

📍 **MUNICIPAL CASE STUDY**

**Lower Salford Township, Pennsylvania**

*Lower Salford’s water quality problems, including stormwater, nutrient pollution, and sediment pollution, mainly come from two waves of population growth that occurred in the mid and late 20th century. The township entered into successful litigation with the Pennsylvania Department of Environmental Protection (PADEP) over their Total Maximum Daily Loads (TMDLs). The township has also dedicated funding to the problem, revised their planning and zoning, and worked with technical assistance providers, like the Perkiomen Watershed Conservancy and Penn State Extension. It also leads by example with Best Management Practices (BMPs) on its golf course and stormwater basins.*



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**Background**

Lower Salford Township is located in Montgomery County, Pennsylvania, within the greater metropolitan area of Philadelphia. The township is 14.5 square miles with a 2015 estimated population of 15,277 people. The township is a mainly residential bedroom community; local residents and employees highlight its good school district, low crime rates, and good access to local parks and open space. The township’s median household income is \$92,574 (2015 Five-Year American Community Survey).

The community contains a linked network of green spaces, with trails that connect people to parks and other natural resources.

There is a scenic rural component to the township, which contains 7,000 acres of preserved open areas, including some farms. Lower Salford’s land use, broadly, is 44.55 percent developed, 35.11 percent agricultural, and 13.13 percent forested.

**Watersheds and Waterways in Lower Salford**

Lower Salford contains five subwatersheds that include the Perkiomen Creek and its tributaries. The drainage area for the Skippack Creek and West Branch Skippack Creek comprises about 60 percent of the township, followed by Perkiomen Creek and West Branch Perkiomen Creek with about 30 percent. The Indian Creek makes up about 10 percent of Lower Salford.

**Quick Stats**  
*Lower Salford Township*

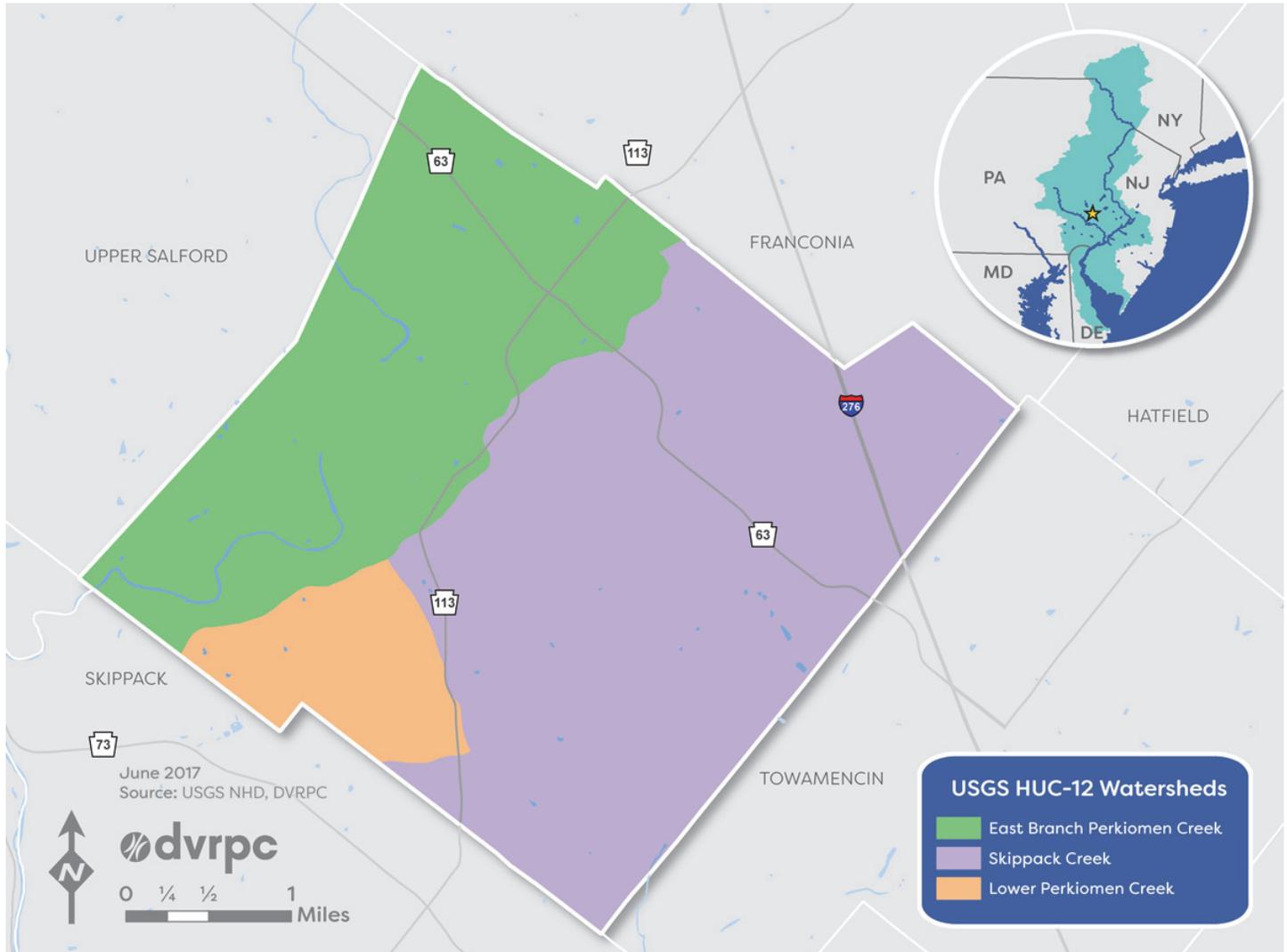
**Population:** 15,227 (2015)

**Land area:** 14.5 square miles

**Water area:** 0.1 square miles (0.69%)

**Median household income:** \$92,574

Map Lower Salford Township’s Watersheds



**Water Quality Problems**  
**Population Growth**

Lower Salford’s water quality problems mainly come from two waves of population growth that occurred in the mid and late 20th century. The first wave occurred between 1950 and 1970. The population jumped by 48 percent between 1950 and 1960 and by 47.8 percent between 1960 and 1970. This growth was largely attributable to the openings of two major highways, the Northeast Extension/Route 476 (1955) and Route 422 (1965), which facilitated travel between Lower Salford and regional economic centers.

In the 1990s, the township experienced its second surge in growth. Steven L. Nelson, chief of countywide planning at the Montgomery County Planning Commission during that time, attributed this growth to “access and...available land.” Chris Canavan (Lower Salford Board of Supervisors) similarly noted that it was simply the natural next stage of development pressure on the suburban rings of Philadelphia. The inner ring was built out, and then development was moving to outer rings, where there was more available land.

The township's existing infrastructure and facilities were stretched thin as a result of this growth, and it struggled to quickly provide new infrastructure for its new residents.

### Key Terms

**TMDL:** A regulatory term in the U.S. Clean Water Act that describes the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.

**Municipal Separate Storm Sewer System (MS4):** A system of infrastructure that moves stormwater, *not* sewer water, that typically includes roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains, and that is owned by a public entity.

**Minimum Control Measures (MCMs):** Six program elements required through the state MS4 permit, and focused on municipal practices as well as resident behavior, that are expected to result in reductions of pollutants discharged into receiving water bodies.

**Urbanized Area (UA):** A geographic area defined by the last decennial Census. A “densely settled core of census tracts and/or census blocks that have a population of at least 50,000 along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core.”

### Lower Salford's Impaired Waterways

New construction from these two waves of growth increased the amount of impervious surface in the township. Trees and vegetation were removed to make way for new homes, retail, and the roads and parking lots that served them, increasing the volume of water flowing across surfaces and into storm sewer systems and streams rather than percolating into the ground. Greater volumes of this stormwater, moving at faster rates, increased the amount of pesticides, fertilizers, fuel, livestock waste, trash, sediment, and other pollutants carried into local streams by stormwater. Stormwater flowing out of storm sewers and into streams moved at greater velocities, eroding stream banks, churning up sediment, and causing localized flooding. Together, these conditions degraded the township's water quality. PADEP determined that the township's waterways contained sediment and phosphorus concentrations too high to support their typical use by humans or wildlife.

### State and Federal Requirements

Lower Salford is working to comply with two sets of water quality regulations. The root of these regulations is the federal Clean Water Act of 1970, the implementation of which is the responsibility of each state.

- MS4 Program

In 2002, PADEP initiated an MS4 (see definitions above) permitting process for smaller municipalities within an urbanized area (see definitions above). Because Lower Salford is considered an urbanized area and has an MS4, it must comply with federal and state regulations to control certain pollutants that the community commonly (and usually inadvertently) disposes into sewer drains and thus into waterways.

In order to meet the permit's requirements, Lower Salford must create and implement a stormwater management program that reduces the discharge of pollutants into the storm sewer system. Part of Lower Salford's and other MS4 communities' responsibilities include meeting six MCMs (see definitions above). These measures are intended to increase community awareness of and involvement in water quality issues,

eliminate illicit discharges into waterways, control stormwater runoff during and after construction projects, and prevent pollutants from getting into waterways.

The permit also requires that municipalities pass a stormwater management ordinance to regulate development and any other activities that affect stormwater runoff. Lower Salford passed this ordinance in March 2005.

- TMDLs

Because Lower Salford's MS4 discharges water into impaired streams, the township is also required to create and implement a plan to achieve specific pollutant reductions in those waterways.

Lower Salford must reduce to acceptable limits the quantity of sediment and nutrients entering the Skippack and Indian creeks from within its borders. PADEP calculated these "acceptable limits" and issued them as TMDLs (see definitions above) for these water bodies. The Skippack Creek has a TMDL for sediment, and the Indian Creek has TMDLs for both sediment and nutrients.

- Nutrients

Lower Salford is required to reduce phosphorus concentrations in Indian Creek through its nutrient TMDL. An excess of phosphorus in water bodies can yield rapid growth of algae in the short term and algal blooms in the long term, which severely reduce if not eliminate dissolved oxygen in the water, leading to illness or death in fish populations. Algal blooms can also produce toxins and yield bacterial growth that can make people sick from contact with polluted water, consumption of tainted fish or shellfish, or drinking contaminated water.

- Farm and lawn stormwater runoff

Runoff in Lower Salford contains phosphorus from farmers, residents, and the township overfertilizing their crops and lawns, respectively. In areas where no riparian buffer exists between a stream and lawns or farmland, fertilizer can easily run off into the stream.

- Wastewater treatment plants

Wastewater treatment plants are one of several contributors to an excess of phosphorus in Lower Salford's waterways. The township operates two sewage treatment plants that are managed by the Lower Salford Sewer Authority. The Harleysville plant discharges to the tributary of the East Branch of the Indian Creek and the Mainland plant discharges to the Skippack Creek. Lower Salford's wastewater treatment plants process wastewater through secondary treatment, which does not remove enough nutrients to mitigate the impact of phosphorus on the township's water quality. Retrofitting or developing tertiary treatments would require significant funds from the township.

- Sediments
  - Issues with legacy infrastructure

During the development boom in the 1970s, stormwater management regulations were more limited in scope. As a result, the flood control basins in Lower Salford from this time are not designed to remove nutrients. Furthermore, they are insufficient for holding the volume of stormwater runoff produced in present-day storms from present-day levels of impervious surface. As a result, the excess stormwater contributes to sedimentation by moving soil from streambanks into waterways.

- Construction Sediment Control

Sediment-laden runoff can also be caused by the improper installation or enforcement of sediment control measures during construction. Michelle Fountain of CKS Engineers noted that all development projects in Lower Salford must get an Erosion and Sediment Control Plan approved by the municipality. If the development is less than 5,000 square feet, then the MCCD has to approve the plan. If the development is between 5,000 square feet and one acre, the plan has to be approved by the township, the MCCD, and PADEP. This system has been in place for a long time and is working well, Fountain said, but enforcement of current practices is challenging. In particular, construction crews install silt fence and stone construction entrances but do not maintain them, and the entrances stop functioning, resulting in sediment runoff. Fountain believes the township needs stronger enforcement of erosion and sediment controls.

In 2005, Lower Salford Township entered into litigation with PADEP over the TMDL limits they issued for the township. The township argued that the TMDL level set for the phosphorus in the Skippack Creek was unsound: “(1) premised upon an indefensible scientific position which is fundamentally flawed and technically insufficient; (2) based on flawed modeling; (3) not substantiated by fact or law; and (4) contrary to law.” In 2007, the U.S. Environmental Protection Agency (EPA) withdrew the nutrient TMDL requirement for the Skippack Creek, acknowledging that the regression formula used to come up with the TMDL limits was flawed. The model the EPA developed assumed that unwanted plant growth in streams occurred at the same rate as unwanted algal growth when exposed to the same levels of phosphorus. However, studies showed that this assumption “could give results [two] to [sixty] times greater than the standard method.” The nutrient TMDL for the Skippack Creek is still yet to be revised, and the township is still disputing Indian Creek’s nutrient and sediment TMDLs.

### Water Quality Solutions

Despite litigation with PADEP, Lower Salford staff and the township engineer maintain that water quality is a high priority for the municipality. The township’s water quality champions assert that they are pushing many projects forward because they believe in the environmental and health benefits of these regulations. As Krista Scheirer of the MCCD noted, “Lower Salford is not a township that says, ‘I don’t know where to start—what do I do?’ They have a good handle on their obligations; they care, and know why it’s important.”

With the sediment TMDL for the Skippack Creek in place, the township is taking steps to remediate the creek’s sediment levels. Lower Salford has proposed 14 projects to reduce the amount of sediment reaching the creek

**Key Partners**

**Mary West, assistant township manager, Lower Salford:** Primary champion for water quality efforts.

**Chris Canavan, Lower Salford Board of Supervisors and former head of Sewer Authority:** Point person for reaching TMDL limits.

**Michelle Fountain, CKS Engineers (Lower Salford’s township engineer):** Involved with helping the township meet PADEP’s water quality regulations.

**Jessie Kemper, conservation coordinator, Perkiomen Watershed Conservancy:** Point person for helping Lower Salford with riparian buffer projects and other projects to help the township meet its water quality standards.

**Krista Scheirer, Montgomery County Conservation District (MCCD):** Former conservation coordinator, Perkiomen Watershed Conservancy.

by 222,000 pounds, with a further goal of reducing sediment by 15,000 pounds per year each year from 2013 to 2017. The township is responsible for eliminating approximately 289,000 more pounds of sediment, but this volume will be addressed in a future TMDL permit cycle.

**Dedicated Funding**

All of the case study interviewees indicated that finding money for capital improvements is the greatest obstacle to improving water quality. Canavan said that if funds were available, they would implement the projects needed to meet the TMDL limits “in an instant.” For the 2016 fiscal year, the township dedicated up to \$100,000 for stormwater projects. Canavan added that the township has the reserves to increase that number if necessary. This funding may be needed if any of the three TMDLs currently under dispute are ruled as required for Lower Salford. However, it is

unclear what level of improvements for the Skippack and Indian creeks are needed at this time, and thus how much staff time and funds will be needed to address the township’s impairments.

**Planning and Zoning**

The township has followed a regional comprehensive planning effort to ensure that future growth will be better managed. In 2005, the Indian Valley Regional Planning Commission, which is part of the Montgomery County Planning Commission and of which Lower Salford is a member, passed a regional plan for 2025. The plan establishes designated growth and non-growth areas, focusing growth around existing infrastructure (mainly sewer and water) that will help reduce development in rural areas and the conversion of the region’s remaining open space into impermeable surfaces (see right). Approximately one-third of Lower Salford is in the designated and future growth areas, but the southern half of the township is planned as a rural resource area that supports agriculture, other extractive industries, and tourism. Public infrastructure will not be provided in this area except in villages.

**Partnership with Technical Assistance Providers**

The township uses resources from a number of entities for technical support: the Perkiomen Watershed Conservancy, a local watershed non-profit, for resources on meeting MCMs; Penn State Extension for educating local farmers; the Pennsylvania Environmental Council for webinars; the MCCD for water quality education and projects; and PADEP for sample ordinances and trainings.

- Perkiomen Watershed Conservancy’s MS4 Membership Program

Lower Salford is a member of Perkiomen Watershed Conservancy’s MS4 membership program, which helps municipalities achieve the MS4 permit’s MCMs for a fee. The Perkiomen Watershed Conservancy offers four membership options to MS4 municipalities, which include varying levels of resources and support. Lower

Salford is a member at the “Benefactor” level. Chris Canavan noted that Lower Salford does not participate in a higher membership level because it takes care of much of the work to meet those MCMs itself or partners with the Conservancy throughout the years on tree plantings.

- 1) The “Promoter” level (\$250 per year to a municipality) includes access to educational resources for redistribution to residents. The distribution of these resources helps municipalities fulfill their MS4 “Public Education and Outreach of Stormwater Impact” requirement. Six municipalities participate at this level.
- 2) The “Patron” level (\$500 per year) includes the benefits of the Promoter level, provision of an online stormwater survey, and a one-hour workshop for residents facilitated by the conservancy about water quality issues. These additional benefits help municipalities fulfill their MS4 “Public Involvement/Participation” requirement. Eight municipalities participate at this level.
- 3) The “Benefactor” level (\$1,000 per year) includes the benefits of the Promoter and Patron levels, as well as a two-hour presentation training session for municipal staff on pollution prevention and good housekeeping for municipal operations, such as how to prevent pollution when salting roads, proper ways to clean vehicles, and sediment control during construction projects. This session helps to meet the MS4 requirement “Pollution Prevention/Good Housekeeping for Municipal Operations.” Eight municipalities participate at this level.
- 4) The “Advocate” level costs \$2,500 per year and includes the benefits from the preceding levels and up to 30 hours of support from the Conservancy with planning events and recruiting volunteers for projects in the municipality, such as tree plantings. No townships have joined at this level.

- Riparian Restoration Efforts

Lower Salford maintains an almost 20-year-old riparian corridor program, built through a partnership with the Perkiomen Watershed Conservancy. The Conservancy works with the township to plant trees and understory shrubs as part of riparian buffer restoration projects. By intercepting and slowing the movement of runoff from the land into streams, riparian buffers protect streams from excess nutrients and sediment. In addition, established riparian plantings with dense root networks keep stream banks from eroding from fast-moving streams or floods.

Lower Salford has been able to plant trees with the Conservancy roughly every other year since 1998 through the TreeVitalize Watersheds grant program. This program, implemented by the Pennsylvania Horticultural Society and its partners, and funded by PADEP and corporate sponsors, plants trees and understory shrubs to create riparian buffers and protect sensitive natural environments. Thousands of trees are planted each year throughout the region through the program.

- Farmer Education

Penn State Extension assists with educating local farmers on water quality issues. Farmland comprises a very small percentage of Lower Salford’s land use, but Canavan said it still contributes to sediment and nutrient issues. Any soil exposed before planting crops and after harvesting them is vulnerable to being washed away during storms. In addition, crops can be overfertilized with phosphorus, which can run off and enter waterways

during storms. Canavan and West believed that the township's farmers are responsible and that the Penn State Extension does a good job of educating farmers on BMPs, such as leaving a buffer between creeks and crops so that when they are plowing, soil and fertilizer do not run off into the creek.

### Serving as an Example

#### Township Golf Course

The township-owned golf course, Lederach Golf Club, is working to keep fertilizer out of the water by educating public works staff on different techniques for maintaining the golf course and instituting no-mow areas that include land next to stream channels, which leaves needed vegetation in areas prone to erosion. The township has not quantified the effects of these strategies, but Canavan thinks they are helping address its sediment requirements.

#### Detention Ponds

The township is also removing sediment from its detention ponds. Removing the silt that has accumulated in the ponds over decades allows more water to be detained in them, enabling silt to settle to the bottom before the water that carried it in is discharged. Michelle Fountain is also exploring retrofitting detention basins with wood baffles that would allow silt to separate out of the water more easily.

#### Public Education and Outreach

The township publishes a newsletter about stormwater management twice a year. In partnership with the MCCD, Lower Salford also sponsored a rain barrel workshop to help collect stormwater on private properties. This water can be used for irrigating gardens and lawns, and diverts water out of storm sewer systems during rain events. The reduction in volume can prevent flooding and strong, erosive flows.

The township also works with a local pharmacy to collect and dispose of expired medicines, preventing them from entering and further polluting local waterways along with other household waste. Pharmaceuticals can harm aquatic animals; there is evidence that some such chemicals “disrupt the endocrine balance in various ecological species...and can adversely affect fish and other aquatic species,” potentially interfering with or mimicking natural hormones and disrupting reproduction, development, and behavior. Many pharmaceuticals cannot be filtered through traditional water treatment methods. At this point, there is no evidence of pharmaceutical products in water harming people, as the concentrations are generally too small, but long-term low-level exposure could be a concern.

### Progress to Date and Challenges Ahead

Although the township has dedicated funding, an engaged staff, strong partnerships, projects in place to address its MS4 and Skippack Creek TMDL requirements, and a temporary reprieve from addressing multiple TMDLs during its litigation process, the township has still encountered challenges in implementing its water quality program.

#### Funding

Although Lower Salford dedicates funds to water quality projects, more sources are needed to fully comply with the state's permits. Canavan is seeking further support for grant-writing and implementation projects, but securing adequate funding for these activities is a challenge. The township's sewer fees cannot be raised to support stormwater projects—only sewer projects. Taxes offer an alternative funding source but Canavan reported that residents would support only a modest tax increase to support water quality projects.

Kemper mentioned that funding is available to municipalities through PADEP Environmental Education grants; Schuylkill River Heritage Area grants; and funds from the Pennsylvania Association for Conservation District, which gives matching funds for engineering. Lower Salford could make use of PennVest, which provides municipalities with low-interest loans to fund infrastructure updates, to achieve lower levels of phosphorus through adding a tertiary treatment step or enhanced biological nutrient removal in its wastewater treatment plants. The MCCD and other environmental non-profits provide additional technical assistance and grant-writing support, which could offset township funding for staff time to do the same work.

According to Canavan, however, knowing about additional resources is not the primary challenge. In order to raise enough money for water quality projects, the township has to cobble together grants and other resources, a process that takes its own resources, as well as time and coordination. In addition, Canavan noted that the available grant programs are up to a decade old and do not address current state requirements for stormwater. He believes that grant programs that specifically address stormwater issues would help communities across the state more easily meet water quality requirements.

### Education of the Township and of Private Landowners

Canavan said the township could benefit from clear instruction on the best way to achieve sediment and phosphorus reductions in creeks. The township has a technical understanding of what is being proposed by PADEP but is unsure of the best and most efficient way to get to the desired result.

Lower Salford also seeks more education for its residents. As sediment and nutrient problems persist, municipalities are scrutinizing all sources of non-point source pollution, and farms—particularly since they are not regulated under the Clean Water Act—are a potential polluter in the township. Chris Canavan suggested further education of farmers by the Penn State Extension about techniques for keeping sediment and phosphorus from running off of their land. Canavan also noted that homeowner education and a shift in perception of how lawns should actually look could remediate additional nutrient and sediment problems.

### Larger Watershed Protection Efforts: A Possible Solution

Faced with funding challenges, information gaps, and the difficulties of working on a watershed-wide issue while restricted by political boundaries, Lower Salford and other municipalities are exploring regional approaches to water quality issues.

Fountain has recently noticed an increase in municipal supervisors or managers meeting with other municipalities as a group to discuss how to meet MS4 requirements. This activity has precedent in the multi-municipal work conducted around TMDL requirements in the Wissahickon Watershed. The EPA and PADEP are allowing municipal permittees in this watershed to develop a collective approach to meeting the stipulations of their TMDL plans. This project developed because individual municipalities were struggling to meet their phosphorus and sediment TMDLs, and the work they had accomplished was not substantially improving water quality in the watershed. The EPA and PADEP decided to allow municipalities to work together and contribute funding to a solution that they developed collectively.

#### Motivating Factor

**Development pressure:** Stretched existing infrastructure and facilities

Lower Salford belongs to a group of municipalities that seek a similarly regional approach for the Skippack Creek Watershed. In this effort, municipalities would pool resources and fund larger water quality improvement

projects that would have a larger impact on the watershed. This group is in the early formative stage, but this collaborative model could eventually help alleviate the challenges that Lower Salford faces in meeting its MS4 requirements alone.

### Key Factors in Success

The key factors to Lower Salford's success are:

- a dedicated municipal staff and professional consultants;
- a willingness to engage in litigation with PADEP;
- a dedicated funding source for stormwater projects and the ability to cobble together funding from other sources; and
- assistance from the Perkiomen Watershed Conservancy and Penn State Extension.

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