Effect of Water Quality on Rate of Percolation in Different Soil

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Abstract-Percolation testis a very important test which measures the movement of fluid inside the soil. It describes the property known as permeability. Hence, before construction of any structure, this test should be done. The result of percolation test mainly depends on the soil type, climatic condition, type of fluid etc. With this in view, efforts were made to determine different properties of soil that can be employed in determining how the results from percolation test depend on the properties of soil. In short, this project report contains the experimental approach defining the effect of soil type. Nature of fluid used the climatic condition on the rate of percolation.

1. INTRODUCTION

Percolation test is a veritably important trial as it completely describes colorful important parameters of a certain soil. This test provides the rate at which a fluid percolates through the voids of soil. Percolation rate is an indicator to a soil's felicity for waste disposal. Percolation provides a veritably simple model of arbitrary media that nonetheless retains enough literalism to make its prognostications applicable in operations. It's a test ground for studying more complicated critical marvels and a great source of suspicion. Percolation is the movement of water through the soil and its layers, by graveness and capillary forces. The florescence moving force is graveness. Generally the direction of water movement is changed grounded on the geological boundary condition. Percolation test is a good tool to the ground face where other field permeability operations cannot be applicable. Percolation rate depends on the indicator parcels of soil like liquid limit, plastic limit, and flyspeck size distribution. The percolation test is primarily employed for chancing proper septic. A percolation test measures the quantum of time it takes for liquid to be expended through soil. This is important because it determine whether the property can accommodate a filtering field where effluent from the septic system will be directly and released back into the ground. The percolation test evaluates the soil where the drain field will be placed, to determine whether or not the soil has the capability to absorb and filter the water when it's released into the drain field. Soil which is loose or flaxen is far superior for a drain field position and the test will include having an authorized soil annotator physically way to gain a quantitative suggestion of the hydraulic conductivity of the sub-soil.

2. SITE INVESTIGATION

2.1 Selection of Site

Different sites were investigate and studied. Finally two sites were selected. One is at the site free from tree roots or any other obstruction. Site-1 is at rear side of Block-A and Site-2 is at the end of college ground.

2.2 Soil sample collection

From the test pits (0.3*0.3*0.3) meter of two sites, the excavated soil was collected and it was preserved in the Geotechnical laboratory of our college.

2.3 Collection of fluid

The fluids to be used in the test pits were collected from different sites. Total three samples were collected and these used in test pits for percolation test at two sites. The fluid samples are Sampl-1 form Boys hostel drain water, Sample-2 from Bhimpur pond and Sample-3 was collected from Kuakhai river water.

3. EXPEIMENTAL RESULTS

3.1 Soil sample characteristics

3.1.1 For Site-1

3.1 For Site-2

Tests	Results
Sieve Analysis	C_u= 7.2 C_c= 1.08
Liquid Limit	44%
Plastic limit	23%
Swelling Index	30%

3.2 Water sample characteristics

Tests	Results
Sieve Analysis	C_u= 6.67 C_c= 2.01
Liquid Limit	22.35%
Plastic limit	Non-plastic
Swelling Index	40%

3.2.1 Sample-1

Properties	Values
pH	6.0
Turbidity	35 NTU
Total Solids	1600 mg/l

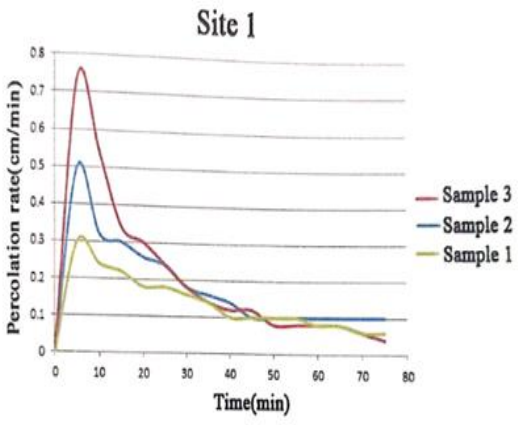
3.2.1 Sample-2

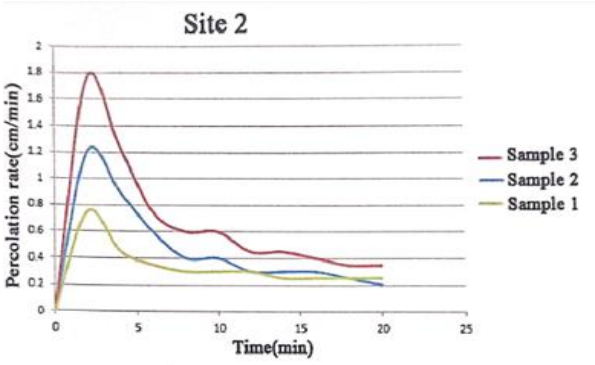
Properties	Values
pH	6.5
Turbidity	28.7 NTU
Total Solids	1250 mg/l

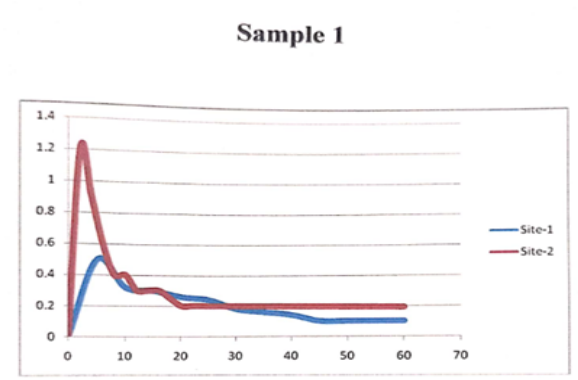
3.2.1 Sample-3

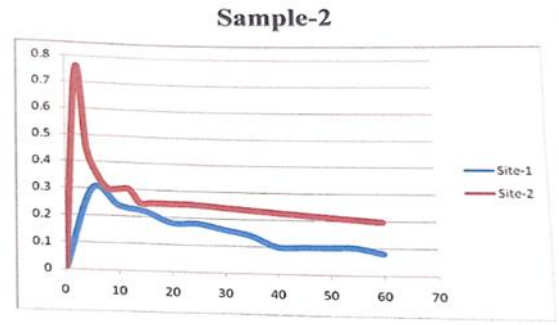
Properties	Values
pH	6.5
Turbidity	28.7 NTU
Total Solids	1250 mg/l

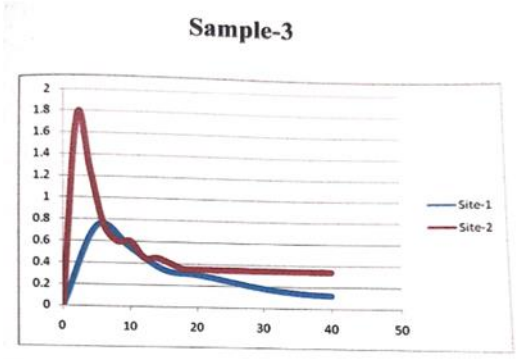
4. EXPERIMENT GRAPHS

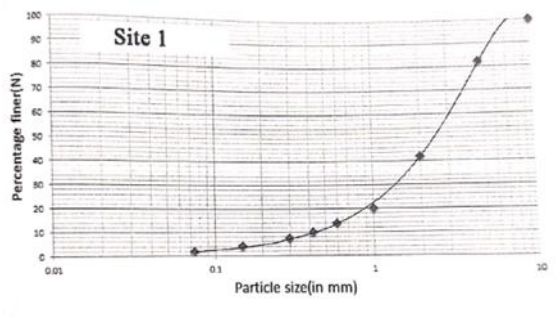


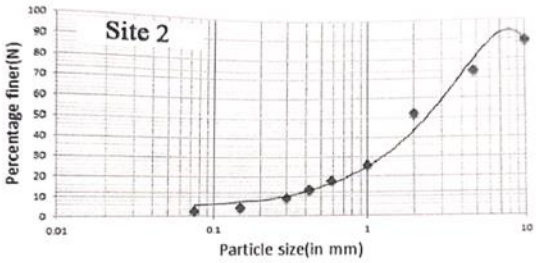


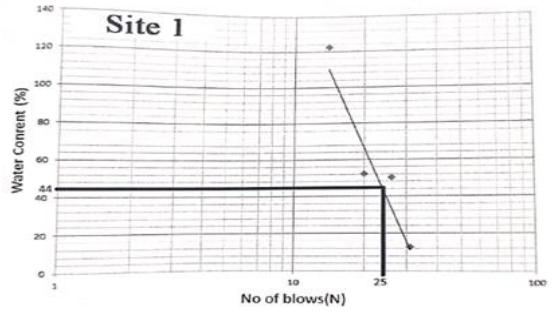


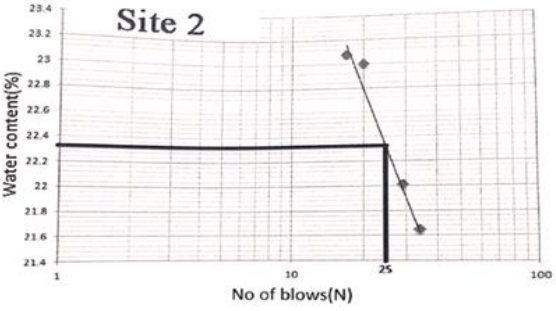












5. RESULTS AND DISCUSSION

Sample-1, rear side of Block-A: From the particle size distribution curve, we found that the soil is coarse grained. The value of C_u and C_c was calculated. As C_u > 6, it is a sandy soil. As C_c lie3s between 1 and 3, it is well graded soil. As more than 50% of the soil is retained on 0.0075mm sieve, it is designated as coarse grained soil. But less than 50% of the soil is retained on 4.75mm sieve; therefore it is termed as Sand. The swelling index of the soil sample is 30%.

Sample-2, end of college ground: From the particle size distribution curve, we found that the soil is coarse grained. The value of C_c and C_c was calculated. As C_u > 6, it is a sandy soil. As C_c lies between 1 and 3, it is well graded soil. As more than 50% of 6the soil is retained on 0.0075mm sieve, it is designated as coarse grained soil. But less than 50% of the soil is retained on 4.75mm sieve; therefore it is termed as Sand. The liquid limit of the soil was found to be 22 and the soil is non-plastic. The swelling index of the soil sample is 40%.

The average percolation rates at Site-1 were found to be 0.18, 0.14 and 0.20cm/min and the steady state percolation rates were 0.08, 0.06, and 0.04cm/min for the three water Sample 1, 2 and 3 respectively. The rate of percolation calculated from Jaky's empirical formula was found to be 11.39cm/min for Site-1 and 2.25cm/min. for Site-2, which is quite high as compared to the actual field results.

6. CONCLUSION

From this project, we found that the different factors such as nature of the soil, climate condition, location of water table, nature of fluid etc, have effect on rate of percolation. It was found that the permeability of the soil is affected by the water quality. Water with higher values of total solids show rate of percolation than water with lower value of total solid even in the same soil. Soils near water bodies have relatively slower rate of percolation than soils distant from water bodies. Percolation test seems to be a better option to obtain the coefficient of permeability in soils close to the ground surface where other empirical equations do not give satisfactory results. It was found that the soils having liquid limit show less rate of percolation as compared to soils having lower values of liquid limit.

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