**Project**: Convert an existing fishing pond into an Extended Detention Facility

**Size of Area Treated**: Approximately 390 acres

**TMDL or impaired water the project addresses**: Cameron Run/Hunting Creek Bacterial TMDL, Chesapeake Bay TMDL for phosphorous, nitrogen, and sediment.

**Specific need for this project**: Much of the highly urbanized area which is the City of Alexandria developed without the benefit of stormwater quality improvements and quantity controls. A Chesapeake Bay TMDL Compliance Analysis and Options study completed in August of 2012 determined that the most cost effective manner for the City to meet its first 5% Municipal Separate Storm Sewer System (MS4) pollution reduction requirement (as outlined in the Virginia Watershed Improvement Plan (WIP) to reduce nutrients and sediment in the Chesapeake Bay and integrated into the City’s MS4 permit) would be through either pond retrofits or the construction of new ponds. Due to prior development, there are very few opportunities for regional treatment facilities. Lake Cooke is one of five locations (two pond retrofits and three proposed ponds) studied in a March 2013 feasibility study for water quality and quantity improvement opportunities. City Council approved the application to apply for this grant because this pond retrofit has the greatest chance of success in protecting downstream waters from further deterioration, preventing further pollution, and indeed restoring the health of both Cameron Run and Hunting Creek (and thus the Potomac River) through improved upstream treatment.

**The Proposed Project**: Lake Cooke is located just north of Eisenhower Avenue and is adjacent to Cameron Run Regional Park – Great Waves Water Park and to the Animal Welfare League of Alexandria. There are several sets of train tracks to the north of the lake including Virginia Railway Express (VRE), Washington Metro, and CSX. The lake was originally constructed in the 1970s as a fishing pond and is still used for this purpose. The Virginia Department of Game and Inland Fisheries’ Urban Fishing Program stocks the pond with trout in the winter months.

The pond obtains water from two sources: Cameron Run and Strawberry Run. There is a low flow intake in Cameron Run that diverts water through a series of pipes discharging to the west end of the lake. This intake provides flow through the lake and facilitates a turnover of the detained water in the upper reach of the lake. Without this turnover, there is a potential during extended dry...
periods for the lake to become stagnant. Strawberry Run discharges directly into the center of the lake from the north. The outlet control structure is a rectangular weir just upstream of the dual 90-inch corrugated metal pipe (CMP) outfall.

The pond was last dredged in January/February 1993 where approximately 3,500 to 4,000 cubic yards of sediment were removed. During the dredging, the City maintenance worker noted that a clay bottom was encountered.

Lake Cook is located in a FEMA regulated floodplain on FIRM Panel 515519 0036 E, effective June 16, 2011, in a Zone AE with Base Flood Elevations (BFEs). The Zone AE floodplain with BFEs along Lake Cook designates the 1-percent-annual-chance floodplain and the BFEs designate the elevations associated with that floodplain. FEMA has a no-rise requirement of 1.00 foot for Zone AE areas, so a CLOMR would be required for a project in this area only if BFEs were increased by greater than 1.00 foot. Once a project is completed, a LOMR would be required to incorporate any changes into the FIRM. The City does have a no rise requirement due to development but variances are issued for good and sufficient cause.

Sixteen soundings were completed for the lake and the mean thickness of sediment was 2.6 feet. Three grab samples were taken from different locations in the lake and the composite sample was analyzed for benzene, toluene, ethylbenzene and mixed xylene isomers (BTEX); Total Petroleum Hydrocarbons – Diesel Range Organics (TPH-DRO); Total Petroleum Hydrocarbons – Gasoline Range Organics (TPH-GRO); RCRA Total Metals; moisture content and ignitability. All of the target analyte concentrations were either below the limits of detection or at levels below the US EPA Risk Based Concentrations. These data suggest that the pond sediment will not require any special handling or treatment; however the sediments should be re-sampled upon dredging to verify the preliminary results of this testing.

Opportunities

- There is a small amount of land to the west where it may be possible to increase the pond surface area
- The pond can be dredged to increase the treatment volume
- Additional pond features can be added like an upflow filter, aquatic benches, floating island wetlands, and/or aeration devices
- There is room for a sediment forebay at the confluence of Strawberry Run
- The runoff from the water park, rail system and other surrounding areas may contain high pollutant loads that can be treated

Constraints

- The drainage area is large at 391 acres
- There is a limited amount of open space surrounding the lake
- There are numerous train tracks to the north used/owned by Metrorail, VRE, CSX and Amtrak

Lake Cook Scenario 1 – Level 1 Wet Pond Design (With Upflow Filter)

The first design scenario for Lake Cook consists of a Level 1 Wet Pond Design in accordance to VA DCR Stormwater Design Specification 14 and the installation of an upflow filter control structure.
The VA DCR Level 1 specification requires a treatment volume of at least 10.8 acre-feet and includes the following pond components:

- A sediment forebay (computed to be at least 1.6 acre-feet)
- Standard aquatic benches (min. 4’ wide x 1’ deep)
- Turf in pond buffers

Based on the 391 acre drainage area, and in order to meet the volume requirements documented in the specification for a Level 1 Wet Pond Design, the pond will need to have a treatment volume of 10.8 acre-feet. Using the survey of the pond bottom, normal pool elevation, and available City GIS data, an existing pond volume of 8.5 acre-feet was computed. Therefore, 2.3 acre-feet of sediment will need to be removed to meet the VA DCR Level 1 criteria. City staff field notes from the pond dredging in 1993 indicate that 2.5 acre-feet of sediment was removed during the project. If a similar amount of sediment has accumulated from 1993 to present day, another dredging project will leave the lake with the volume meeting the VA DCR Level 1 specification.

The sediment forebay will be constructed where Strawberry Run discharges into the lake and will be designed to retain much of the sediment that is currently distributed throughout the lake. The specifications require the forebay depth to be at least 4-feet which corresponds to a surface area of 0.4 acres. It is anticipated that the forebay walls will be constructed of reinforced concrete with the outlet discharging water to the west to increase the length of travel of the incoming flows and take advantage of the western portion of the lake.

The aquatic benches will be 4-feet wide and 1-foot deep with typical wetland type vegetation to promote pollution filtration. There is currently turf surrounding the lake area acting as a buffer, so no modification is needed regarding this requirement.

This scenario also includes a modification to the existing concrete weir to construct an upflow filter, similar to the one in Cameron Station Pond, adjacent to the existing weir. Like in Cameron Station Pond, the upflow filter media will be comprised of aggregate.

**Lake Cook Scenario 2 – Increase WSE and Install Upflow Filter**

This design scenario includes increasing the normal pool water surface elevation (WSE) 1.5 feet, from 24.5-feet to 26-feet, by altering the height of the downstream concrete weir. By increasing the normal pool elevation, the volume of the pond is increased from approximately 8.5 acre-feet to 13.2 acre-feet, which exceeds the VA DCR Level 1 size requirements. As stated previously, a volume of 10.8 acre-feet is required to meet the VA DCR Level 1 Wet Pond specification. The FEMA flood insurance rate map shows a base flood elevation of 35-feet for the lake. The FEMA model will have to be rerun to determine if there is an increase in base flood elevation as a result of the proposed increase in the normal pool elevation.

Similar to design scenario 1, this scenario also includes a modification to the existing concrete weir to construct an upflow filter similar to the one in Cameron Station Pond.