

MODEL MANAGE



A Wisconsin shopping plaza achieves interim flood protection via storm water modeling

By John R. Davel, P.E.

Landmark Plaza is a retail center located on the west side of the city of Oshkosh, Wis. Campbell Creek, with an upstream watershed of 200 acres, flows along the south and east side of Landmark Plaza.

All of the tenant spaces in the plaza's main building were flooded when two large storm events occurred within a week of one another in June 2008. A similar weather pattern had occurred in June 2004, causing similar damage.

To identify and evaluate solutions to the flooding, the city hired a consultant to study the Campbell Creek watershed. One solution proposed that would have an immediate effect was the construction of a new storm sewer from Landmark Plaza east to Perry Tipler School and the construction of a dry

detention pond on the school property.

Although the city agreed with the recommendation, physical improvements were at least a year away and the plaza could not tolerate another season of flood damage. Davel Eng. was chosen by Landmark Plaza to evaluate the conditions and determine immediate actions for providing the protection necessary to prevent another damage-causing flood.

Davel created a detailed hydrologic storm water model of the site. This model was then used to recommend and design specific improvements for the desired flood protection.

Existing Site Conditions

Hydrologic modeling of the property revealed the factors that contributed to

the plaza's flooding problems:

- High flows from development upstream of the Landmark Plaza property;
- Inadequate capacity of onsite storm sewers and culverts to pass the flows entering the property and the flows generated on the property;
- Inadequate capacity of downstream storm sewers and overland flow paths to handle flows leaving the property; and
- Insufficient grade to protect buildings from floodwaters that resulted when the storm sewers surcharged and overflowed.

Proposed Conditions

Study of the site indicated that there were four components of the flooding that need to be addressed to effectively deal with the flooding:

- 1. Backflow Prevention.** The project team needed to prevent offsite floodwaters from backing up into the property. This was accomplished by eliminating connections to Campbell Creek where possible and by adding in-line backflow preventers on all storm sewers that discharge to the creek.
- 2. Inflow Control.** It was also necessary to prevent upstream flows from overflowing the ditches and pipes meant to convey the water around the property. To prevent the flow of overland storm water, where it could add to the already undersized and



Landmark Plaza experienced severe flooding after summer rain events in 2004 and 2008.

overflowing onsite storm sewer system, a dike was proposed between the stream and the property.

3. **Onsite Storm System.** In addition to undersized pipes, much of the parking surface was served by only two catch basins. The pavement was recontoured and numerous catch basins added to eliminate the localized flooding caused

by insufficient inlet capacity. As a secondary benefit, the regraded parking lot will shed water more efficiently.

4. **Onsite Flood Storage.** The parking lot was reconstructed at a lower elevation, resulting in an increase in storage volume of nearly 2 acre-ft.

On their own, none of these actions would have resolved the flooding problems. The combination of the four

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as determined by the storm water model has resulted in improved protection for plaza tenants and owners.

Storm Water Modeling

StormNET, a hydrologic and hydraulic computer model, was used to model the runoff characteristics of the watershed and the storm sewer system. The Kinematic Wave method was used, allowing for flows in the downstream and upstream directions in conduits and channels. The StormNET model was run using both the Huff and SCS-Type II storms for the subbasins.

Each proposed solution was evaluated using the model under the most extreme conditions. The resulting peak flood elevation in relation to floor levels and the duration of the flood was the primary focus.

Summary

The changes to the Landmark Plaza property were constructed in Spring 2009. They provided an added degree of protection from the flooding associated with large storm events during the 2009 storm season.

The city completed the construction of a detention facility at Perry Tipler School and is scheduled to upgrade the storm sewer capacity downstream of Landmark Plaza in 2010. [SWS](#)

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