



Parking Lot Rain Garden Retrofit

Site Location: Greenbelt Homes, Inc., Greenbelt, Maryland

Property Description: 250-Acre residential Community owned and managed by Greenbelt Homes, Inc, a 1,600 member housing cooperative.

Project Site Description: Private residential parking lot encompassing approximately 12,000 square feet and providing parking for 42 vehicles.

Statement of problem:

The parking lot surface was deteriorated and due for major reconstruction. The existing storm water catch basin serving the lot had deteriorated and the asphalt curb at the basin was crumbling causing ponding of water in the lot and muddy conditions in adjacent grass areas. (Figure 1a) Extensive head cutting and erosion was present at the storm water outfall contributing to stream degradation in adjacent forest conservation area parcels. The area surrounding the storm water outfall was overgrown with invasive shrubs and vines and was a frequent site of trash dumping. (Figure 1b)

Proposed solution:

Reconstruct parking lot to include a rain garden bioretention retrofit for the site to divert and capture a majority of rainfall runoff and promote infiltration to reduce negative impact to headwater stream system. Install a concrete curb with inlets to direct storm water toward the infiltration basin and construct a concrete-bypass structure to accommodate proper drainage in large storm events. Landscape entire area with native trees, shrubs, and wildflowers to beautify site and discourage future trash dumping.

Planning Process:

GHI Staff followed a team approach to plan and implement the parking lot restoration and rain garden retrofit project. The GHI staff engineer took the lead working with OIP, Inc. – an engineering and design firm – to develop the restoration plan for the lot and the design of the rain garden bypass drain. A GHI contract manager coordinated the work of the CPE, Inc. the parking lot contractor to undertake the structural construction elements of the project and the GHI grounds department manager took the lead designing and overseeing construction and planting of the rain garden. Planning occurred during March and April. Parking lot construction took place during August and September. Rain garden grading and planting took place in September.



Figure 1a. Original Site Conditions



Figure 1b. Original Drain Outfall

Implementation:

The construction of the rain garden and restoration of the parking lot were closely intertwined. As a complex project, careful timing of each phase of implementation was essential.

The first phase of construction involved excavating the garden site with a backhoe and forming the outline of the garden. (Figure 2a) During the excavation, the contractor carefully located and exposed the existing drain pipe that would be connected to the new drain by-pass structure. (Figure 2b) Most of the existing soil was removed from the site but some was retained to form the berm around the garden perimeter which would create a ponding area for rainfall runoff from the parking lot. (Figure 2c) In total approximately 30” of soil was excavated.



Figure 2a. Initial Excavation



Figure 2b. Existing Drain Pipe



Figure 2c. Forming berm

Once the drain pipe was located, the contractor began the second phase of constructing the drain by-pass which allows excess rain water to drain off during heavy rain storms. (Figure 3a) The drop-structure forming the by-pass was constructed from poured concrete. (Figure 3b) Forming and pouring the new concrete curb for the parking lot also took place at the same time. (Figure 3c) This step was the first portion of the parking lot restoration component of the project.



Figure 3a. Drain by-pass structure



Figure 3b. Pouring by-pass



Figure 3c. Pouring parking curb

All initial steps were conducted by the parking lot contractor, CPE Inc. and took place over a period of four working days. Since the project site was an active residential area, at the conclusion of each working day the contractor installed temporary fencing around the construction zone to keep children and adults away from the excavated area.

The third phase involved identifying the correct height for the top of the drain by-pass and berm to ensure a 6-8" ponding depth for the garden at final grading. (Figure 4a) Then staff shaped and compacted the clay soils of the berm. (Figure 4b) This step is important to harden the berm which acts as a levee to hold ponding water in the garden area. Staff then leveled the existing sub-soil in the garden to prior to adding the new garden medium. (Figure 4c)



Figure 4a. Leveling by-pass



Figure 4b. Compacting berm



Figure 4c. Garden Profile

The fourth phase was to install the drainage and growing medium. CPE, Inc. assisted GHI staff to install approximately one foot of ¾" wash gravel to improve drainage. GHI staff leveled the gravel and installed a fabric silt barrier on top. (Figure 5a) Next CPE and staff installed a specially designed bioretention soil mix containing high organic material and coarse sands to promote good plant growth. (Figure 5b) Staff leveled the grade of the garden to ensure a ponding depth of approximately six inches from the garden soil and the top of the berm. (Figure 5c)



Figure 5a. Install fabric barrier



Figure 5b. Install soil mixture



Figure 5c. Final garden grade

The fifth phase of the project was to undertake the restoration of the parking lot surface. This step was timed for after heavy construction was completed prior to avoid truck damage to the new asphalt. This phase was completed entirely by CPE and took place over approximately two days. No vehicle traffic was permitted on the new surface during this time. The contractor then painted the lines for all the parking stalls.

The sixth phase of the project was to install plant material in the garden and surrounding berm area. Staff planted a sod buffer strip in the garden at each of the curb cuts to help slow the flow of water into the garden and seeded the berm perimeter with a fast-growing fescue grass mix (Figure 6a.) GHI then installed a coconut fiber erosion control blanket on the back berm of the garden (Figure 6b) and planted the slope with a mix of native shrubs and grasses to stabilize soils. (Figure 6c)



Figure 6a. Grass filter



Figure 6b. Erosion fabric on berm



Figure 6c. Planted back slope

The sixth and final phase was planting and mulching the garden bed and installing the final signage. Planting took place in two steps over a period of several days. During the first step, GHI staff installed 35 native trees and shrubs according to the design plan. (Figure 7a) The second step entailed planting more than 900 native wildflower and grass plugs. (Figure 7b) Lastly the garden was mulched with a 2-3” layer of shredded hardwood mulch and the informational sign installed. (Figure 7c)



Figure 7a. Planting shrubs



Figure 7b. Planting wildflowers



Figure 7c. Educational signage



Final Garden- Initial Year



Final Garden- After rainstorm

Partners:
Greenbelt Homes, Inc. – Project lead, funding, and garden design, construction, planting, and maintenance.
Chesapeake Bay Trust – Project Funding
OIP, Inc. – Parking lot and drain design and engineering
CPE, Inc. – Parking lot rehabilitation, drain installation, and rain garden excavation

