North Gay Avenue
Portland, Oregon

PROJECT SUMMARY

Project Type:	Street reconstruction with pervious pavement—demonstration project
Technologies:	Pervious concrete; pervious asphalt
Major Benefits:	• Pervious pavement provides more natural stormwater management than a piped system, allowing stormwater to be absorbed, filtered, and cleaned before recharging groundwater. • Stormwater infiltration into the ground reduces combined sewer overflows to the Willamette River and reduces basement flooding caused by rain storms that overload sewers. • The project will provide information about how well different pavement materials manage stormwater and hold up as a street surface.
Cost:	$400,000 total, with $212,500 paid by EPA grant funds
Constructed:	Completed summer 2005

Overview of the Stormwater System

- This project was initiated by the construction of a 54-inch combined sewer pipe in North Gay Avenue. Rather than repaving the entire street with traditional concrete, this presented a unique opportunity to use alternative, pervious materials for demonstration and testing purposes.

- Each of the four blocks of North Gay in the project area was paved with different materials:

  - One block (between Wygant and Humboldt) was paved curb-to-curb with pervious concrete.
  - One block (between Alberta and Webster) was paved curb-to-curb with pervious asphalt.
  - One block (between Humboldt and Alberta) was paved with pervious concrete in the 8-foot-wide parking strips along each curb and with standard concrete in the middle travel lanes of the street.
  - One block (between Webster and Sumner) was paved with pervious asphalt in the 8-foot-wide parking strips along each curb and with standard asphalt in the middle travel lanes of the street.

- The pervious pavement allows most or all of the stormwater from four blocks of public right-of-way to filter through the street surface into layers of rock below the street and then into the ground. This runoff would otherwise drain into Portland's combined sewer system. Existing storm inlets remain to take any excess runoff; with the porosity of the pervious materials, however, runoff is not expected to reach the inlets.

Figure 1: Pervious Concrete

Figure 2: Pervious Asphalt

Figure 3: 8 foot wide pervious concrete parking strips with standard concrete in traffic lanes

Figure 4: 8 foot wide pervious asphalt parking strips with standard asphalt in traffic lanes

STORMWATER CAPACITY AND SYSTEM COMPONENTS

Stormwater Management Goal

The stormwater management goal was to learn how well pervious concrete and asphalt manage stormwater and perform as a street surface and how cost effective they are. The project was designed in accordance with the City of Portland's 2002 *Stormwater Management Manual.*

System Components

Facility footprint: 32,000 square feet
Catchment area: 50,000 square feet

Pervious Concrete

The pervious concrete section consists of 10 inches of pervious concrete mix on top of 6 inches of clean crushed aggregate. The base material is hydraulically connected to the roughly 20-foot by 20-foot granular sewer trench below. This provides excellent drainage through the pavement section and into the surrounding soils. The depth of the base rock was designed to contain a 25-year storm without backup into the pavement section.

The typical installation procedure for pervious concrete is:

1) Excavate to bottom of base coarse layer. Place filter fabric.
2) Place base rock and compact to desired percentage rate. Note that the base layer typically does not contain fines and therefore retains a high percentage of voids with compaction. Wet the base rock.
3) Pour the concrete in 8-foot to 10-foot-wide strips. As the concrete is poured, rake it to ½ inch above the finish elevation, cover in plastic, and compact (usually with a drum roller) to the final grade. Leave the plastic layer on the finished concrete for a number of days to allow for proper curing. Cure time is approximately 7 days.

Figure 5: Laying the concrete

Figure 6: Pervious concrete next to regular concrete

Pervious Asphalt
Pervious asphalt is installed in the same manner as traditional asphalt.

Figure 7: Pervious Asphalt

Figure 8: Pervious asphalt next to regular asphalt

BUDGET

The North Gay Avenue project cost a total of $400,000, broken down as follows:

- Design: $97,000 (24 percent of the overall project cost)

- Construction: $303,000 (76 percent of the overall project cost). This included:
  - $256,000 for porous pavement
  - $47,000 for water main replacement in North Gay Avenue at Alberta and Humboldt Streets

An EPA Innovative Wet Weather Projects grant to the Bureau of Environmental Services (BES) paid for $212,500 of the project cost.

MAINTENANCE AND MONITORING

It is important to control site erosion and sedimentation of pervious pavement surfaces to prevent clogging and maintain permeability. Cleaning or vacuuming the surface once or twice a year maintains porosity. Properly installed pervious paving systems last more than 20 years.

The City will evaluate the street surface for durability, maintainability, and public acceptance.

PUBLIC INVOLVEMENT

BES conducted several neighborhood outreach sessions on this project. BES and the Portland Office of Transportation also conducted an open house at Beach Elementary School. Neighbors were extremely supportive of the project, without any voiced opposition.

SUCCESSES AND LESSONS LEARNED

Pervious Pavement Performance: Pervious asphalt and concrete have been used locally in parking lots and private driveways, but not on a public street. In 2004, the city installed pervious paving blocks on a street in the Westmoreland neighborhood. The North Gay and Westmoreland projects will test how these three pervious paving materials perform on residential public streets.

Information Sources: Outside contacts provided key information for this project. The design team met several times with representatives from Tri-Met and concrete companies to learn about the pervious concrete product, refine specifications, and trouble-shoot the project. Lessons were learned regarding concrete placement technique and aggregate size.

Pervious Concrete Construction: With pervious concrete, construction technique greatly influences the quality of the finished product. The mix is extremely dry to begin with and can be difficult to remove from the concrete trucks during delivery. The method of placement can also cause the surface to be inconsistently dry and wet in places.