FLORAL PARK STORMWATER NETWORK DESIGN

SPENCER IVEY, OLIVIA LEFEVRE, KAYLEE NEAL, LAYLA STEIN

Faculty Advisor: Dr. Mark Dougherty

BACKGROUND

The City of Opelika has proposed renovations to Floral Park which include a new parking lot, a multiuse sports field, a playground, a press box/concession stand building, a new restroom facility, two water features, an additional walking pathway and an updated stormwater management system. The focus of this project is the design of a stormwater management system to accommodate the renovation of the park. An updated stormwater system will be designed to replace existing failing stormwater infrastructure and to minimize the effects of increased stormwater runoff due to new development. In the stormwater design, green infrastructure practices were implemented due to their low cost and opportunity for public education with the use of signage that detail their advantages.

PROBLEM STATEMENT

Floral Park was developed in the late 1970’s with its newest addition being a dog park in 2018. The restoration of the park will generate revenue, increase local usage, and attract more visitors to the city. With this restoration the stormwater network will need to be inspected and updated to make sure that the existing network can handle the stormwater generated by the updates to the park.

Design Constraints:
- 8” sanitary sewer main
- 18” water main
- Underground utility lines
- Budget of $150,000

LOCATION MAP

Floral Park is located in Lee County, Opelika, AL and is on the intersection of Floral St. And Sixth Avenue, within walking distance of the downtown area of Opelika.

DESIGN OBJECTIVES

- Design a stormwater management plan that effectively reduces the post-renovation runoff of 63 cubic feet per second (cfs) to equal or lower than pre-renovation flow of 48 cfs from the 23-acre site while meeting all City of Opelika stormwater management regulations and standards.
- Implement at least one green infrastructure practice in the stormwater management system to provide stormwater treatment while increasing the aesthetic value of the park and educating the public.
- Provide a stormwater management design that does not exceed $150,000, 15%, of the total $1,000,000 renovation budget.

DESIGN PROPOSAL

Native Vegetation

- Bearded Beggarticks
- Wild Geranium
- Joe Pye Weed
- Harstem Bulrush

Bioretention Cells

Cell 1: 20 x 10 ft NW site location

Cell 2: 34 X 17 ft connected to parking lot by grass swale

After evaluation of the existing pipe network, the two pipes between inlets A, B, and C were found to be undersized and have been replaced with 30" reinforced concrete pipe. All other existing pipe sizes were found to be correctly sized for current flow conditions.

Inlet Replacement

Upon inspection of the site, inlets B, C, and H were found to be failing and have been resized and replaced with galvanized steel, open throat grate inlets.

Pipe Network

Post Renovation Site Plan

DESIGN APPROACH

The pre-development and post-development runoff of the site were calculated using both the Rational and Curve Number methods. To assess the current stormwater pipe network, the topography of the park was used to divide the site into individual basins to determine the peak flows that would be entering each inlet for the appropriate storm events. Using Hydraulflow Express and Hydraulflow Storm Sewers, along with the calculated peak flows from each basin, the pipe diameters needed to manage the runoff at 50-75% capacity for a 25-yr storm event were found. Along with the stormwater network, two bioretention cells and a dry swale will be used to reduce the runoff from the impervious sections of the developed area on the site. Bioretention cells were sized using the methods and guidelines provided in the Georgia Stormwater Management Manual and the Alabama Water Resource Management Design and Construction Manual. The design was completed in accordance with all ADA Safety Standards and appropriate environmental regulations.

COST ESTIMATION

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Infrastructure</td>
<td>$3,063</td>
</tr>
<tr>
<td>Stormwater Network</td>
<td>$61,404</td>
</tr>
<tr>
<td>Erosion and Sedimentation Control</td>
<td>$2,508</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>$1,385</td>
</tr>
<tr>
<td>Subtotal</td>
<td>$68,359</td>
</tr>
<tr>
<td>Contingency (10%)</td>
<td>$6,836</td>
</tr>
<tr>
<td>Total</td>
<td>$75,195</td>
</tr>
</tbody>
</table>

Figure 1: Stormwater Design Cost Summary

SUMMARY

- The post renovation peak runoff was decreased by 0.14 cubic feet per second compared to pre-renovation peak runoff.

ACKNOWLEDGEMENTS

LOKS Engineering would like to thank the following members of the Auburn University Biosystems Engineering Department:
- Dr. Mark Dougherty
- Mr. Jon Davis