

Kelly Elementary School

9030 SE Cooper Street, Portland, Oregon

PROJECT SUMMARY

Project Type:	Public school parking lot stormwater retrofit—demonstration project
Technologies:	Asphalt removal; vegetated swales
Major Benefits:	<ul style="list-style-type: none">• 1,950 square feet of asphalt was removed from the existing parking lot, and vegetated swales were created to manage parking lot runoff.• 1,600 square feet of asphalt was removed to create a pervious Head Start playground.
Cost:	\$45,237 total, with \$43,237 paid by EPA funds
Constructed:	August 2004 through October 2005

Overview of the Stormwater System

- Runoff in the parking lot previously drained to existing central stormwater inlets. The parking lot had three long, 6-foot-wide areas between facing parking spaces that could be converted into swales for stormwater infiltration (Figure 1).
- Asphalt was removed from the three 6-foot-wide, 108-foot-long rows. These areas were filled with topsoil and mulch and grass seeded for erosion control and groundcover (Figure 2). The swales manage runoff from 4,500 square feet of impervious parking lot area.
- Tire stops were added to keep cars from accidentally driving through the swales. Concrete pavers were added for pedestrian access at regular intervals along the swales.
- Kelly Elementary School students planted trees, shrubs, and other groundcovers (Figure 3).
- Approximately 1,600 square feet of asphalt playground was removed to create a pervious vegetated Head Start play area (Figure 4).

Figure 1: Asphalt between facing parking spaces



Figure 2: Swales excavated, backfilled, and grass seeded



Figure 3: Vegetated swales



Figure 4: Completed Head Start play area



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*.

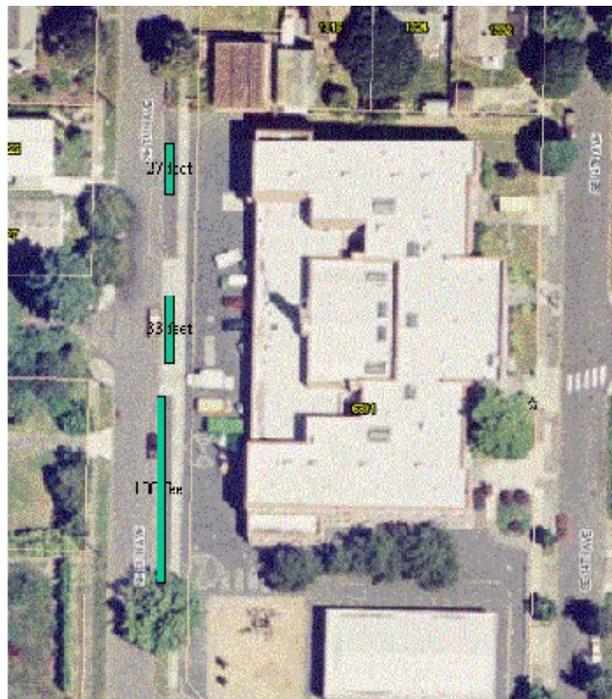
System Components

Vegetated Swales

(See Figure 5.)

Catchment area: The parking lot is approximately 28,500 square feet. Approximately 4,500 square feet drains to the outer two swales. It is difficult to determine how much drains from the inner two parking aisles to the middle swale because some of that drainage goes directly to the stormwater inlets.

Figure 5: Site Plan



Facility footprint: The three swales are each 6 feet wide and 108 feet long, or 648 square feet each, for a total of 1,944 square feet.

Overflow: Two central stormwater inlets in the center of the parking lot provide for safe overflow in case of heavy rains.

Additional information: Concrete pavers were added for pedestrian access at regular intervals along the swale. Recycled rubber tire stops were added to prevent tire damage and reduce accidental driving into the swales.

General Landscaping

Once the swales were excavated and backfilled with topsoil, they were seeded with a native grass mixture for erosion control and low-maintenance groundcover. The following 2002 *Stormwater Management Manual*-approved grassy swale mix was used. No irrigation is provided for the grass mixture.

Hobbs and Hopkins Pro-Time 835, Bio-filter Summer Green Vegetative Cover

Perennial ryegrass	<i>Lolium perenne</i>
Eureka hard fescue	<i>Festuca ovina duriuscula</i> 'Eureka'
Dwarf white yarrow	<i>Yarrow millefolium</i>

At a planting with Kelly Elementary students, Friends of Trees planted 18 native trees: 5 Western dogwood, 5 Indian plum, 4 grand fir, and 4 quaking aspen. The students helped plant the trees and install shrubs and other groundcovers, including slough sedge, spreading rush, kinickinick, western yarrow, field strawberry, small flowered lupine, creeping foxtail, and creeping Oregon grape. Friends of Trees will maintain summer irrigation for the trees by water barrels for 3 years. If necessary, Friends of Trees will replace non-surviving trees.

BUDGET

The Kelly Elementary School project cost a total of \$44,237 for design, construction, landscaping, and permits (including volunteer labor by students).

Construction				\$35,754
	Construction and	\$15,484		
	BES contract management	\$3,217		
	Head Start area asphalt removal	\$3,000		
	Bureau of Maintenance repairs	\$11,463		
	Tire stops	\$2,590		
	Subtotal	\$35,754		
Landscaping				\$7,780
	Topsoil and gravel	\$1,375		
	Vegetation (grass seed, trees, shrubs, groundcovers)	\$3,877		
	Vegetation installation by Kelly Elementary students (100 students for 1 hour at \$10/hr)		\$1,000	
	Concrete pavers	\$93		
	Summer irrigation and plant warranty	\$1,525		
	Subtotal	\$6,780	\$1,000	
Permitting				\$703
	Commercial permit	\$703		
	Subtotal	\$703		
	TOTAL	\$43,237	\$2,000	\$44,237

Budget Elements

Non-Construction Activities

The staff 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 BES on-call services contract completed the 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).

Cost Components

Construction

Construction elements cost a total of \$35,754, or 83 percent of the overall project cost (excluding volunteer labor). Contractor work and BES contract oversight cost \$18,701, or 43 percent of the overall project cost (excluding volunteer labor).

Heavy rains that occurred shortly after construction was completed in fall 2004 highlighted several problems. The soil mixture that was used had a higher clay percentage than originally specified and was not allowing for infiltration. The swales were overflowing and causing the parking lot to be muddy. The site was also plagued by weeds (including poison hemlock) that were in the topsoil mixture or arrived through wind deposition. The Bureau of Maintenance (BOM) was contracted to fix these problems, and the final cost for the BOM repair work was \$11,811, or 27 percent of the total project cost (excluding volunteer labor). The repair included excavation of the two outer swales and the addition of new topsoil and erosion control (jute and grass seed) (Figure 6).

Figure 6: Jute mat and grass seed erosion control in repaired swale



Asphalt removal for the Head Start playground cost \$3,000, or 7 percent of the overall project cost.

Landscaping

Landscaping elements cost \$6,780 (excluding volunteer labor), or 15 percent of the overall project cost.

Permitting

The permits for this project cost \$703, or 2 percent of the overall project cost (excluding volunteer labor).

Cost Comparisons

The parking lot did not need to be restriped or refigured, and the stormwater facilities could fit into the existing space, reducing potential costs. Because of necessary repairs, however, this project cost more than originally estimated. Private-sector projects with similar simple design plans might cost less and take less time if more experienced contractors are used.

MAINTENANCE AND MONITORING

Portland Public Schools is responsible for the facility and its overall maintenance. Friends of Trees is committed to 3 years of summer watering of the trees and overall tree survival. Kelly Elementary is responsible for general site maintenance and any potential enhancements to the project site. No water quality monitoring will be performed at this site, but BES staff will make regular visits to photograph the site and ensure overall performance.

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 Kelly Elementary School to take home, and extra copies were provided to school office staff to give to people who had questions (approximately 500 copies total). A BES environmental educator provided watershed health and stormwater programs to four classes at Kelly Elementary School; all of these classes were later involved in planting trees and vegetation.

SUCSESSES AND LESSONS LEARNED

Schedule Delays: Construction should occur as early in the dry season as possible. Heavy rains occurred shortly after construction was completed in fall 2004, delaying vegetation installation by a year. The soils did not allow infiltration, which created ponding water and muddy overflows to the parking lot and necessitated repair of the swales. Construction of this project had to be scheduled around the school calendar; if this is the case, the project should be scheduled for as early in the school year as possible.

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.

Grading: The subtle grading of the site makes it difficult to assess exactly how much of the parking lot is directed to swales prior to overflow to the inlets.

Facility Damage: The swales suffered a series of “drive -through” accidents shortly after construction, before trees were installed. Adding trees (or some other large visual cues such as stakes or a rope fence) shortly after construction could help reduce tire damage to the grass and soil.

Kelly Elementary 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 parking lot on the north side of the school. Portland's Environmental Services is working with Portland Public Schools on a project to reduce stormwater runoff from the school. Some of the parking lot asphalt will be removed and replaced with a series of vegetated swales. New speed bumps will help water flow into the swales.

Environmental Benefits

Removing asphalt lets more rainwater soak into the ground like it did before it was paved over. Instead of flowing into sewer pipes, the water will now help refresh natural groundwater supplies. Stormwater in sewer pipes can cause basement flooding and it contributes to combined sewer overflows (CSOs) to the Willamette River.

The swales will be shallow, narrow depressions planted with native trees, shrubs and groundcovers. Both Friends of Trees and Kelly students will do the planting. Stormwater runoff from the parking lot will flow into the swale.

Pollutants will settle and filter out as water soaks into the ground.

The new trees will shade and help cool the school and the parking lot, and will attract wildlife. Trees also capture rainwater on their leaves

and branches allowing it to evaporate, and they help reduce erosion by holding the soil together with their roots.

A New Look

The swales are designed to enhance the existing landscape. Asphalt speed bumps across the aisleway will direct stormwater into the swales. Tire stops made of recycled rubber will keep cars from driving into the swales. Most of the construction should be done by late October.

Environmental Education

Environmental Services has worked to make the courtyard, entry planters, and play area a safe and attractive part of the school grounds, and an educational resource. This fall, an Environmental Services educator will teach Kelly students about water quality and stormwater management. The activity 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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