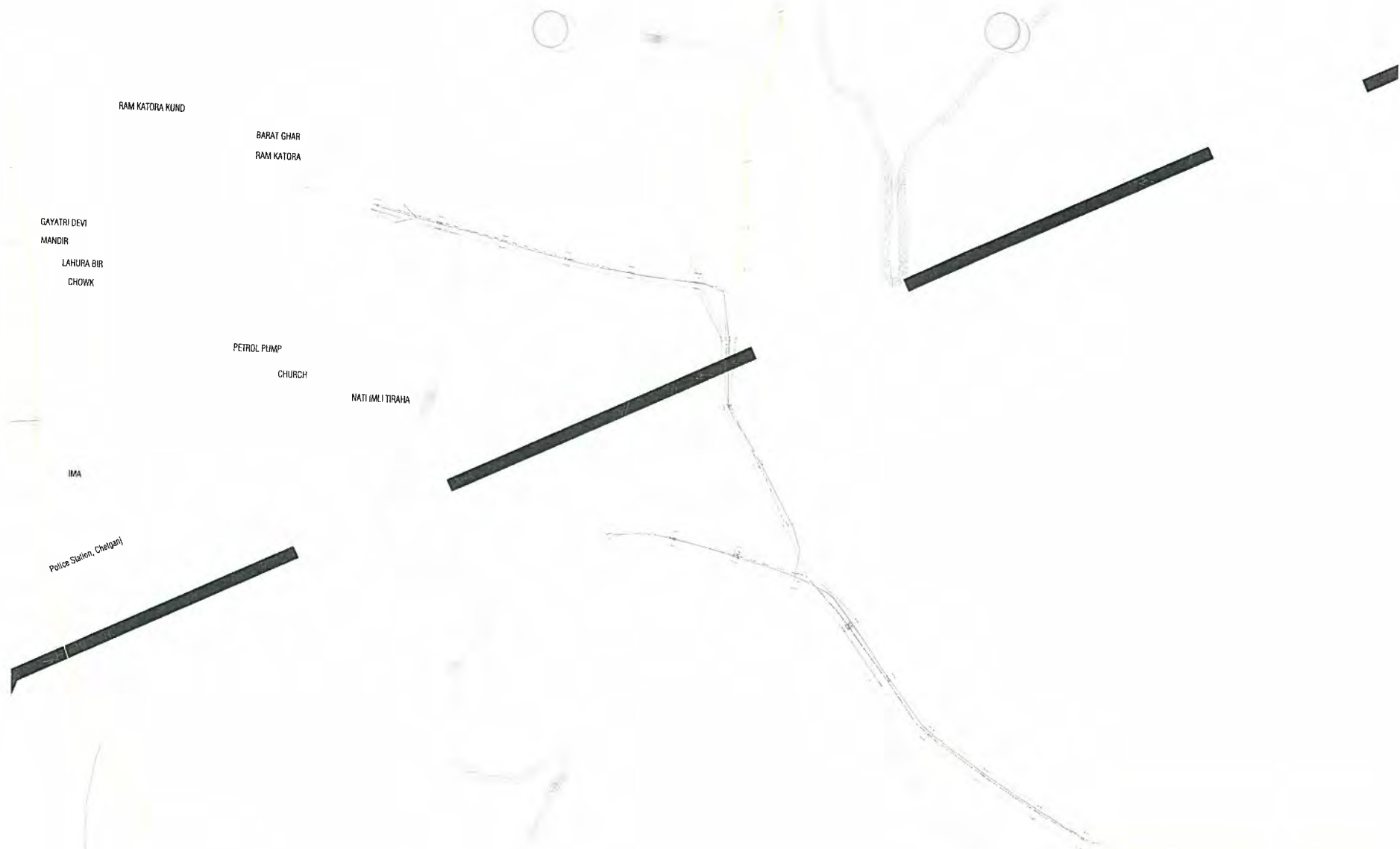
LEGEND

- ROAD WITH WALL
- ROAD
- RAILWAY
- RIVER
- CANAL
- DRAIN
- TOWER
- TELEPOST

CLIENT: N.J.S. CONSULTANTS CO. LTD.

TITLE: TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR THE PAVEMENT SURVEY ON GHATIA ROAD/PROJECT - DISTT I.L.E. VARANASI

SURVEYED BY: SPINA A.C. COVERIANTS
BY: KANAK KUMAR, PRANAY K. SHARMA
DATE: 15/08/2018
SCALE: 1:500



RAM KATORA KUND

BARAT GHAR
RAM KATORA

GAYATRI DEVI
MANDIR
LAHURA BIR
CHOWK

PETROL PUMP
CHURCH

NATI (M) TIRAH

IMA

Police Station, Chetgani



LEGEND	
BOUNDARY WALL	---
DRIVE	---
POULING	---
ROAD	---
LENS	---
STAKE	---
CLIENT N.S. CYRUSIA (PVT) LTD	
PROJECT INFRASTRUCTURE DEVELOPMENT PROJECTS UNDER THE MANAGEMENT OF THE PUNJAB GOVT. (GATEWAY, AIRPORT, ROAD, BRIDGE, ETC.)	
SCALE AS SHOWN	
DATE 15/08/2024	
PROJECT 15/08/2024	
SCALE 1:500	
DATE 15/08/2024	



1145

1144

1143

1142

1141

1140

1139

1138

1137

1136

1135

1134

1133

1132

1131

1130

1129

1128

1127

1126

1125

LEGEND -

- BOUNDARY
- ROAD
- WATER
- ...

CLIENT: N.J.S. CONSULTANTS LTD.

TITLE: TECHNICAL APPROVAL DRAWING FOR THE PROPOSED SUBDIVISION OF LAND IN THE VILLAGE OF ...

SCALE: 1:500

DWG NO: S42/100



LEGENDA

- ...
- ...
- ...
- ...
- ...
- ...

CLIENT: H.J.S. CONSTRUCTION LTD.

TITLE: INTERIOR ARCHITECTURAL PROJECT FOR THE OFFICE BUILDING OF THE POLICE DEPARTMENT - 1000 LAKE AVENUE

DATE: 10/15/2010

SCALE: 1/4" = 1'-0"

NGAR

ROTIARY
CHOWK

Temple

MP



LEGEND
BOUNDARY WALL
ROAD
BUILDING
CANYON
LEVEL
CANYON
CLIENT: N.J.S CONSULTANTS CO. LTD
SITE: TIRUPATI PANCHAYAT AND DISTRICT INSPECTOR GENERAL
PROJECT: SITE LAYOUT WORKS
SURVEYED BY: SPAN, ALLI, CHENDE, PAVITHRA
SCALE: 1:500
DATE: 1/1/2024





LEGEND -
 BOUNDARY WALL
 FENCE
 DR. DRAIN
 OPEN
 LEVEL
 C.S. POINT



DATE: 11.12.2018
 PROJECT: SITE PLAN FOR SHRI KHALUWA RASHTRIYA SR. SECONDARY MATH SCHOOL
 PREPARED BY: S. S. SINGH
 SCALE: AS SHOWN
 DATE: 11.12.2018
 SCALE: 1:500
 SHEET NO. 1 OF 1



LEGEND

- ROAD
- WALL
- TEMPLE
- WATER

CLIENT: M/S. C. P. S. ENGINEERS LTD.

TITLE: ROAD MAP OF THE AREA SURROUNDING THE AREA OF THE PROJECT.

DATE: 15/01/2023

SCALE: 1:500

DRAWN BY: S. S. S. S.



SET (2/3)
 APPROVED
 ROAD
 BOUNDARY
 DRAIN
 LEVEL
 CEMENT

DRAWN BY: N. J. K. (20/08/18) (ANIS/03/11/18)
 TITLE: TECHNICAL DRAWING FOR THE RAILWAY ALIGNMENT SURVEY OF THE RAILWAY DEPARTMENT PROJECT - EAST J. K. SHIRWAN.

SURVEYED BY: S. P. S. (20/08/18) (ANIS/03/11/18)
 20 PAPERWORK, P. 08/03/18
 (20/08/18) (ANIS/03/11/18)
 (20/08/18) (ANIS/03/11/18)

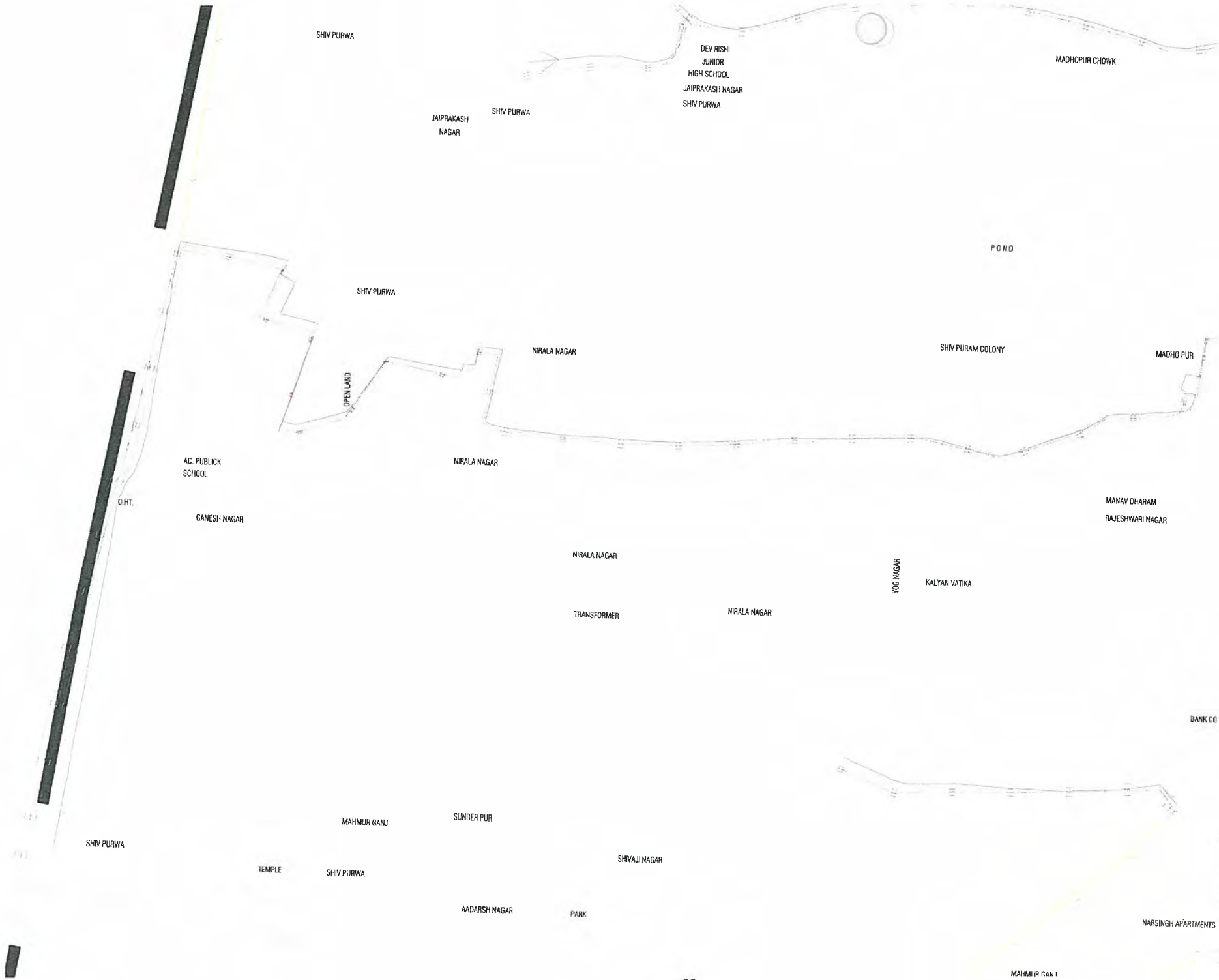
GPS-74 000 M TAKEN AT 3111 18/08/2018 10:00 AM

SCALE - 1:500





LEGEND	
	Building
	Road
	Water
	Fence
	Open
	Boundary
CLIENT H.N.S. CHINA INDUSTRIES LTD.	
TITLE FOR A FURNISHING AND INTERIOR DESIGN FOR THE EARLY LEVEL DRAWINGS FOR THE EARLY LEVEL DRAWINGS FOR THE EARLY LEVEL DRAWINGS FOR THE EARLY LEVEL DRAWINGS	
DATE 15/07/2018	
SCALE AS SHOWN	
DESIGNER H.N.S. CHINA INDUSTRIES LTD.	
APPROVED BY H.N.S. CHINA INDUSTRIES LTD.	
DATE 15/07/2018	
PROJECT NO. HNS/18/07/01	
DRAWING NO. HNS/18/07/01/01	



LEGEND

STAIRWAY/HALL
ROAD
DRUMS
CLUB
WELL
PLANT

CLIENT N.J.S. CONSTRUCTION CO. LTD.

TITLE TOPOGRAPHICAL AND UTILITY INSPECTION SURVEY FOR PRELIMINARY SURVEY OF NARSINGH APARTMENTS PROJECT - ERECT. IN N. INDIA

SCALE 1:500

DATE 20/08/2024

DRAWN BY NARSINGH APARTMENTS

SCALE 1:500

DATE 20/08/2024



LEGEND

- - - - - ROAD
- - - - - SIDEWALK
- - - - - FENCE
- - - - - WALL
- - - - - TOWER
- - - - - LIGHT

DATE: 10.12.2019

TITLE: ROAD LAYOUT FOR THE PROPOSED ROAD IN THE AREA OF PURVANCHAL ELECTRIC BAWAN, CHANDIGARH.

SCALE: 1:1000

PROJECT: ROAD LAYOUT FOR THE PROPOSED ROAD IN THE AREA OF PURVANCHAL ELECTRIC BAWAN, CHANDIGARH.

DESIGNED BY: [Name]

CHECKED BY: [Name]

DATE: 10.12.2019



LEGEND:

- METERS/INCHES
- ROAD
- BOUNDARY
- OPEN
- LEVEL
- CANAL

CLIENT: H.J.S. CONSULTANTS LTD.

TITLE: TOPOGRAPHICAL AND HYDROGRAPHIC SURVEY FOR THE MUNICIPALITY SURVEY OF URBAN AREA

PROJECT: EST. 1 & 2, VARANASI

DATE: 20/11/2024

SCALE: AS SHOWN

DATE: 20/11/2024

EST-24/0011 TAKEN AT 10:15 AM ON 20/11/2024

SCALE: 1:500

DATE: 20/11/2024

2. District III (Varanasi)

LIST OF BANCH MARKS ESTABLISHED AT SITE

VARANASI DISTT-III:-					
TBM FOR ROUTE SURVEY = TBM 74.743 M TRANSFERED FROM STP BHAGWANPUR, VARANASI (74.969 M).					
SL. NO.	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (1)	702792.982	2796625.97	74.743	PLINTH OF TEMPLE RAMNAGAR ROAD SAMNE GHAT TIRAHA
2	TBM (2)	701859.924	2797444.52	75.946	TOP OF HANDPUMP NAGWA CHAURAHA
3	TBM (3)	701757.819	2796831.06	76.437	TOP OF WELL BHAGWANPUR
4	TBM (4)	699811.556	2797716.56	77.46	PLINTH OF TEMPLE SUNDERPUR CHAURAHA.
5	TBM (6)	701700.809	2797630.58	76.365	TOP OF CIRCLE LANKA CHAURAHA
6	TBM (7)	700847.656	2797318.81	78.91	PLINTH OF PUMP HOUSE NARIYA TIRAHA
7	TBM (8)	698880.422	2797808.7	79.74	FOUNDANTION BOARD VISHWANATH PURI COLONY
8	TBM (9)	698582.19	2797811.09	79.9	PLINTH OF TEMPLE NAWADA COLONY
9	TBM (10)	698710.288	2798328.29	81.135	PLINTH OF JUNCTION BOX JANKINAGAR COLONY
10	TBM (11)	698097.04	2796374.43	80.595	TOP OF KM. STONE CHITAIPUR CHAURAHA.





SIDDHARTHA

BURI ENCLAVE

PUMP HOUSE

KEDAR NAGAR COLONY

UPKAR HOSPITAL

KAKARMATTA

S.H.J HOSPITAL AND
RESEARCH CENTRE

PETROL PUMP



- LEGEND -
- BENCH
 - BENCHMKT
 - BENCH
 - LEVEL
 - CLEARANCE

CLIENT - N.J.S. CONSULTANTS CO., LTD
 TITLE - TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR
 PREPARATORY SURVEY GANGA REJUVENATION
 PROJECT - DIST-III VARANASI

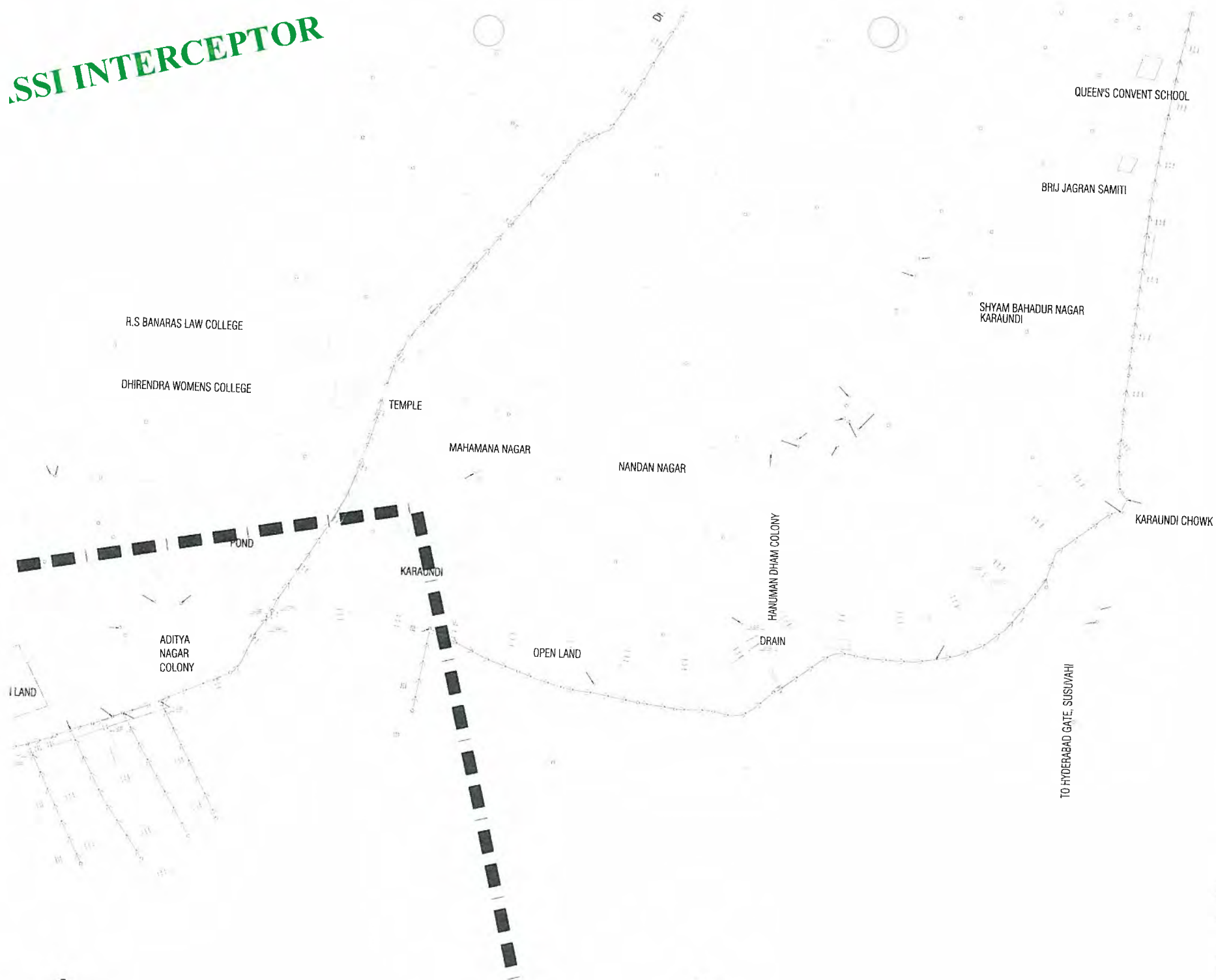
SURVEYED BY -
 SPACE AGE CONSULTANTS
 352, PARIKHANNA, ROAD NO. 41, PITHAMPURA
 DIST-III VARANASI, PIN-221012, U.P.
 email: info@spaceage.co.in

BM= 74.969 M TAKEN AT TOP OF PILLAR AT S.T.P. VARANASI
 SCALE - 1 : 500 | DRG. NO. SAC/1924



LEGEND	
•	WELL
○	WATER
—	ROAD
—	LEVEL
—	SETBACK
CLIENT	N.J.S. CONSULTANTS CO. LTD.
TITLE	TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR INTERCITY SURVEY GAZETA REJANATION PROJECT - DISTT. BHUVANESHWAR
DRAWN BY	SPACE AGE CONSULTANTS 875, P. CHANDRA NARAYAN, ROAD NO. 41, P. CHANDRA NARAYAN, P. CHANDRA NARAYAN, P. CHANDRA NARAYAN
SU-174	100 M TALL EN AT TOP OF PILLAR AT S.T.P. VARANASI
SCALE	1:500
	CRG NO. SAC/15/24

SSI INTERCEPTOR



LEGEND
- R/WAY
- BOUNDARY
- CHOUK
- LEVEL
- CUMBER

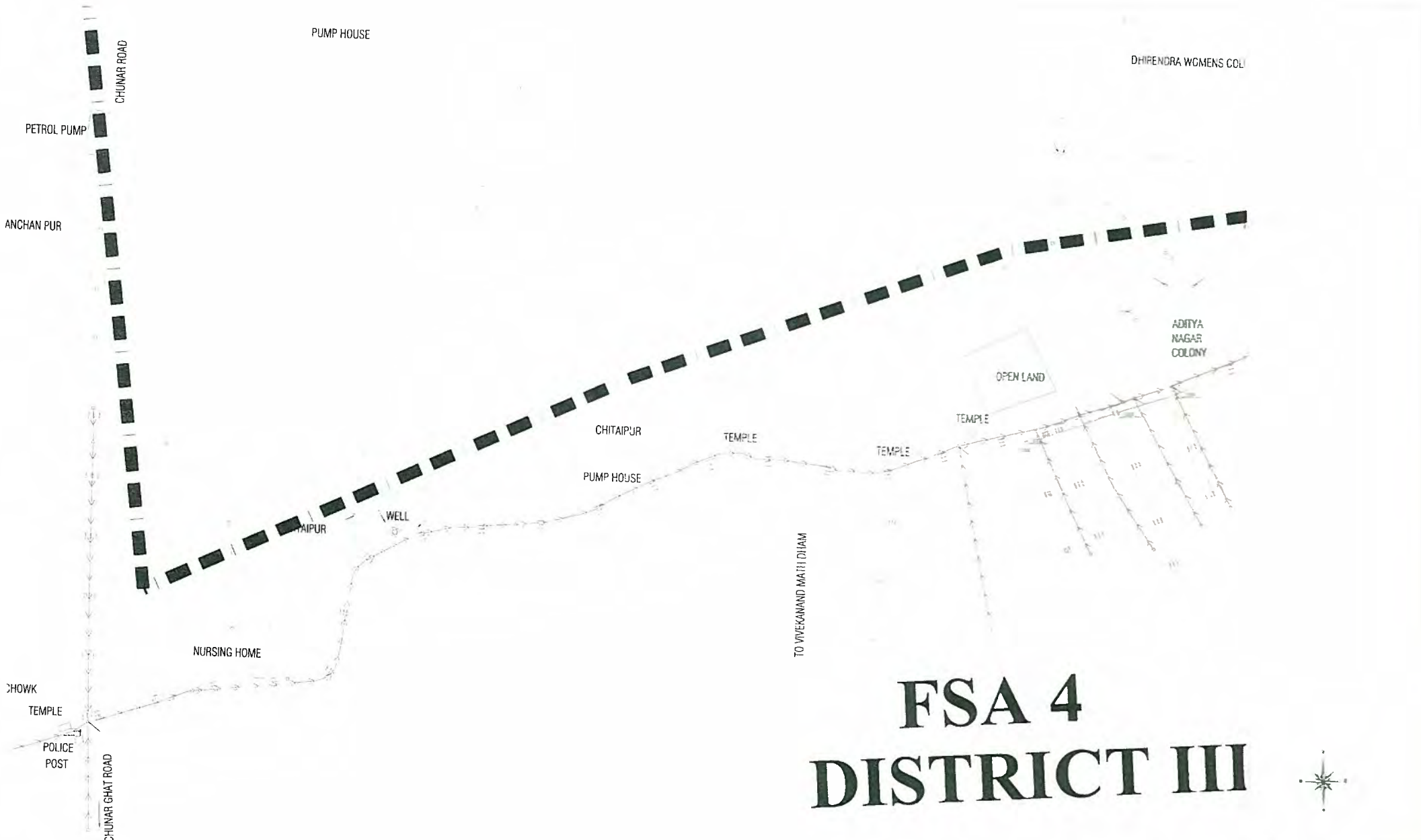
CLIENT: N.J.S. CONSULTANTS CO., LTD.

TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUVENATION PROJECT - DISTT-III VARANASI

SURVEYED BY: SPACE AGE CONSULTANTS
303, PASHUPAN MALL, ROAD NO. 43, PIPRAHATIA
DELHI-110068, TEL: 011-2614722, 2606615
MOB: 9810200000

BM = 74.969 M TAKEN AT TOP OF PILLAR AT S.T.P. VARANASI

SCALE - 1 : 500 DRG NO 'SAC/1924'



FSA 4 DISTRICT III



LEGEND	
—	WIDE
- - -	WATER
- - -	ROAD
- - -	TEMPLE
- - -	WELL
CLIENT: N.J.S. CONSULTANTS CO. LTD.	
TITLE: TOPOGRAPHICAL & ROUTE SURVEY FOR PROVISIONAL PLANS & GRAYM REGENERATION PROJECT - DIST III VARANASI	
DRAWN BY: SHARAD K. JAIN	
CHECKED BY: DR. P. K. JAIN	
DATE: 14.05.2014	
SCALE: 1:500	DRG NO: SAC/124



LEGEND

- DRAIN
- OPEN LAND
- ROAD
- LEVEL
- ELEVATION

CLIENT: N.J.S. CONSULTANTS CO. LTD.

TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA RE-ARMENATION PROJECT - DISTT. III VARANASI

SURVEYED BY: SPACE AGE CONSULTANTS
 SVA, PLOT NO. 10, INDUSTRIAL AREA, GATE NO. 1, KANPUR
 U.S. 100, KANPUR, U.P. 208002, INDIA
 email: info@spaceage.co.in

BM = 74.969 M TAKEN AT TOP OF PILLAR AT S.T.P. VARANASI

SCALE - 1 : 500 DRG. NO. SAC/1924



FSA 4 DISTRICT III

LEGEND

- BOUNDARY
- EASEMENT
- EMBANKMENT
- LEVEL
- SURVEY

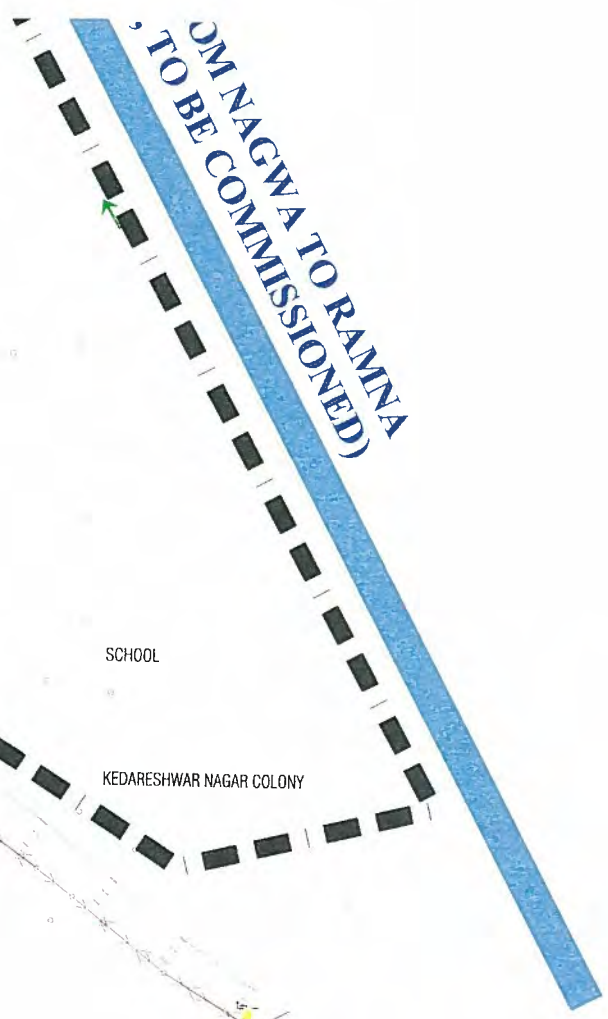
CLIENT: M. J. S. CHANDRASEKHAR & CO. LTD.

TITLE: TECHNICAL ROUTE INSPECTION SURVEY FOR REGRADATION (M. J. S. CHANDRASEKHAR & CO. LTD. PROJECT - DISTRICT III)

DRAWN BY: TRADE AGE CONSULTANTS

SCALE: 1:500

DATE: 15/05/2024



H NAGAR COLONY

I NAGAR COLONY

SCHOOL

KEDARESHWAR NAGAR COLONY

TEMPLE

TO RAM NAGAR

LPG GAS GODOWN

PANTUN BRIDGE



- LEGEND
- (BLACK) - ROAD
 - (DASHED) - SURVEY
 - (DASHED) - LEVEL
 - (DASHED) - SURVEY

CLIENT - N.J.S. CONSULTANTS CO. LTD.
 TITLE - TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REAJUVENATION PROJECT - DISTT. OF VARANASI

SURVEYED BY - SPACE AGE CONSULTANTS
 305, PASHUPATI MALL, PUNDA RD. RAMPURVA
 DISTT. VARANASI, U.P. PIN CODE 221002
 TEL: 2222222222

BM - 74 969 M TAKEN AT TOP OF PILLAR AT S.T.P. VARANASI
 SCALE - 1 : 500 | DWG. NO. : SAC/1924

3. Ramna STP (Varanasi)

LIST OF BANCH MARKS ESTABLISHED AT SITE

RAMNA:-					
TBM AT STP = TBM 73.879 M TRANSFERED FROM STP BHAGWANPUR, VARANASI (74.969 M).					
TBM FOR ROUTE SURVEY = TBM 73.879 M TRANSFERED FROM STP BHAGWANPUR, VARANASI (74.969 M).					
SL. NO.	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (1)	701560.227	2793497.41	73.879	PLINTH OF PUMP HOUSE RAMNA STP
2	TBM (A)	703600.48	2794631.96	75.334	PLINTH OF POLICE BOOTH GADHWA GHAT.



LEGEND:
 . Survey Station
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries
 --- Proposed S.T.P. Boundaries



SCALE: 1 : 500
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 DATE: 10/11/2023
 PROJECT: [Project Name]
 SHEET NO. 1 OF 1
 TOTAL SHEETS: 1

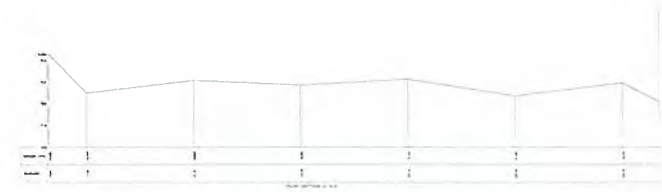
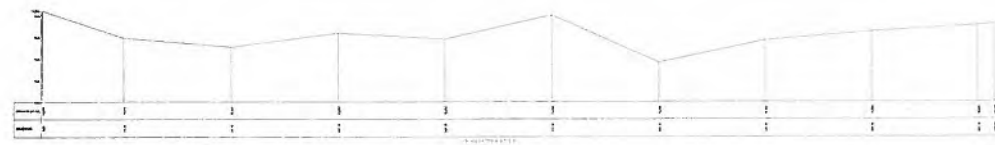
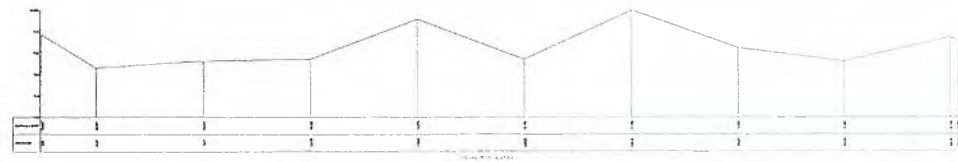
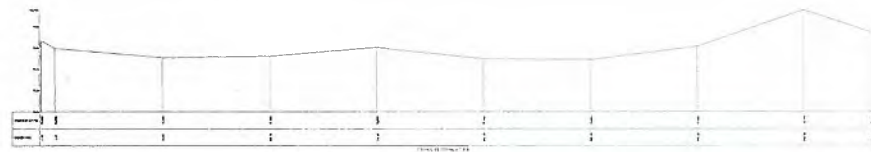
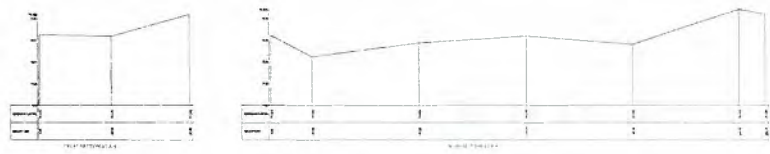


- LEGEND:
- BOUNDARY WALL
 - PLANT
 - FENCE
 - ROAD
 - FISH
 - WATER
 - CANAL
 - TOWER
 - TELEPHONE POLE
 - POWER

CLIENT: NJS CONSULTANTS CO. LTD.
 TITLE: TOPOGRAPHICAL SURVEY PLAN OF PROPOSED S.T.P., RAMNA

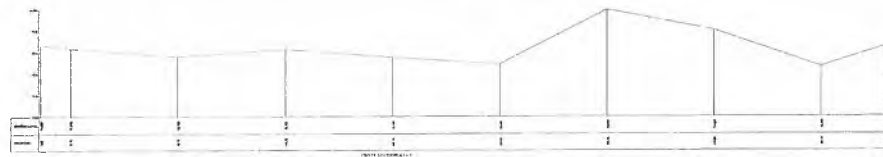
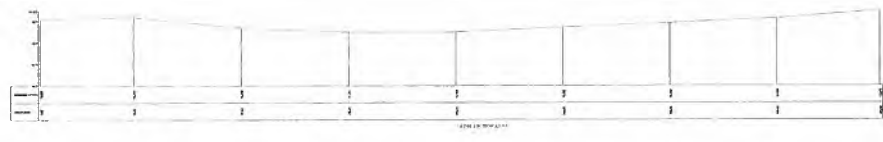
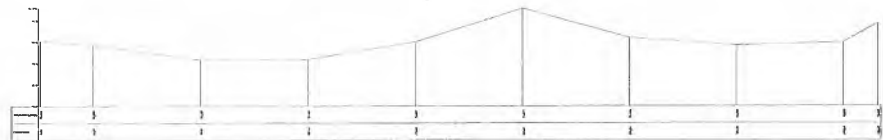
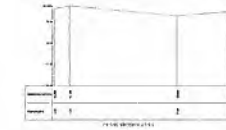
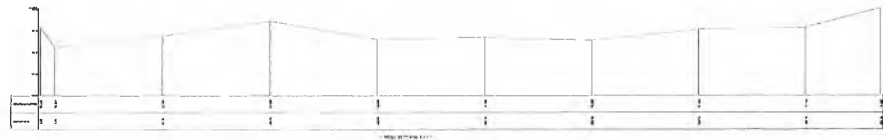
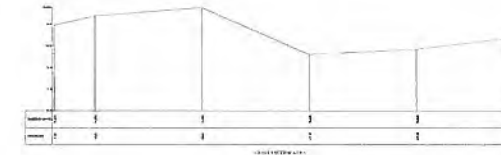
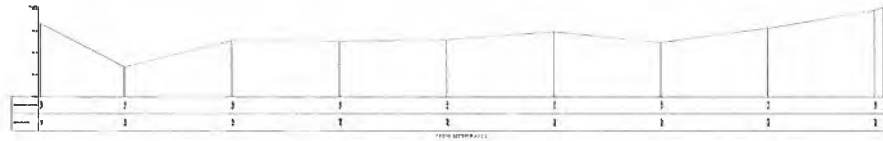
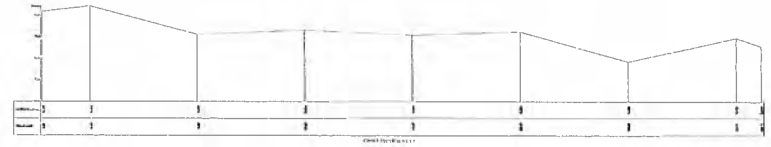
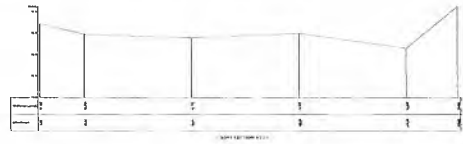
SURVEYED BY: SPACE AGE CONSULTANTS
 23, PANDURAM ROAD NO. 43, 7TH FLOOR,
 BUNGALOW, P. M. HILL COLONY, CHENNAI
 email: info@spaceage.co.in

DATE: 24/06/2024 AT THE OFFICE OF P. L. R. AT S.T.P., VARANASI
 COURTESY: INTERAGI TAKRAN (P) LTD.
 SCALE: 1:500



1	2	3	4	5	6	7	8	9	10	11	12
1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
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1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1

DRAWN BY: [Name]
 CHECKED BY: [Name]
 DATE: [Date]
 PROJECT: [Project Name]
 SHEET NO: [Sheet Number]
 TOTAL SHEETS: [Total Sheets]



CLIENT: HFC CONSULTANTS CO. LTD.
 PROJECT: COMMERCIAL BUILDING PLAN OF
 BUILDING AT KANSAI
 SURVEYOR: HFC CONSULTANTS
 NO. 1, KANSAI ROAD, KANSAI
 DISTRICT, SINGAPORE
 DATE: 15/01/2011
 SCALE: 1:100

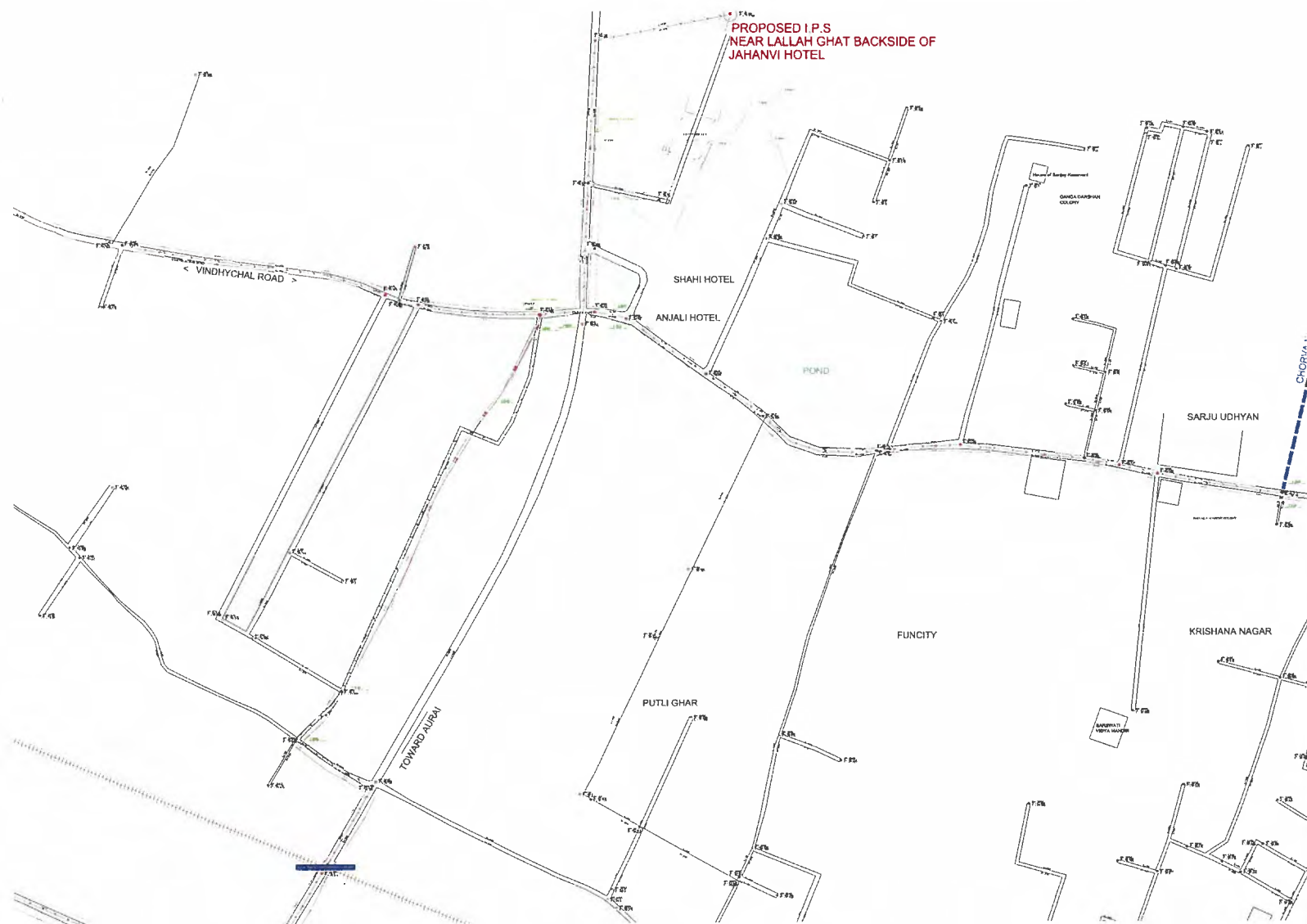
4. Mirzapur

LIST OF BANCH MARKS ESTABLISHED AT SITE

MIRZAPUR:-					
TBM AT STP = 83.600 M					
TBM FOR ROUTE SURVEY = 83.600 M					
SL. NO.	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (1)	659893.445	2782596.38	83.557	TOP OF WEST WATER DRAIN CULVERT VESHNAMPURAM COLONY
2	TBM (2)	660017.668	2783034.35	83.620	TOP OF CULVERT GHURAHU GHURAHU PATTI CHAURAHA
3	TBM (3)	660439.826	2783102.2	82.940	TOP OF CULVERT JOGIYA WARI ROAD.
4	TBM (4)	659860.922	2783345.62	80.008	TOP OF WEST WATER DRAIN CULVERT NEAR NAGARPALIKA STORE.
5	TBM (5)	659821.294	2782009.98	83.147	PLINTH OF TEMPLE BRAHMPURI COLONY.
6	TBM (6)	659404.286	2782210.63	83.746	FOUNDATION OF TRANSFORMER PARRADE GROUND.
7	TBM (7)	659389.209	2781697.77	83.697	PLINTH OF TEMPLE TEHSEEL CHOWK.
8	TBM (8)	659637.806	2780723.69	84.723	TOP OF CIRCLE STATION ROAD.
9	TBM (9)	655676.17	2782585.08	86.295	TOP OF SHASTRI BRIDGE.
10	TBM (10)	655615.223	2782422.72	81.085	PLINTH OF TEMPLE VINDHYCHAL ROAD LALLA GHAT.
11	TBM (11)	660072.909	2783470.92	83.595	TOP OF CULVERT MORCHAGHAR COLONY.
12	TBM (12)	660660.826	2784167.19	84.500	TOP OF WATER LINE CHAMBER NEAR BAN SAGAR COLONY
13	TBM (13)	661156.114	2785079	83.575	TOP OF KM. STONE NEAR SAI BABA LANE
14	TBM (14)	661534.121	2785970.24	83.025	PLINTH OF BOUNDARY WALL GATE NURSERY FORM
15	TBM (15)	658231.045	2781219.96	84.395	TOP OF WELL PURANI DASHMI COLONY.
16	TBM (16)	658613.43	2780836.84	84.535	PLINTH OF POLICE BOOTH ROADWASE TIRAHA.
17	TBM (17)	659306.22	2781412.05	84.115	PLINTH OF TEMPLE SHUKLAHA KACHEHRI ROAD.
18	TBM (A)	655369.886	2781796.26	81.496	PLINTH OF TEMPLE NATBA TIRAHA.
19	TBM (B)	657251.218	2781300.77	84.375	PLINTH OF TEMPLE SABRI CHUNGI CHAURAHA.
20	TBM (C)	654999.163	2781952.2	80.013	TOP OF CULVERT NEAR BADI BASAI COLONY.
21	TBM (D)	656539.325	2781585.84	85.33	FOUNDATION OF LIGHT POLE NATBIR CHAURAHA.



PROPOSED I.P.S
NEAR LALLAH GHAT BACKSIDE OF
JAHANVI HOTEL



LEGEND -

- BOUNDARY WALL
- FINE FENCE
- BUSHBOND
- ROAD
- FENCE
- FLAGMARK
- DRAIN
- TOWER
- LIGHT POLE
- QUANTER

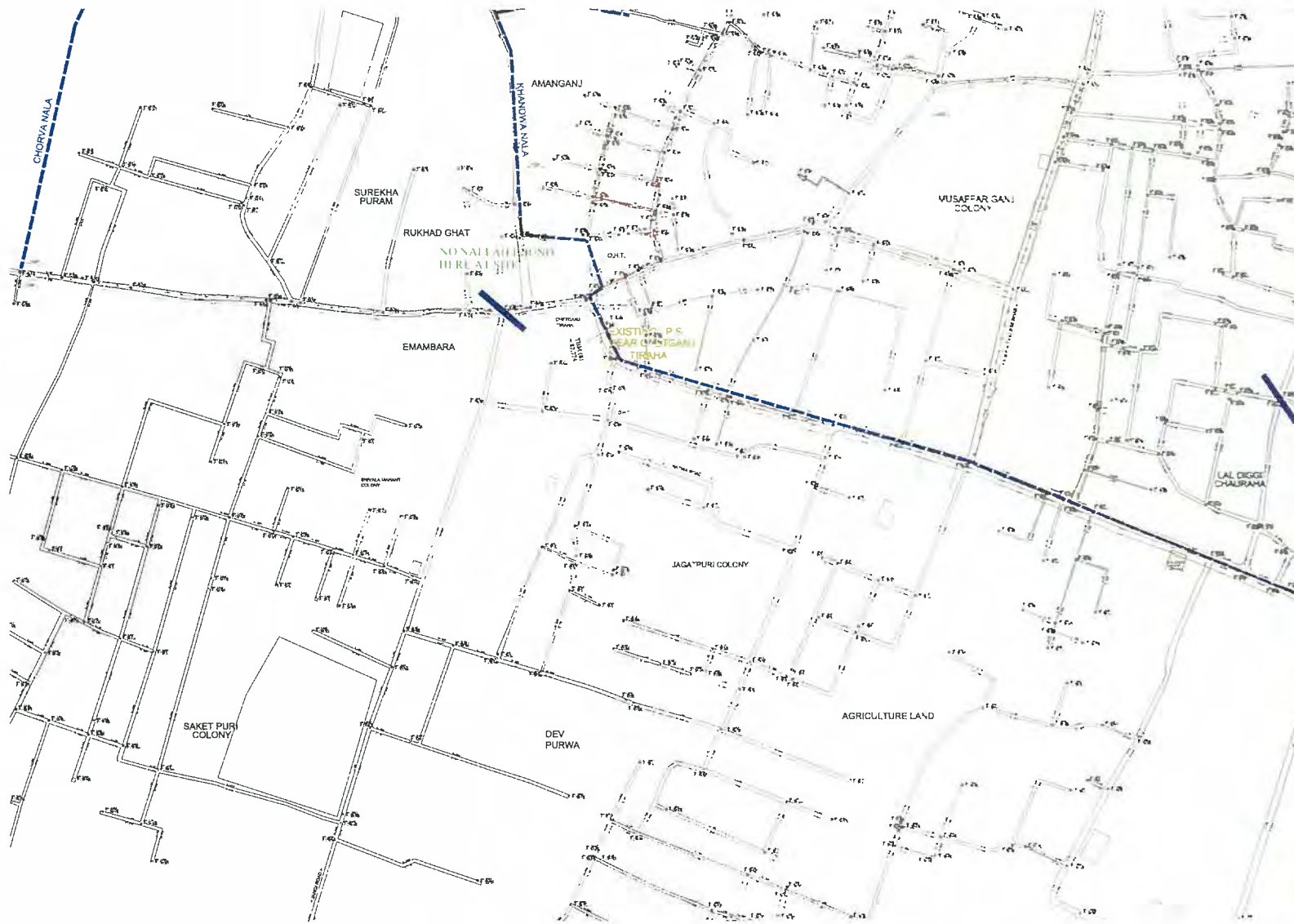
CLIENT: N.J.S. CONSULTANTS CO. LTD.

TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUVENATION PROJECT - MIRZAPUR.

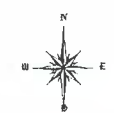
SURVEYED BY: SPACE AGE CONSULTANTS
329, FASHION MALL ROAD NO-43, PITAMPURA
DELHI-110034, PH. 011-27011252, 32946435
email : info@spaceage.co.in

BM-83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR
CONTOUR INTERVAL TAKEN AS 0.25M.

SCALE - 1 : 500 DRG. NO. :SAC/ 1917



LEGEND: - BOUNDARY WALL - PLYMOUTH - 4/5/6/7/8/9 - FIELD - LINES - CLOSURE - BRUSH - TELEPHONE - LIGHT POLE - CANTONMENT	
CLIENT: SLS CONSULTANTS CO., LTD. TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUVENATION PROJECT - MIZAPUR. SURVEYED BY: SHREE AGE CONSULTANTS 229, F4 BROAD WALK, ROAD NO. 45, HOBBOLKALY DELHI 110044, PH: 911-27332322, 28144143 email: info@ageconsultants.com	
BM-11.671 M TAKEN AT TOP OF PILLAR AT S.T.P. MIZAPUR. CONTOUR INTERVAL TAKEN AS 0.25M.	
SCALE = 1:500	DRG. NO. SAC/1917



LEGEND:-
 - BOUNDARY WALL
 - PLANT LUMP
 - BUILDING
 - ROAD
 - LEVEL
 - CHANSEER
 - DRAIN
 - CUMBER
 - LIGHT PILE
 - CONTOUR

CLIENT: N.J.S. CONSULTANTS CO., LTD.
 TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUVENATION PROJECT - MIRZAPUR
 SURVEYED BY: SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO-43, PITAMPURA
 DELHI-110034, PH. 011-27011252, 32946415
 email : info@spaceage.co.in

BM=83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR
 CONTOUR INTERVAL TAKEN AS 0.25M.
 SCALE - 1 : 500 | DRG. NO :SAC/1917



- LEGEND:-
- BY PRODUCTIVITY W. 422
 - PLAIN LINE
 - BOUNDARY
 - ROAD
 - SPUR
 - CHANNEL
 - SW. 60
 - CULVERT
 - LIGHT P.W.
 - SURVEYED



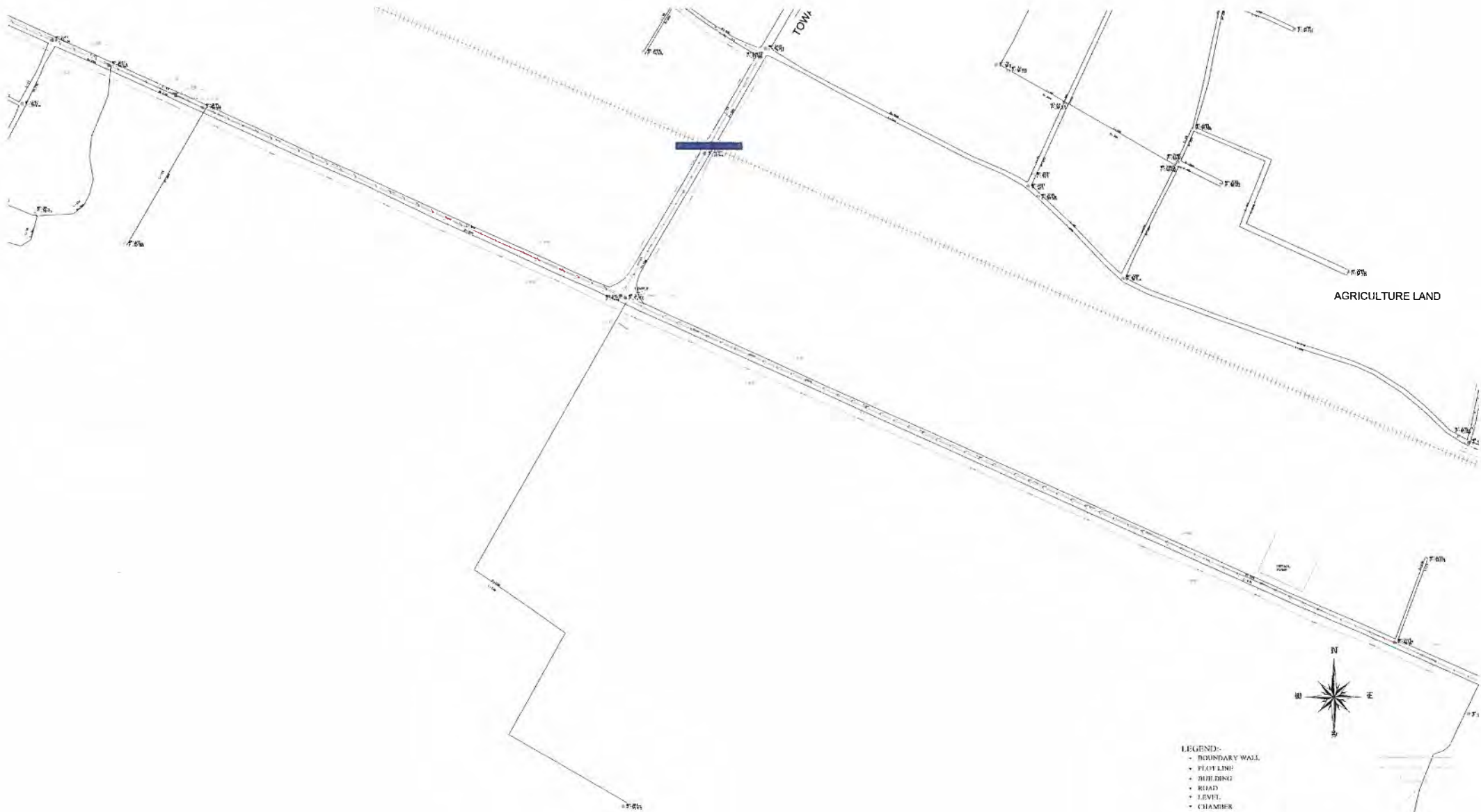
CLIENT: H.J.S. CONSULTANTS CO. LTD

TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA RENOVATION PROJECT - MIRZAPUR.

SURVEYED BY: SPACE AGE CONSULTANTS
 329, FARDINA, PHEEL, IC-3-D-17, GLETHAMANE,
 DELHI 110084, PH. 011-2751252, 2741418
 FAX: 011-2751254, 2741419

BM+51.625 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR.
 CONTROL. INTERVAL TAKEN AS 0.25M

SCALE - 1 : 500 DFG NO. SAO/1917



- LEGEND:-
- BOUNDARY WALL
 - FOOT LINE
 - BUILDING
 - ROAD
 - LEVEL
 - CHAMBER
 - DRAIN
 - CULVERT
 - LIGHT POLE
 - CONTOUR

CLIENT: N.J.S. CONSULTANTS CO., LTD
 TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY
 FOR PREPARATORY SURVEY GANGA REJUVENATION
 PROJECT - MIRZAPUR.

SURVEYED BY:
 SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO -43, PITAMPURA
 DELHI-110034, PH. 011-27011252, 32946415
 email : info@spaceage.co.in

BM=83.600 M TAKEN AT TOP OF PILLAR AT S.T.P, MIRZAPUR
 CONTOUR INTERVAL TAKEN AS 0.25M.

SCALE - 1 : 500 | DRG. NO. :SAC/ 1917





POSED P.S
(side of District Jail
Power House)

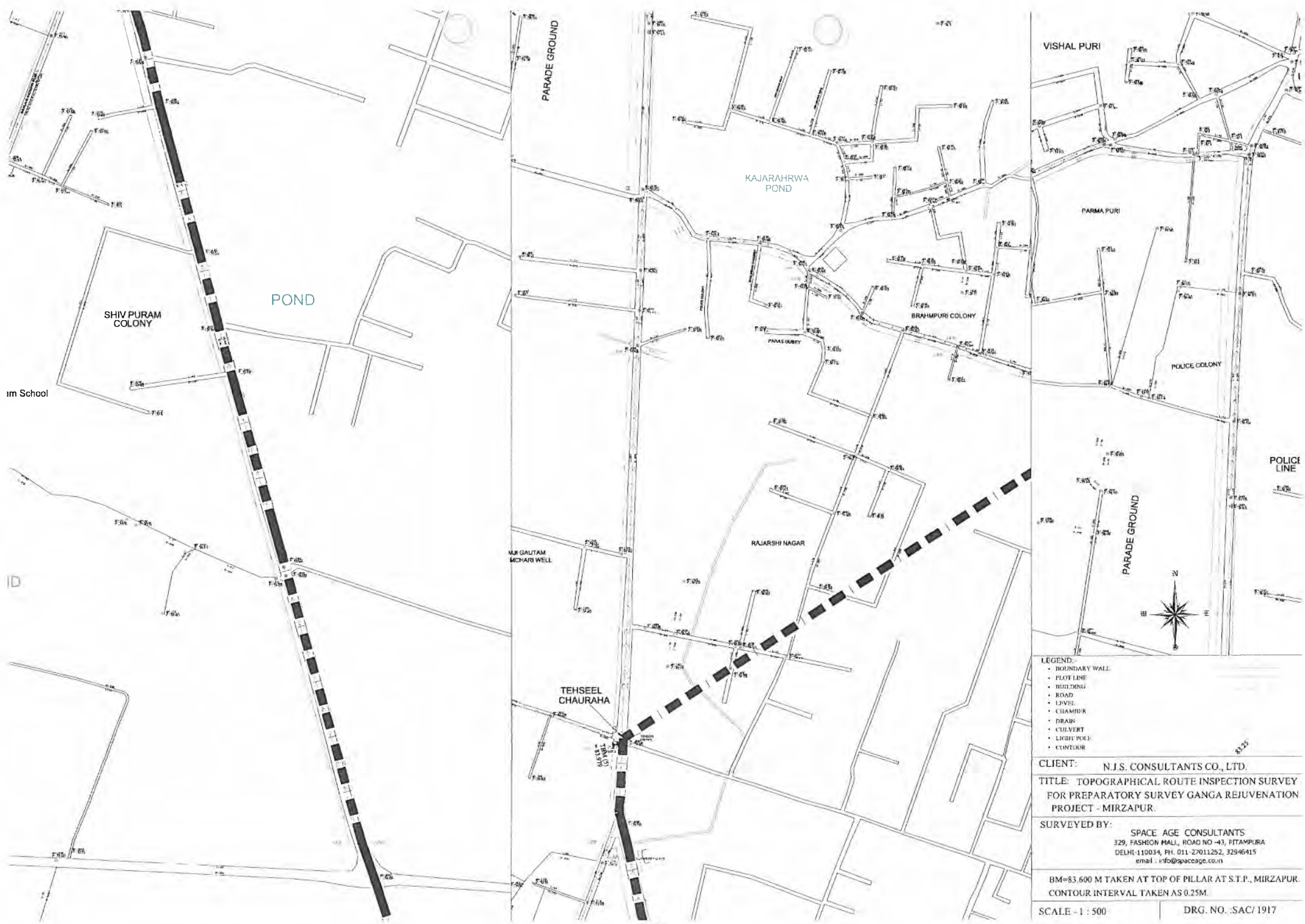


- LEGEND:
- BOUNDARY WALL
 - PLANT SHED
 - MOUND
 - BRIDGE
 - CLUSTERS
 - BRICK
 - CEMENT
 - LIME
 - GRAVEL

CLIENT: N I S CONSULTANTS CO. LTD
 TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY
 FOR PREPARATORY SURVEY GANGA RENOVATION
 PROJECT - MERZAPUR.

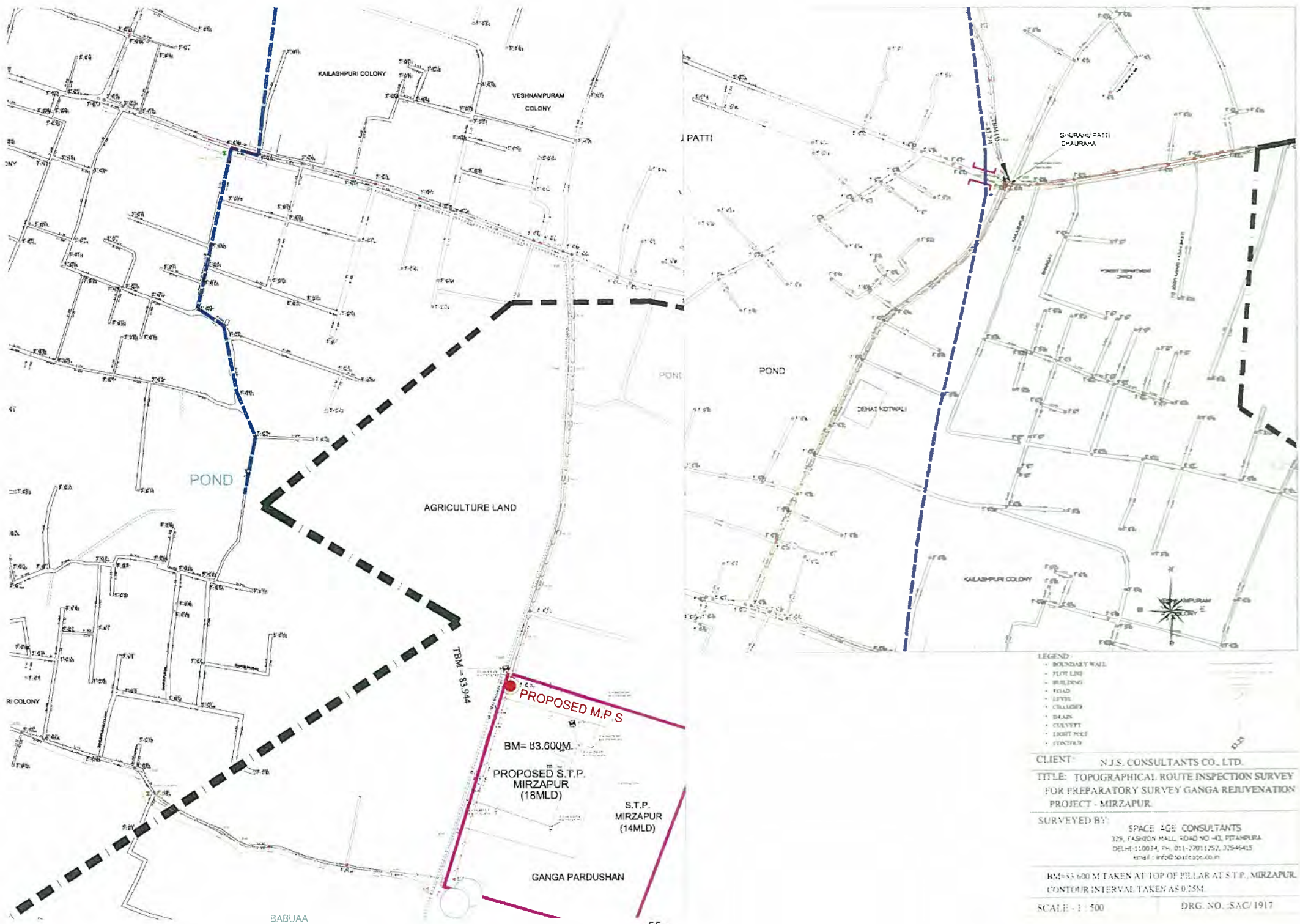
SURVEYED BY: SPACE AGE CONSULTANTS
 224, FORT ROAD, CHENNAI - 600 009
 TEL: 2284 1111, 2284 1112, 2284 1113
 FAX: 2284 1114

BM 4 + 83.600 M T.A.CEN AT TOP OF PILLAR 11 S.T.P., MERZAPUR.
 CONTOUR INTERVAL TAKEN AS 0.25M.
 SCALE: 1:500 DRG NO. SAC/1917



- LEGEND:**
- BOUNDARY WALL
 - PLOT LINE
 - BUILDING
 - ROAD
 - LEVEE
 - CULVERT
 - LIGHT POLE
 - CONTOUR

CLIENT:	N.J.S. CONSULTANTS CO., LTD.
TITLE:	TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUENATION PROJECT - MIRZAPUR.
SURVEYED BY:	SPACE AGE CONSULTANTS 329, FASHION MALL, ROAD NO -43, PITAMPURA DELHI-110034, PH. 011-27011252, 32946415 email : info@spaceage.co.in
BM=83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR. CONTOUR INTERVAL TAKEN AS 0.25M.	
SCALE - 1 : 500	DRG. NO. :SAC/1917



- LEGEND:-
- BOUNDARY WALL
 - PLOT LINE
 - BUILDING
 - ROAD
 - LEVELS
 - CHAMBER
 - DRAIN
 - CULVERT
 - LIGHT POLE
 - STATION

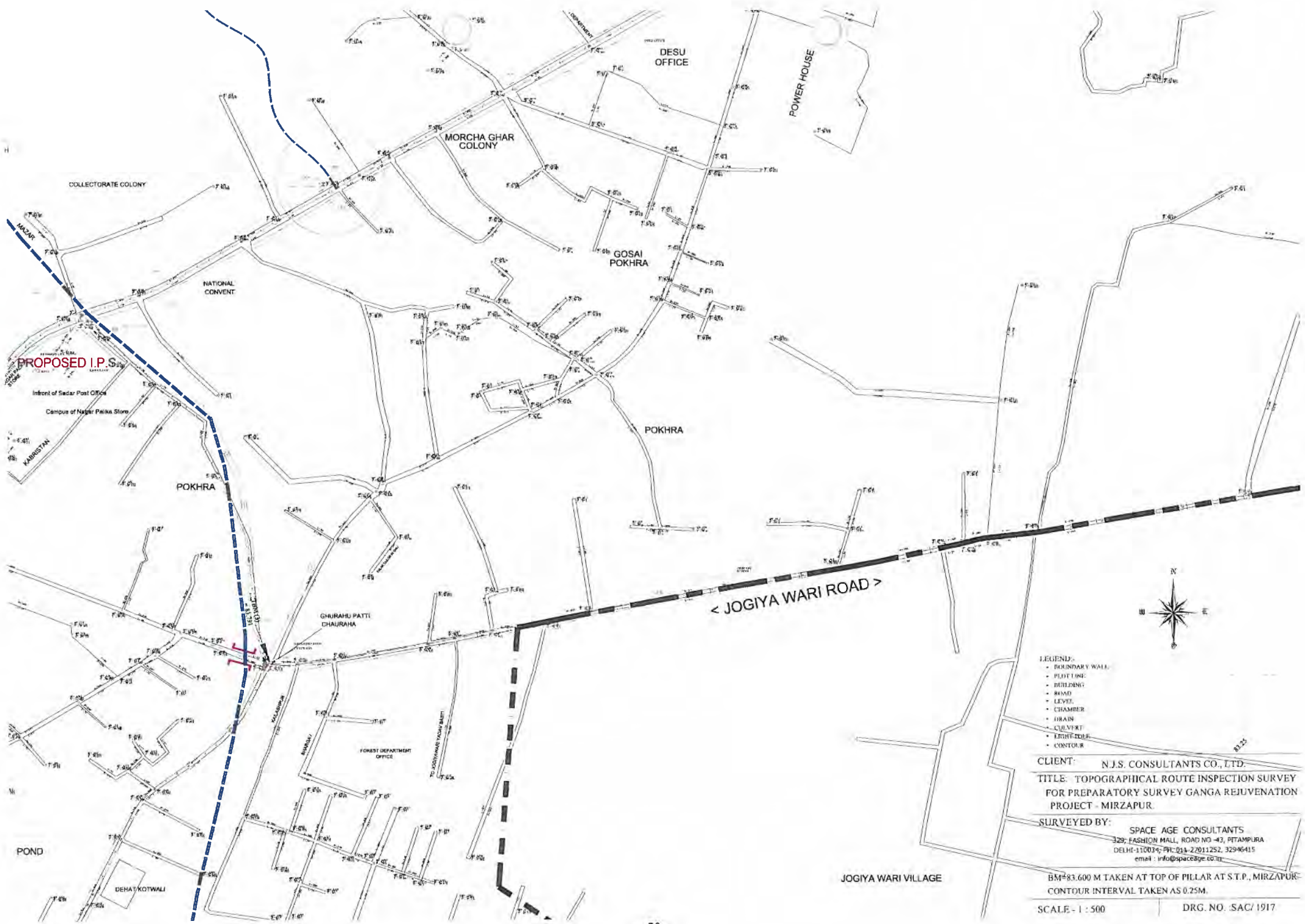
CLIENT:- N.J.S. CONSULTANTS CO., LTD.

TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUVENATION PROJECT - MIRZAPUR.

SURVEYED BY: SPACE AGE CONSULTANTS
 375, FASHION MALL, ROAD NO-43, PITAMPURA
 DELHI-110034, PH. 011-27011257, 32544415
 email : info@spaceage.co.in

BM=83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR.
 CONTOUR INTERVAL TAKEN AS 0.25M.

SCALE : 1 : 500 DRG. NO. : SAC/1917



PROPOSED I.P. Survey

< JOGIYA WARI ROAD >



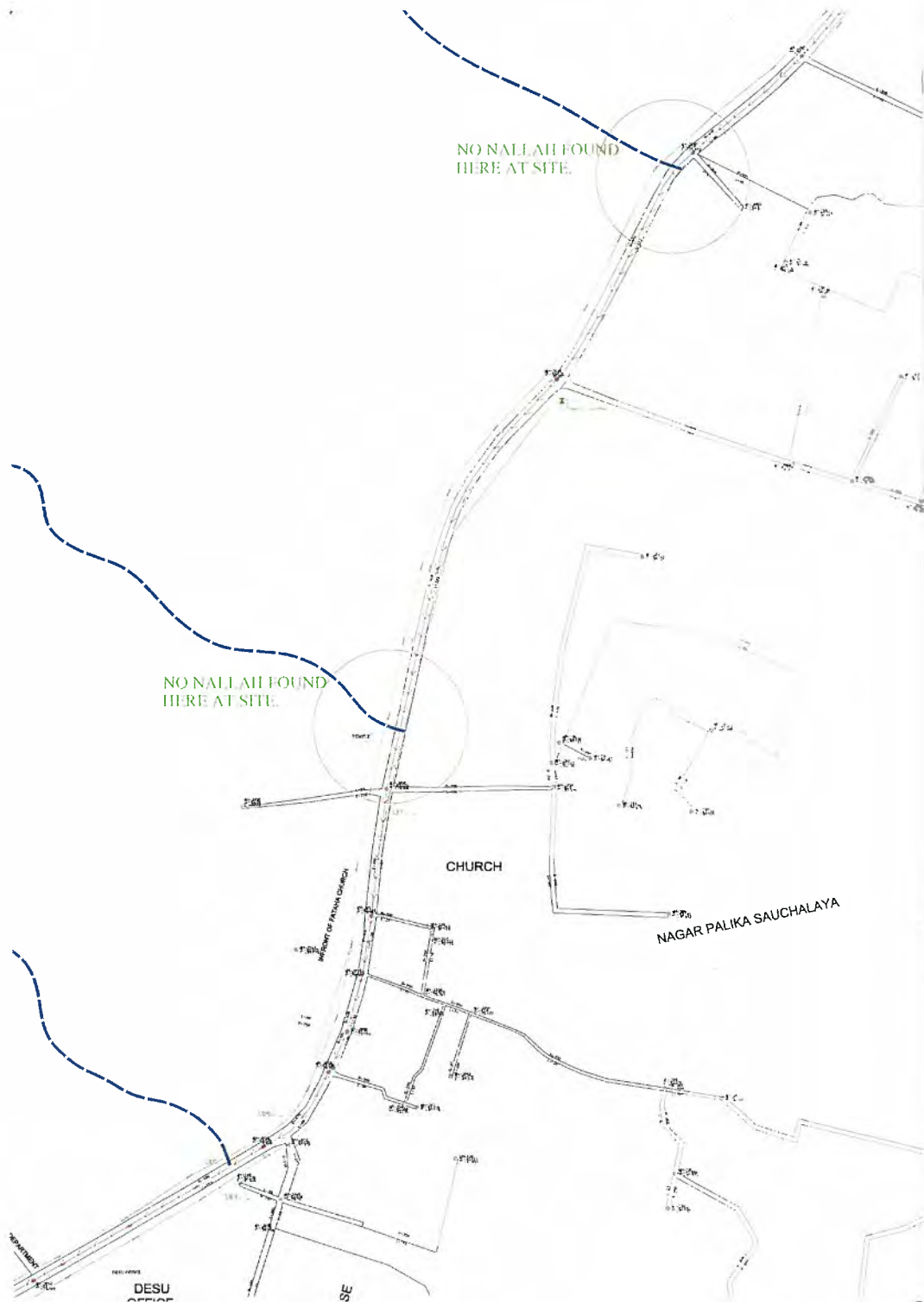
- LEGEND:-
- BOUNDARY WALL
 - PLOT LINE
 - BUILDING
 - ROAD
 - LEVEL
 - CHAMBER
 - DRAIN
 - CULVERT
 - LIGHT EDGE
 - CONTOUR

CLIENT: N.J.S. CONSULTANTS CO., LTD.
 TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY
 FOR PREPARATORY SURVEY GANGA REJUVENATION
 PROJECT - MIRZAPUR.

SURVEYED BY:
 SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO-43, PITAMPURA
 DELHI-110034; PH: 011-27011252, 32946415
 email: info@spaceage.co.in

BM#83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR
 CONTOUR INTERVAL TAKEN AS 0.25M.

SCALE - 1 : 500 | DRG. NO. : SAC/1917



- LEGEND:-
- BOUNDARY WALL
 - PLOT LINE
 - BUILDING
 - ROAD
 - LEVEL
 - CHAMBER
 - DRAIN
 - CURVEY
 - LIGHT POLE
 - CONTOUR

CLIENT: N.J.S. CONSULTANTS CO. LTD.

TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY
FOR PREPARATORY SURVEY GANGA REJUVENATION
PROJECT - MIRZAPUR.

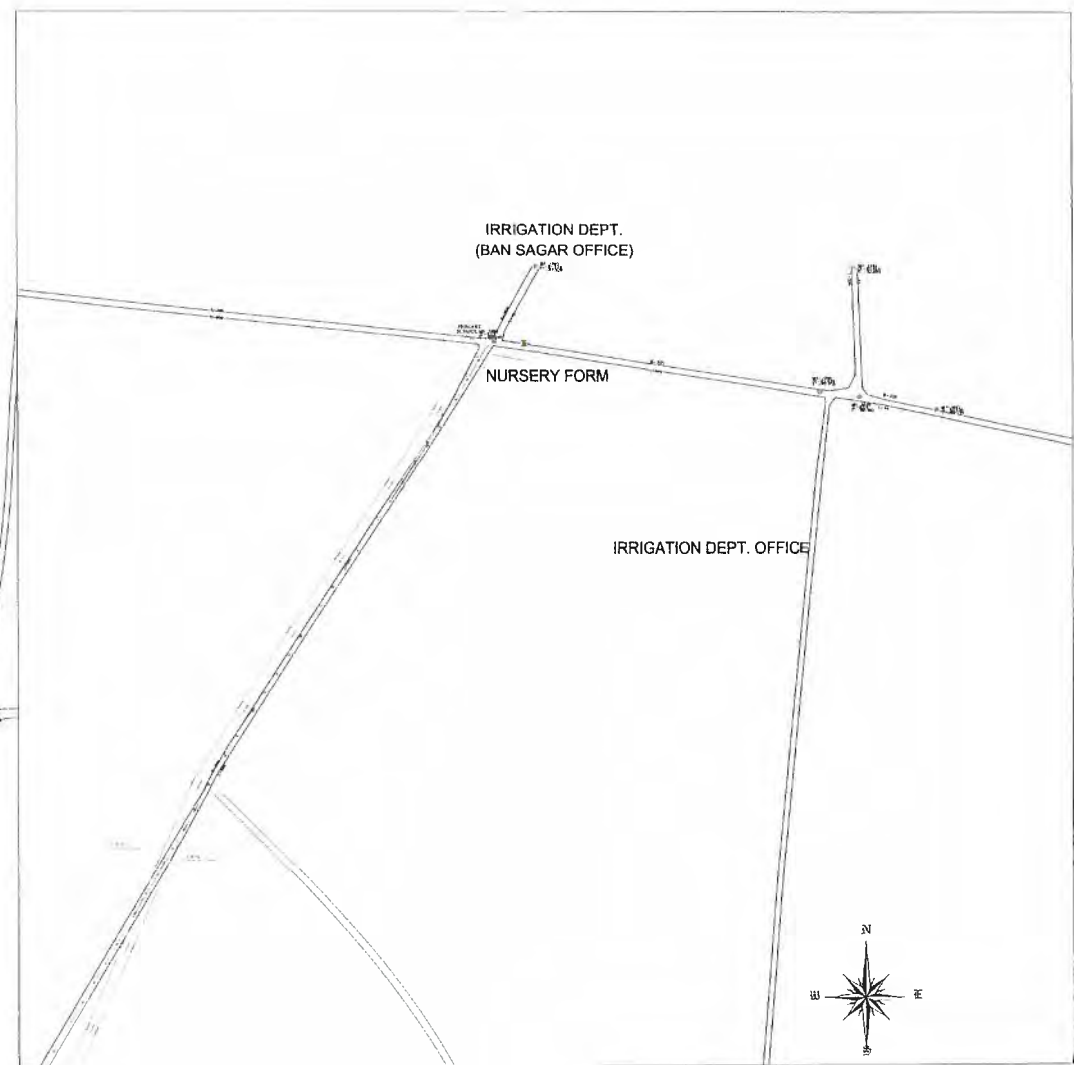
SURVEYED BY:

SPACE AGE CONSULTANTS
315, FASHION MALL, ROAD NO. 45, JIITAMPURA
DELHI-110024, PH. 011-27011252, 27946415
email - info@spaceage.co.in

BM=81.600 M TAKEN AT TOP OF PILLAR AT S.I.P. MIRZAPUR.
CONTOUR INTERVAL TAKEN AS 0.25M.

SCALE - 1 : 500

DRG. NO. SAC/1917



- LEGEND -**
- BOUNDARY WALL
 - PLOT LINE
 - BUILDING
 - ROAD
 - LEVEL
 - CHAMBER
 - DRAIN
 - CULVERT
 - LIGHT POLE
 - CONTOUR

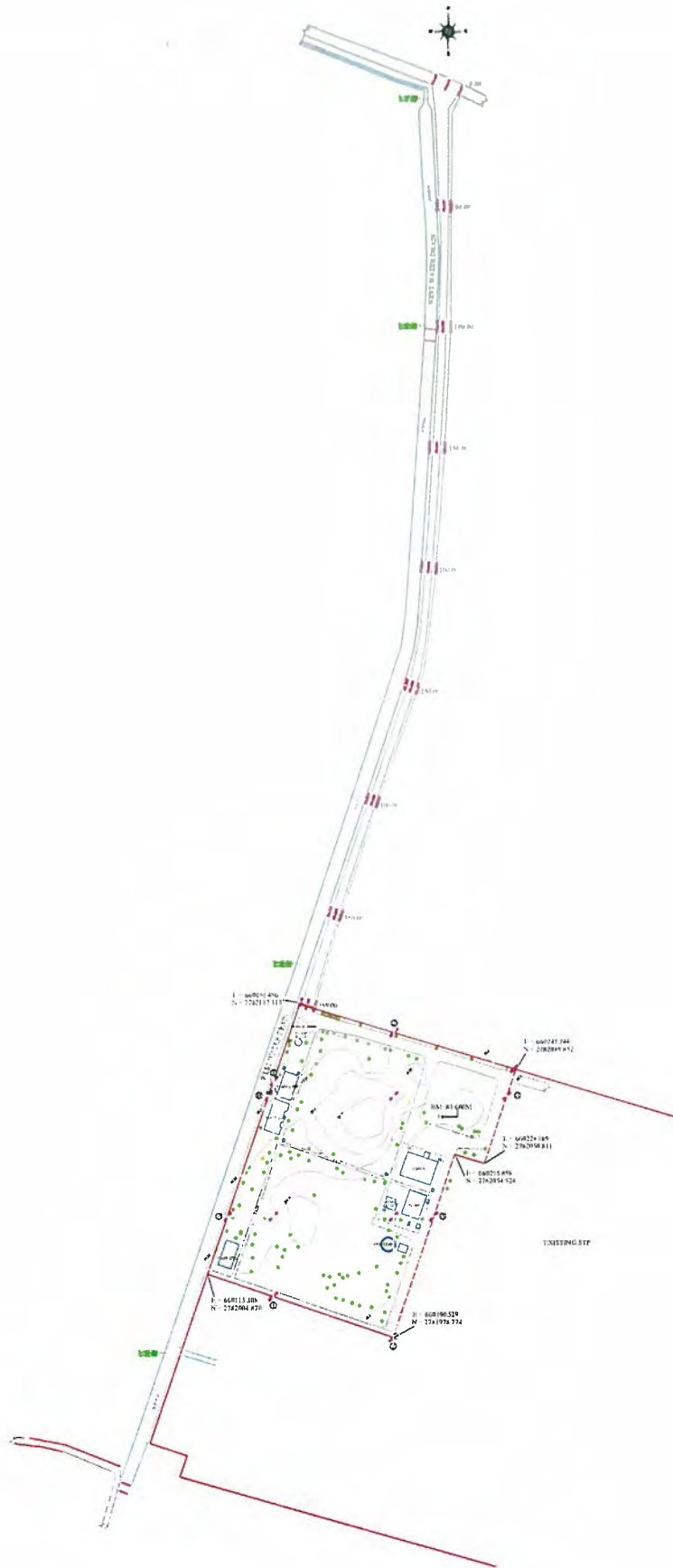
CLIENT: N.J.S. CONSULTANTS CO., LTD.
 TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUVENATION PROJECT - MIRZAPUR.

SURVEYED BY: SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO -43, PITAMPURA
 DELHI-110034, PH. 011-27011252, 32946415
 email : info@spaceage.co.in

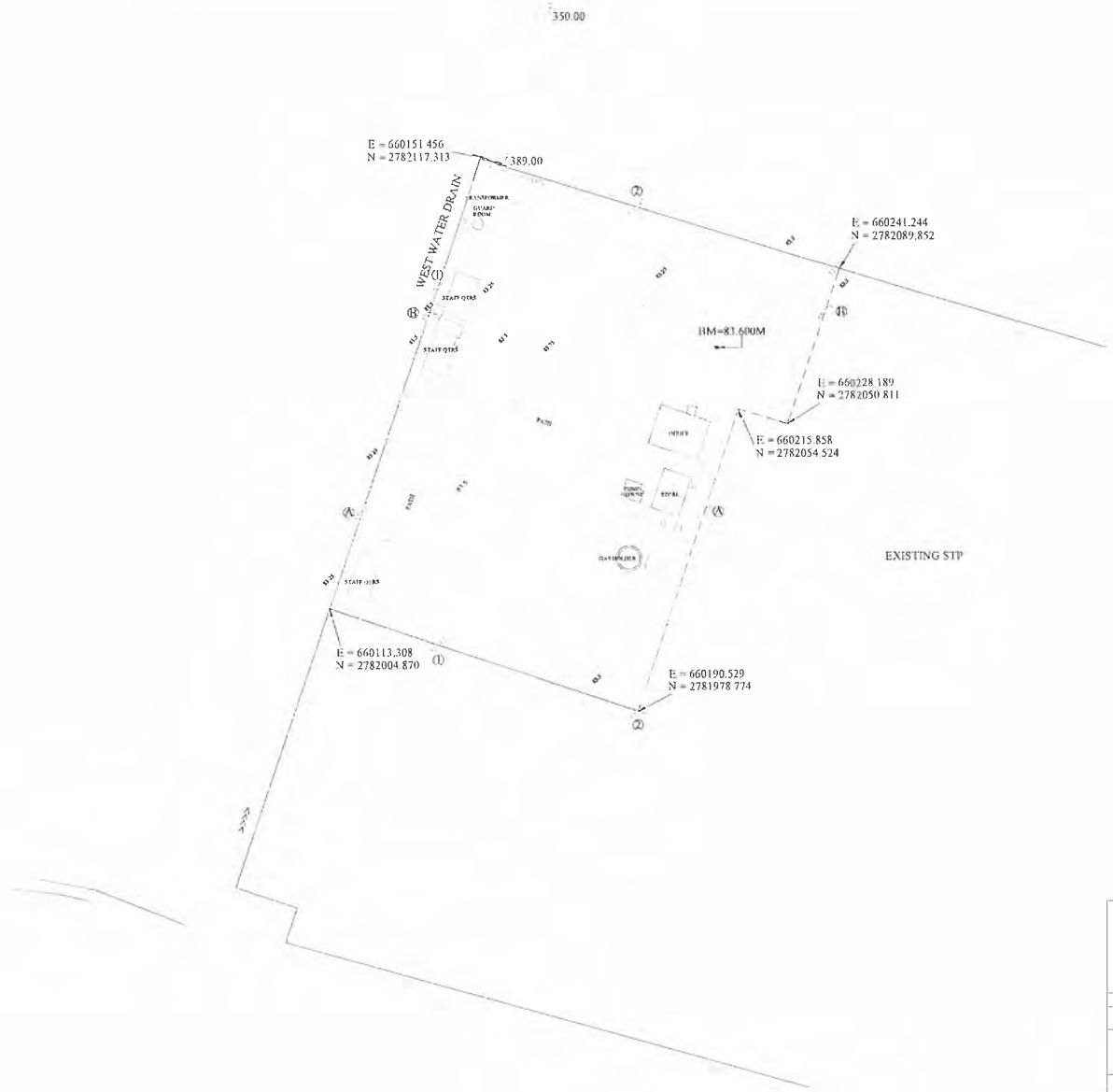
BM=83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR.
 CONTOUR INTERVAL TAKEN AS 0.25M.

SCALE - 1 : 500

DRG. NO. :SAC/1917



<ul style="list-style-type: none"> Proposed Existing Boundary Water Drainage Utility Structure Plant Tree Other 	<p>PROJECT: N/A COMBAT SPORTS LTD</p> <p>TITLE: PROPOSED DEVELOPMENT OF PROPOSED STP, MCDONALD</p> <p>PREPARED BY: N/A COMBAT SPORTS LTD</p> <p>DATE: 15/08/2024</p> <p>SCALE: 1:1000</p> <p>DATE: 15/08/2024</p>
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LEGEND: - BOUNDARY WALL - PLOT LINE - BUILDING - ROAD - FENCE - CHANNEL - CULTURE - LIGHT POLE - CONTOUR	
CLIENT:	N.J.S. CONSULTANTS CO., LTD.
TITLE:	TOPOGRAPHICAL SURVEN PLAN OF PROPOSED S.T.P., MIRZAPUR.
SURVEYED BY:	SPACE AGE CONSULTANTS 201, PABSON HALL, ROAD NO-03, PITHAMPURA DHAKA-1100, TEL: 81-2761332, 2766111 email: info@spaceage.co.in
BM=83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR CONTOUR INTERVAL TAKEN AS 0.30M.	
SCALE: - 1 : 500	DRG. NO. -SAC/1917/STP

11.4
 11.4
 E - 2° 38' 00" AT 74.5
 N - 87° 28' 00" AT 85.5

1500.00

1600.00

1500.00

1600.00

1700.00

1800.00

WEST WATER DRAIN

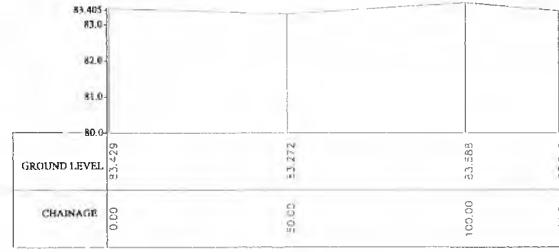
1900.00

2000.00

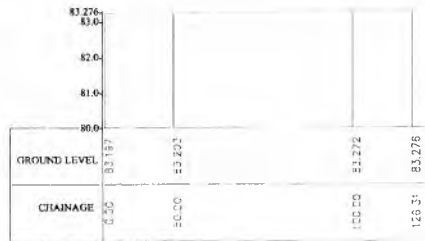
LAUNCH: PROPERTY #101 11/1/20 1/2, 3/20 1/20 1/20 1/20 1/20 1/20 1/20	
CLIENT: N.A.S. CONSULTANTS CORP. TITLE: TOPICAL PRELIMINARY PLAN OF PROPOSED ST. 7, MERZAPOL	
SURVEYED BY: SPACIUM CONSULTANTS 274 HERRON ROAD, SUITE 200, KANSAS CITY, MISSOURI 64111 (816) 452-1111 www.spacium.com	
896-41 WE H TALKIN 'T TOP OF PELLAS AT 4.77, MERZAPOL CENTRAL INTERVAL 7.4200 AS 2.15M	
SCALE: 1" = 100'	DWG. NO. SAC/1517/STP



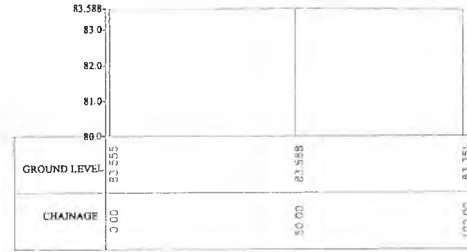
SECTION AT 1-1
SCALE: H=1:100, V=1:10



SECTION AT 2-2
SCALE: H=1:100, V=1:10

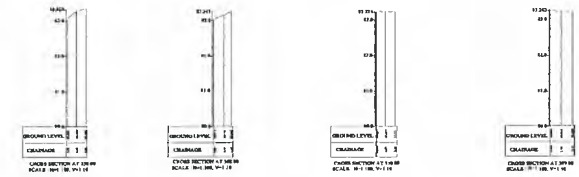
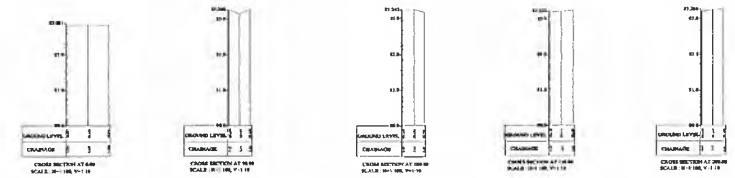


SECTION AT A-A
SCALE: H=1:100, V=1:10



SECTION AT B-B
SCALE: H=1:100, V=1:10

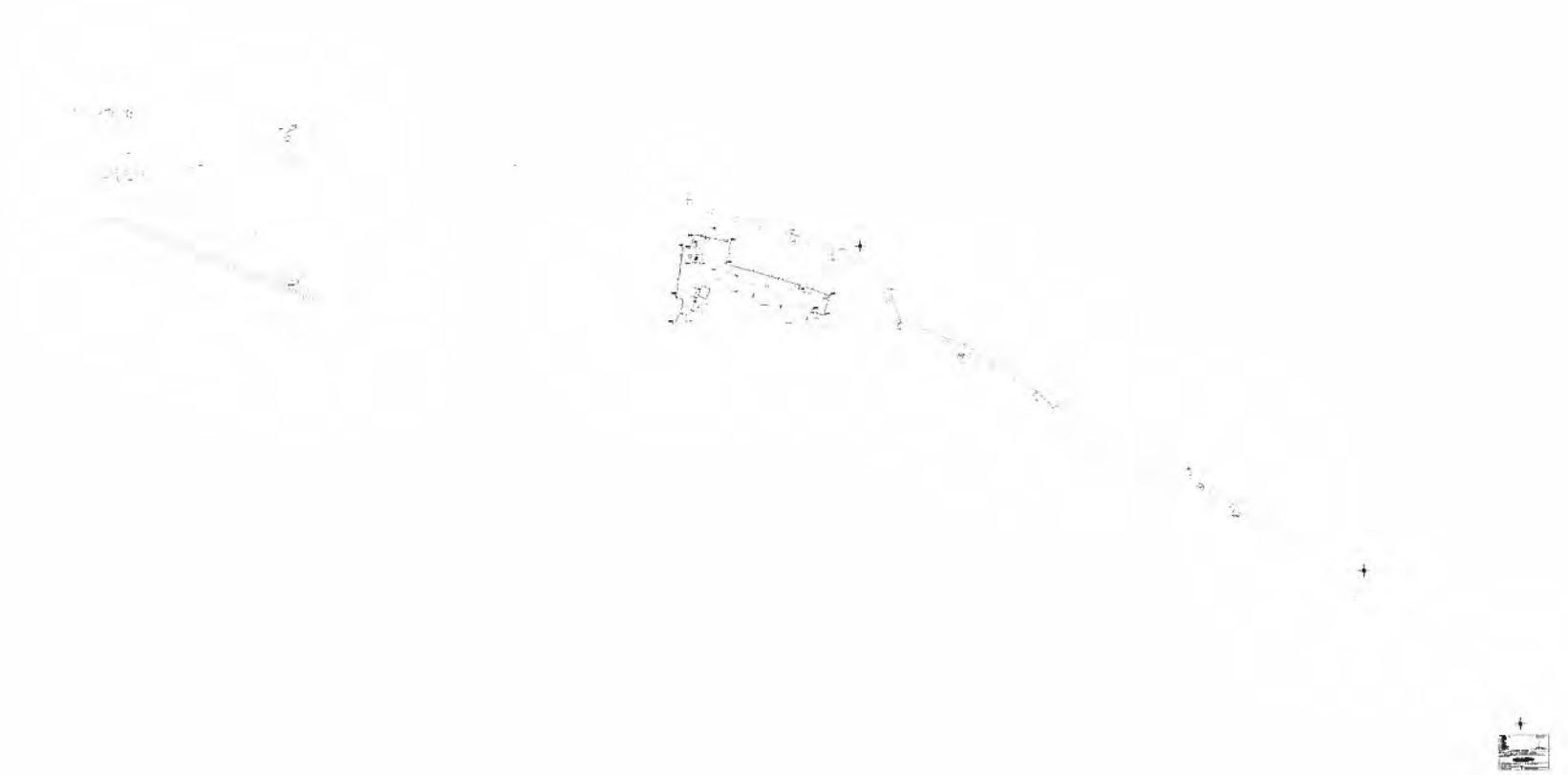
SECTION OF STP SITE



CROSS SECTION OF APPROACH ROAD TO S.T.P.

CLIENT:	N.J.S. CONSULTANTS CO., LTD.
TITLE:	TOPOGRAPHICAL SURVEN PLAN OF PROPOSED S.T.P., MIRZAPUR.
SURVEYED BY:	SPACE AGE CONSULTANTS 329, FASHION MALL, ROAD NO -43, PITAMPURA DELHI-110034, PH. 011-27011252, 32946415 email : info@spaceage.co.in
BM=83.600 M TAKEN AT TOP OF PILLAR AT S.T.P., MIRZAPUR. CONTOUR INTERVAL TAKEN AS 0.25M.	
SCALE - 1 : 100	DRG. NO. :SAC/ 1917/ STP

5. Vindhyachal (Mirzapur)





LEGEND • Proposed Road - Right Lane - Left Lane - Lane - Shoulder - Drain - Utility - Structure - Existing Road - Existing Lane - Existing Shoulder - Existing Drain - Existing Utility - Existing Structure	
CLIENT	N/S CONSULTANTS CO., LTD
TITLE	CONSTRUCTION AND TRAFFIC IMPACT STUDY FOR PHO A TRAY QUAY ON GANG LUEN TSEI IN PRECINCT 1, SENEH ATRIAL, QUANTON
DESIGNED BY	SPACE AGE CONSULTANTS 10/F, HONG KONG & SOUTH CHINA BANK BUILDING 110-112, QUEEN'S ROAD, HONG KONG TEL: 2522 2222 FAX: 2522 2222 WWW.SPACEAGE.COM.HK
DATE	15/08/2011 AT THE TOP OF SHEET 1 OF 11 SHEETS
SCALE	AS SHOWN
DATE	15/08/2011

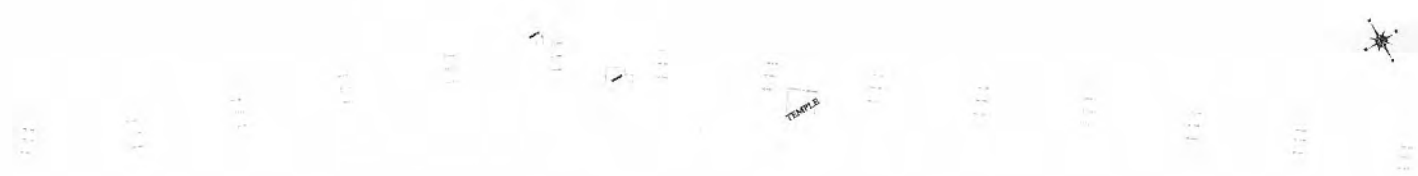


N
E
D
W

LEGEND: - BOUNDARY WALL - FLOOR PLAN - SETTING - ROAD - LEVEL - SIGNPOST - POLE - POLE TOP - TELEPHONE - WATER TOWER - SANDY LAND	
CLIENT: N.I.S. CONSULTANTS CO., LTD.	
TITLE: TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT-VINDHYACHAL.	
SURVEYED BY: SPACE AGE CONSULTANTS 209, FASRODI KHAL, ROAD NO-43, PITAMPURA DELHI-110048, PH- 011-26102020, 26102025 email- info@spaceage.co.in	
BM = 77.00 M TAKEN AT TOP OF PILLAR AT SET, VINDHYACHAL. CENTER INTERVAL TAKEN AS 4.50M	
SCALE - 1 : 500	DRG. NO. SAC/1918



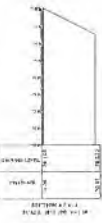
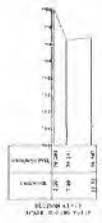
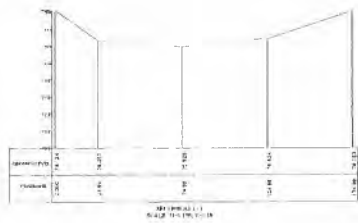
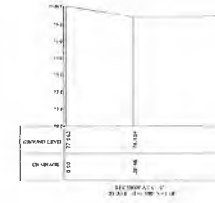
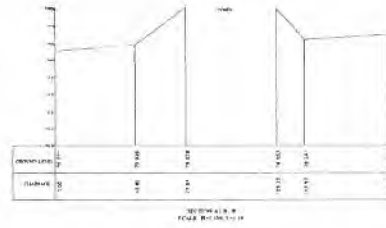
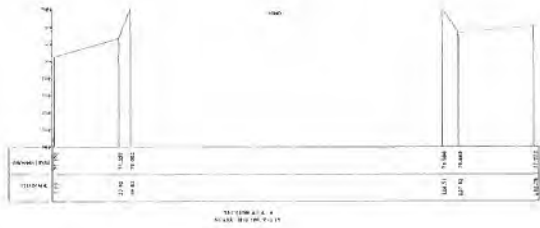
<ul style="list-style-type: none"> • Boundary • Road • Pond • Canal • Well • Structure • Elevation • Spot Level • Contour 	
CLIENT - S/S. CONCRETE CO., LTD.	
TITLE - TOPOG. SURVEY AND SITE INVESTIGATION FOR THE PROPOSED CONCRETE PLANT AT S/S. CONCRETE CO., LTD.	
DRAWN BY - S/S. CONCRETE CO., LTD.	
CHECKED BY - S/S. CONCRETE CO., LTD.	
DATE - 15/05/2011	
SCALE - AS SHOWN	
DRAWN BY - S/S. CONCRETE CO., LTD.	
DATE - 15/05/2011	



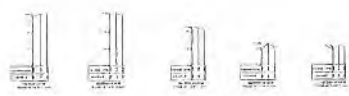
<ul style="list-style-type: none"> • BOUNDARY WALL • FISH LENS • CHANNEL • ROAD • LEVEL • CANAL • FARM • CULTIVATED • SETTLEMENT • CULTIVATION • WATER LENS 	
<p>CLIENT: N. S. CONSULTANTS CO., LTD.</p>	
<p>TITLE: SUPPLEMENTAL AND REVISION SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT, VISHVAKALIA</p>	
<p>SURVEYED BY: SPACE AGE CONSULTANTS 101, FASHION PALL ROAD NO-41, PEARLUNA BANGALURU-560078, INDIA email: info@spaceage.co.in</p>	
<p>ISM = 77 MM TAKEN AT TOP OF REF. LK AT STP., VISHVAKALIA. CONTOUR INTERVAL TAKEN AS 0.5 MM</p>	
SCALE = 1 : 500	DRG. NO. : SAC/1918



LEGEND:- - BOUNDARY MARK - BUILDING - ROAD - CANAL - MANHOLE - OPEN - CULVERT - ELECTRIC PILLAR - ANCHOR		
CLIENT: N/S CONSULTANTS CO. LTD		
TITLE: TOPOGRAPHICAL SURVEN PLAN OF PROPOSED S.T.P., VINDHYACHAL.		
SURVEYED BY: SPACE AGE CONSULTANTS 329 FASOON MALL, ROAD NO. 43, PONTAMPURA DELHI-110034, PH. 011-27012522, 32946415 email: syc@spaceage.co.in		
BM = 77.00 M TAKEN AT TOP OF PILLAR AT SPT, VINDHYACHAL. CONTOUR INTERVAL TAKEN AS 0.50 M.		



SECTION OF SITE



SECTION OF SITE

CLIENT:	N.J.S. CONSULTANT'S CO., LTD.
TITLE:	TOPOGRAPHICAL SURVEN PLAN OF PROPOSED S.T.P., VINDHYACHAL.
SURVEYED BY:	SPACE AGE CONSULTANTS 329, FASHION MALL, ROAD NO 43, PITAMPURA DELHI-110034, PH. 011-27011257, 32946415 email : info@spaceage.co.in
BM = 77.00 M TAKEN AT TOP OF PILLAR AT STP, VINDHYACHAL.	
SCALE - 1 - 100	DRG. NO SAC/1918

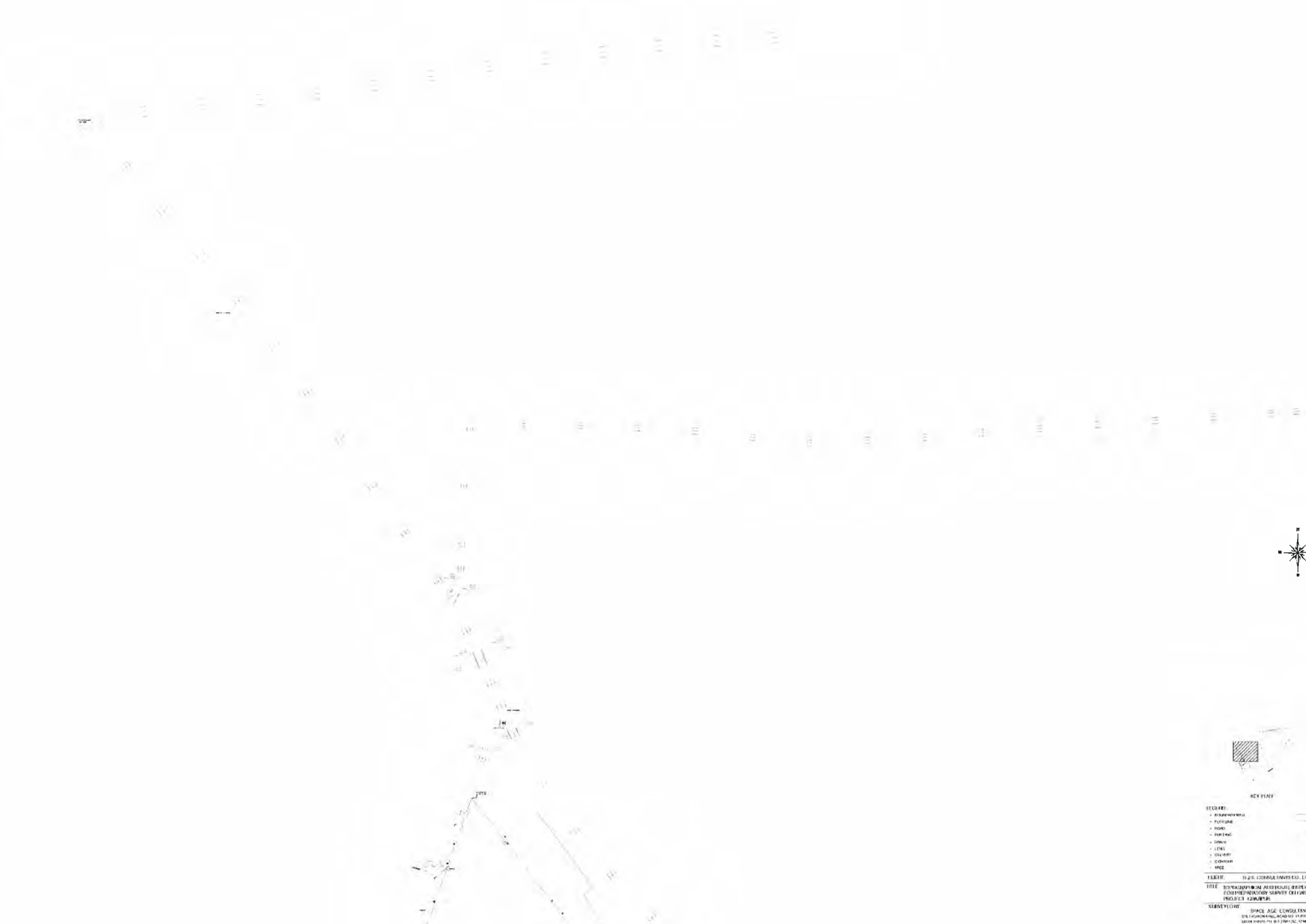
6. Ghazipur

LIST OF BANCH MARKS ESTABLISHED AT SITE

GHAZIPUR:-					
TBM AT STP = TBM 71.141 M TRANSFERED FROM RAILWAY STATION GHAZIPUR (74.000 M).					
TBM FOR ROUTE SURVEY = TBM 71.141 M TRANSFERED FROM RAILWAY STATION GHAZIPUR (74.000 M).					
SL. NO.	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (1)	756539.14	2830844.82	71.141	TOP OF PLATFORM SARAI CROSSING.
2	TBM (27)	759478.4	2832057.41	73.890	PLINTH OF TEMPLE KAPUR CHUNGI
3	TBM (D)	756910.014	2830369.75	72.445	PLINTH OF TEMPLE ITI CHAURAHA.
4	TBM (E)	756189.536	2829490.26	73.110	TOP OF CIRCLE P.G. COLLEGE CHAURAHA.
5	TBM (F)	755075.329	2828965.23	72.902	PLINTH OF TEMPLE CHOCHAKPUR ROAD.
6	TBM (10)	760205.458	2831872.63	68.380	PLINTH OF PUMP HOUSE NEAR TOWN HALL.
7	TBM (11)	760790.444	760790.444	70.290	TOP OF CHAMBER NEAR PRIMARY SCHOOL MARTIN GANJ.
8	TBM (16)	758371.61	2831748.82	72.990	PLINTH OF TEMPLE DURGA CHAURAHA.
9	TBM (20)	757439.883	2830234.29	71.490	PLINTH OF EXISTING O.H.T. RAJENDRA NAGAR T -POINT




Technical Drawing of a Mechanical Assembly

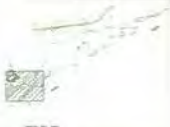


- LEGEND:**
- BUILDING
 - PARKING
 - ROAD
 - FENCE
 - DRIVE
 - LEVEL
 - DRAIN
 - CONCRETE
 - TREE

CLIENT: H.S. CONSTRUCTION LTD.
 TITLE: SUBMITTAL AND DESIGN FOR CONSTRUCTION OF COMMERCIAL BUILDING AND PARKING LOT AT 1234567890
 SURVEYOR: SPACE AGE CONSULTANTS
 DATE: 2024-10-27
 SCALE: 1:500



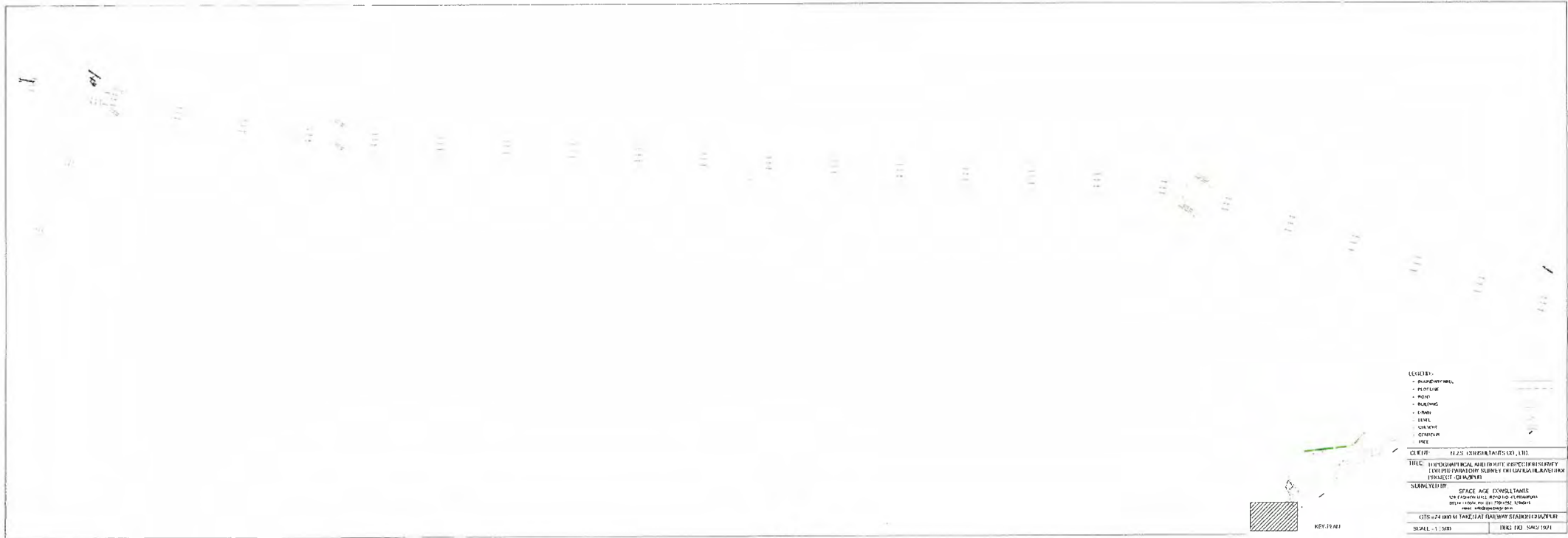




 1:50,000

LEGEND
 - Contour lines
 - 1:50,000
 - Road
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000
 - 1:50,000

CLIENT: H.S. OVERSEAS CO., LTD.
 PROJECT: TOPOGRAPHICAL AND RECONSTRUCTION SURVEY FOR THE PROPOSED INDUSTRIAL ZONE AT CHANGHAI INDUSTRIAL ZONE, CHINA.
 DATE: 2023.12.01
 DRAWN BY: [Name]
 CHECKED BY: [Name]
 SCALE: 1:50,000



- LEGEND:
- PROPERTY LINE
- FUTURE
- ROAD
- BUILDINGS
- DRIVE
- LEVEL
- SURVEY
- STAKE
- TREE

CLIENT: PLAS CONSULTANTS CO., LTD.
 TITLE: HISTORICAL AND PRESENT SURVEY OF THE LANDS OF THE
 COUNTY OF DUBLIN, SURVEYED BY GEORGE WILKINSON
 IN 1824.
 SURVEYED BY: SPACE AGE CONSULTANTS
 SURVEYED ON: 10/10/2010
 DRAWN BY: J. J. J. J. J.
 CHECKED BY: J. J. J. J. J.
 SCALE: 1:500
 THIS PLAN IS NOT TO BE USED FOR ANY OTHER PURPOSES

KEY PLAN



LEGENDA

- 0.50m contour
- 1.00m contour
- 1.50m contour
- 2.00m contour
- 2.50m contour
- 3.00m contour
- 3.50m contour
- 4.00m contour
- 4.50m contour
- 5.00m contour
- 5.50m contour
- 6.00m contour
- 6.50m contour
- 7.00m contour
- 7.50m contour
- 8.00m contour
- 8.50m contour
- 9.00m contour
- 9.50m contour
- 10.00m contour

OTHER

- 0.50m contour
- 1.00m contour
- 1.50m contour
- 2.00m contour
- 2.50m contour
- 3.00m contour
- 3.50m contour
- 4.00m contour
- 4.50m contour
- 5.00m contour
- 5.50m contour
- 6.00m contour
- 6.50m contour
- 7.00m contour
- 7.50m contour
- 8.00m contour
- 8.50m contour
- 9.00m contour
- 9.50m contour
- 10.00m contour

DATE: 10/10/2018

SCALE: 1:1000

PROJECT: DEVELOPMENT OF A NEW INDUSTRIAL ZONE AT THE PORT OF PASIG, CALABARZON, PHILIPPINES

CLIENT: J.S. CHAVEZ & CO. LTD.

DESIGNER: J.S. CHAVEZ & CO. LTD.

DATE: 10/10/2018

SCALE: 1:1000

PROJECT: DEVELOPMENT OF A NEW INDUSTRIAL ZONE AT THE PORT OF PASIG, CALABARZON, PHILIPPINES

CLIENT: J.S. CHAVEZ & CO. LTD.

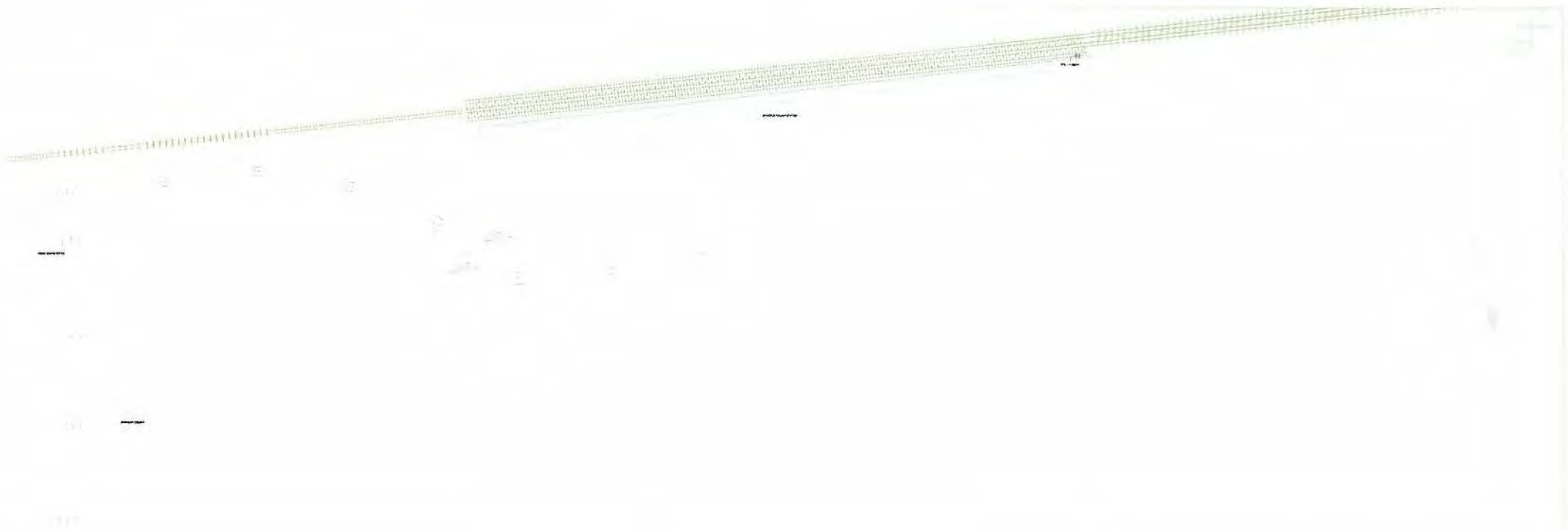
DESIGNER: J.S. CHAVEZ & CO. LTD.



KEY PLAN

- LEGEND:
- BOUNDARY
 - FLOODLINE
 - ROAD
 - RIVER
 - CANAL
 - DRAIN
 - CHANNEL
 - SHED
 - TREE

CLIENT: H&S CONSULTANTS CO., LTD.
 TITLE: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY FOR THE PROPOSED 2.5 KM ROAD PROJECT - KAMPOT
 SURVEYED BY: STACEY ANN USANGKARN
 DATE: 15/05/2023
 SCALE: 1:500







KEY PLAN

SYMBOL	DESCRIPTION
	BOUNDARY WALL
	ROAD
	DRAINAGE
	WATER
	CONTOUR LINE
	SPOT HEIGHT
	BUILDING
	TREE

CLIENT: S.P.S. CAPITAL INVESTMENT CO., LTD.
 TITLE: TOPOGRAPHICAL AND EXISTING PROJECTS SURVEY FOR PRE-FEASIBILITY STUDY FOR CONSTRUCTION OF A 10 MW PHOTOVOLTAIC POWER PLANT
 SURVEYED BY: S.P.S. CAPITAL INVESTMENT CO., LTD.
 DATE: 14/05/2014
 SCALE: 1:500



REF: PLAN

- LEGENDA:**
- BOUNDARY
 - BUILDING
 - DRIVE
 - PARKING
 - DRIVE
 - DRIVE
 - DRIVE
 - DRIVE
 - DRIVE

CLIENT: FLS CONSULTANTS CO. LTD.
 TITLE: COMMERCIAL AND INDUSTRIAL DEVELOPMENT OF 1.0 HA FOR FAMILIARITY SURVEY AND LAYOUT PLAN FOR PROJECT - GAZIYER
 SURVEYED BY: SPACE AGE CONSULTANTS
 DRAWN BY: SPACE AGE CONSULTANTS
 CHECKED BY: SPACE AGE CONSULTANTS
 SCALE: 1:500 | DWG NO: SAC/121



LEGEND	
—	Proposed Road
—	Existing Road
—	Proposed Structure
—	Existing Structure
—	Proposed Utility
—	Existing Utility
—	Proposed Drainage
—	Existing Drainage
—	Proposed Fencing
—	Existing Fencing
—	Proposed Landscaping
—	Existing Landscaping
—	Proposed Signage
—	Existing Signage
—	Proposed Lighting
—	Existing Lighting
—	Proposed Security
—	Existing Security

CLIENT: J.S. CONSTRUCTION CO. LTD.
 TITLE: CONSTRUCTION AND MAINTENANCE OF HIGHWAY AND SIDEWAYS FOR THE PROJECT OF THE J.S. CONSTRUCTION CO. LTD.
 DRAWN BY: J.S. CONSTRUCTION CO. LTD.
 CHECKED BY: J.S. CONSTRUCTION CO. LTD.
 SCALE: 1:500
 DATE: 2024-10-27



REF PLAN

LEGEND:	
—	BOUNDARY WALL
—	CONCRETE
—	ROOF
—	FOUNDATION
—	WALL
—	FLOOR
—	CEILING
—	DOOR
—	WIND
NOTES: SEE CONSTRUCTION CO. 111	
TITLE: SUPPLEMENTAL ARCHITECTURAL DRAWINGS FOR THE PROPOSED SINGLE-FAMILY RESIDENTIAL PROJECT, GARFIELD	
SURVEYOR:	SPACE CONSULTANTS
	1000 14th Street, Suite 100, Berkeley, CA 94704
	TEL: 415.863.1111 FAX: 415.863.1112
	WWW.SPACECONSULTANTS.COM
DATE: 11/20/2011	SCALE: 1" = 50'



425 000

LEGEND

- 100m contour
- 200m contour
- 300m contour
- 400m contour
- 500m contour
- 600m contour
- 700m contour
- 800m contour
- 900m contour
- 1000m contour

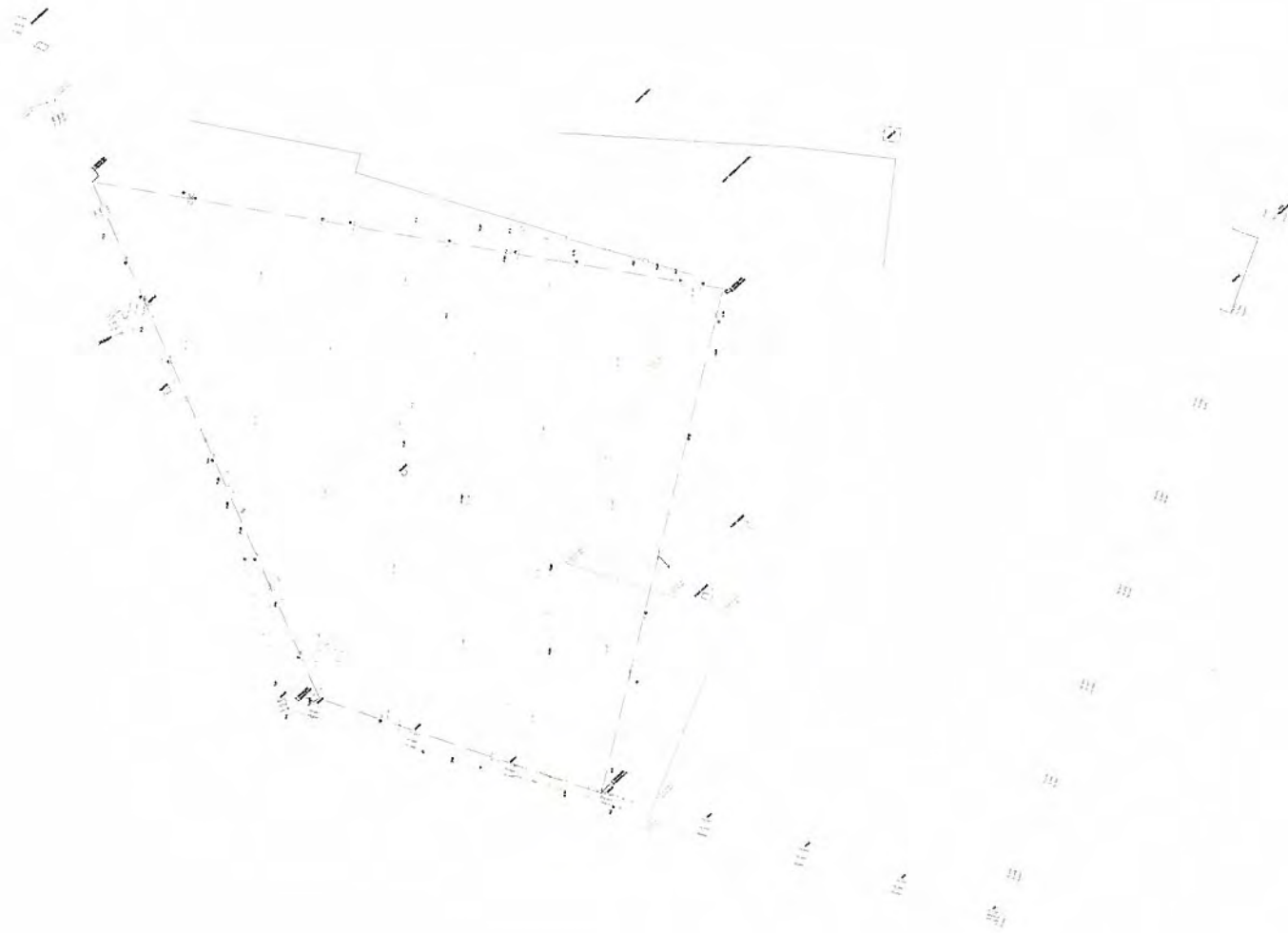
CLIENT M. S. COOPER LANDS CO. LTD

TITLE SITE INVESTIGATION AND REPORT FOR THE PROPOSED DEVELOPMENT OF A RESIDENTIAL PROJECT (3.5/1/14)

SCALE 1:1000

DATE 14/01/2014

BY [Signature]



LEGEND:-

- BOUNDARY WALL
- PLOT LINE
- ROAD
- BUILDING
- DRAIN
- LEVEL
- CULVERT
- CONTOUR
- TREE

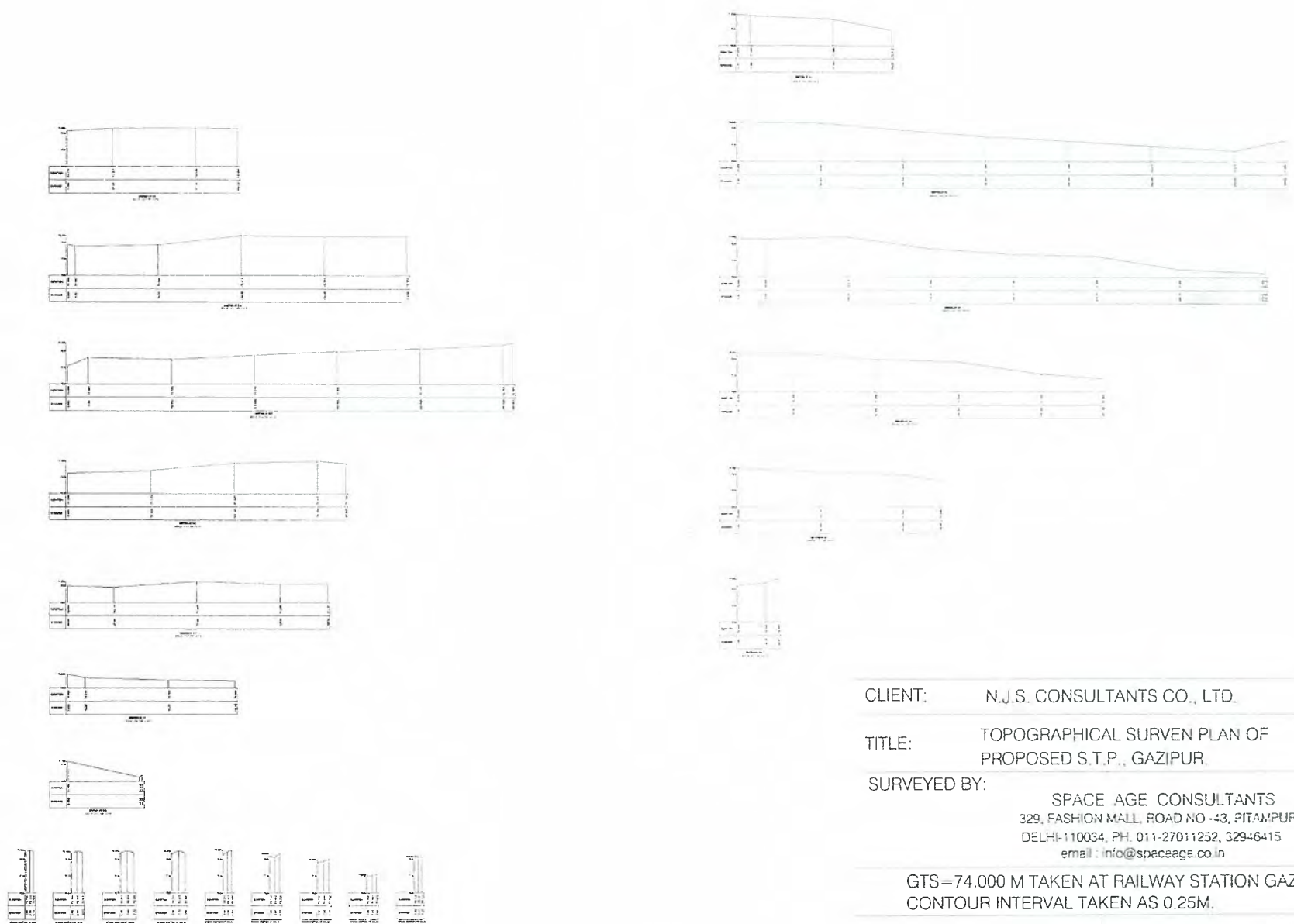
CLIENT: N.J.S. CONSULTANTS CO., LTD.

TITLE: TOPOGRAPHICAL SURVEN PLAN OF PROPOSED S.T.P., GAZIPUR

SURVEYED BY: SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO-43, PITAMPURA
 DELHI-110024, PH: 011-27011262, 32849415
 email: 310@spaceage.co.in

GTS=74 000 M TAKEN AT RAILWAY STATION GAZIPUR.
 CONTOUR INTERVAL TAKEN AS 0.25M

SCALE - 1 : 500 | DRG NO. SAC/ 1921



CLIENT: N.J.S. CONSULTANTS CO., LTD.

TITLE: TOPOGRAPHICAL SURVEN PLAN OF PROPOSED S.T.P., GAZIPUR.

SURVEYED BY: SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO -43, PITAMPURA
 DELHI-110034, PH. 011-27011252, 329-6415
 email : info@spaceage.co.in

GTS=74.000 M TAKEN AT RAILWAY STATION GAZIPUR,
 CONTOUR INTERVAL TAKEN AS 0.25M.

SCALE - 1 : 100

DRG. NO. :SAC/ 1921

7. Ramnagar

LIST OF BANCH MARKS ESTABLISHED AT SITE

RAMNAGAR:-					
TBM AT STP = TBM 73.523 M TRANSFERED FROM STP BHAGWANPUR, VARANASI (74.969 M).					
TBM FOR ROUTE SURVEY = TBM 73.523 M TRANSFERED FROM STP BHAGWANPUR, VARANASI (74.969 M).					
SL. NO.	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (1)	703370.741	2798384.73	73.523	TOP OF PILLAR STP, RAMNAGAR
2	TBM (2)	704668.798	2798196.27	77.157	TOP OF CULVERT BYEPASS ROAD
3	TBM (3)	704535.874	2797543.55	77.050	FOUNDATION OF LIGHT POLE SHAHEED SMARAK PARK JANAKPUR
4	TBM (4)	704507.594	2796870.16	78.535	TOP OF CULVERT NEAR JAN KALYAN SAMITI.
5	TBM (5)	704465.01	2796391.64	79.500	PLINTH OF POLICE BOOTH RAMNAGAR CHAURAHA
6	TBM (6)	703972.8	2796507.05	76.080	CIRCLE OF LA LBAHADUR SHASHTRI CHAURAHA
7	TBM (7)	703825.732	2796818.55	76.555	TOP OF CULVERT SHAKTI GHAT NALA





<p>Legend</p> <ul style="list-style-type: none"> --- Structural walls - - - - - Wall lines --- Windows --- Doors --- Stairs --- Stairs (up) --- Stairs (down) --- Stairs (up/down) --- Stairs (up/down) --- Stairs (up/down) 	
<p>Scale: 1:100</p>	
<p>Project: [Illegible]</p>	
<p>Client: [Illegible]</p>	
<p>Architect: [Illegible]</p>	
<p>Date: [Illegible]</p>	
<p>Sheet: [Illegible]</p>	





la

IGH

<p>LEGEND:</p> <ul style="list-style-type: none"> - BOUNDARY WALL - FLOOR LINE - BUILDING - DRIVE - LANE - TOP LEVEL/PERMIT LEVEL - DRAIN - CURB 	<p>DATE: 01/11/2011</p> <p>PROJECT: 100% ARCHITECTURAL AND STRUCTURAL DRAWING FOR THE PROPOSED DEVELOPMENT OF LAND AT PLOT NO. 100/1, 100/2, 100/3, 100/4, 100/5, 100/6, 100/7, 100/8, 100/9, 100/10, 100/11, 100/12, 100/13, 100/14, 100/15, 100/16, 100/17, 100/18, 100/19, 100/20, 100/21, 100/22, 100/23, 100/24, 100/25, 100/26, 100/27, 100/28, 100/29, 100/30, 100/31, 100/32, 100/33, 100/34, 100/35, 100/36, 100/37, 100/38, 100/39, 100/40, 100/41, 100/42, 100/43, 100/44, 100/45, 100/46, 100/47, 100/48, 100/49, 100/50, 100/51, 100/52, 100/53, 100/54, 100/55, 100/56, 100/57, 100/58, 100/59, 100/60, 100/61, 100/62, 100/63, 100/64, 100/65, 100/66, 100/67, 100/68, 100/69, 100/70, 100/71, 100/72, 100/73, 100/74, 100/75, 100/76, 100/77, 100/78, 100/79, 100/80, 100/81, 100/82, 100/83, 100/84, 100/85, 100/86, 100/87, 100/88, 100/89, 100/90, 100/91, 100/92, 100/93, 100/94, 100/95, 100/96, 100/97, 100/98, 100/99, 100/100.</p>
--	--

Ram Bagh Nala

IPS
RAM BAGH
NALA

Shakti Ghat Nala

Salotri Nala

Iua Ghat Nala



LEGEND

- 100mm dia. Pipe
- 75mm dia. Pipe
- 50mm dia. Pipe
- 25mm dia. Pipe
- Valve
- Tank

SCALE

1 cm = 10 m

DATE

10/11/2011

PROJECT

IPS RAM BAGH NALA

DESIGNED BY

M. S. S. SINGH

CHECKED BY

M. S. S. SINGH

DATE

10/11/2011



LEGENDA

- Bacia de captação
- Rede de distribuição
- Rede de abastecimento
- Rede de drenagem
- Rede de saneamento
- Rede de águas pluviais
- Rede de águas superficiais
- Rede de águas subterrâneas
- Rede de águas residuais
- Rede de águas de superfície
- Rede de águas de subsolo

L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)
 L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)
 L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)
 L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)

L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)
 L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)
 L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)

L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)
 L. 1.º DE ABRIL DE 1964 (Lei nº 1.320)

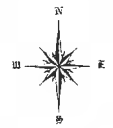
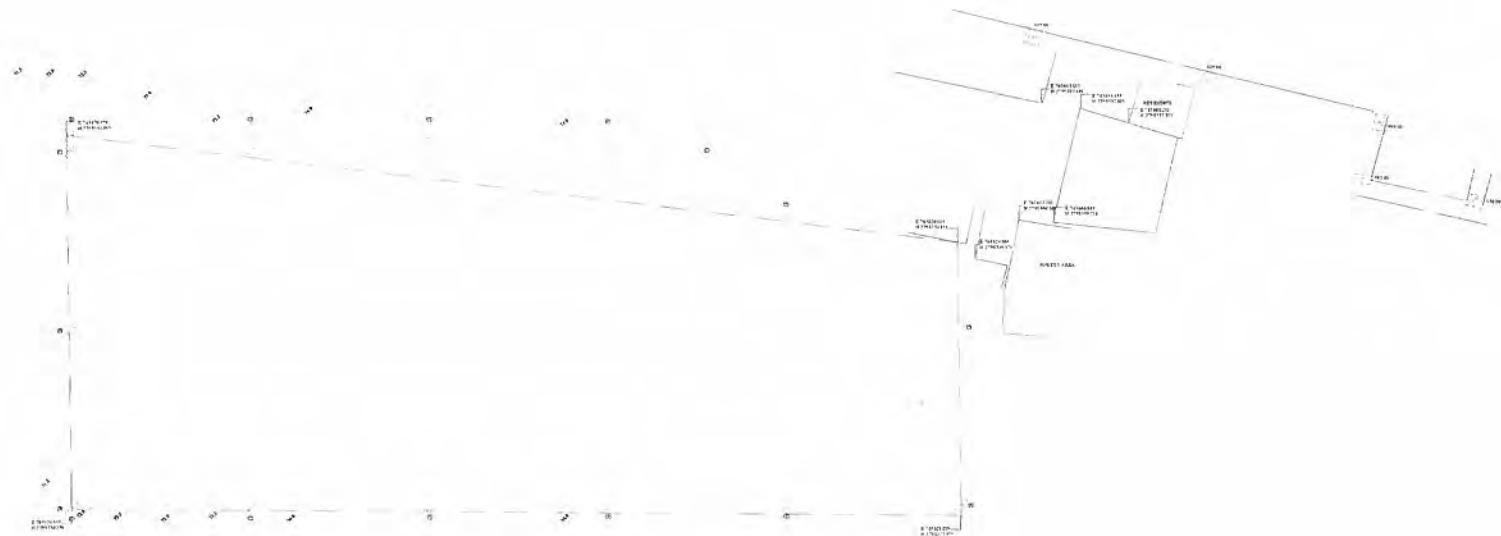


SCALE	1:500	DWG NO	SEC/128
CHECKED BY	R.S. SURESH		
DATE	10/10/2011		
PROJECT	RURAL INFRASTRUCTURE DEVELOPMENT PROJECT - II		
LOCATION	BUDA THIRY ROAD (NARROW)		
DESIGNED BY	R.S. SURESH		
DATE	10/10/2011		
SCALE	1:500		
DWG NO	SEC/128		



LEGENDA	
•	Manhole
—	1000mm
—	500mm
—	150mm
—	100mm
—	75mm
—	50mm
—	Culvert
—	Structure

GENERAL NOTES	
1.	THESE PLANS AND SPECIFICATIONS SHALL BE USED AS A GUIDE IN THE CONSTRUCTION OF THE WORK.
2.	ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE CURRENTLY APPLICABLE CODES AND STANDARDS.
3.	THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
4.	THE CONTRACTOR SHALL MAINTAIN ACCESS TO ALL ADJACENT PROPERTIES AT ALL TIMES.
5.	ALL MATERIALS AND WORKMANSHIP SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY THE ENGINEER.



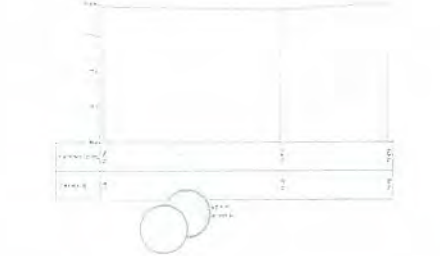
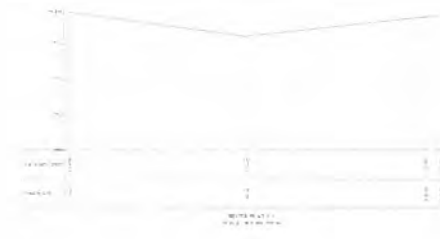
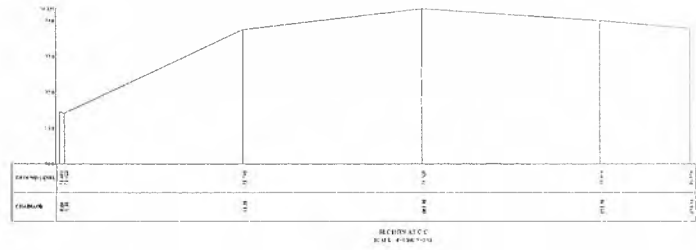
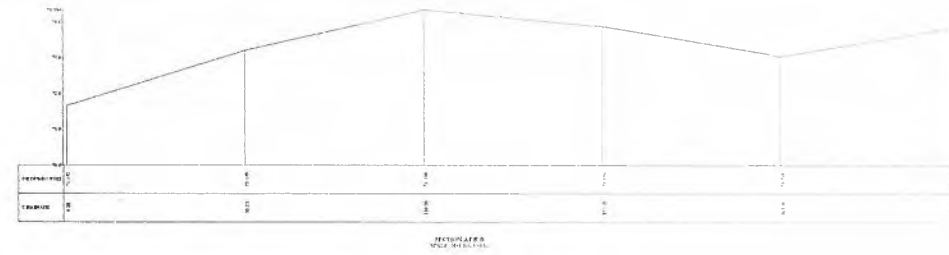
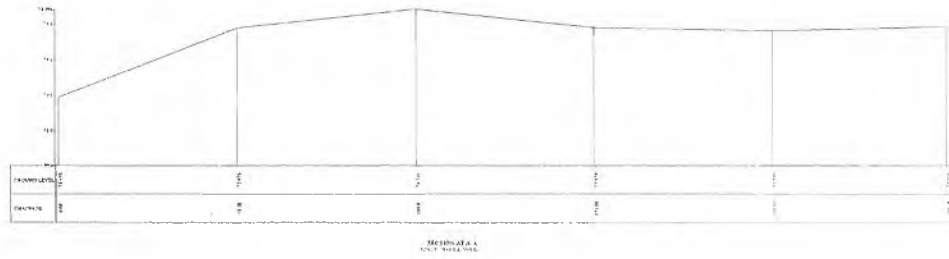
- LEGEND -
- BOUNDARY WALL
 - FENCE LINE
 - MUD WALL
 - ROAD
 - LEVEL
 - CONTOUR

CLIENT: N.J.S. CONSULTANTS CO., LTD.
 TITLE: TOPOGRAPHICAL SURVEY PLAN OF PROPOSED S.T.P., RAM NAGAR.

SURVEYED BY: SPACE AGE CONSULTANTS
 329, FASHION HALL, ROAD NO. 43, PEFAMPURA
 DELHI 110034, PH: 011 27812152, 22465415
 email: info@spaceage.co.in

BM-74.969 M TAKEN AT TOP OF PILLAR AT S.T.P. VARANASI
 CONTOUR INTERVAL TAKEN AS 0.50M

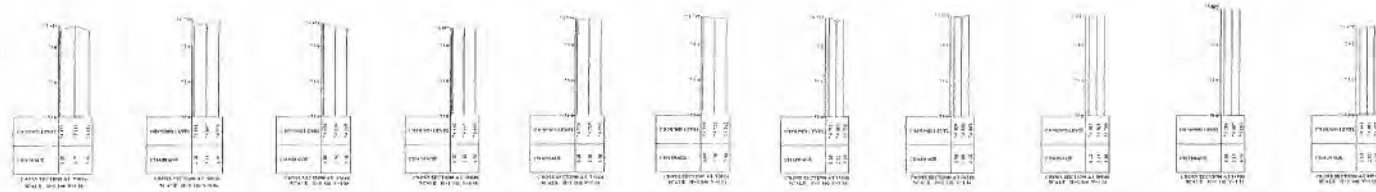
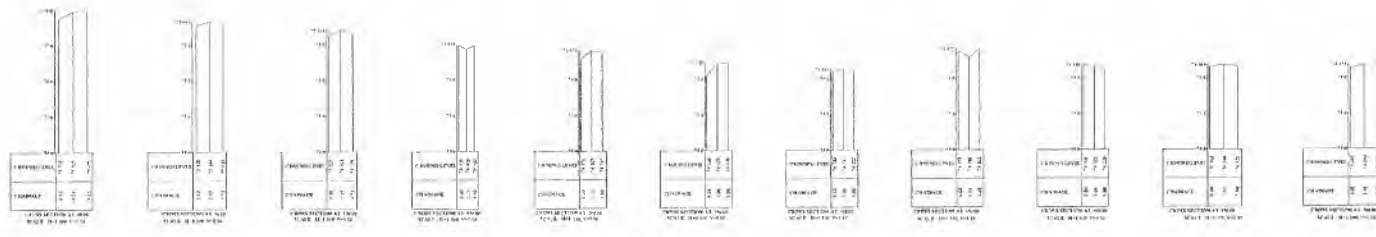
SCALE - 1 : 500 DRG. NO. SAC/1920/STP



SCALE HORIZONTAL SCALE VERTICAL SCALE REDUCED SCALE ORIGINAL



CLIENT: N.J.S. CONSULTANTS CO., LTD
 TITLE: TOPOGRAPHICAL SURVEY PLAN OF PROPOSED S.T.P., RAM NAGAR
 SURVEYED BY: SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO-43, FITAMPURA
 DELHI-110034, PH: 011-27011252, 312946415
 email: info@spaceage.co.in
 RM-71 969 M TAKEN AT TOP OF PILLAR AT S.T.P., VARANASI
 CONTOUR INTERVAL TAKEN AS 0.50M
 SCALE = 1 : 100 DRG. NO. :SAC/1920/STP



CLIENT: N.J.S. CONSULTANTS CO., LTD.
 TITLE: TOPOGRAPHICAL SURVEY PLAN OF PROPOSED S.T.P., RAM NAGAR
 SURVEYED BY: SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO-43, PITAMPURA
 DELHI-110034, PH: 011-27011252, 32946415
 email: info@spaceage.co.in

BM-74969 M TAKEN AT TOP OF PILLAR AT S.T.P., VARANASI
 CONTOUR INTERVAL TAKEN AS 0.50M.
 SCALE - 1:100 DRG. NO. :SAC/1920/STP

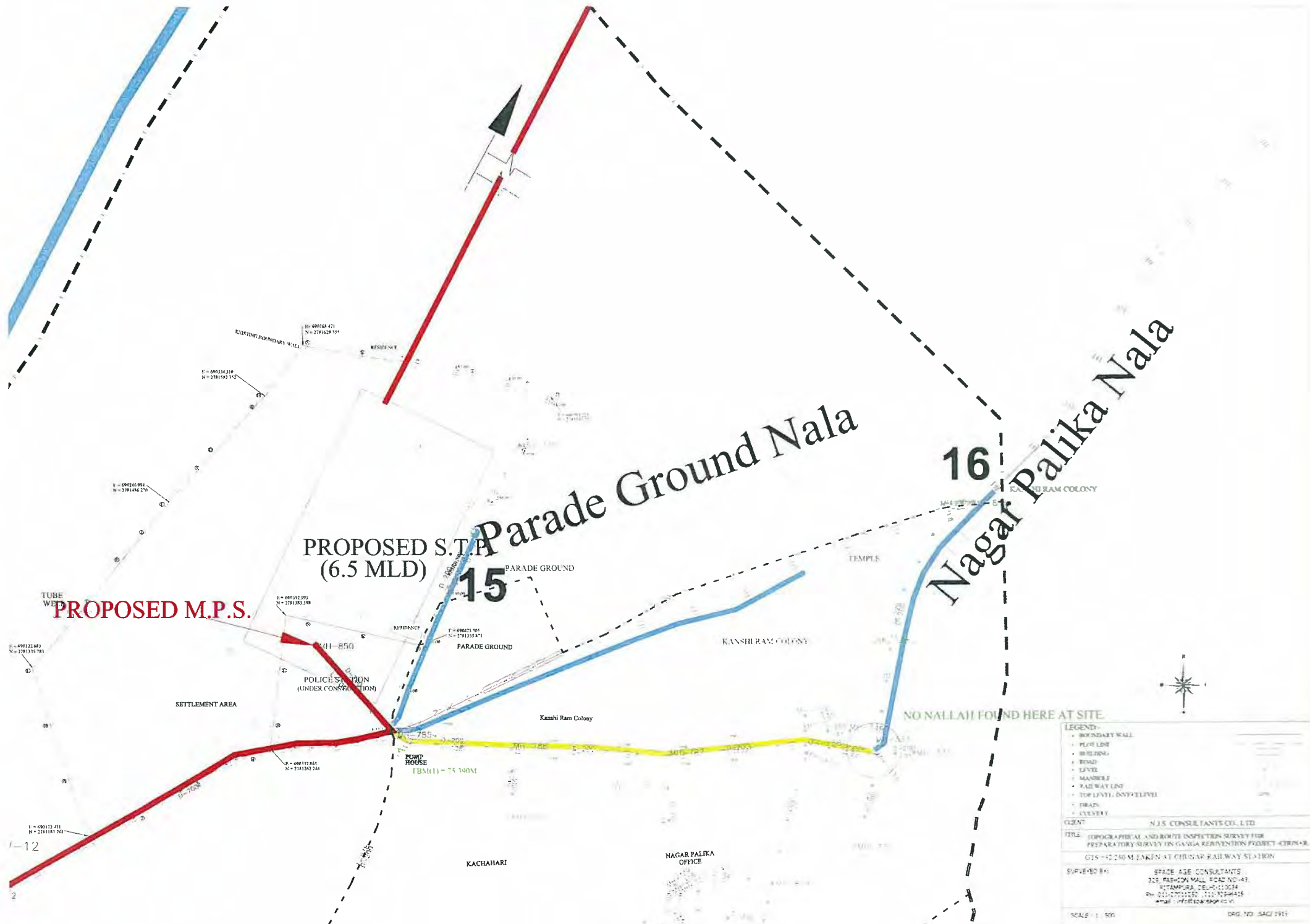
8. Chunar

LIST OF BANCH MARKS ESTABLISHED AT SITE

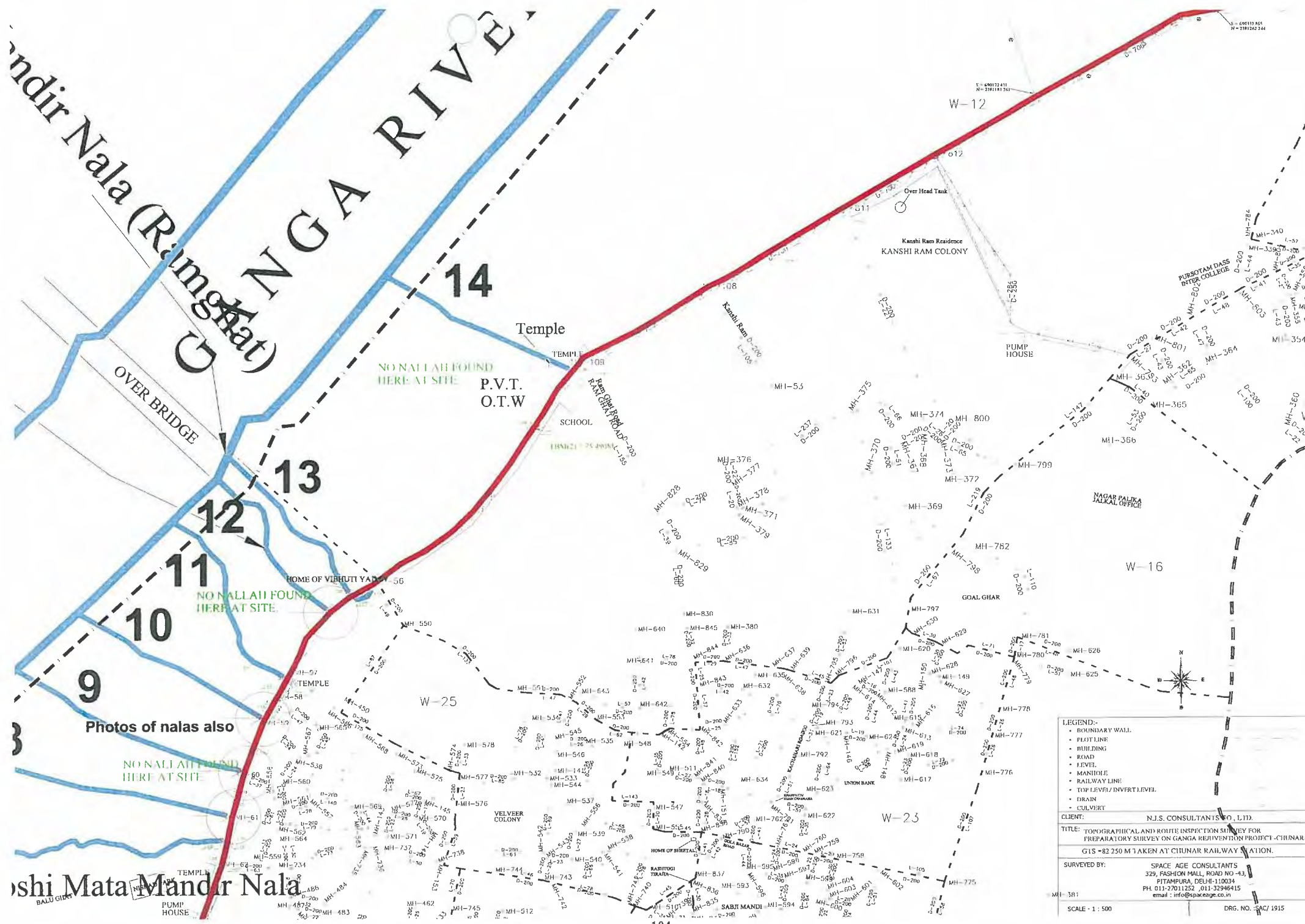
CHUNAR:-					
TBM AT STP = 75.390 M TRANSFERED FROM RAILWAY STATION CHUNAR (82.250 M).					
TBM FOR ROUTE SURVEY = 75.390 M TRANSFERED FROM RAILWAY STATION CHUNAR (82.250 M)					
SL. NO.	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (2)	689716.627	2780878.079	75.490	TOP OF CULVERT JALALPUR MAFI ROAD BALUGAT
2	TBM (3)	689383.250	2780385.577	74.555	PLINTH OF REST ROOM JALALPUR MAFI ROAD BALUGAT
3	TBM (4)	689328.476	2779761.888	75.305	FLOOR LEVEL OF JUNCTION BOX FORT ROAD
4	TBM (5)	690404.908	2780122.185	73.299	TOP OF CULVERT JARGO RIVER
5	TBM (6)	689388.384	2779074.504	73.240	FOUNDATION OF ELECTRIC POLE NEAR GLOBAL ACADEMY
6	TBM (7)	687302.590	2777924.224	78.731	PLINTH OF PRIMARY SCHOOL TAMMAL GANJ
7	TBM (8)	687957.555	2777547.166	78.874	TOP OF CULVERT MIRZAPUR ROAD NEAR RAILWAY CROSSING
8	TBM (9)	688426.170	2777644.17	85.386	PLINTH OF POLICE POST MIRZAPUR ROAD
9	TBM (10)	689472.985	2777215.936	85.323	FOUNDATION OF SIGNAGE BOARD NEAR CHACHERI CROSSING.
10	TBM (11)	690057.888	2777413.646	82.461	TOP OF K.M. STONE PIRALLIPUR TIRAHA.
11	TBM (12)	690513.947	2777841.88	77.268	TOP OF CULVERT MIRZAPUR ROAD NEAR PISHLIPUR VILLAGE

1	Water
2	Canals
3	Roads
4	Boundaries
5	Buildings
6	Vegetation
7	Other





LEGEND	
—	BOUNDARY WALL
—	PLUM LINE
—	W/REINFC
—	ROAD
—	LEVEL
—	MANHOLE
—	PAVWAY LNS
—	TOP LEVEL, INSTALLEVEL
—	DRAIN
—	CULVERT
CLIENT: N.J.S. CONSULTANTS PVT. LTD.	
TITLE: TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA REINVENTION PROJECT -CHRNOR.	
GIS - 12.240 M. LAKEN AT CHUNAR RAILWAY STATION	
SURVEYED BY: SPACE AGE CONSULTANTS	
325, PAB-SON MALL ROAD NO-43,	
KUTAMPURA, DELHI-110024	
Ph: 011-26102022, 011-26102425	
email: info@spaceage.co.in	
SCALE: 1:500	DRG. NO.: SAC/1915



Chandigarh Nala (Ramghat)

GANGA RIVER

14

13

12

11

10

9

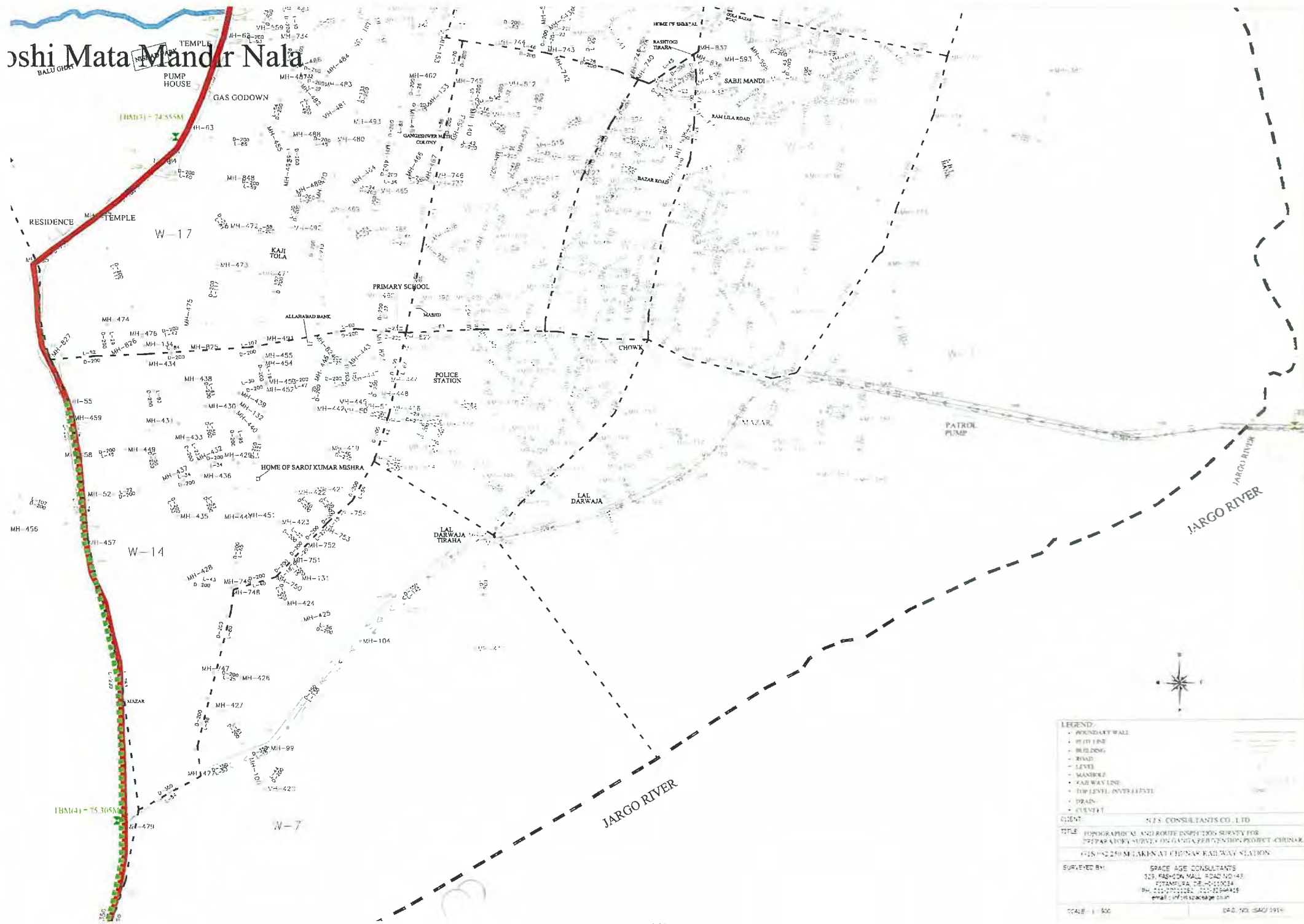
Photos of nalas also

NO NALLAH FOUND HERE AT SITE

Koshi Mata Mandir Nala

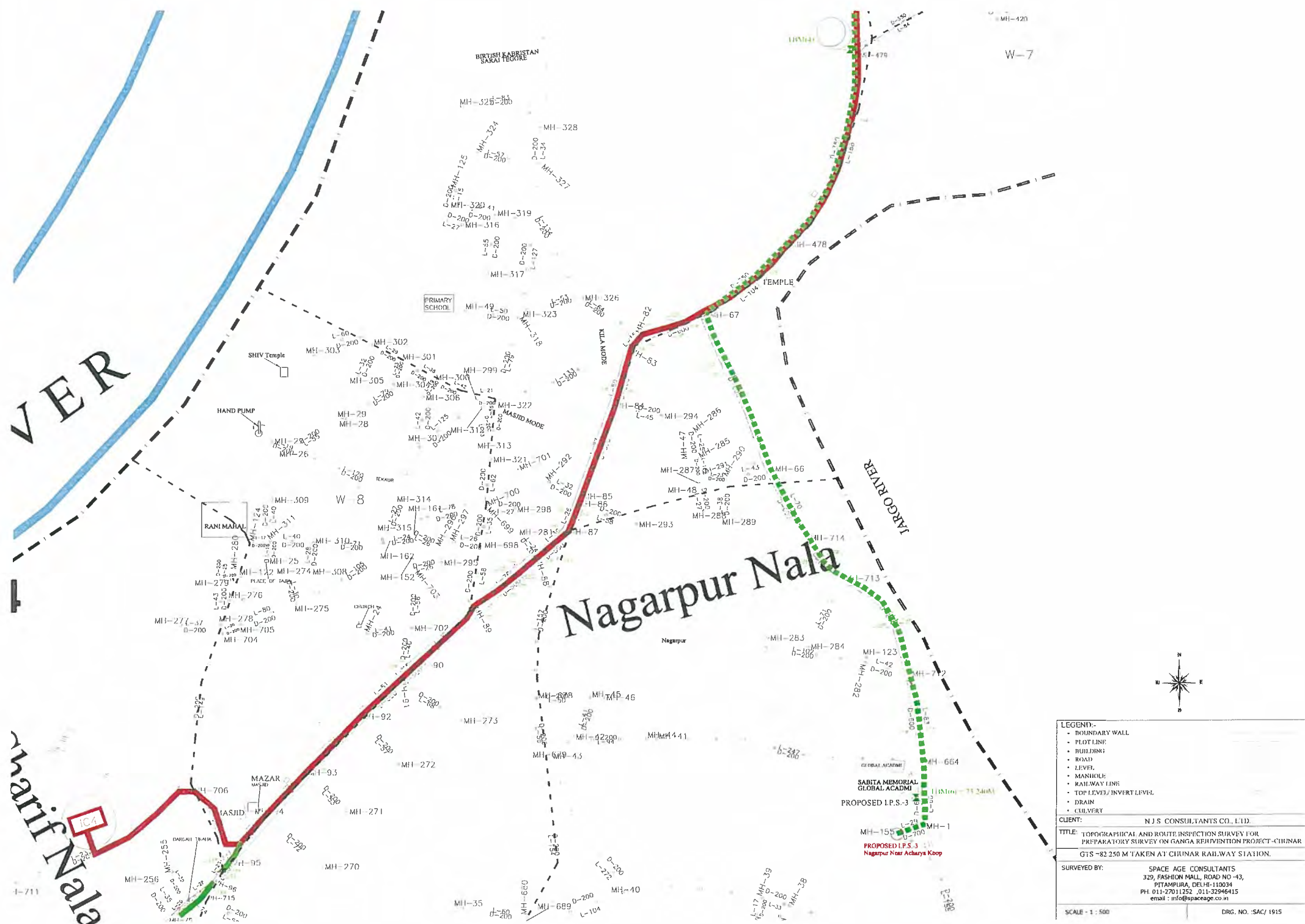
LEGEND:- • BOUNDARY WALL. • FOOTPATH. • BUILDING. • ROAD. • LEVEL. • MANHOLE. • RAILWAY LINE. • TOP LEVEL/ INVERT LEVEL. • DRAIN. • CULVERTY.	
CLIENT:	N.J.S. CONSULTANTS PVT. LTD.
TITLE:	TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA REDUVENTION PROJECT - CHNAR
	GIS - 82 250 M TAKEN AT CHUNAR RAILWAY STATION.
SURVEYED BY:	SPACE AGE CONSULTANTS 329, FASHION MALL, ROAD NO-43 PITAMPURA, DELHI-110034 PH. 011-27011252, 011-32946415 email : info@spaceage.co.in
SCALE :	1 : 500
	DRG. NO. /SAC/ 1915

Doshi Mata Mandir Nala



LEGEND	
- - - - -	BOUNDARY WALL
- - - - -	WELL LINE
- - - - -	BUILDING
- - - - -	ROAD
- - - - -	LEVEL
- - - - -	MANHOLE
- - - - -	CAR WAY LINE
- - - - -	TOP LEVEL INTERLEVEL
- - - - -	DRAIN
- - - - -	CURRENT

CLIENT	S.T.S. CONSULTANTS CO. LTD
TITLE	TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATION OF SUPPLY OF GANGA FEEDING PROJECT -CHINDAR ON 22.250 M. LAKINAT CHINDAR RAILWAY STATION
SURVEYED BY	SPACE AGE CONSULTANTS 105, RAJENDRA MALL ROAD, NO-43 HYDRAABAD, TEL-24110114 PH. 211-27111252, 211-21264415 email: info@spaceage.co.in



LEGEND:-	
-	BOUNDARY WALL
-	PLOT LINE
-	BUILDING
-	ROAD
-	LEVEL
-	MANHOLE
-	RAILWAY LINE
-	TOP LEVEL/INVERT LEVEL
-	DRAIN
-	CULVERT
CLIENT: N J S CONSULTANTS CO. L.L.D.	
TITLE: TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT-CHUNAR	
GTS -82 250 M TAKEN AT CHUNAR RAILWAY STATION.	
SURVEYED BY: SPACE AGE CONSULTANTS 329, FASHION MALL, ROAD NO-43, PITAMPURA, DELHI-110034 PH. 011-2701252, 011-32946415 email : info@spaceage.co.in	
SCALE - 1 : 500	DRG. NO. :SAC/ 1915



MH-221
SHUJATPUR TIRAHA
HARAM GANJ

MH-247
DARGAR
KABIRISTAN

Nala

KABIRISTAN
MH-245b
MH-72
MH-73
MH-245

MH-672
MH-200
MH-208
MH-206
MH-205
MH-204
MH-203

LEGEND

- BOUNDARY WALL
- PLOT LINE
- BUILDING
- FIELD
- LEVEL
- MANHOLE
- RAILWAY LINE
- TOP LEVEL/INVERT LEVEL
- DRAIN
- CULVERT

CLIENT: NJS CONSULTANTS CO. LTD.

TITLE: TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA PERIVENTION PROJECT -CHIRGA.

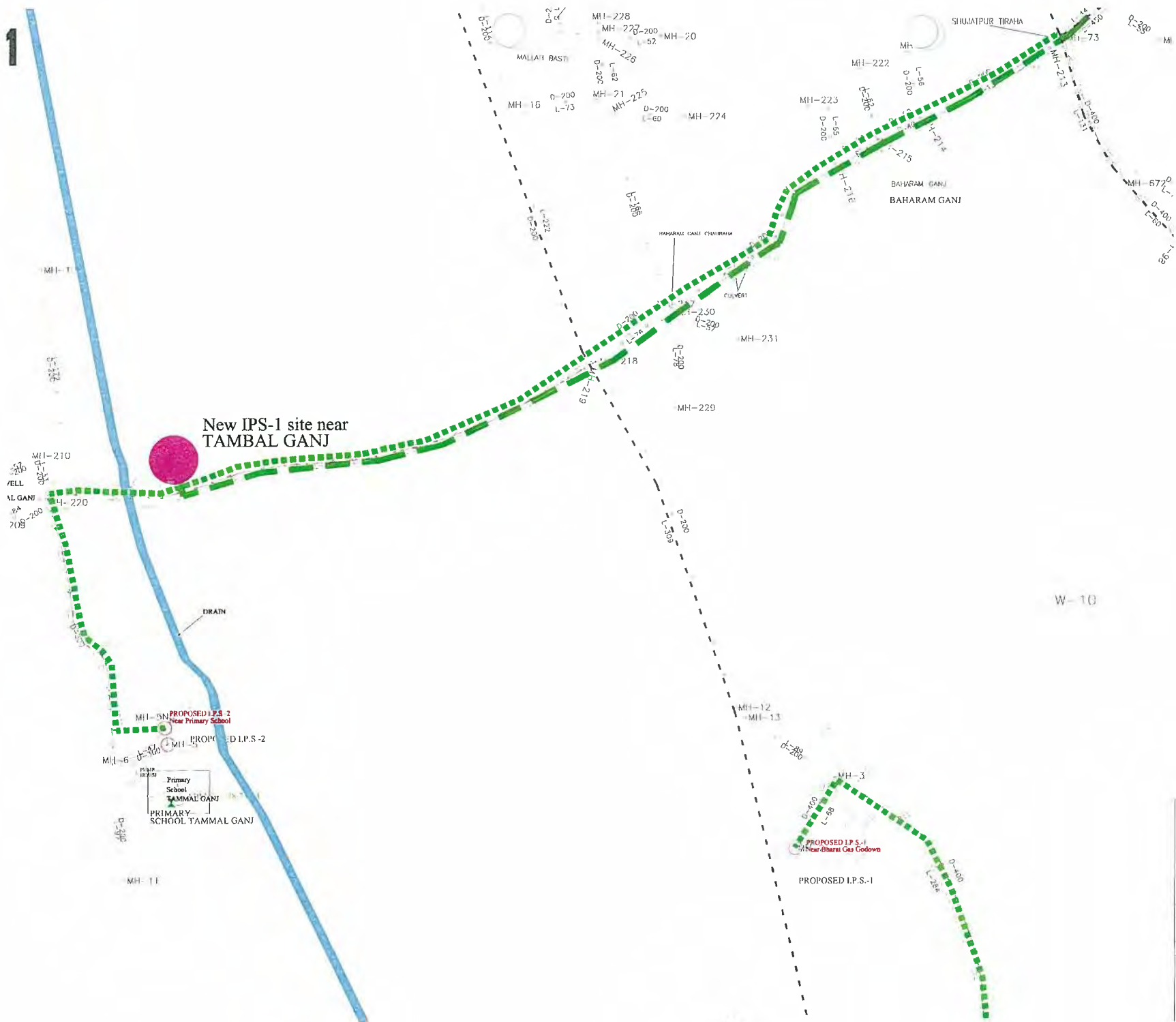
GIS - 22.250 M TAKEN AT CHIRGA RAILWAY STATION

SURVEYED BY: SPACE AGE CONSULTANTS
135, FAS-ROA WALL, ROAD NO-41,
SIYAMULKA, DELHI-110035
PH: 011-27012351, 011-25944415
E-MAIL: info@spaceage.co.in

SCALE: 1:500

DRG. NO. SAC/1915

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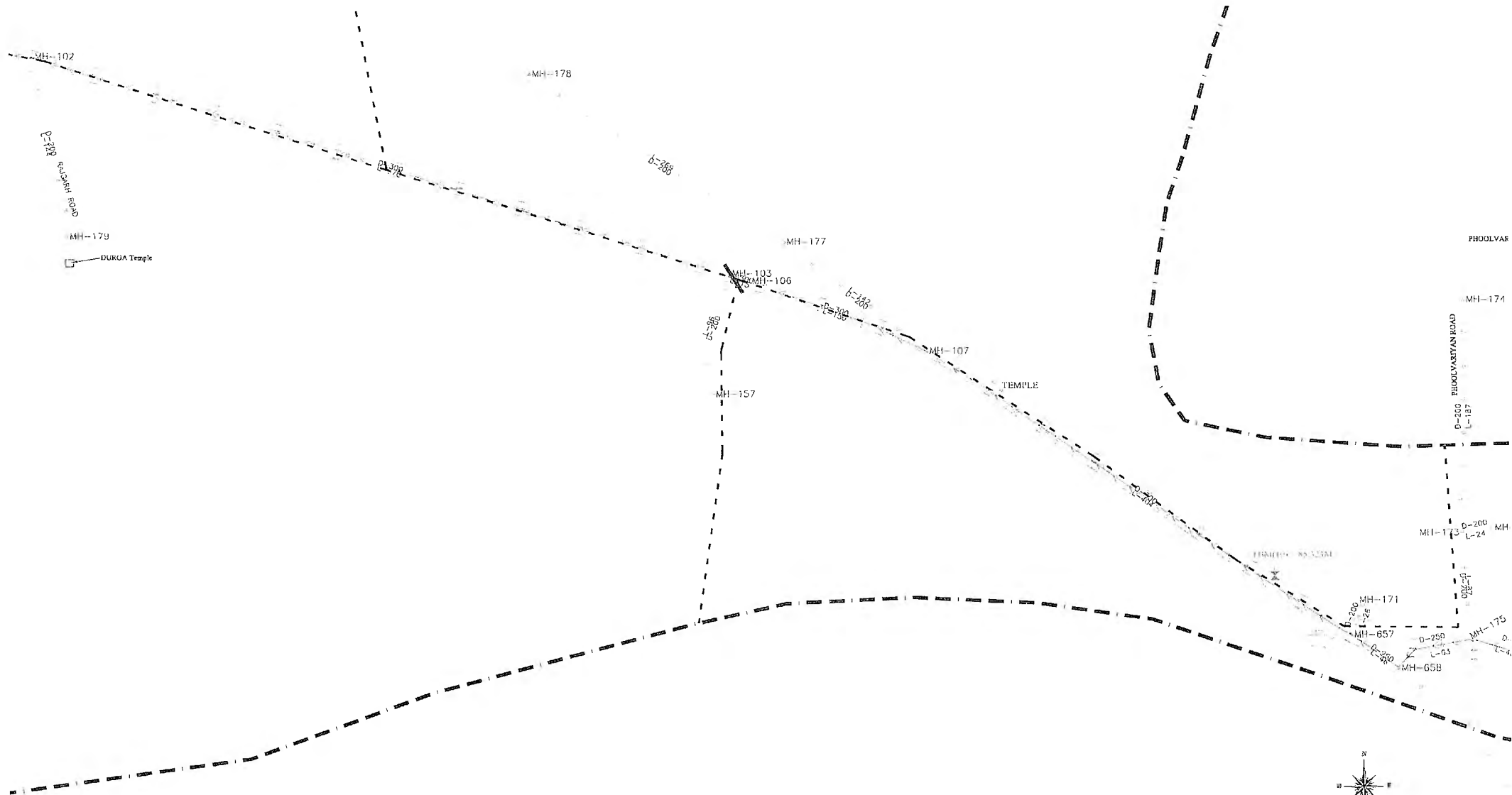
W-10



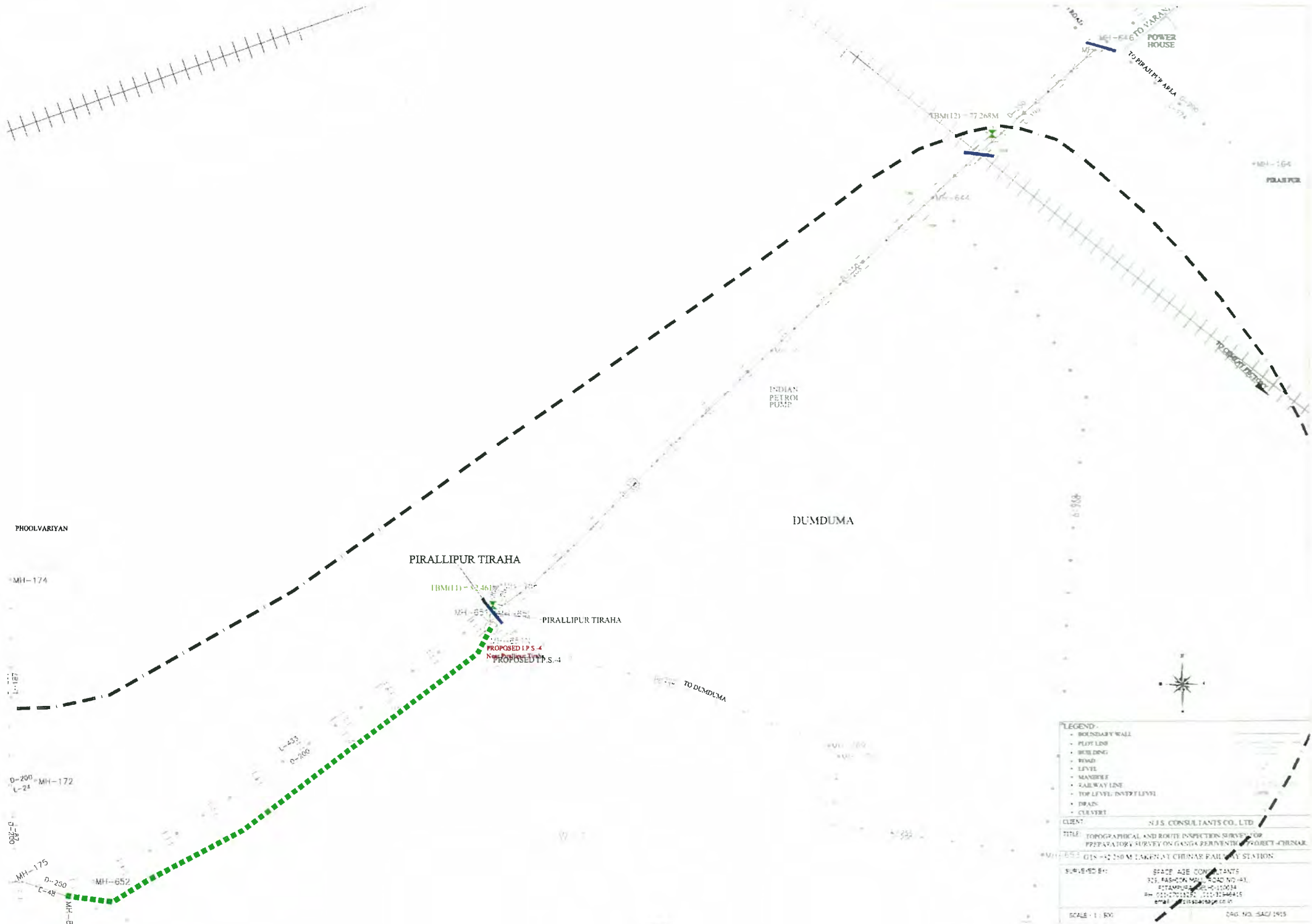
LEGEND:-	
•	BOUNDARY WALL
-	PLOT LINE
□	BUILDING
—	ROAD
—	LEVEL
—	MANHOLE
—	RAILWAY LINE
—	TOP LEVEL/INVERT LEVEL
—	DRAIN
—	CULVERT
CLIENT:- N.J.S. CONSULTANTS CO., L1D.	
TITLE:- TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT -CHUNAR	
GIS -82 250 M TAKEN AT CHUNAR RAILWAY STATION.	
SURVEYED BY: SPACE AGE CONSULTANTS	
329, FASHION HALL, ROAD NO-43, PITAMPURA, DELHI-110034	
PH. 011-27011252, 011-32946415	
email: info@spaceage.co.in	
SCALE - 1 : 500	DRG. NO. :SACJ 1915



LEGEND - BOUNDARY WALL - PLOT LINE - BUILDING - ROAD - LEVEL - MANHOLE - FILLWAY LINE - TOP LEVEL, INVERT LEVEL - DRAIN - CULVERT	
CLIENT	N.I.S. CONSULTANTS CO., LTD.
TITLE	TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT -CHINAR G/S - 2.50 M TAKEN AT CHINAR RAILWAY STATION
SURVEYED BY	STATE AGE CONSULTANTS 375, 454-604 MAL, STAD NO-43, SITAMPURA (G.O. NO-10014) PH-05127022257, 05127444415 EMAIL-1978@STATEAGE.CO.IN
SCALE	1:500
DRG. NO.	SACI/015



LEGEND:-	
•	BOUNDARY WALL
•	PLOT LINE
•	BUILDING
•	ROAD
•	LEVEL
•	MANHOLE
•	RAILWAY LINE
•	TOP LEVEL/INVERT LEVEL
•	DRAIN
•	CULVERT
CLIENT: N.J.S CONSULTANTS CO., L.I.D.	
TITLE: TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY ON GANGA REJUVENATION PROJECT - CHUNAR	
GTS - 82.350 M TAKEN AT CHUNAR RAILWAY STATION.	
SURVEYED BY: SPACE AGE CONSULTANTS	
329, FASHION MALL, ROAD NO -43,	
FITAMPUR, DELHI-110034	
PH. 011-27011252 ,011-32946415	
email : info@spaceage.co.in	
SCALE - 1 : 500	DRG. NO. :SAC/ 1915



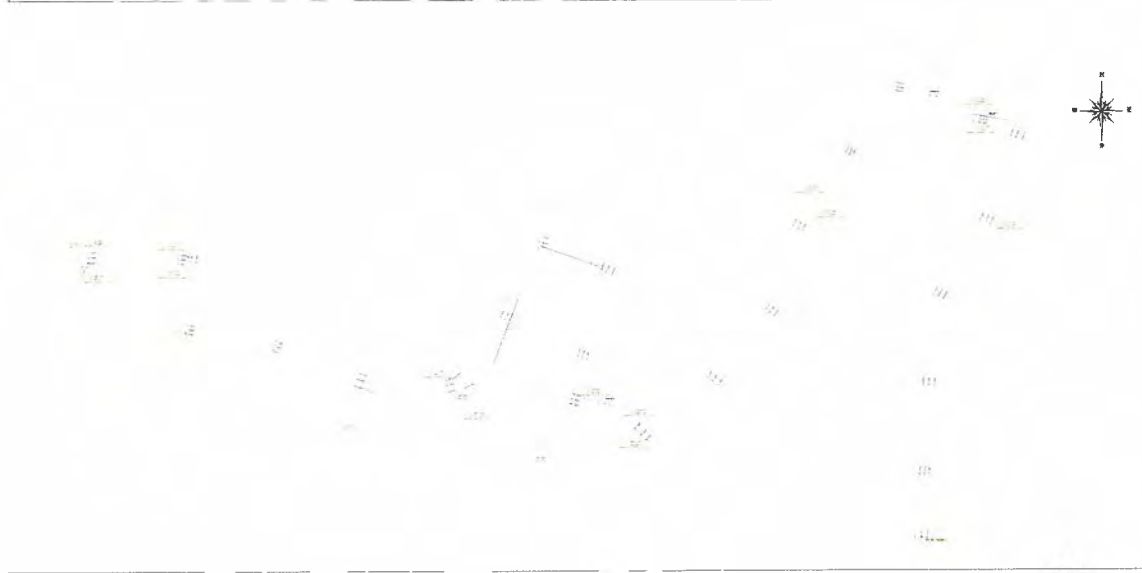
LEGEND	
-	BOUNDARY WALL
-	PILOT LINE
-	BUILDING
-	ROAD
-	LEVEL
-	MANHOLE
-	RAILWAY LINE
-	TOP LEVEL INVERT LEVEL
-	DRAIN
-	CULVERT

CLIENT:	N.J.S. CONSULTANTS CO., LTD.
TITLE:	TOPOGRAPHICAL AND ROUTE INSPECTION SURVEY FOR PREPARATION OF SURVEY ON GANGA PERVENTIVE PROJECT -CHUNAR.
PROJECT NO.:	GIS-42 250 M LAKEN AT CHUNAR FAIR PLAY STATION
SURVEYED BY:	SPACE AGE CONSULTANTS 317, BANGSARA MAIN ROAD, SAC NO-43, PITAMPURA DELHI-110034 PH- 011-2702120, 011-2744415 email: info@spaceage.co.in
SCALE: 1:500	DWG. NO. SAC/2405

9. Saidpur

LIST OF BANCH MARKS ESTABLISHED AT SITE

SAIDPUR--					
TBM FOR ROUTE SURVEY = 72.863 M TRANSFERED FROM JOHAR GANJ CANAL (76.500 M-HFL)					
SL. NO	BM	EASTING	NORTHING	LEVEL	LOCATION
1	TBM (1)	721803.693	2826516.24	72.863	FOUNDATION OF SIGNAGE BOARD NEAR POLICE STATION.
2	TBM (2)	723215.968	2825955.5	72.345	FOUNDATION OF SIGNAGE BOARD PAKKA GHAT.
3	TBM (3)	723627.233	2825839.19	69.855	FOUNDATION OF SIGNAGE BOARD



- LEGEND:-
- ROAD
 - BUILDING
 - DRAIN
 - LEVEL
 - CULVERT

CLIENT: N.J.S. CONSULTANTS CO., LTD.

TITLE: TOPOGRAPHICAL ROUTE INSPECTION SURVEY FOR PREPARATORY SURVEY GANGA REJUVENATION PROJECT - SAIDPUR.

SURVEYED BY:
 SPACE AGE CONSULTANTS
 329, FASHION MALL, ROAD NO-43, PITAMPURA
 DELHI-110034, PH: 011-27011252, 32946415
 email: info@spaceage.co.in

HFL=76.500 M TAKEN AT JOHARGANJ CANAL, SAIDPUR.

SCALE - 1 : 500 | DRG. NO. SAC/1922