

## **Abstract**

The City of Mentor, the Chagrin River Watershed Partners, Inc. (CRWP) and the Simon Property Group received funding to explore site suitability for a green infrastructure stormwater management project within the parking lot of the Great Lakes Mall in Mentor, Ohio. The Mall, an aging shopping center built in 1961, was contributing to downstream flooding and poor water quality. The largely impervious 114-acre commercial site gathered storm water through 28 catch basins that merged all the water volumes into a single 72-inch outflow pipe draining directly into the Newell / Ward Creek. Periodic heavy rain events triggered water volumes that contributed to flooding downstream of the outflow pipe at an apartment complex and a City park. Newell Creek flows further downstream into the Chagrin River and Lake Erie shortly thereafter.

Akron-based Environmental Design Group (EDG) was hired through a competitive RFP process to lead the study. The EDG group used the soil test findings to develop a conceptual design utilizing green infrastructure techniques for on-site drainage, and sympathetic landscape architecture treatments. Test results and the proposed final design suggest that more than 50% of all water draining from 75 acres of asphalt parking lots at the Mall could be absorbed on-site.

The LEPF study findings and green design concepts were then used to develop and obtain a \$770,000 implementation award through the USEPA Great Lakes Restoration Initiative for recommended site work at the Great Lakes Mall, and two other sites in the adjoining downstream communities of Willoughby and Eastlake.

## **Project Summary:**

Newell-Ward Creek is a tributary of the Chagrin River. Non-point pollution and flooding are two results of urbanization affecting water quality of the Chagrin River and contributing to non-attainment of water quality standards in Newell/Ward Creek. The Mall, an aging shopping center built in 1961, was contributing to downstream flooding and unsatisfactory water quality. Channel and stream bank erosion, sediment transportation and degradation of landscape elements were other downstream factors of concern at sites downstream in the adjacent communities of Willoughby and Eastlake. The lower corridor of this stream in Eastlake is in a green corridor, protected by Eastlake and Lake Metroparks; however, this section does not meet Ohio EPA standards largely due to stormwater discharges and habitat modifications upstream, such as the Mentor shopping mall.

The Mall site is the largest single commercial property within the City and represents 7% of all impervious surfaces within the Newell / Ward Creek watershed, all of which drains into the Chagrin River and Lake Erie. Ohio EPA designated the Newell/Ward Creek as a Warmwater Habitat (WWH) stream. This designation, which considers waters to be in generally good health, represents the principal restoration target for the majority of water resource management efforts in Ohio. Based on 2003-2004 Ohio EPA sampling downstream in the City of Eastlake, Newell/Ward Creek was in non-attainment of the WWH aquatic life use due to sedimentation and erosion from flow alteration and nutrient inputs and organic enrichment from urban runoff and storm sewers. Ohio EPA also noted excessive stormwater effects, such as down cutting, bank erosion, and sedimentation. Ohio EPA noted that, "Excessive water energy from impervious area runoff, siltation and loss of riparian habitat are likely stressors on biology given the urban nature of the watershed, and should be the focus of future water quality studies."

The study purpose was to test soil conditions within a representative area under the asphalt lot, consider the overall stormwater system on site, evaluate drainage sheds, and devise appropriate solutions. The Akron-based Environmental Design Group (EDG) was hired through a competitive RFP process to lead the study. EDG, in turn, hired the Timmerman Geotechnical Group to conduct soil borings and infiltration tests. The EDG group used the test findings to forward the development of a conceptual design utilizing green infrastructure techniques for on-site drainage, and sympathetic landscape architecture treatments. Test results and the proposed final design suggest that more than 50% of all water draining from 75 acres of asphalt parking lots at the Mall could be absorbed on-site.

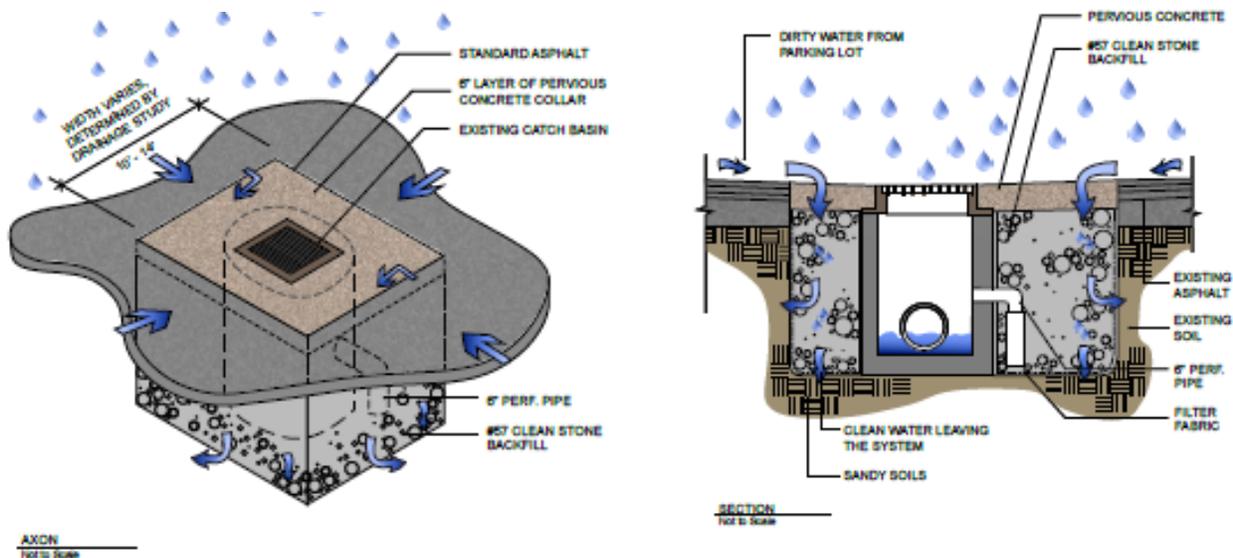
The Mall is the highest priority for stormwater retrofit and green infrastructure for both CRWP and the City of Mentor. The Great Lakes Mall lies along the City's main commercial corridor, State Route 20. The roadway follows a historic Lake Erie beach ridge. Test results confirmed that soil infiltration rates at the site varied from 13.5 inches to as much as 31 inches per hour – which are infiltration rates that are very conducive to managing some storm water on-site.

The process of developing the proposal included extensive outreach on the part of the City and CRWP to the management team at the Great Lakes Mall, and through them to corporate staff of the Simon Property Group, owners of the Mall. Simon Property Group is an international real estate management group that is redeveloping the property and has an expressed interest in finding and implementing cost-effective sustainable practices. But a cost-effective follow-up action plan was needed in order to create a sufficiently compelling scenario to motivate the site owners into participating and contributing towards the utilization of a green infrastructure approach within the Mall's parking lot areas, as they were under no mandate within existing stormwater management standards in either the City or County to do so.

**Background Context:** The Simon Property Group, Inc. is an S&P 500 company and country's largest owner, developer and manager of retail real estate properties. Simon Property Group owns or has an interest in 325 properties in the United States comprising 240 million square feet, and 67 properties comprising an additional 23 million square feet in the rest of North America, Europe and Asia. Twenty-two of these properties are within the Great Lakes Basin. Thus, a cost effective implementation of more sensitive stormwater infrastructure methods at the Great Lakes site could trigger similar efforts at other Simon Property sites. The Mall ownership group is also cognizant of the growing popularity of re-visioning the retail experience through the development of lifestyle centers that use outdoor pedestrian environments and programming as part of the market draw. One of the study goals was to look for cost effective solutions that could also have a transformative impact in terms of creating a landscape design opportunity on at least one portion of the parking lot – preferably in a high-visibility area. The Mall draws six million visitors annually, which would generate educational opportunities.

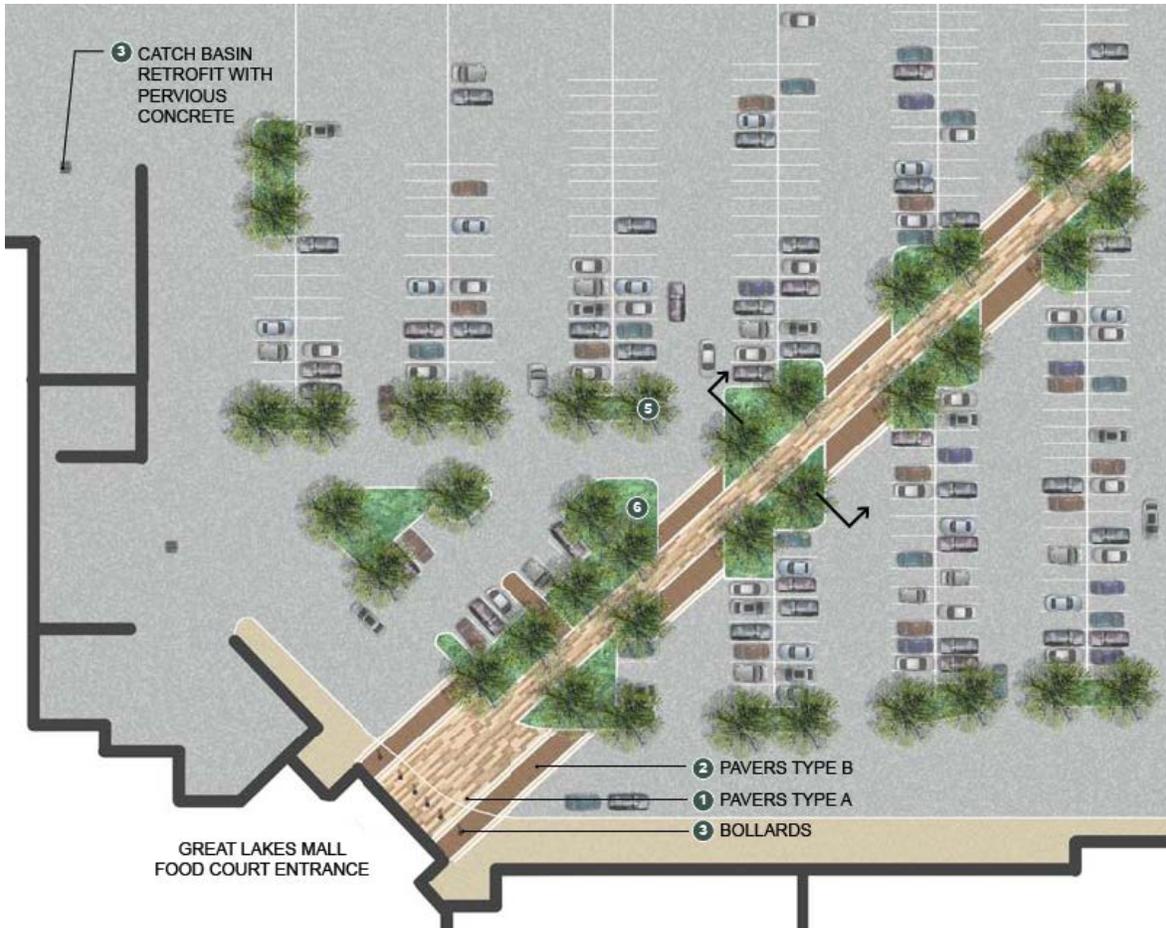
### Project Results

Based on the test findings, the EDG staff refined their initial proposals with sufficient technical detail to offer an overall project design with reasonable project cost estimates and an understanding of the probable improvements to water drainage and water retention on site. The project has two main features, the first treating overall volumes from most of the existing parking lot.



Illustrations courtesy of Environmental Design Group.

**Part 1.** The proposed green infrastructure design at Great Lakes Mall calls for a retrofit of as many as thirty of the existing catch basins with permeable concrete collars along with additional layers of gravel and secondary subsurface drains from the existing catch basin. This system modification will have the capacity to infiltrate the stormwater volumes from a 2-year, 24-hour storm event (2.25 inches of rain in a 24 hour period) from approximately fifty percent of the existing 75 acres of the Great Lakes Mall parking lot areas. This runoff reduction will improve water quality by minimizing bank-full flows that cause erosion and transport sediment and pollutants. The project will provide infiltration of stormwater to better mimic the natural flow regime of Newell/Ward Creek. The project will reduce stormwater volumes to Newell/Ward Creek and also treat the stormwater quality by reducing nutrient and sediment loading and lower the temperature of the discharged stormwater.



Illustrations courtesy of Environmental Design Group.

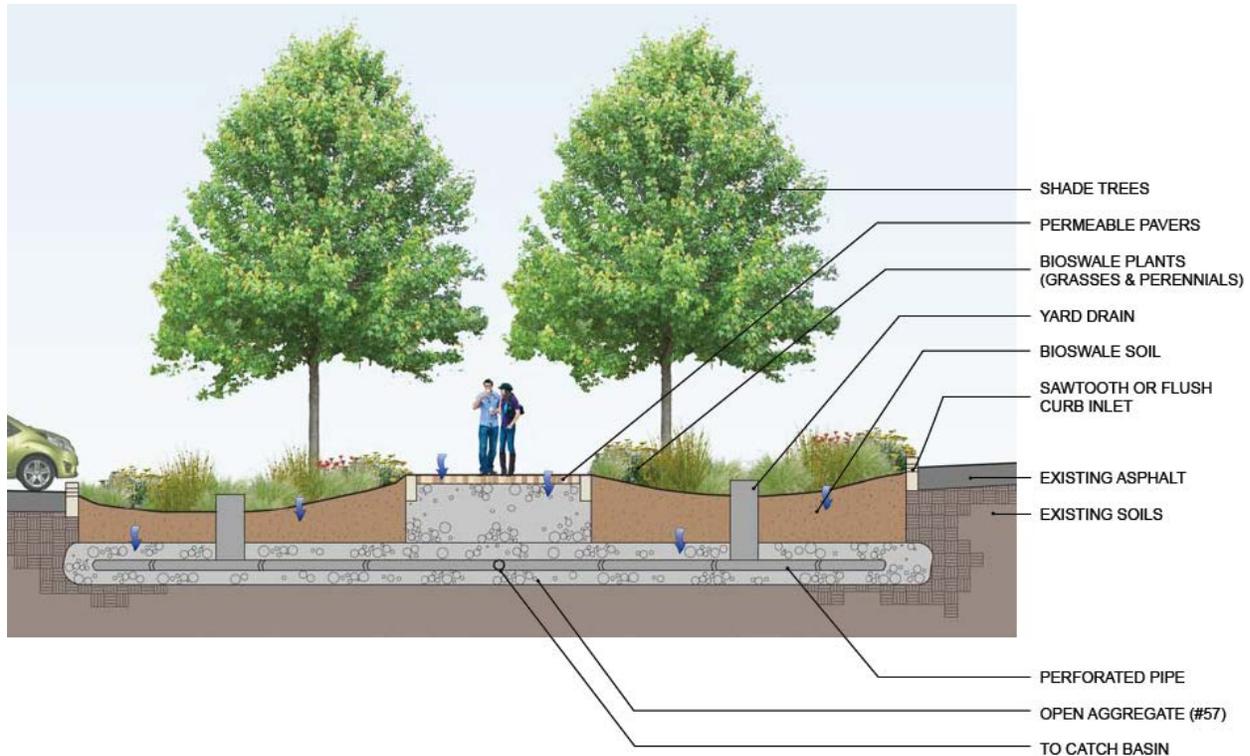
**Part 2.** The second component of the project is a 'Permeable Promenade' that is designed to combine a variety of best management practice methods that include more prominent landscape architecture and visual design elements.

The promenade will cut a diagonal swath through an existing parking lot adjacent to one of two main entry points to the Great Lakes Mall.

This design allows the existing parking lot configuration to be maintained and ties into the existing stormwater infrastructure. The pervious paver walkway treats stormwater for a 2-year storm event and provides a 20 foot wide pedestrian corridor that can improve pedestrian safety while maintaining existing drive lanes.

**Inset:** Main Entry at the Food Court  
Great Lakes Mall,  
in Mentor, Ohio.





Illustrations courtesy of Environmental Design Group.

In addition, 5,000 square feet of bioretention cells will have stormwater treatment capacity and create an opportunity to introduce trees, which will provide shading for cars and pedestrians.

The new design will serve as a visual draw for visitors, which the Mall management intends to support through the introduction of additional site amenities such as bench seating, accent and season lighting. Great Lakes Mall staff and aerial photos support the contention that the Mall entry at the Food Court is the most actively utilized parking acreage on the site.

The City of Mentor Public Information Office maintains a full-production video and post editing staff and operates a government access broadcast station (the Mentor Channel), with companion on-line links. The City will work in partnership with the Simon Property Group and partners to develop high-quality informational video magazine segments about the project. These will have promotional value to the Mall operators, but they also offer the City and the project funders an opportunity to demonstrate the benefits of a public private partnership approach to introducing green infrastructure practices at a large retail commercial site. Given that the community's main commercial thoroughfare runs along a former glacial beach ridge, the City sees this project as a means to potentially introduce these techniques on other commercial sites as they are redeveloped. The project also offers a means to track the long-term project life cycle benefits from both the public and private sector perspectives.

All the project partners have an interest in monitoring the results and promoting the positive impacts of the project. Anticipated life-cycle benefits to the Mall owners are lower annualized maintenance costs, and increased visitor safety for pedestrians entering the Mall's Food Court via the Promenade as the combination of material choices and drainage capacity will reduce the phenomena known as 'black ice'. Other private and public sector benefits from the GLRI-funded portion of this initiative occur further downstream within the watershed area.

## **Project Timeline**

**November 2011 – February 2012.** Upon notice of grant approval through the Lake Erie Protection Fund in late 2011, the City and partners proceeded to work on consultant selection and study development on a fast-track basis.

A compelling factor was the awareness that CRWP and the City intended to use the study results to prepare a proposal for project implementation funding through the Great Lakes Restoration Initiative. The goal was to obtain an evidence-based understanding of site soil conditions and develop a subsequent conceptualized implementation plan of sufficient technical detail to support a base-line determination of project costs and potential improvements to the local watershed. The City, CRWP and Great Lakes Mall management collaborated in an RFP and consultant selection process through the months of January and February of 2012.

**March – May 2012.** The Akron-based Environmental Design Group, Inc. (EDG) was selected in March and subsequently engaged. EDG hired the Timmerman Geotechnical Group to conduct soil test borings, which were performed early in May. These tests confirmed that the soils are predominantly 'silty' sand with gravel, meaning that these soils are well drained with infiltration rates of 13-31 inches per hour. These soils provide the opportunity to retrofit a significant amount of the existing impervious parking lot with green infrastructure stormwater best management practices; on-site drainage through the introduction of pervious pavements and on-site bioretention. A preliminary understanding of the overall project scope and probable soil conditions allowed the EDG group and project partners to develop a series of most-probable solutions, which were then validated by the subsequent soil tests. The test results and proposed solutions were used to support a larger, more comprehensive proposal submitted in May for funding consideration through the Great Lakes Restoration Initiative.

### **June – September 2012.**

EDG provided final renderings and project design refinements in June, completing their contract in July, with the City completing its interim project reports and final payments in the beginning of September.

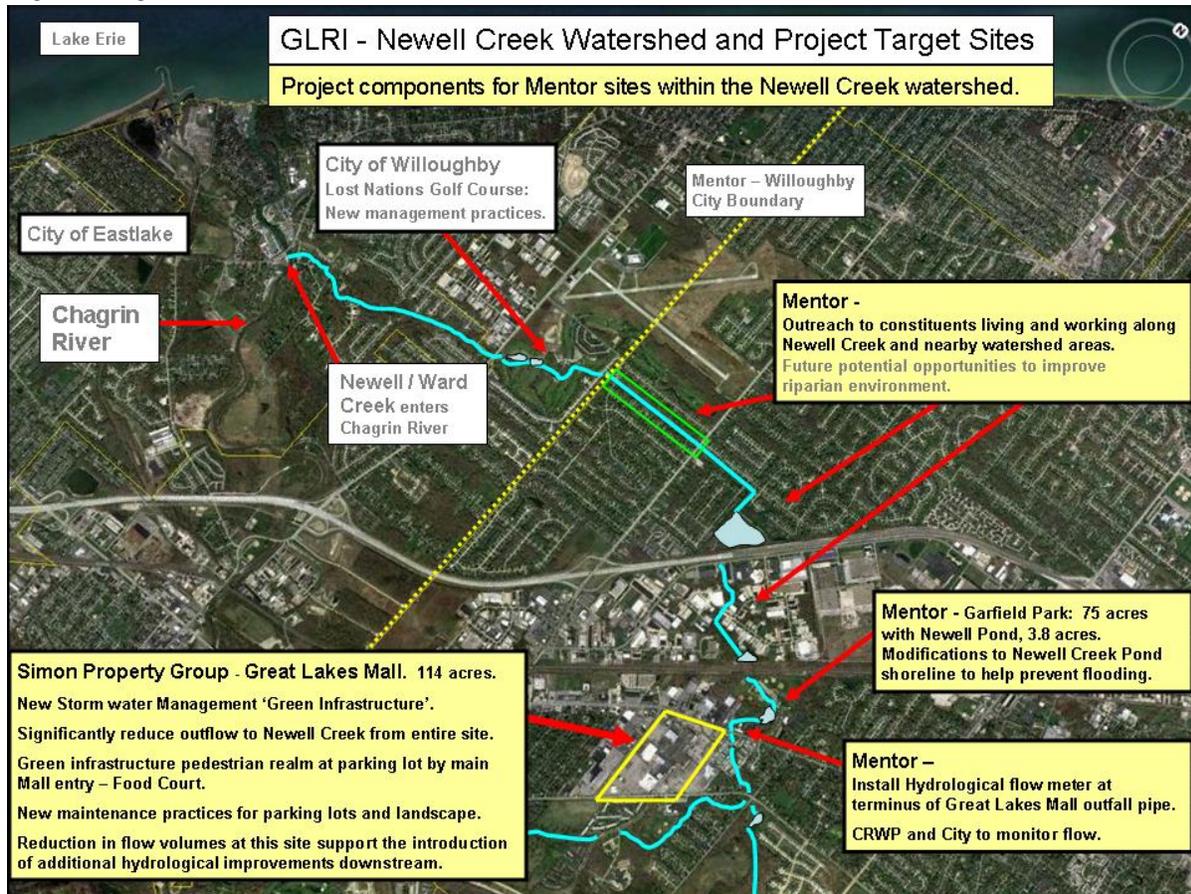
### **Post-LEPF Grant Award Timeline.**

This project was funded through the Lake Erie Protection Fund (LEPF). The LEPF is supported by the voluntary contributions of Ohioans who purchase the "Erie...Our Great Lake" license plate featuring the Marblehead lighthouse. [www.lakeerie.ohio.gov](http://www.lakeerie.ohio.gov). The study results and proposed solutions were instrumental in CRWP obtaining a \$770,000 award for Newell Creek Green Infrastructure through the US EPA Great Lakes Restoration Initiative (GLRI). This award will be used for implementation of best management practices at the Great Lakes Mall and additional work on sites in the adjoining downstream communities of Eastlake and Willoughby, and educational outreach. \$350,000 of the GLRI award is for project implementation at the Great Lakes Mall, using the LEPF study results as a guide. Project implementation will proceed through Year 2013.



## LEPF Project and GLRI Implementation Phase: Overall Project Scope

The following implementation project generated with help from the Lake Erie Protection Fund study will serve to foster improvements within a 7.8 square mile watershed that drains into the larger Chagrin River watershed and onward to Lake Erie.



The Great Lakes Mall retrofits are now part of a larger project that includes 2,900 linear feet of stream-bank and riparian corridor restoration along portions of the Newell/Ward Creek in the downstream communities of Willoughby and Eastlake. The combined GLRI-funded project implementation components will be complemented by an educational outreach campaign that will reach out to property owners along the watershed, with a special emphasis on owners with creek frontage. The stream restoration project directly implements the *Chagrin River Total Maximum Daily Load (TMDL)* by reducing sediment inputs from the eroding stream banks at the restoration sites and will assist in obtaining TMDL targets for nitrogen and phosphorus levels, restore the warmwater habitat status, and improve aquatic habitat to this perennial, seasonal fish habitat stream. Restoring natural infiltration and flow regimes in concert with stream restoration will have long-term water quality benefits past the life of this project. This Lake Erie Protection Fund study, and the GLRI project it fostered, will generate tangible improvements to this local watershed, and will serve to stimulate many additional opportunities for outreach and implementation over time.