

# Service Plaza Stormwater Project

Value engineered design change saves time and money.

**F**or maintenance and safety purposes, the Pennsylvania Turnpike Commission (PTC) decided to modify an existing stormwater detention system at the Peter J. Camiel Service Plaza, located in Wallace Township, Chester County, PA. Two rock-filled detention ponds were located in a truck parking area and were surrounded by bollards to prevent vehicles from accidentally entering them. Due to tight turning movements, many of the bollards had been struck and knocked over by trucks maneuvering in the area. Also, the facility is located within the Marsh Creek Watershed—part of the Schuylkill River Watershed—which flows through Philadelphia. The Pennsylvania Department of Environmental Protection, under Pennsylvania Code Chapter 93, designated the Marsh Creek Watershed as a “high quality” watershed. The stormwater runoff from the service plaza drained into Marsh Creek that in turn drained into Marsh

Lake, a major recreational facility in Southeastern Pennsylvania.

Located about 30 miles northwest of Philadelphia, the service area is on the westbound portion of the Pennsylvania Turnpike. The service plaza has 2 3/4 acres of impervious surface consisting of a restaurant building, fueling station, and a paved parking lot. The intention and scope of the project was to collect, store, manage, and treat stormwater runoff at the service plaza.

With the original stormwater control system, a portion of the stormwater entered the basins via overland flow, while the remainder reached the basins through a network of inlets and pipes. At the base of each pond was an inlet box that collected both overland flow and pipe flow. Stormwater flowed from one inlet to the other via an 18-in. diameter reinforced concrete pipe, after which the runoff flowed through a 9 1/2-in. orifice to limit the outflow rate. After passing through the orifice, the runoff flowed through another 18-in.

diameter reinforced concrete pipe and outlet into a grassy field adjacent to a sewage treatment plant.

dition and sediment control reports outlining existing stormwater conditions at the site. Based upon existing conditions and the desired objective of elimination of safety issues and updating stormwater management and treatment, the consultant also prepared plans and specifications for the project.

Dale Groff, project manager for Terre Hill Stormwater Systems, a division of Terre Hill Concrete Products, ([www.terrestorm.com](http://www.terrestorm.com)) reviewed the plans and specifications and then contacted the PTC to propose a value engineered design change. The PTC reviewed the proposed change and informed Groff that the design change would be acceptable. However, due to timing issues, the PTC did not authorize any change to the plans for bidding purposes. The PTC did state that once the bids were received, the company was permitted to contact the successful bidder to attempt to negotiate a contract change to include the value engineered design change. Bertolet Construction, Inc., the successful bidder, agreed to the design change.

## Original Design

In January 2005, when the PTC issued the Peter J. Camiel Service Plaza Detention Basin Modification, (M.P.304.84 WB Contract No. 099-032-RC6U-C) for reconstruction and upgrade of the stormwater detention and treatment facilities, Wallace Township required stormwater treatment and increase of detention basin capacity to reduce pollutants discharged to the Marsh Creek Watershed. Existing stormwater facilities did not capture pollutants or treat the stormwater runoff. Trash, oils, grease, and sediment were discharged into Marsh Creek. The temperature of the runoff from the



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*The box culvert, part of the value engineered design change, exceeds the 50-year design and performance standards.*

paved parking areas increased the water temperature of Marsh Creek, and because of their location, the open detention basins were hazardous.

The township required construction of stormwater detention volume capacity for a 50-year storm and control of flow rates from 2-, 10-, and 50-year storm events. The original design proposed the replacement of the two existing open detention basins with two underground detention basins, using four- and five-ft diameter plastic pipes as underground detention structures. Truck traffic and parking were to be prohibited on the surface above the underground facilities.

An oil-grit separator was proposed downstream from the detention pipe structures, which would have provided no removal of any pollutants before stormwater entered the underground plastic pipe.

Potential problems with this solution

was expected to be continually wet and soft.

### Change Proposal

Terre Hill Stormwater Systems redesigned the stormwater management and treatment system by:

- Consolidating all underground detention in one area using concrete a Terre Box™ four-sided concrete box culvert manifold with an HS-25 loading capacity that would allow truck traffic and parking directly above the detention basin. Volume is about 14,525 cu ft.
- Placing a Terre Kleen™ 18, its patented, stacked, inclined plate, hydrodynamic separator before the box culverts to capture trash, debris, oil, grease, and sediment from the runoff stream before it entered the detention structure. The separator has two chambers. The primary chamber floats oil and litter and set-

included 1) accumulation of trash and sediment in the underground plastic pipes, 2) inability to maintain the plastic pipe located under the paved parking area, and 3) difficult access to the oil-grit separator because the surrounding area

ties coarse debris. The secondary grit chamber is where the stacked inclined plate cells are located. Water enters the cells at the midpoint of the device water depth and travels upward across the stacked inclined plate's surface area, requiring the polluted runoff to travel over the large sedimentation area created by the stacked inclined plates in a cross current flow towards the overflow weir. Each cell has a projected sedimentation area of 6.4 sq ft. The weir has V-notches and the plates stick out above the water level; the flow to each sedimentation cell is equal to the next because the water pressure in each cell is regulated by the principles of communicating vessels. Small friction differentials on the plates are compensated by pressure equalization from the bottom up, not the top down.

- Construction time, originally planned for five weeks, was reduced to 4 1/2 days, saving the contractor approximately 23 days for a four-man crew at prevailing pay scales required by the Davis-Bacon Act.
- The hydrodynamic separator and four-sided concrete box culvert manifold are easily maintained through an access manhole by a vacuum truck located on the surface of the parking lot.

Bertolet prepared the site, and after the manufacturer installed the box culvert, the contractor installed the separator and backfilled the site. Both the separator and the box culvert included in the value engineered change proposal exceed the 50-year design and performance standards.

Maintenance consists of cleaning the separator and testing its discharge and surrounding soil for pollutants once every 18 months unless quarterly inspections indicate otherwise. Terre Hill Stormwater Systems, through its maintenance program, performs periodic inspection, maintenance, and documentation of pollutant removal under a contract with the PTC. To date, experience indicates that removal of captured sediment will be necessary only about once every 18 months.

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*The completed project, on which there are no truck traffic parking prohibitions.*