HOLLYMEAD LAKE SEDIMENT SURVEY

INTRODUCTION: (abbreviated)

TEC Inc (TEC) has been contracted by the Forest Lakes Community Association (FLCA) and the Hollymead Citizens Association (HCA) to conduct a sediment survey of Hollymead Lake, which is jointly owned and maintained by the Associations. This work is an outgrowth of a visual survey conducted by TEC in August 2005 in which a trail of recent sedimentation was traced upstream of the lake to the culverts under US Route 29 that drain an area of recent and ongoing shopping center development.

During this recent development on the northwestern side of US 29 (Seminole Trail), a large area of former woodlands was cleared and soils exposed to erosion. On at least two occasions erosion control barriers on the construction site were breached and releases of sediment occurred into the two streams that supply Hollymead Lake. At the upstream end of the lake a delta of reddish-brown sediment has built up and covered former marsh areas and their shallow water channels.

The Associations have become concerned that sediment from the development sites has caused the lake to become silted-in to the point that dredging will be required to restore it to acceptable depths. If such dredging is required, the cost would be considerable and the Associations would need to seek financial aid from responsible parties to meet that cost. The objective of the lake bottom sediment survey was therefore to determine the quantity and type of sediments on the lake's floor. To achieve this objective, TEC proposed vibracore sampling of the sediment profile resting on the lake floor.

SITE ACTIVITIES: (abbreviated)

TEC subcontracted Aqua Surveys, Inc (ASI) of Flemington NJ to conduct the vibracoring. On Tuesday, July 10, 2007 twelve core samples were collected and logged. The plastic liners with the core were placed in a PVC trough and the liner opened to expose the sediments. The layer of slough that coats the core was scraped off to prepare it for photography and logging.
The geologist then divided the core into units of similar sediment or soil types. Each of the units was then geologically described noting:

- color;
- major constituents (i.e. clay, silt, sand) and minor constituents;
- consistency (soft-hard);
- moisture content;
- plasticity, determined by the ability of the soil to be rolled into threads; and
- other distinctive features such as organic material, debris, or animal activity.

Each unit was then classified as *recent sediment, earlier sediment,* or *saprolite*. The *recent sediment* is very soft and probably has been deposited in the last few years; the *earlier sediment* is much firmer and was deposited starting in 1968 when the lake was established. The word *saprolite*, in Greek, literally means rotten rock. It is the product of the long period of weathering to which the rocks of the Virginia Piedmont have been subjected. Although the original minerals have been converted to clay and silica, the original mineral texture and structure of the parent rock (referred to as "relict textures" and "relict structures") can be identified in this material. The top of the *saprolite* marks the original floor of the lake as it was graded in 1968.

(see page 3 for Results)

3.0 RESULTS

Table 1 shows the water depths, thickness of *recent sediments*, thickness of *earlier sediments,* total thickness of all sediments, and the depth (below Lake Surface) to the top of *saprolite*..

Table 1 Water Depths, Sediment Thicknesses, and Depths to Saprolite Surface

Boring	Water Depth	Recent Sediment	Earlier Sediment	Total Sediment	Top of Saprolite
LH-1	1.3	6.2	>3.8	>10	>11.3
LH_2	6.5	1.5	1.3	2.8	9.3
LH-3	7.7	2.2	1.0	3.2	10.9
LH-4	11.3	3.6	1.5	5.1	16.4
LH-5	9.4	1.2	0.0	1.2	10.6
LH-6	12.2	3.9	1.9	5.8	18.0
LH-7	13.7	2.6	0.5	3.1	16.8
LH-8	16.5	3.2	0.7	3.9	20.4
LH-9	18.2	1.1	0.4	1.5	19.7
LH-10	21.6	2.3	2.5	4.8	26.4
LH-11	2.8	5.3	>4.2	>9.5	>12.3
LH-12	6.9	3.7	0.0	3.7	10.6

Notes:
All measurements are in tenths of feet.
Sediment readings are thicknesses.
> means "greater than."
The top of saprolite is the depth below the Hollymead Lake water surface.

As noted above, two types of sediment were recognized in the core retrieved from the borings. They are termed *recent sediments* and *earlier sediments*. All borings, except for Borings 1 and 11, both drilled in the delta area, penetrated into the third unit, *saprolite*, that represents the original material upon which the lake basin was constructed.

The very soft to soft uncompacted silts that form the upper sedimentary layer are interpreted as *recent sediments*. These silts are thickest in the area of the upstream delta (6.2' in Boring 1 and 5.3' in Boring 11). The *recent sediments* thin out downstream but not in a totally consistent pattern as their deposition is probably controlled by currents and bottom topography. The thinnest layer occurs near the dam (1.1' in Boring 9).

Thicknesses of the *earlier sediments* follow the same pattern as that of the *recent sediments*. The *earlier sediments* are thickest in Borings 1 and 11 although the sediments also thin out fairly rapidly downstream. The relatively thin layer of *earlier sediments* in the lake, given its 39-year history, is most probably due to the fact that the two branches of Powell Creek feeding the lake have a restricted watershed, and that watershed was covered by a well established second growth forest and grasslands. Under these conditions little erosion would have taken place within the watershed and, thus, little sediment was introduced to the lake.

It should be noted that the sediments interpreted as *recent sediments* exceed the *earlier sediments* in all borings by an average ratio of 2.2/1. This is a measure of the accelerated sedimentation that has occurred in the past few years.

CONCLUSIONS:

1. Three geologic units were observed in core recovered from the vibracore borings. These are, from lake bottom surface downward: *recent sediment*, *earlier sediment*, and *saprolite*. The *recent sediments* are interpreted to have been deposited in the past 4 years, the *earlier sediments* were deposited between the inception of the lake in 1968 and 2002, and the s*aprolite* represents the original geologic materials upon which the lake was established.

2. The *recent sediment* varies in thickness between 1.1 feet to 6.2 feet and thins in the down-lake direction.

3. Total thickness of all lake sediments varies between greater than 10 feet to 1.5 feet and also thins in the down-lake direction.

4. The greatest sediment thicknesses were found in the upper 100 meters of the lake with the thickest sediments occurring in the area of the delta in the lake's northwest corner. These sediments consisted of recently deposited, light colored, silts up to 6.2 feet thick.

5. The sediments currently stored in the delta area and the upstream branches of Powell Creek pose a threat to the lake. Future major storm events could mobilize these sediments into the lake's basin severely impacting aquatic life, recreational activities, and creating a situation requiring sediment removals.

6. The rate of future sedimentation (siltation) will be greater than it was during the early history of the lake as commercial development northwest of US 29 has removed the layer of protective forest and grasslands from the watershed that supplies the lake, thereby accelerating erosion. This situation will continue for several years as further development of the Hollymead Lake watershed has recently been approved by Albemarle County officials.

7. The presence of the commercial properties with in the watershed increases the danger of pollutants being introduced into the lake, particularly from the extensive parking areas.

8. Run-off from the paved areas upstream will provide significantly more water influx to the lake during storm events.

9. The overall conclusion is that, at present, the lake exhibits good "health." However, there are significant thicknesses of sediment appearing to be of recent origin that are impacting the lake's viability. Should this sedimentation continue or be accelerated, serious damage is predicted.

RECOMMENDATIONS

1. Dredging or other excavation activities are recommended to remove the mass of sediments in the upper reaches of the lake. The deltaic build-up of recent sediments in the lake's northwest corner should be removed and the upper 100 meters of the lake cleared of sediments to allow at least 2.5 feet of water depth.

2. The planned bathometric survey of the lake is strongly recommended. The bathometric survey, together with this sedimentation study, will provide a "benchmark" against which future water depth measurements and sediment thickness measurements can be compared to determine the degree of siltation resulting from continuing development in the lake's watershed.

3. Vigilance on the part of the Associations is strongly recommended to document further siltation, especially following major storm events.

4. It is recommended that the Associations collect a suite of lake bottom sediment samples for chemical analyses as a baseline study to use as a comparison should evidence of pollution be observed in the future.