



Triangle Park

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Triangle Park is a 2.5-acre neighborhood park with a playground, baseball field and basketball court located in an older, densely developed area of Rutledge Borough, Delaware County. The park, surrounding residential neighborhood, as well as nearby Stoney Creek, have a history of flooding. The Borough, eager to improve these conditions, participated in an urban stormwater retrofit project sponsored by the Pennsylvania Environmental Council (PEC) and the Darby-Cobbs Watershed Partnership, which provided technical assistance and support with project fundraising.

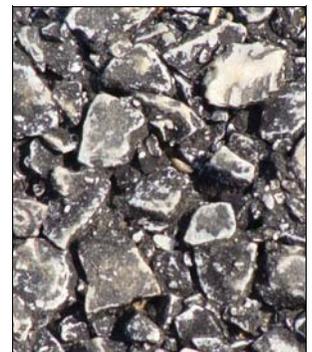
Borough residents and a team of stormwater professionals, including a licensed engineer, looked at existing conditions in the park and the surrounding area to identify retrofit opportunities and best management practices (BMPs) that could alleviate flooding and water quality problems in Stoney Creek. The park's asphalt basketball court and grassy ball field, with its heavily compacted earth, were essentially impervious to stormwater, which meant that instead of rain soaking into the ground, it accumulated on the surface. Combined with runoff from nearby development, this stormwater contributed to local flooding. Over many years, the volume of uncontrolled runoff caused erosion and damage to the creek.

In addition to flooding, uncontrolled urban runoff flushes pollutants, including oil and grease residues from streets, nutrients from unabsorbed residential fertilizers, and sediment from eroded land and stream banks, into the waterways. Rutledge Borough worked actively with PEC to identify BMPs that would better control runoff within the park and provide new stormwater management for runoff from adjacent streets.

Proposed retrofit concepts featured sustainable stormwater practices including both structural BMPs and non-structural, or biological, BMPs. Triangle Park BMPs were designed to divert and infiltrate runoff to reduce overland flow and flooding and, in so doing, reduce erosion and wash-out in and around the park. BMPs also trap and filter pollutants from stormwater runoff. The proposed BMPs were designed to manage the small frequently-occurring storms, reduce flooding and improve conditions in Stoney Creek.

Once the land and soil surveys were completed and BMP concepts accepted by the community, the Borough's engineer prepared final designs and bid the project for construction. Due to budget limitations, construction was bid in two phases. Phase I included the basketball court resurfacing and an underground infiltration system, and new inlets and pipe. Phase II included rain gardens and inlet modifications.

Phase I: the porous asphalt basketball court and subsurface infiltration system was successfully installed over a 5-week period in the summer of 2008. These BMPs work in tandem with the porous asphalt conveying rainwater directly into the underground infiltration system. New storm inlets installed along the street also convey runoff into the subsurface infiltration structure. A modified asphalt mix with larger pore spaces (*see photo on right*) was used for the porous asphalt basketball court, which allows water to rapidly drain down into the underlying system.





Stormwater is then temporarily stored in the underground infiltration structure and slowly percolates into the ground below, where it recharges groundwater. Once underground, the water gradually flows through the earth toward the creek, eventually seeping out of the stream bank and recharging the creek with clean, cool water.



Installed in 2008, the construction of this porous asphalt court was timed to coincide with planned court resurfacing

Water typically does not collect or pond on porous asphalt, since rain rapidly drains into the underground stormwater infiltration system. Therefore, this pavement is less prone to freeze-thaw problems than traditional pavement, and it dries much more quickly, giving basketball players more court time.

The cost to complete Phase 1 construction of the court, infiltration system, two new inlets and conveyance pipe totaled \$75,000.

Implementing state-of-art BMPs, particularly an underground structure, require making a commitment to routine inspect and monitoring. As with any infrastructure, inspections should occur regularly and after major storms. Maintenance should be scheduled and budgeted on an as-needed basis. When used on parking lots, porous asphalt requires routine vacuum cleaning to prevent litter, dirt or other particles from accumulating on the surface, which impedes porosity and drainage.

It is recommended that porous asphalt parking lots be vacuum cleaned at least annually and more often if debris, including fallen leaves and litter, accumulates. Since the park's basketball court is a lower intensity use, the Borough will routinely clean and sweep the surface and hire a contract vacuum service only when needed to prevent clogging. (For example, if it appears that particles or dirt are accumulating on the surface or water is ponding, this is an indicator that the court should be vacuum cleaned.) Trash cans in the vicinity of the court are emptied regularly to prevent litter from collecting on or near the court. Streets and storm inlets are cleaned regularly to prevent trash and debris from impeding flow into the inlets.

The second phase, which includes the final design and installation of rain gardens, demonstrates another sustainable practice that will better manage stormwater and provide attractive landscape features. The location within the park selected for two small rain gardens is a formerly under-used area near the playground subject to runoff and erosion. Another consideration influencing the location of the gardens was the community's interest in creating a visual break between the tot lot playground and the basketball court. Rain gardens are considered a non-structural BMP, which can be adapted for site conditions.



Borough Council was interested in a more manicured appearance, so the designer comprised the planting plan and used rock in the center. This "rock-garden" element may be modified at a later date, depending upon its functionality and appearance over time