



Green Infrastructure & Stormwater Management CASE STUDY

Terraced Reforestation

Location: Interstate 71/75 Corridor,
Covington, KY

Client: Sanitation District No 1 (SD1)

Design Firm(s): Human Nature Inc.,
Strand Associates, Riegler Engineering,
Thelen Associates

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Project Specifications

Project Description: The Terraced Reforestation project involves the construction of a series of vegetated, terraced berms within the Interstate 71/75 right-of-way within the City of Covington. The ultimate goal of the project is to reduce combined sewer overflow volume. Because combined sewers carry both sanitary sewage and storm water through the same pipes, excess storm water that enters the combined sewers can cause the system to overflow, resulting in pollution of waterways. Terraced Reforestation is designed to intercept storm water runoff from approximately 17 acres. A series of 12 vegetated, terraced berms were constructed to slow and detain storm water runoff. Each terrace features compacted berms to hold the storm water within the terrace and engineered soil to promote infiltration. Storm water briefly ponds on the surface of each terrace and then filters through the engineered soil medium before it is released into an underdrain. Underdrains in each terrace slowly release the storm water flow into the next terrace. The 12 terrace, almost one mile in total length, are connected in series for maximum volume reduction and detention time. The terraces are planted with native trees and seeded with native grasses and forbs. Over 280 trees are planted with the intent of establishing maximum canopy coverage over the site.

Project Type:

Transportation corridor/streetscape

A retrofit of an existing property

Design features: Bioretention facility - reforestation was integrated into the bioretention / infiltration trenches.

This project was designed to meet the following specific requirements or mandates:

Federal Clean Water Act

Impervious area managed: 1 acre to 5 acres

Amount of existing green space/open space conserved or preserved for managing stormwater on site: Greater than 5 acres. This section of interstate right-of-way was previously a steep slope, with very poor soil conditions that would not support meaningful vegetation. This project restores and enhances the site ecological function in a very highly visible corridor with approximately 150,000 vehicles passing the site on a daily basis.

The regulatory environment and regulator was supportive of the project.

Did the client request that other factors be considered, such as energy savings, usable green space, or property value enhancements? Yes, not only does the project lead to environmental benefits through reduced combined sewer overflow volume annually, but it also provides long-term energy savings by reducing the amount of storm water that enters the combined sewer system. This reduction also results in less storm water getting treated at the wastewater treatment plant.

Cost & Jobs Analysis

Estimated Cost of Stormwater Project: \$1,000,000-\$5,000,000 (Public funding: Federal, Regional)

Was a green vs. grey cost analysis performed? Yes. This project was modeled both for its storm water runoff reduction as well as the resulting reduction in annual CSO volume. Through SWMM modeling, the Terraced Reforestation in conjunction with a smaller bioretention basin project downstream shows a reduction in annual CSO volume of 3.1 million gallons in a typical year. Alternative grey controls proposed for this area include underground storage tanks and/or deep combined sewer tunnels. The modeled benefits proved to be more cost-effective than the grey solution but also provided additional ecological and social benefits that would not be provided with a grey alternative. This annual reduction in CSO overflow volume also results in less combined sewage requiring treatment at the wastewater treatment plant which results in further savings in energy costs.

Cost impact of conserving green/open space to the overall costs of the site design/development

project: The site was unused interstate right-of-way that consisted of heavy compacted clay, steep slopes, and very little infiltration of storm water runoff. Additionally, the existing site did not support meaningful vegetation. There were no incurred costs of conserving the open space, only costs associated with the construction of the terraces.

Cost impact of conserving green/open space for stormwater management over traditional site design/site development approaches (grey infrastructure)? The Terraced Reforestation was more cost-effective than the needed grey infrastructure to accomplish the same CSO volume reduction benefits.

Number of jobs created: 6-10 construction related jobs during construction of the project

Job hours devoted to project: Not available

Planning and Design: Not available

Construction: Not available

Annual Maintenance: Not available

Performance Measures

Stormwater reduction performance analysis:

The modeled results show a 25 - 30% reduction in storm water runoff on an annual basis. This reduction in runoff in conjunction with the detention functions of the terraces results in a modeled CSO volume reduction of 3.1 million gallons annually during a typical year of rainfall (this includes the benefits of a bioretention basin downstream of the project).

Community & economic benefits that have resulted from the project: The site is a gateway corridor into the City of Covington and the City of Cincinnati.

Additional Information

Links to images:

http://www.sd1.org/resources/Terraced_Reforestation_Project_Fact_Sheet_Updated.pdf

