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GEOTECHNICAL INVESTIGATIONS FOR BARRAGE SITE-A CASE STUDY

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Abstract-Geotechnical investigation is important to avoid structural failures. These failures could lead to disaster which poses serious threats to public safety. Present study mitigates such incidences for that, it is necessary to study the subsurface material. In present study, geotechnical investigations are carried out to construct barrage across Bori River near village Naldurg, Taluka-Tuljapur, District –Osmanabad. Barrage sites is located 3 km from Naldurg village near N.H no. 65 and lies longitude 76^0 17' 34" and latitude 17^0 45' 22"on Toposheet no. 56 c/5.
To evaluate the depth and underlying rock type project engineers have drilled nine drill holes up to depth 11M to 21M. The bore hole lithological study shows the alluvial and Black cotton soil followed by weathered, jointed, zeolitic and massive rock which shows good RQD for proposed sites.
Keyword:-Barrage, Geotechnical, Core drill, RQD, Subsurface investigation

1. INTRODUCTION

Civil Engineering structure failure is becoming critical problem in particular area, has leads to loss of life and property. These failures related to various factors such as inadequate information about subsurface lithology, geological structure, poor foundation design and poor building material. Prior to proposal of construction various investigations are carried out regarding property and quality of the proposed site. Such investigations are carried out in order to avoid structural failures as these failures could leads to disaster which poses serious threats to public safety. The main goal of geotechnical investigation of proposed site is to have appreciable understanding behavior of the soil and rock that will bear load transmitted by water pressure and overburden.

The geotechnical investigation for proposed barrage near village Naldurg across Bori River having length of 104M. The barrage is to be founded on strata comprising mainly of weathered, jointed and hard rock. The field and laboratory investigations at barrage area includes bore hole drilling for assessment of variation of strata .A total nine number of bore hole were drilled for geotechnical investigation which usually reveals detailed information about subsurface lithology. It will focus on the behavior and performance of soil and rock.

2. STUDY AREA

Naldurg Barrage is proposed to construct across the Bori River near village Naldurg, Taluka-Tuljapur, district Osmanabad. Study area is located 3 km away from village Naldurg near NH-65 and lies E Longitude 76^0 17' 34" and N Latitude 17^0 48' 22" on Toposheet no 56 C/5. Barrage site is 52 Km away from Osmanabad and 48 Km away from Solapur city. Figure 1 shows location map of the area.

3. GEOLOGY OF THE AREA

The area of investigation forms parts of the famous Deccan Traps, which occur in all the districts of the State of Maharashtra, except Nagpur, Bhandara, Gondia and Gadchiroli. The Deccan Traps is world famous as continental tholeiite province occurring in western and central parts of India.(Subbarao and Hooper 1986),(Mitchel and Cox 1988), characterized by the basaltic terrain with minor alluvial cover. The transverse taken in the project area comprising the Naldurg barrage indicate that it is formed by basaltic lava flow which is termed as Deccan trap of Eocene to cretaceous age. The rock exposures were observed all along the National Highway road cutting. The contact between weathered basalt and red bole were well observed Eastern side of Naldurg village. The well known igneous columnar joints in basalt were observed which are commonly pentagonal and hexagonal. Table no – shows geological classification of the area.

4. METHODOLOGY

4.1 Borehole drilling (subsurface exploration):

For subsurface exploration total nine boreholes were drilled for geotechnical assessment of foundation strata. The procedure adopted includes drilling with Nx size. To evaluate the depth and underlying rock type so as to ascertain the foundation

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condition for the Naldurg barrage project engineer have drilled nine number of boreholes down to depth average 11M to 21 M.

The boreholes were drilled at identified location in the river bank and flow channel. Drilling was done with Nx size by using single, double and triple barrel as per requirement of strata and to achieve good core recovery. Bore hole information like elevation and position, field observations including water table, change of colour and artesian water zone. During the drilling of each borehole data recorded on the standard format in the field book. Drilling was performed as per Bureau of Indian standard (BIS). Drilled core were preserved in wooden boxes (photograph no 1 wooden core boxes), (Oyedele et.al 2009). Table no – shows the details of each borehole.

From the above data it is seen that five boreholes were taken along the centre line of the barrage and four boreholes 15 M U/S and D/S side of the barrage.

5. RESULT AND DISCUSSION

Considering the bore hole lithology, all sets were observed from nine drillings. The core log obtained from all nine bore holes shows the strata of Black cotton soil, alluvium followed by jointed zeolitic basalt continuation of massive hard basalt.

BH1 along the transverse shows alluvial type of overburden, rock level depth at 5M followed by fresh rock level up to depth 9.5M with fair good RQD. BH2 along the traverse shows alluvial type of overburden, rock level depth up to 4M,fresh rock lies at depth 10M with good to very good RQD. BH3 along with traverse shows rock level depth at 4.5M, fresh massive patch lies below 10M with good to very good RQD. A BH4 observation from drilled core shows alluvial overburden with rock level depth 4M, fresh rock level depth at 11M with good to very good RQD. BH5 observations shows rock level depth at 4M followed by hard jointed rock with very good RQD. BH6 along the traverse indicates alluvial type of overburden up to depth 4M below which is followed by hard rock level depth at 16M with very good class of RQD. BH7 shows rock level depth at 5M below that there is a fresh rock lies at depth 16M with very good class of RQD. BH8 indicates rock with good RQD at depth 15M with overburden of vesicular jointed basalt and alluvium. BH9 shows hard rock depth at 15M with very good RQD overburden of alluvium and fractured jointed basalt.

Table.1. Shows Core Recovery

Depth in meter	Core length in meter										Avg.RQD in %
	Drill hole	1	2	3	4	5	6	7	8	9	
0-2											
2-4				0.34	0.53				0.49	0.63	48
4-6		0.49	0.41	0.43	0.63	0.25	0.46	0.57			48
6-9		0.6	0.47	0.43	0.69	0.53			0.65		55
9-12		0.64	0.71	0.55	0.62	0.63	0.46	0.57		0.77	62
12-14		0.68	0.59	0.57	0.74	0.69			0.66		63
14-20		0.9	0.86	0.88	0.89	0.89	0.87	0.89	0.9	0.9	89

Table 2.Lithology of Drill Hole

Drill hole no	Depth in Meter						
1	0-2	2-4	4-6	6-9	9-12	12-14	14-20
2	BCS	WB	ZB	CJB	ZB	CJB, ZB	HJB
3	BCS	WB	JB	ZB	JB	ZB	CB
4	BCS	WB	JB	VB	JB	ZB	HJB
5	BCS	JB	ZB	VB	ZB	JB	HJB
6	BCS	WB	VB	JB	ZB	ZB	HJB
7	BCS	Sand	JB	JB	ZB	ZB	HJB
8	BCS	VB	VB	VB	AB	AB	HJB
9	BCS	WB	VB	VB	VB	VB	HJB
	BCS	WB	JB	JB	ZB	ZB	HJB

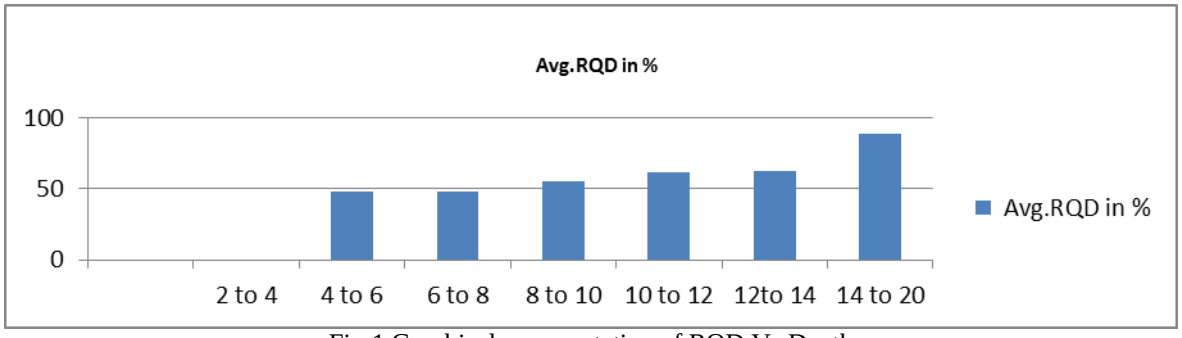
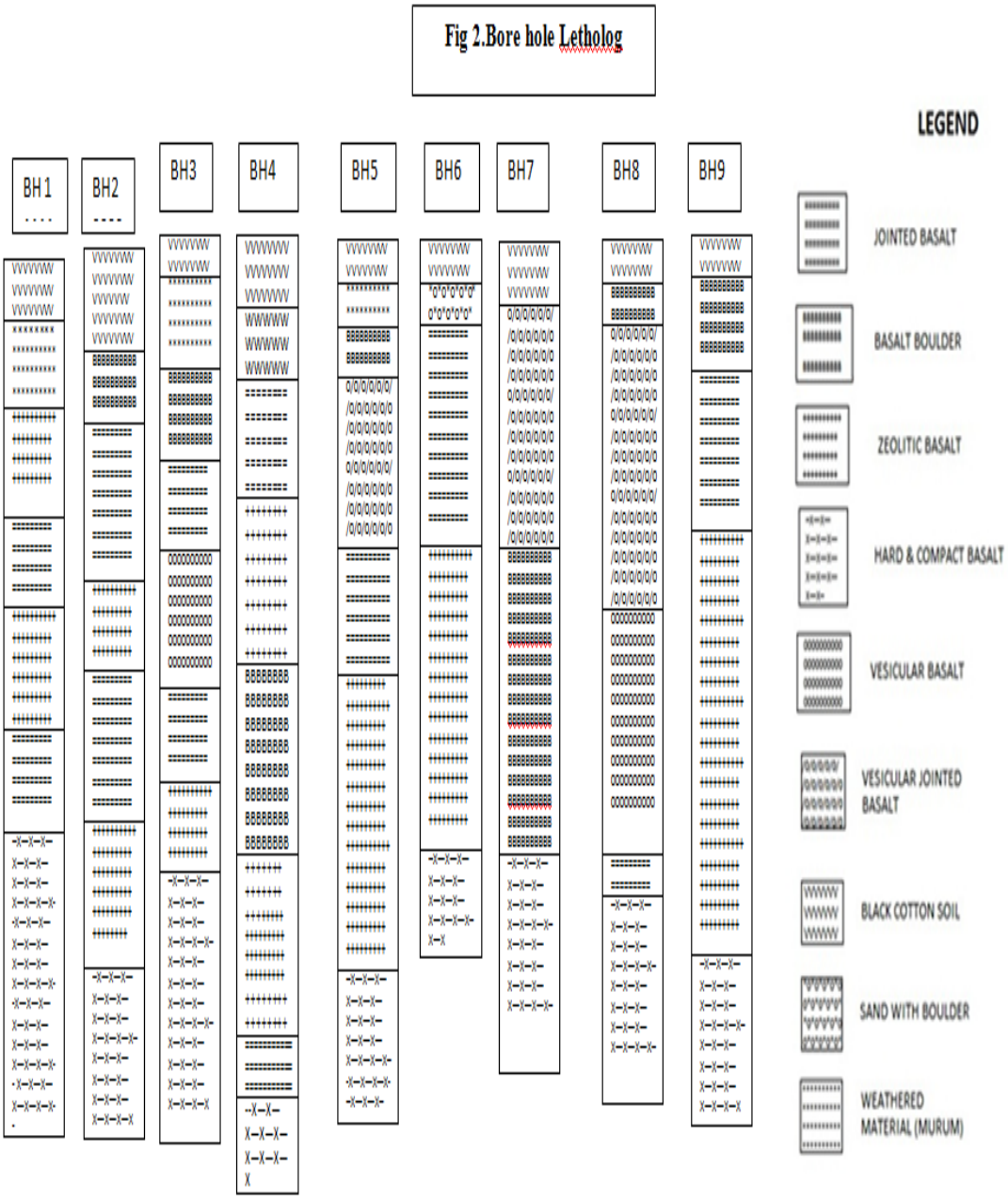


Fig.1.Graphical representation of RQD Vs Depth



6. CONCLUSIONS AND RECOMMENDATIONS

Considering surface Geological and subsurface exploration observations the following conclusions and recommendations are placed for the Naldurg barrage.

1. Barrage site is situated in basaltic lava flow of the Deccan trap.
2. Due to weathered and Zeolitic basalt fresh rock level is deep seated
3. Considering parameters of Physical nature of rock, percentage core recovery, rock quality Designation, fresh rock level is determined.
4. All fresh rock levels shown in the report are depending upon the borehole data. The foundation of the structure can be kept up at higher or lower than these levels depending on quality of rock during execution of construction work.

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