ReBuilding Center
3625 N Mississippi Avenue
Portland, Oregon

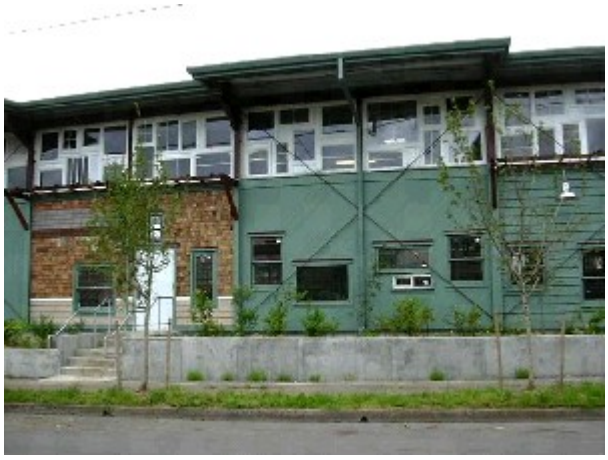
PROJECT SUMMARY

Project Type:	Complete onsite stormwater management for non-profit commercial redevelopment—demonstration project
Technologies:	Infiltration planters, flow-through planters, pervious concrete, drywells
Major Benefits:	• Over 870,000 gallons of stormwater infiltrated and treated onsite each year instead of entering the combined sewer system • Highly visible example of sustainable stormwater approaches • Adds green space and habitat to the urban environment
Cost:	$108,232 for stormwater management components, with $45,000 paid by EPA grant funds
Constructed:	2005

Overview of the Stormwater System

- The ReBuilding Center is a non-profit community enhancement organization dedicated to the reuse of discarded building materials. It is a popular destination for people interested in building with affordable, environmentally low-impact materials. When the center built two new warehouse-type canopy structures adjacent to an existing warehouse, the design included onsite stormwater management for the new buildings and parking lot.

- Roof runoff from the new Michigan Canopy warehouse is directed into two landscaped infiltration planters facing N Michigan Avenue. The infiltration planters have open bottoms, so the stormwater filters through plants, soil, and gravel into the ground.



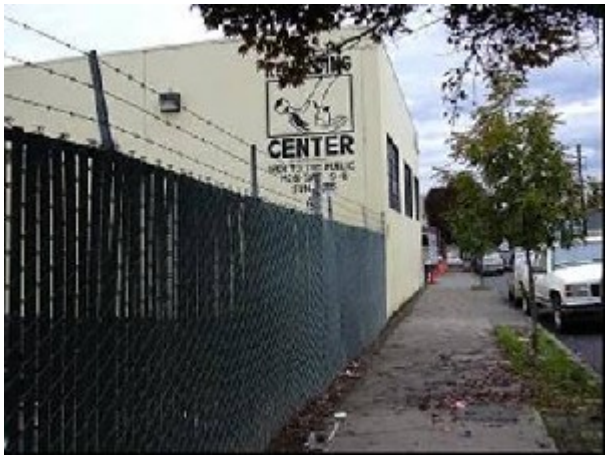
Infiltration planters along the Michigan canopy structure

Infiltration planter

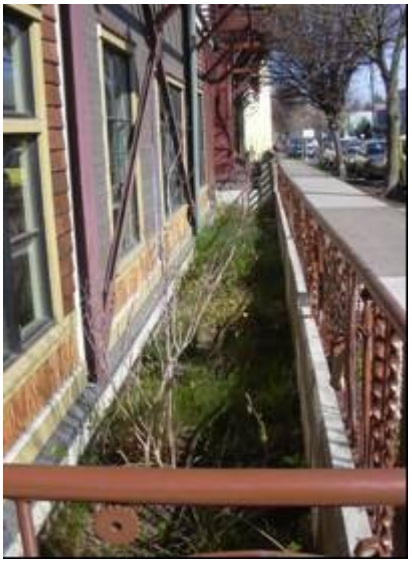
- Roof runoff from the new Mississippi Canopy is directed into two flow-through landscaped planters facing N Mississippi Avenue and one flow-through planter facing the back alley. The flow-through planters have solid bottoms. After stormwater filters through plants, soils,

and rock sub-base, a perforated pipe at the bottom carries excess water to two drywells buried below the parking lot.

- A 3,800-square-foot pervious concrete parking lot allows rain to soak into the ground. The pervious concrete is on top of crushed rock, which temporarily stores water as it soaks into the soil below. An inlet at the lowest point of the parking lot conveys overflow to an existing catch basin.



The ReBuilding Center's existing warehouse before the addition of the Mississippi canopy structure



The flow-through planters in front of the new Mississippi Canopy with existing warehouse in the background

STORMWATER CAPACITY AND SYSTEM COMPONENTS

Stormwater Management Goal

The goal was to provide onsite stormwater infiltration and treatment and reduce the volume of stormwater entering Portland's combined sewer system. The stormwater facilities were designed in accordance with the City of Portland's 2002 *Stormwater Management Manual.*

System Components

Facility footprint: 2,125 square feet (planters)

Catchment area: 38,800 square feet (35,000 roof area and 3,800 parking lot)

Overflow system: Drywells; existing catch basin

Landscaping: The largely native vegetation in the planters includes red twig dogwood, Baltic rush, highbush cranberry, Pacific ninebark, tufted hairgrass, slender rush, Nootka rose, Pacific crabapple, Douglas spiraea or hardhack, common camas, yellow monkey flower, Douglas iris, and slough sedge.

BUDGET

The cost of stormwater components for this project was $108,232, with $45,000 paid for by an EPA Innovative Wet Weather Projects (IWWP) grant. Of this total, an estimated $21,930 (20%) was spent on non-construction activities, and $86,302 (80%) was spent on construction activities, as shown below.

Budget

[Note: Budget elements are estimates from the larger project costs.]

Non-Construction Activities

Project design and engineering:	$18,215
Project management:	1,675
Permits and inspections:	2,040
	$ 21,930

Construction Activities

Porous concrete parking lot:	$34,155
Infiltration planters:	11,603
Flow-through planters:	11,171
Drywell:	6,900
Landscaping (plants, soil, irrigation):	22,473
	$ 86,302

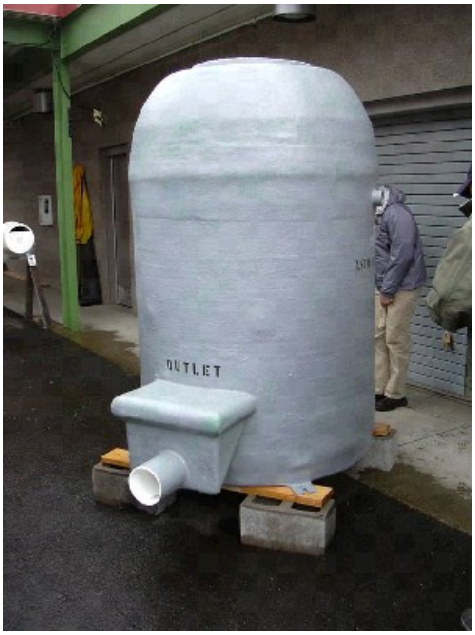
A downspout disconnected into the infiltration planters on Michigan Street

MAINTENANCE AND MONITORING

The property owner is responsible for maintaining the facilities to ensure proper function and appearance. Maintenance may involve removal of nuisance and invasive plant species, removal of debris and sediment, and preventing impedance of stormwater flow into, or overflow from, the facility. The pervious concrete parking lot will require occasional maintenance to ensure it doesn't clog with sediment.

The Bureau of Environmental Services (BES) will monitor the flow-through planters facing N Mississippi Avenue to determine their effectiveness. Flow monitoring equipment will record the amount of water that flows through to the perforated pipe at the bottom of the planters, indicating the volume of stormwater runoff that is not absorbed by the plants and soil. Data will be downloaded and recorded monthly. A manhole unit will house the equipment and allow BES staff to access and record the data.

BES will provide periodic visual assessment of the pervious parking lot and infiltration planters to determine plant viability and facility function.



Manhole for accessing monitoring equipment

Burying the manhole in landscaping area adjacent to the flow-through planters on Mississippi Street

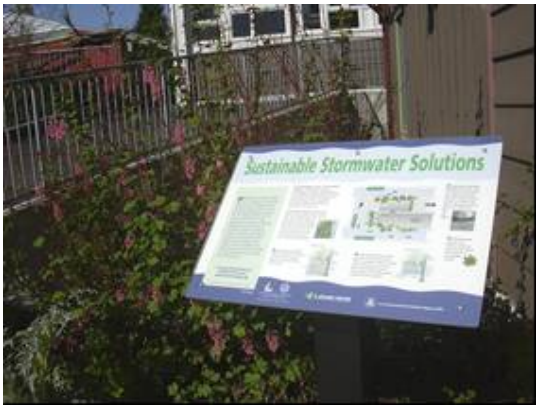
PUBLIC INVOLVEMENT

A permanent interpretive sign at the project site provides information about the sustainable stormwater management techniques used.

The project is used as an example of innovative stormwater management on the BES website and on BES tours of sustainable stormwater management facilities.

The ReBuilding Center hosts dozens of tours each year to inform local, national, and international groups of its sustainable practices, including the stormwater management features. Following its renovation, the ReBuilding Center anticipates up to 300 visitors daily.

SUCCESSES AND LESSONS LEARNED



Positive project example: The ReBuilding Center is a good example of a successful public/private project. It is in a highly visible location in a fast-redeveloping area of the city, with other sustainable development projects occurring close-by. These projects provide opportunities for the public to become more aware of innovative stormwater management techniques, and other developers have expressed interest in using similar approaches. In addition, the center's customers benefit from seeing examples of the kind of onsite stormwater management they can implement on their own properties.

Integration into the built environment: The pervious concrete parking lot and stormwater planters are commendable examples of how stormwater management can be integrated into small urban spaces and fit seamlessly with the building design.

Modified design: Monitoring by the landscape architect showed that the flow-through planters along N Mississippi Avenue were not infiltrating at the minimum two inches per hour rate requested by the engineer. Discussions followed about whether this was caused by clogged filter fabric, undersized facilities for the catchment drainage (approximately 75% of capacity)*, too many fines in the soil mix, or only six to eight inches of storage capacity on top of the soil (freeboard). It was also possible that, given time, infiltration may have improved with plant establishment.

The landscape architect concluded it was a combination of several of these issues. Because the facility sizing could not be modified, the following modifications were implemented to restore the function of the flow-through planters:

- The plants, soil, and filter fabric were removed, and the rock subbase was reduced from 18 inches to 12 inches (in accordance with the construction specifications and *Stormwater Management Manual* requirements).

- Freeboard was increased to 12 inches.

- The clogged filter fabric was replaced with a non-woven fabric, which was layered between the gravel subbase and six inches of washed pea gravel; this is expected to serve as an additional filter for settling fines. The fabric extends from edge to edge rather than up the sides of the planter wall.

- The soil was replaced with a mix of approximately 70% sandy loam, 20% digested paper fiber, and 10% organic compost and installed in six-inch lifts to ensure uniform soil matrix distribution.

- The downspouts were taken off-line temporarily (approximately three months) and diverted to the bottom perforated pipe to allow the soil to settle and bind before heavy storm events occurred.

Drywells – The drywells for the flow-through planters are under the parking lot pavement. It is typical to place a manhole cover at the surface to allow access for monitoring and occasional cleanout when needed. Drywells can potentially fill with sediment, which could reduce their capacity to accept overflows from the planters.

Pervious pavement – Soon after the pervious concrete parking lot was constructed, one third of the parking lot needed replacing because rainfall was puddling on top rather than infiltrating through the concrete. The manufacturer determined that the replaced section was a more dense mixture than was poured for the other two-thirds of the parking lot.

*** The project was approved and constructed under the sizing guidelines in the City's 2002 *Stormwater Management Manual*. These guidelines considered the entire catchment area rather than the drainage area to individual facilities; some planters could be oversized and some undersized as long as the aggregate square footage was correct. The subsequent 2004 manual revised the sizing requirements.**