

City of Ann Arbor &  
University of Michigan



# Energy Dissipation

Harvard Drain & Nichols Arboretum  
Storm Water Enhancements  
**APWA Project of the Year Award**

City of Ann Arbor

Mayor - John Hieftje

Project Management Services Unit - Homayoon Pirooz, Manager

University of Michigan

Owner - Regents of the University of Michigan

Project Management - UM Architecture, Engineering and Construction



## Project Details

**Project:**

Harvard Drain &  
Nichols Arboretum Stormwater Enhancements

**Client:**

City of Ann Arbor  
University of Michigan

**Project Cost:**

\$240,000

**Design Cost:**

\$50,000

**Construction Cost:**

\$170,000

**Design Completion:**

Summer 2009

**Construction Completion:**

Fall 2009

**Consulting Engineers:**

OHM (Orchard, Hiltz & McCliment, Inc.)

**Contractor:**

Birkenstock Enterprises

**Construction Testing:**

CTI & Associates

**Native Planting:**

University of Michigan





Project Site: City of Ann Arbor | University of Michigan - Nichols Arboretum

## Project Background

Harvard Place is a residential street surrounded by single family homes in the City of Ann Arbor. The neighborhood is characterized by hilly terrain, unique homes and the surrounding 125-acre Nichols Arboretum nature preserve. The Nichols Arboretum is a 100-year old public space owned and operated by the University of Michigan as a combination of gardens, nature preserves, research areas and parkland. The area, nestled on the banks of the Huron River, boasts stunning vistas of rolling hills surrounded by wooded preserves. The “Arb”, as it’s known among the locals, is a nature oasis within a highly urbanized area.

The rolling terrain, while a delight for nature lovers, created storm water management challenges for the City of Ann Arbor and the University of Michigan. The steep grades created high velocity discharges, leaving significant erosion and sedimentation issues in its wake.



Harvard Place prior to construction

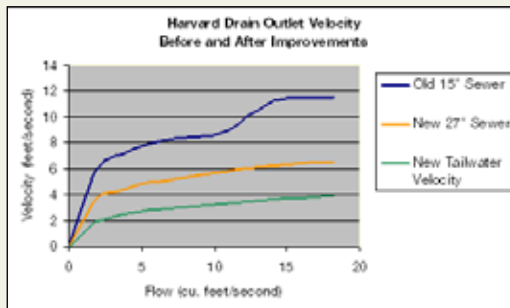


arboretum area prior to construction

## Approach

In mid 2008 the City of Ann Arbor recognized that a problem existed at one of its storm sewer outfalls and budgeted to have the source of the problem identified, evaluated and corrected. The City contracted with Orchard, Hiltz & McCliment, Inc. (OHM) to perform the study and design the most cost-effective improvements to the storm sewer system along the Harvard Place rights-of-way.

The original goal of the project was to reduce outlet velocities to acceptable levels while maintaining all construction work within City of Ann Arbor rights-of-way so that additional easements did not have to be obtained from the University of Michigan (U of M). The



storm sewer piping system extended beyond the rights-of-way and into U of M property, where it discharged to a channel that was constructed years ago in an “engineered” fashion (straight alignment with 90 degree bends). The storm sewer system drains approximately 21 acres and conveys runoff from the road right-of-way and portions of the surrounding residential property with an ultimate outlet to the U of M, Nichols Arboretum (nature preserve).

The hydraulic analysis results indicated that pipe outlet velocities for the design event were greater than 10 feet per second due to extremely steep storm sewer pipe grades and old, undersized clay tile storm sewer pipe. It was clear that the excessive pipe outlet velocities along with sandy soils and the poor outlet channel alignment were all contributors to the erosion within the Arboretum.

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## Approach continued

To solve the problems, the City discussed three alternatives:

1. Design for a higher recurrence interval (lower flow rate)
2. Replace storm sewer with larger, adequately sized pipe
3. Construct dissipation devices at the outlet

Unfortunately, Alternative 1 would not solve the problem since velocities would still be excessive for relatively low flow rates. Alternatives 2 and 3 would require work to be performed within the Arboretum (U of M) property and each alternative completed independently would not solve the problems. Therefore, the City determined that the most cost-effective course of action would be to pursue both Alternatives 2 and 3 and negotiate a cost-sharing agreement with U of M.



channel erosion prior to rehabilitation



storm sewer outlet & channel prior to construction

Before and during design, the project team met with affected residents to obtain input and ensure success during construction. Before construction U of M took the opportunity to eradicate invasive species which started to inhabit the area and engage volunteers to assist with the planting of native species following construction.

The final agreed upon plan included the following:

- Storm sewer replacement including in-system dissipation devices
- Coordination with area residents to establish “buy-in” of the plan
- A circuitously designed channel with step-pool structures to control the 15 foot grade differential
- Stream channel overflow “pocket” areas to enhance storm water infiltration and treatment
- Planting of the area by U of M Nichols Arboretum using native species and maples from around the world as part of its maple collection

## Implementation

The project design was authorized in the winter of 2008/2009 and a meeting was held to discuss the project's construction implementation and schedule. It was decided that an aggressive schedule would be pursued which included construction completion by fall 2009. This was a daunting task given ongoing coordination and negotiations between the two public agencies and the need to obtain Michigan Department of Environmental Quality (MDEQ) Wetlands and Inland Lakes and Streams permits. MDEQ permits were ultimately obtained on June 22, 2009 with bids received on June 30, 2009. The contractor, Birkenstock Enterprises, was awarded the contract on August 2009 and they initiated construction in August 13, 2009. This was an extremely



aggressive schedule since native plantings needed to be installed prior to winter by volunteers, after the contractor was completed with the storm sewer installation and other earth moving and restoration items.

Overall construction management was performed by the City's Project Management Unit with support by OHM on the U of M portions of the project. U of M's Arboretum staff assisted the City with assuring minimal disruption to the trees and vegetation along the access area. Soil erosion control enforcement was managed by U of M OSEH personnel along with support by the City and OHM.

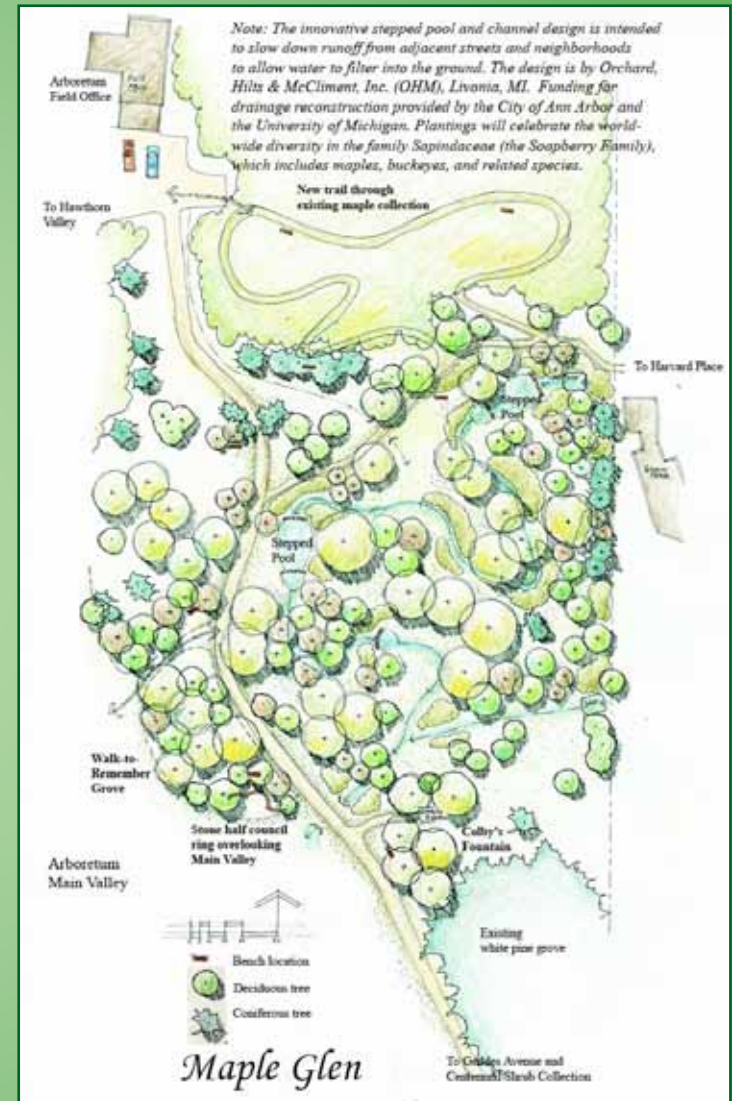


Since the project was located adjacent to and within a "nature preserve" area, environmental considerations during construction were of high importance. These included:

- Removal of non-native invasive plants prior to any construction activities to minimize chance of regrowth - Throughout the summer of 2009, U of M Forestry, Arboretum and volunteers removed invasive vegetation, in plenty of time prior to construction commencement.
- Protection of landmark and donated trees - U of M Arboretum personnel met with the contractor's personnel several times prior to and during the project to minimize disruption and harming of vegetation along the tight access road.

## Implementation continued

- Maintain construction sediment “on-site” – Even though there were four or five rain events that caused erosion, U of M personnel and the contractor diligently worked together to assure that no sediment passed the last line of erosion control fencing.
- Initial restoration completion prior to winter to minimize erosion problems during spring rainfall events - The construction team of the City, U of M, OHM and Birkenstock Enterprises, Inc. successfully completed the construction on time and the School of Natural Resources and Environment students installed native live stakes on December 4, 2009. This was a monumental task given the aggressive schedule and the large number of “rain days” during the construction period.
- All four items were successfully implemented which can be attributed to exceptional project management. The key component being constant communication by all of team members.



## Community Relations

The City and the University of Michigan worked in partnership with residents to define the initial problem, and then closely worked with the closest residents towards a solution. Residents consequently understood the problem and the solution, and willingly gave utility easements to facilitate the project. The whole neighborhood was kept informed of the design process through letters sent to all of the residents, and then kept abreast of construction developments via e-mail. The City posted project information on its website, and the Nichols Arboretum staff members posted project signs describing the upcoming work and also provided updates in their quarterly newsletter.



Local access was maintained for vehicular and pedestrian traffic at all times despite working on a narrow dead end street. Except for several short periods when vehicular traffic was temporarily restricted due to laying of pipe, or paving operations. Driveway access, garbage collection, and mail delivery was maintained throughout the project.



## Project Results

The project was launched with three goals:

- reduce storm water velocities
- eliminate soil erosion and
- create aesthetic land features

The project not only met all three objectives, it was completed on time and within the clients' budgets.

The end result was an inviting land improvement feature that includes several innovative storm water best management practices within an intimate neighborhood and park setting.



Project Site: City of Ann Arbor | University of Michigan - Nichols Arboretum





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