STRATIGRAPHIC CONSTRAINTS ON GROUNDWATER FLOW: EXAMPLES FROM YORK COLLEGE (CUNY) CAMPUS, QUEENS, NEW YORK CITY

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ABSTRACT

Surficial geology of the York College campus is dominated by recent glacial deposits dating back to late Wisconsinan event. Several shallow excavation-type trenches reaching a depth of approximately 6 to 10 feet were dug in the wide greeneries adjacent to the parking lot to determine soil texture and collect in-situ permeability data. Based on these shallow pits, an apparent subsurface stratigraphy has been constructed. In general, the uppermost 8 to 18 inches is mostly clayey-and-silty sand and organic-rich top soil overlying stratified drift (Figure 1 & 2). The uppermost horizons are observed to also contain fill materials such as bricks, concretes, broken glasses, and heterogeneous mixture of rock fragments. Fill materials were encountered in all the trenches with variable thickness. Stratified drift is largely composed of coarse to fine-grained sand (80-90%) with 6-10% gravels and 3-6% admixture of silt and clay. 5-20% water content (Table 1 and Figure 9) and 28 to 36% porosities had been observed for this sandy unit and based on USCS; it can be designated as SP (Figure 3 & 6). It demonstrates an apparent anisotropic sandy unit displaying marked lateral variation in textural attributes. Several measurements of groundwater table from the unconfined Upper Glacial aquifer indicated fluctuation between 21 to 26 feet (Figure 8). Horizontal hydraulic conductivity in the Upper Glacial aquifer averages 260 ft/day. The stratified drift sediments are poorly to moderately consolidated, sometimes finely laminated, and crudely cross-bedded with shallow-angled foresets, accentuated by coarse-grained sand and granule (Figure 5). Stratified drift with primary hydrodynamic structures may be representative of kame deposits thus suggesting a fluvioglacial-dominated process during its deposition. It is interesting to note that identifiable subsurface stratigraphy along with lithological characteristics have direct bearing on the permeability and groundwater flow in this area. The ratio of horizontal to vertical permeability would be expected to be higher in the stratified drift than in the till material. Further investigations will incorporate regional and local groundwater flow and additional textural data obtained from both overburden materials and stratified drift in order to establish the overall groundwater dispersal and aquifer characteristics (Figure 7 & 10).

Figure 7 Water-Table Contour Map

Conclusion

- Infiltration and Percolation Tests
- The infiltration tests were conducted using a double ring testing apparatus (Figure 4).
- The average infiltration rate in the test pits were between 10 and 85 seconds per inch in sandy soils with an average 34 seconds per inch.
- Percolation test consisted of hand dug 12 inch diameter holes that were 24 inches deep. Percolation rates equilibrated at rates ranging from 5 seconds per inch to 30 seconds per inch.

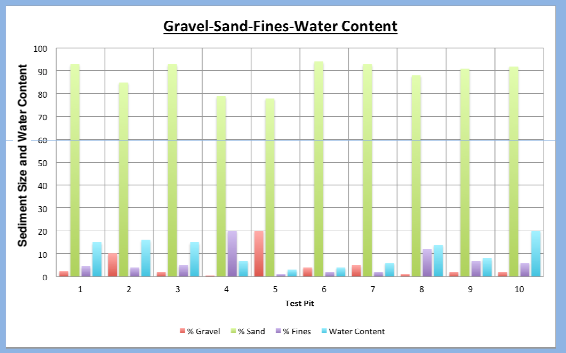

Figure 9 Textural and Water Content Data Involving Test Pits and York Monitoring Well (Sample # 10)

Figure 1 Excavated Test Pits

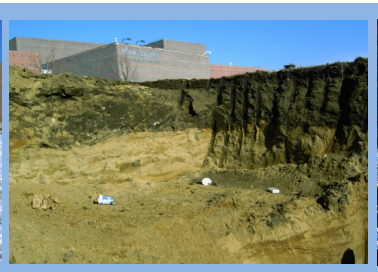

Figure 2 Test Pit Showing Dark Gray, Organic-rich Topsoil Capping Stratified Drift

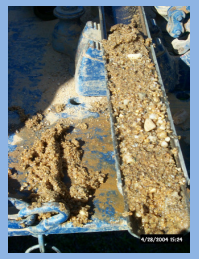

Figure 3 Split Spoon Sample Displaying Stratified Drift

Figure 4 Dominantly Sandy Unit Typifying Upper Glacial Aquifer

Test Pit	Depth (ft)	% Gravel	% Sand	% Fines	USCS	Water Content
1	10	2.4	93	4.6	SP	15
2	25	10.1	85	4	SP	16
3	10	2	93	5	SP	15
4	3.5	0.5	79	20	SP	7
5	6.5	20	78	1	SP	3
6	9	4	94	2	SP	4
7	5	5	93	2	SP	6
8	6.5	1	88	12	SP	14
9	6	2	91	7	SP	8
10	50	2	92	6	SP	20

Table 1 Summary Data Involving Nine Test Pits and York College Monitoring Well (# 10)

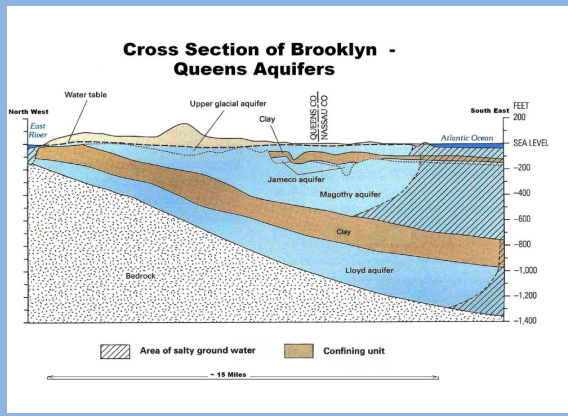

Figure 10

Figure 4 Conducting Infiltration Test

Figure 5 Cross-stratification within Stratified Drift Suggesting Fluvio-glacial Deposition

Figure 6 York Students Thakur Chaturgan (left) and Dorean Flores (right) Investigating In-situ Split Spoon Samples

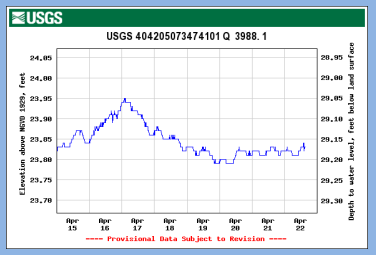

Figure 8 A Typical Groundwater Table Recording of York College Monitoring Well (USGS)