



Christ Church Stormwater Management

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Introduction

Plaster Creek is an impaired waterway that runs through Kent County. The Plaster Creek Stewards (PCS) is a non-profit organization whose goal is to restore the waterway so that it is safe for fishing and human bodily contact.

Christ Church is located on Breton Road in Grand Rapids, MI, and lies within the Plaster Creek watershed. Runoff from this site contributes to high sediment levels and flash flooding within the Plaster Creek. Accordingly, PCS has chosen to invest in the church property with funds from a 319 grant, awarded to them by the Michigan Department of Environmental Quality (MDEQ).

Team 03 has come alongside PCS to design a robust stormwater management plan for Christ Church's property, and so aid the overall effort to restore Plaster Creek.

Objectives

Due to financial constraints, the team decided to split the project into two phases. Phase I concentrates on the redirection of water away from the unstable ravine on the property, and to the detention pond. Phase II will concentrate on the restoration of the ravine area. The team was responsible for the design of Phase I only.

The team identified three main objectives for Phase I of the project:

- To route runoff from parking lot surfaces away from the ravine outlet and into the existing detention pond.
- To design rain gardens and green infrastructure that infiltrate and treat as much runoff as possible from a 2-year 24-hour storm event.
- To improve the existing detention pond so that collected runoff is released from the site at a rate mandated by the regulations of the City of Grand Rapids.

Team 03: The Infiltrators



The Site



Christ Church PCA – Breton Road (Grand Rapids)
(Plaster Creek is marked in blue)

Conclusions

The team has delivered the complete EPA SWMM model and construction planset to Professor Julie Wildschut. The stormwater infrastructure changes proposed in this project will serve to reduce the risk of flash floods downstream, improve the water quality and sediment levels in Plaster Creek, improve the aesthetics of the Christ Church property, and enable the Plaster Creek Stewards to invite others to help restore Plaster Creek.

The project will be completed under the supervision of the Plaster Creek Stewards by funds from the Michigan Department of Environmental Quality and volunteer labor from the youth group of Christ Church. Wonderfully, the project is scheduled to be built within the next year.

Design

The team designed the following components to achieve the project objectives:

- A 12-inch concrete pipe to collect water from 0.86 acres of impervious surface and to re-route it into the existing detention pond.
- Two rain gardens which encompass two existing parking lot manholes. These rain gardens will encourage infiltration as well as detain and treat runoff to improve water quality downstream.
- A forebay, bioswale, and berm within the existing detention pond. This infrastructure will extend the current flow path from 28 feet to 200 feet and will result in longer runoff detention time. Additional detention time will allow more sediment to settle out of the runoff, and so improve water quality downstream.
- Modifications to the detention pond outlet structure. Currently, runoff exits the pond via a 6.5-inch diameter PVC pipe. Instead, a perforated riser will reduce the release rate to the mandated 0.22 cubic feet per second.

Deliverables

EPA SWMM Model:

The majority of the design work was guided by hydrologic modeling of the site. The team used the Environmental Protection Agency Storm Water Management Model (EPA SWMM) software to model the existing site, and then to model and select alternative solutions.

Construction Planset:

The primary product is a complete planset of the design. Julie Wildschut, Calvin professor and PCS project engineer, will review, stamp, and submit the planset to the MDEQ and to the City of Grand Rapids to secure funds and permits.



Planset Title Sheet for Christ Church Improvements

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