

## Case Study: John Rolfe Square, Henrico County, VA *Dual-Purpose Storm Water Detention Systems*

As land developers continue to face ever increasing challenges in managing storm water runoff, their engineers are tasked with innovating storage systems that effectively and efficiently meet storm water regulations with minimal encroachment into the actual or “perceived” development. Engineering innovations that both streamline construction and optimize land usage afford cost benefits to the developer that can be passed on to the lot owner. John Rolfe Square provided the setting where such an advance would occur.

Bowman Consulting Group of Richmond Virginia, design engineers for the 10 acre, 40 lot, single-family development located in Henrico County, quite possibly changed the status quo of site development by combining soil erosion and sedimentation control practices with storm water management requirements; merging the temporary with the permanent.

In essence, the temporary function of the traditional above ground sedimentation basin was incorporated into the permanent underground detention basin, eliminating the need to construct both types of basins independently and in separate designated areas. With two areas designated for storm water detention in the John Rolfe Square development, four separate basins would normally have been constructed.

The inter-relationship between the two types of facilities lends itself to this natural solution. The importance of the temporary wanes as that of the permanent becomes more needful. That is, as the initially disrupted site gives way to impervious surface and soil stabilization, sedimentation concerns drop dramatically while the site experiences an overall increase in storm water runoff.

The dual nature of each basin was easily accommodated with corrugated steel pipe and fittings arranged to temporarily compartmentalize the sedimentation area, and service life requirements were addressed by specifying Aluminized Type 2 Corrugated Steel Pipe. Each system, designated as System Alpha and System Beta, utilized a combination of perforated and non-perforated (i.e. solid) pipe. The solid portions of each system were temporarily isolated from the perforated segments with the design and installation of strategically placed removable panels. Initially, sediment will be confined to the solid pipe where it can be removed before conversion to the permanent storage function. At conversion, the panels will be



Engineering Design  
Bowman Consulting Group  
Richmond, VA

Owner-Developer GC  
Eagle Construction  
Glen Allen, VA

Basin Manufacturer  
Lane Enterprises, Inc.  
Beaeton, VA

**Beta System**  
88' x 70' Footprint  
Aluminized Type 2 Steel Pipe  
293' of 96" Diameter CSP  
286' of 60" Diameter CSP

**Alpha System**  
90' x 63' Footprint  
Aluminized Type 2 Steel Pipe  
570' of 96" Diameter CSP

removed and the full storage potential of each system will be realized, which includes the storage available in the open-graded clean stone backfill (40% porosity) used for the entire pipe system via the perforated pipe segments.

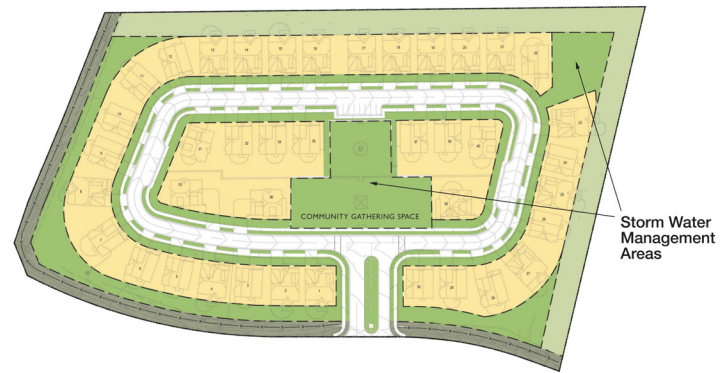
Essentially, both systems will function in the same manner. However, while System Alpha was constructed entirely of 8' diameter pipe, System Beta utilized both 8' and 5' diameter pipe to create the added feature of an overlying rain garden in the depression above the 5' pipe section.

All in all, and in due course, the corrugated steel pipe systems will provide for sediment capture and removal, storm water detention and restricted outflow, ground water infiltration and recharge, and in the case of System Beta, the added water quality benefits afforded by a rain garden.

This innovation has all the marks of repeatability. Sedimentation basins are naturally located in or near areas convenient for storm water storage. Since sedimentation basins are excavated in the initial phases of the land development (after land balancing), the dual-purpose system had to be constructed sooner than usual, but the benefits afforded still seem to outweigh the traditional approach.

A traditional sedimentation basin needs to be duly restored once the development reaches a predetermined point. In the case of John Rolfe Square it is around the time when 80% of the homes have been constructed. Dredging or excavating the sediment and backfilling with suitable soils is necessary before the lot can be used for other purposes, such as another home. This operation is cumbersome, messy, and can involve a certain stench; all in the midst of 80% of the residents' who live there. Essentially, excavating twice and backfilling once. While cleaning is still necessary before the dual-purpose system can be converted to its permanent form, the cleaning is readily accomplished with standard sewer cleaning equipment with little to no ill effects.

At the end of the day what will be said of the dual-purpose system? Is it an innovation? Indeed. Engineers striving for improvement? Absolutely. A change in the status quo? Time will tell.



Conceptual Master Plan Systems Alpha and Beta.

