

George Middle School

10000 N Burr, Portland, Oregon

PROJECT SUMMARY	
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Project Type:	Public school planter box stormwater retrofit – demonstration project
Technologies:	Flow-through and infiltration stormwater planter cells
Major Benefits:	<ul style="list-style-type: none"> • Runoff from 1,260 square feet of rooftop was rerouted from the combined sewer system to an onsite stormwater planter. • Monitoring equipment was installed to assess how effectively the flow-through planter cell reduces stormwater flow and removes pollutants.
Cost:	\$26,426 total, with \$25,226 paid by EPA funds
Constructed:	August 2004 through February 2006

Overview of the Stormwater System

- An existing brick landscape planter was excavated to a depth of 44 inches. New concrete walls were added to divide the planter into three cells: an infiltration cell, a flow-through cell, and a monitoring cell (Figures 3 and 4).
- A waterproof liner was installed against the building foundation in the infiltration cell. The infiltration cell was backfilled with topsoil and planted with native vegetation. An existing downspout that drains approximately 1,260 square feet of rooftop was rehung and disconnected into the infiltration cell.
- The flow-through cell was completely lined with a waterproof liner. A perforated pipe was installed from the bottom of the flow-through cell through the wall of the monitoring cell to the monitoring equipment. The flow-through cell was filled with topsoil and planted with native vegetation.
- Water quality and quantity monitoring equipment was securely installed in the monitoring cell.



Figure 1: Site Plan



Figure 2: Original Landscape Planter

STORMWATER CAPACITY AND SYSTEM COMPONENTS

Stormwater Management Goal

The stormwater facilities were designed in accordance with the City of Portland's 2002 *Stormwater Management Manual*.

System Components

Flow-through Cell

Facility footprint: Approximately 36 square feet

Overflow: Infiltrates to a perforated pipe to an existing standpipe (connected to the combined sewer system)

Infiltration Cell

Facility footprint: Approximately 465 square feet total.

Overflow: None



Figure 3: Monitoring, flow-through, and infiltration cells of stormwater planter retrofit (from back to front of photo)



Figure 4: Installed monitoring equipment

Landscaping

- Once the planter was excavated and backfilled with topsoil, it was planted with native vegetation. George Middle School students designed the overall planting plan and installed the vegetation. No irrigation was installed for the vegetation.
- The vegetation for the infiltration cell includes 2 vine maples, 2 western serviceberry, 2 mock-orange, 10 salal, 4 tall Oregon grape, 3 red flowering currant, 3 common snowberry, 10 brome grass, 10 western red fescue, 5 tufted hair grass, and 15 Oregon iris.
- The vegetation for the flow-through cell includes 1 Sitka willow, 1 Douglas spirea, 2 Pacific ninebark, 2 lady fern, 2 slough sedge, 2 slender rush, 2 spreading rush, and 2 western sword fern.



Figure 4: Stormwater planter with native plants in bloom



Figure 5: Disconnected downspouts in stormwater planter

BUDGET

The George Middle School project cost a total of \$ 26,426 for construction, landscaping (including volunteer labor), and permits. The budget includes costs for needed repair work performed by the City's Revegetation Program and Bureau of Maintenance.

Item	Item Cost	Volunteer Effort	Total Cost
Construction			\$22,606
Excavation and backfilling of stormwater facility	\$10,193		
BES contract oversight	\$3,551		
Bureau of Maintenance & Revegetation Program repair work	\$3,669		
Monitoring vault construction and plumbing	\$5,193		
<i>Subtotal</i>	\$22,606		
Landscaping			\$2,612
Plant material (trees, shrubs, grasses)	\$795		
Vegetation installation – volunteers (60 student for 2 hours at \$10/hour)		\$1,200	
Topsoil and gravel	\$617		
<i>Subtotal</i>	\$1,412		
Permitting			\$1,208
Commercial permit	\$564		
Plumbing permits	\$644		
<i>Subtotal</i>	\$1,208		
TOTAL	\$25,226	\$1,200	\$26,426

Budget Elements

Non-Construction activities

The cost for design and overall project management was not included in the budget because these elements were considered a part of existing staff responsibilities and were not tracked separately for this project.

Construction Activities

A contractor with an existing on-call services contract completed construction of multiple school site projects. The contractor billed the work for each school site by general activity (labor, machinery used) and did not break down costs by project activity (excavation, backfilling, grading, landscaping). The City's Revegetation Program and Bureau of Maintenance performed needed repair work. .

Cost Components

Construction

Construction elements cost a total of \$22,606 or 90 percent of the overall project cost (excluding volunteer labor). The contractor did not have a great deal of experience in stormwater retrofit projects, resulting in final costs higher than the original bid.

The City's Revegetation Program had to replace the original topsoil used by the contractor, and the Bureau of Maintenance had to attach the waterproof lining to the planter wall. The cost to fix these problems was \$3,669, or 15 percent of the overall project cost (excluding volunteer labor).

Landscaping

Landscaping elements (contractor materials and a direct buy at a local nursery) cost \$1,412, or 6 percent of the overall project cost (excluding volunteer labor).

Permitting

The permits for this project cost \$1,208, or 5 percent of the overall project cost (excluding volunteer labor). These costs were higher than expected because of the multiple plumbing permits needed for various project phases.

Cost Comparisons

This project had a relatively simple design. The landscape planter already existed, and only minor plumbing modifications were needed to fulfill *Stormwater Management Manual* requirements for safe disposal and overflow. The project is a good example of potential retrofits for existing development. Similar private-sector projects with more experienced contractors might cost less and take less time.

MAINTENANCE AND MONITORING

Portland Public Schools is responsible for the facility and its maintenance. Water quality monitoring will be performed at the site by BES. Effluent water quality samples will be collected to assess pollutant removal effectiveness. Flow samples will be collected to assess flow reduction effectiveness. Only the flow-through section will be monitored. The replacement soil type (potting soil) does not meet *Stormwater Management Manual* standards and has settled to less than the required soil depth for stormwater planters, so the monitoring results will not fully correspond to results for facilities that meet manual requirements.

PUBLIC INVOLVEMENT

A one-page handout (Attachment 1) was developed to educate the local community about the benefits of the project. Copies were provided for each student at George Middle School to take home, and extra copies were provided to school office staff to give to people who had questions (approximately 800 copies total). A BES environmental educator provided watershed health and stormwater programs to two classes at George Middle School; these classes were later involved in installing vegetation in the planter.

SUCSESSES AND LESSONS LEARNED

Construction Problems: The contractor used topsoil with high clay content, and heavy rains occurred shortly after construction was completed in fall 2004. The soil did not allow infiltration, causing standing water in the flow-through cell. The Revegetation Program was contracted to replace the topsoil with potting soil, which had a very high infiltration rate. Soil types should be carefully checked prior to initial installation. New soil specifications that will be included in the 2007 *Stormwater Management Manual* should help address this issue. The original mastic used to attach the waterproof liner did not work well, and the original contractor cut the liner too short to allow for a 6-inch air gap above the soil layer, as required by the *Stormwater Management Manual*. The Bureau of Maintenance was contracted to attach the liner to the planter wall to protect the school building foundation.

Construction Budget: The contractor billed multiple school site projects by general activity, rather than by project phase, making it difficult to make detailed cost comparisons.

Plumbing: Following construction of the stormwater facility, it was very difficult to find a plumbing contractor to disconnect the final downspout to the infiltration cell. The scope of work was too small and did not attract a bidder through the informal bidding process. The project manager contacted unions and MWESB (minorities, women and emerging small businesses) firms and publicly advertised the project, but was unable to find a contractor. Eventually a plumber was hired through an existing contract with Portland Public Schools. It would be more effective to bid the entire project to a prime contractor and let that contractor be responsible for finding a plumbing subcontractor.

George Middle School Innovative Wet Weather Project

September 2004

working for
clean rivers,
healthy
watersheds,
and a livable,
sustainable
community

You've probably noticed construction in the planter box in front of the school gym building and entrance to the front office. Portland's Environmental Services is working with Portland Public Schools on a project to reduce stormwater runoff from the school. The existing planter will be converted to a stormwater planter box, which will collect and filter stormwater from the gym roof.

This is a companion project of the two bioswales built on the west side of the school campus. The swales have been treating water from the school rooftop for over a year.

Environmental Benefits

The vegetation in the converted stormwater planter box will filter stormwater from the gym roof and allow it to soak into the ground. This helps refresh natural groundwater systems and keeps stormwater from flowing into sewer pipes where it could contribute to basement flooding and combined sewer overflows (CSOs). In addition, the new plantings will help cool the building and will provide new wildlife habitat. The planter will be divided into two sections; one to filter roof runoff and one that allows the water to soak into the ground.

A New Look

The structure of the planter box won't change much but it will have new native plants that are good for filtering stormwater runoff. Students will plant native vegetation in the planter box this fall.

Environmental Education

Environmental Services has worked with Portland Public Schools to make the swales and the planter box safe and attractive, as well as an educational resource. This fall, an Environmental Services educator will teach George Middle School students about water quality and stormwater management. The activities will show students how to be stewards of the new stormwater management areas on their own school campus.

For More Information

If you have questions or concerns about site activities please contact:
Dawn Hottenroth, City of Portland
Bureau of Environmental Services
503-823-7767
dawnh@bes.ci.portland.or.us



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