Variance of Field Parameters in Alluvial Deposits of River Jhelum in RajBagh, Srinagar

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Abstract— After the recent devastating flood in Kashmir in 2014, a detailed geotechnical investigation has become imperative prior to construction of any structure. The detailed geotechnical investigation has to be kept in mind before suggesting any suitable foundation. The Net safe bearing/Pile capacity depends on soil parameters which include field & laboratory results. Considering lack of funds, a detailed investigation is not possible for every structure. As such a rough estimate of the field parameters may be of help in and around the area. N value being a reliable part of field investigation can be used as an indicative of engineering properties of soil and net safe bearing/Pile capacity. In this regard boring was carried out on alluvial deposits in the field at Raj Bagh, Srinagar to ascertain the rough behaviour of the soil using shell and auger boring. Boring was carried in two boreholes (BH1 & BH2) upto 20m and 25m respectively. Standard Penetration Test (SPT) values were taken at different depths ranging from 1.5m to 3m.

Keywords—geotechnical investigation, flood, N Value, SPT Values.

I. INTRODUCTION

ALLUVIAL has very low bearing capacity. The site is proximate to the banks of Jhelum River. The standard penetration test is the most commonly used in-situ test, especially for cohesionless soil which cannot be easily sampled[1].This River is flood prone and has a history of causing large scale damage to the adjoining structures. The site has plain topography and deposits consist of alluvial silt of low to medium plasticity upto full bore depth. A few layers of sandy silt/silty sand have also been encountered at certain depths. The strata show erratic resistance and N–values show no definite trend with depth. However, the resistance upto about 7.5m is quite low and there is no definitive trend beyond 7.5m. Ground water was encountered at 1m depth. Keeping in view the maximum credible earthquake magnitudes in the region, the site area is classified in zone 5 of B/S code of practice (IS-1893-2016)

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where earthquake magnitudes can exceed 7.5. The field work was started on 25-04-2018 and completed on 28-04-2018 which includes 2 boreholes at locations. As per the stipulated proposal the bore depth is 20 to 25mtrs. Standard Penetration Tests (SPT), were carried out on the collected samples in the laboratory. The water table will be fluctuating depending upon the flood level in the river and it will be assumed at NSL for better safety.

MATERIALS AND METHOD

Alluvial soil of Raj Bagh proximate to River Jhelum of Srinagar city was tested using Standard penetration test. The alluvial deposits were tested at intervals of 1.5 to 3m.. Virgin soil properties like SPT Values were taken. Density & In situ moisture content was recorded after sampling using split spoon sampler.

. RESULTS AND DISCUSSION

Virgin soil properties were analysed and the soil sample was found to be weak.

Visual observation fully established the silty and clayey nature of strata. During the process of boring there was very less resistance upto a depth of 7.5m where the N value varies from 2 to 5.Beyond 7.5m ,there is increase in N values without showing any definite trend and the N-values vary from 4 to 13.

Standard Penetration tests (SPT) conducted at various depths show no definite trend with the depth reaching a maximum N value at 25 mtrs. The recorded N-value have been corrected for over-burden and dilatancy. The overall average observed N value is 6.0 and corrected value is 5.0.The dry density of the material varies from $1.40T/m^3$ to $1.71T/m^3$ with an overall average of $1.52T/m^3$.The average bulk density is approximately about $2.03T/m^3$ which is very close to saturated density with an average moisture content of 33.79%.This will give the submerged density of $1.0 T/m^3$.

Variation of N Value with bore depth

During the process of boring there was very less resistance upto a depth of 7.5m where the N value varies from 2 to 5.Beyond 7.5m ,there is increase in N values without showing any definite trend and the N-values vary from 4 to 13. The overall average observed N value is 6.0 and corrected N value after overburden & dilatancy is 5.0.

TABLE 1. N Value

Depth	BH-1	BH-2	Average N Value	
			Obs	Corr
1.5	3	3	3	5
3	-	-	-	-
4.5	4	4	4	5
6	-	-	-	-
7.5	5	3	4	4
9	-	-	-	-
10.5	6	8	7	6
12	-	-	-	-
13.5	9	11	10	8
15	-	-	-	-
16.5	9	4	7	5
18	-	-	-	-
20	11	7	9	5
21.5	-	6	3	2
23	-	9	5	2
25	-	13	7	4
Avg Values	-	-	**6**	**5**

Variation of dry density with bore depth

The dry density of the material varies from $1.40T/m^3$ to $1.71T/m^3$ with an overall average of $1.52T/m^3$.The average bulk density is approximately about $2.03T/m^3$ which is very close to saturated density with an average moisture content of 33.79%. The dry density shows no definitive trend. However, maximum dry density is observed at 6m depth in BH2. Minimum dry density is observed at 25mtrs. Considering the split spoon sampler has a poor recovery ratio in this case i.e. thin walled sampler was not used. An accurate in situ dry density could not be derived as such.

TABLE 2. Density (g/cc)

Depth	BH-1	BH-2	Average N Value
1.5	1.48	1.53	1.50
3	1.50	1.44	1.47
4.5	1.43	1.58	1.50
6	1.52	1.71	1.62
7.5	1.57	1.49	1.53
9	1.68	1.66	1.67
10.5	1.70	1.59	1.65
12	1.64	1.56	1.60
13.5	1.57	1.41	1.49
15	1.49	1.42	1.45
16.5	1.47	1.52	1.49
18	1.42	1.47	1.44
20	1.62	1.37	1.49
21.5		1.41	1.41
23		1.44	1.44
25		1.40	1.40
Average Values	1.55	1.50	**1.52**

Variation of moisture content with bore depth

The moisture content of the soil varies from 12.43% to 41.68% with an overall average of 33.79%.

TABLE 3. Moisture Content (%)

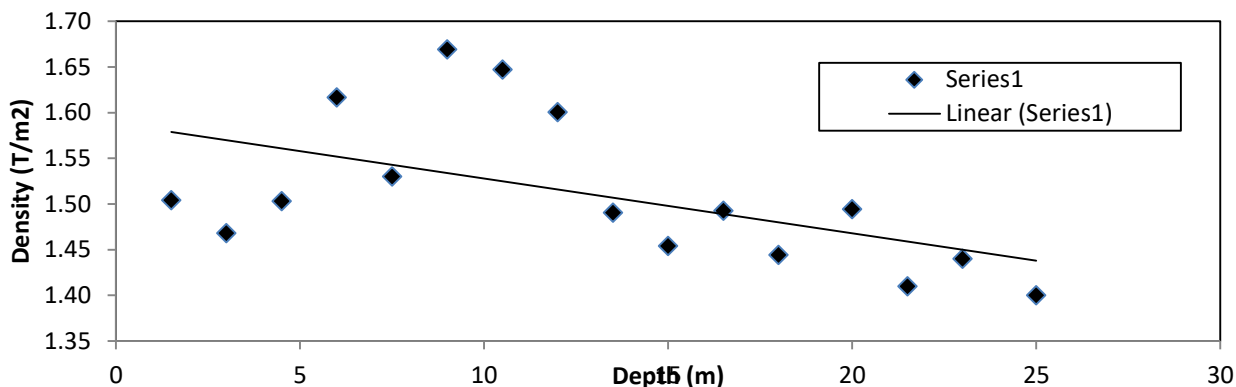| Depth	BH-1	BH-2	Average N Value
1.5	33.53	36.07	34.75
3	33.87	20.65	27.26
4.5	34.19	33.72	33.96
6	35.86	27.07	31.46
7.5	35.42	38.29	36.86
9	25.80	25.39	25.60
10.5	28.86	33.05	30.95
12	26.80	33.22	30.01
13.5	19.68	33.11	26.40
15	26.59	32.84	29.72
16.5	33.44	17.14	25.29
18	41.68	36.57	39.12
20	25.69	12.43	19.06
21.5	-	26.27	26.27
23	-	24.47	24.47
25	-	40.34	40.34
Average Values	30.88	34.51	**33.79**

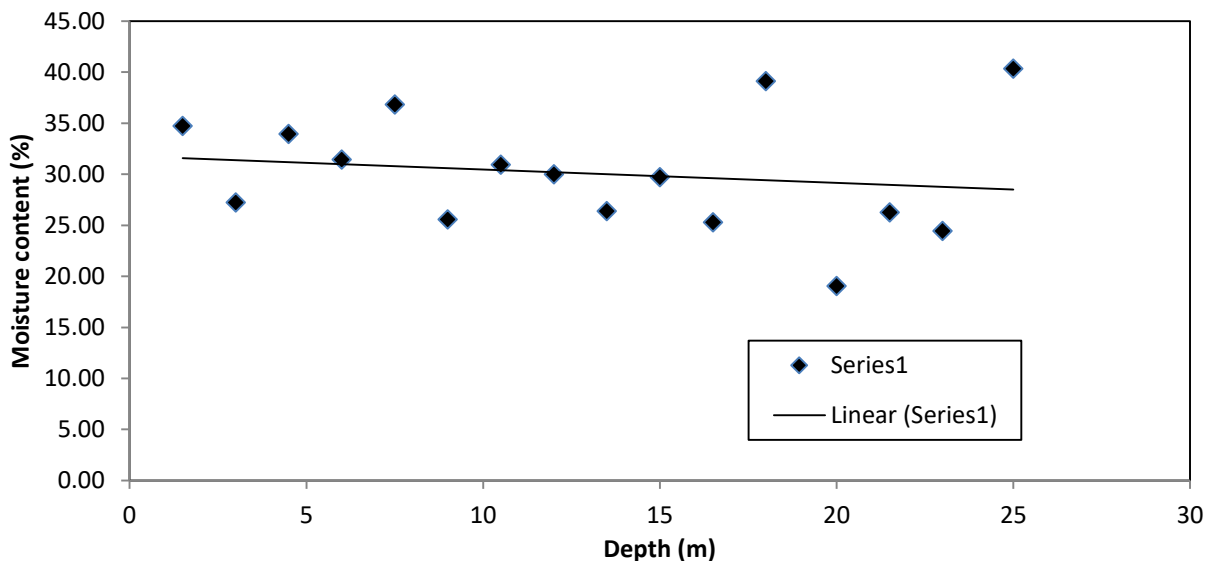Fig. 1. Variation of Dry Density (T/m^2) with bore depth

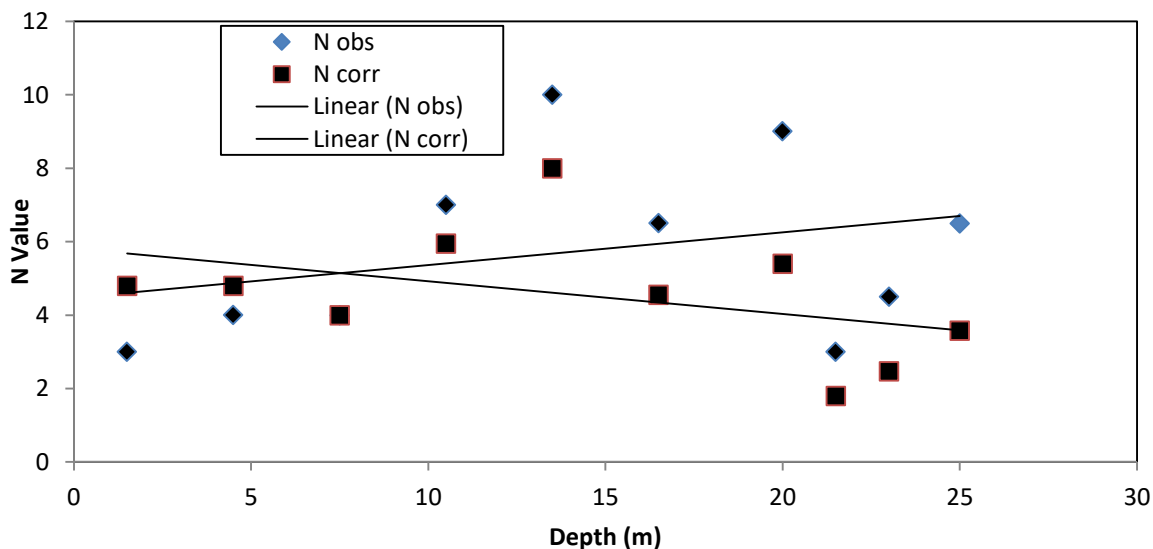Fig. 2. Variation of moisture content (%) with boredepth

Fig.3.Variation of N Value with depth

CONCLUSION

The study reveals that the soil has following parameters
1. Alluvial deposits in Raj Bagh proximate to Jhelum River have very low N value.

2. However, a detailed geotechnical investigation should be done as per the importance of the project.

3. There could be significant variation in the area and complete dependence on these results is not technically feasible. However, it can be used to get a preliminary idea of the geotechnical field parameters.

Scope of future work

- A detailed field investigation around the area can be carried out.
- A detailed laboratory investigation should also be considered.

REFERENCE

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