# Creating a Stormwater Park
## in the City Meadow of Norfolk, Connecticut

View of City Meadow looking north along path of existing drainage ditch.

The management of stormwater is often considered an undesirable aspect of land development, the orphan child of the development process. It is to work well without being seen. However, the out of sight and out of mind philosophy creates a lot of unintended consequences. First, being out of sight has a direct correlation with the amount of maintenance that the system needs to function optimally. If no one can easily see the system, then required maintenance may not be done. Secondly, the proper functionality of the system is often overlooked until a significant failure occurs causing downstream impacts. The Town of Norfolk, Connecticut decided to take a different approach to stormwater management by including it in the center of their community as a public amenity.

**Site Description**

Norfolk, a small community located in the northwest corner of Connecticut, has a population of 1,700 and contains approximately 46.4 square miles. The center of the community overlooks an area known as the "City Meadow". The meadow was originally used as a grazing area for local cows in the late 1800's and early 1900's. As the town's commercial center developed around it, agricultural use of the meadow slowly decreased and eventually stopped.

In the early 1940's drainage from the adjacent state and local road networks was discharged into the meadow at the southern and eastern portions. As these discharges of stormwater have been continuous to the present time, the soil has become increasingly saturated, slowly changing the soil profile from a moderately well drained

**Outlet pipes from existing state and municipal drainage system discharges at the southern end of the City Meadow.**

soil to a poorly drained soil. The stormwater discharges have created several eroded channels through the Meadow with the most pronounced one being located along the western side. This channel does not provide any water quality benefit and is strictly a conveyance system. The Meadow has also been taken over by a sea of invasive phragmities.

The Blackberry River flows through the Town of Norfolk and the portion of the river located downgradient of the town center is listed on the State 303d as impaired for nutrients. As the watershed of the Blackberry River south of the town center is primary comprised of undeveloped land with some very low density residential housing, the source of the nutrient impairment was determined to be from the stormwater being discharged to the Meadow. The town needed to address this impairment, but was not certain how to go about it.

**Project Description**

A committee of local residents was formed to discuss ideas for a solution. The Meadow Committee, as they were known, reached out to the local Conservation District staff for ideas on how the water quality impairment could be addressed. The District Staff then contacted Steve Trinkaus of Trinkaus Engineering, LLC and he created preliminary sketches of stormwater systems that could be used to address the water quality impairment. The Meadow Committee was intrigued and after obtaining input from the public the idea was reinforced of creating a Stormwater Park in the Meadow in order to connect the commercial areas of the town center.

**After evaluating the topographic conditions on the site, it was determined that an Extended Detention Shallow Wetlands (EDSW) and deep water pond would be the primary treatment systems.**

As the stormwater treatment system was being designed, input from a local landscape architect was incorporated on the layout of the deep water pond as well as providing public access to the Stormwater Park. The final design will not only reduce the pollutant loads from stormwater runoff, but also function as a public amenity. The Stormwater Park will include pedestrian features to provide a connection to the existing commercial portions of the town and encourage the public to use this area for passive recreation pursuits.

**Design of the Treatment System**

The contributing watershed area is 21.59 acres and consists of a mix of roadways and predominately single-family residences. The peak rate of runoff was determined for the two-year storm (21.19 cfs) & ten-year storm (43.68 cfs). The percentage of the impervious cover in the watershed was 40.6%, which is significant and is due to the average size of residential lots being 0.5 acres. The Water Quality Volume (WQV) for the contributing area was calculated to be 24,536 cubic feet (0.56 ac-ft).

In designing a stormwater management system, the most important component is the forebay. The forebay is a depressed area located at the inlet of a stormwater treatment system. The forebay must provide a minimum of 10% of the required WQV, have a depth of 4-6' and a length to width ratio of 3:1. These parameters are very important to permit coarse and some fine sediment particles to settle out and not be re-suspended during future storm events.

After evaluating the topographic conditions on the site, it was determined that an Extended Detention Shallow Wetlands (EDSW) and deep water pond would be the primary treatment systems. These components were connected by either a wet swale or stepped stone swale to provide additional water quality improvement as well as a stable conveyance system that would not be subject to erosion.

The EDSW was designed along the eastern side of the site at the base of the steep slope. It is approximately 290'in length with an average width of 50', which provides a 5.8:1 ratio, well in excess of the desired 3:1 ratio. Longer flow paths increase the contact time between the stormwater, the soils and vegetation in the system which enhances pollutant reduction.

Four areas of high marsh were created in the EDSW with low marsh areas intertwining between the high marsh areas. At the northern end of the system, a 10' deep micro-pool was created. A broad, shallow, but short vegetated wet swale conveys the stormwater from the forebay to the EDSW.

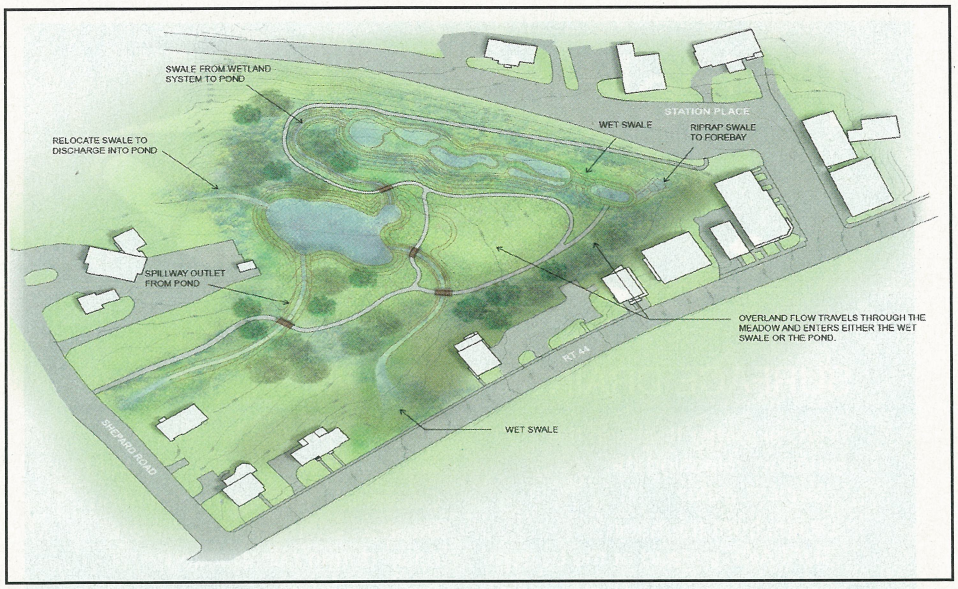
A deep water pond was utilized to create a focal point in the park. In order to make the Stormwater Park attractive to the public, it was desired to create unique features in conjunction with the stormwater treatment aspects. This was accomplished in the following manner:

- The swale from the EDSW to the pond was designed as a natural stone channel. A narrow, shallow channel was provided in the center of the channel for stormwater from small events, while a larger channel section was utilized for larger storm flows.

**Oil Sheen on stormwater in drainage ditch.**

- As the swale had approximately a 15' drop, two stone waterfalls were built into the slope of the swale to create the sound of falling water as well as for the aeration of the stormwater. The swale had a curvilinear alignment to create interest on the landscape.

From the northwest end of the deep water pond, a broad vegetated wet swale with randomly placed boulders will convey flows to the existing culvert under Shepard Road at the north end of the Meadow. Two additional wet swales will be constructed to




**Final plan showing stormwater systems and public access paths.**

convey runoff from an existing ditch from the Norfolk Fire Department property as well as for the conveyance of runoff from a future parking area to be constructed west of the Meadow area.

### Water Quality

The treatment train consists of a forebay, wet swales, EDSW and open pond and will significantly reduce the current pollutant loads being discharged to the Blackberry River. The Schueler Method was used to calculate the pollutant loads on an annual basis for the contributing watershed. The contributing watershed is discharging significant pollutant loads to the Blackberry River every year. With this system, nutrients will be reduced by over 60%, TSS and Metals by over 70% which will address the impairment in the Blackberry River over time. Portions of the meadow not being used for the treatment systems will be restored as native wetland meadows by the removal of invasive species and planting native wetland plants as an enhancement to the environment.

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### Public Access

Walking paths, which are fully handicap accessible, will connect the existing sidewalks on both sides of the meadow and will wind their way through the stormwater park. Timber bridges will be used to cross the swales to expose the public to the sights and sounds of running water. An open, covered gazebo will be installed overlooking the pond and provide a place for the public to sit and enjoy the surroundings.

### Approval Process

The plans for the Stormwater Park were submitted to the Norfolk Inland Wetlands Commission in the fall of 2012 for review and approval. A public hearing was held in November 2012 by the Inland Wetlands Commission where the project received very positive comments from the public. The application was approved by the Inland Wetlands Commission in December 2012.

Trinkaus Engineering then met with a representative of the Army Corps of Engineers (ACOE) and the State of Connecticut Department of Energy and Environment (DEEP) in January 2013 to walk the site and obtain preliminary comments about the project. While there were some concerns related to the use of a wetland for stormwater management by the DEEP representative, it was not seen as an insurmountable issue as the wetland area has been seriously degraded by the introduction of the stormwater during an extended period of time. At the current time, more formal comments are expected from both the ACOE and DEEP so that the appropriate applications can be filed with these agencies to obtain approval of the project.

The construction of the Stormwater Park will not be borne by the Town of Norfolk. A series of grants have been applied to fund the anticipated construction cost of $ 525,703.00. It is also anticipated that private donations from residents will also be used for the construction cost.

### Conclusions

This is the first known example of creating a stormwater park in Connecticut that will also provide a large public benefit in addition to the environmental benefits. It is hoped that this concept will become a template to implement in other communities to address the adverse impacts of stormwater. Stormwater treatment can now be considered an environmental enhancement and be part of the public forum instead of being out of sight and out of mind. **L&W**

*by Steve Trinkaus, PE, CPESC, CPSWQ*

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