

# SAVING ROADS

## FLOOD MITIGATION

# Raising or Relocating Roads Out of Floodplains Can Save Money in the Long Run

Pennsylvania has been hit hard by major storms the past couple of years and township roads, especially in the Northern Tier, have taken a beating. Rather than rebuild the roads exactly as they were, one engineer suggests that elevating or relocating them out of the floodplain is a more cost-effective solution, saving townships money down the road.

BY BRENDA WILT / ASSOCIATE EDITOR

**P**ennsylvania townships are no strangers to flooding. In the past several years, hurricanes and tropical storms have taken their toll on township roads, destroying some completely and causing major damage to others.

Out of expediency and for financial reasons, roads near creeks and streams are simply rebuilt in the same location, which means that they will likely be flooded again in short order.

Britt Bassett, a civil and environmental engineer and president of Lycoming County-based Bassett Engineering Inc., believes townships in flood-prone areas should consider raising or relocating such roads out of the floodplain. Although this approach would cost more initially, he says it would save money in the long run.

“The cost of raising or relocating a road is small compared to the costs from flooding,” he says. “Damage to

three homes would pay for elevating one mile of roadway.”

Bassett has begun presenting his idea to groups such as the Pennsylvania Association of Floodplain Managers in the hope that municipalities will begin to think about road elevation and relocation as a proactive form of flood mitigation. A few townships have begun taking this approach when replacing bridges or culverts, recognizing the benefits of moving the roads out of flood waters’ path.

### Locating roads along waterways

In Pennsylvania’s early days, roads were often located along waterways, which had acted as the first highways, Bassett says. Land along the banks was often the most level ground, and the soil was easy to excavate by hand to create a road. Plus, homes were located near the water source so it made sense to put the road there, too.

As these streamside roads were upgraded from dirt tracks, they became unplanned levees, disconnecting waterways from their natural floodplain. The only way for high water flow to reach the floodplain is by topping the road. No one would locate a road next to a stream today, but it was the easiest thing to do in earlier days.

Bassett has lived along Loyalsock Creek in Plunketts Creek Township, Lycoming County, for 35 years and has seen first-hand how devastating floods can be on these rural roads. Complicating the problem, he says, is that many of the roads provide the only access to the homes there.

“Addressing this problem is critical from the standpoint of emergency access during and after a flood,” he says. “It’s been a serious problem for a long time around here. Flooding has resulted in the loss of life because people have been trapped in their homes and rescuers couldn’t get to them.”

There are situations like this throughout the Northern Tier of Pennsylvania, with roads running along a creek or stream and houses sitting right along the road. That part of the commonwealth has been particularly hard hit by recent storms, and many of these roads have paid the price.

### **Finding a cost-effective solution**

Bassett believes the best solution is to relocate roads away from the floodplain, but that likely requires surveying, permitting, and acquiring rights of way. The latter issue is often what keeps PennDOT and municipalities from considering relocation, he says. The benefits of relocating the road are significant, however.

“The road would always be available for evacuation during flooding and for access afterward,” he says. “It would

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**Roads built along creeks and streams, like these in Plunketts Creek Township, Lycoming County, are extremely vulnerable to flood damage. Civil engineer Britt Bassett is proposing that such roads be elevated or relocated out of floodplains to minimize future damage and costs. (Photos courtesy of Britt Bassett.)**



## SAVING ROADS

eliminate all flood damage to the road and restore the natural floodplain, which reduces flooding and allows for natural riparian buffers to be regrown.”

In cases where relocation is not possible, Bassett feels elevating the road is the next best alternative.

“It’s fairly simple, and the cost is much lower than rebuilding the road after a flood,” he says.

Raising the road involves tearing up the road surface, adding fill, such as stone, and putting down a new road surface. Retaining walls or other measures may also be needed to stabilize the newly created banks.

Bassett admits that raising a road is not a perfect solution. It may still channelize flood waters and keep them from reaching the floodplain, but it will provide access to the homes and hopefully not require rebuilding after the flood.

East Earl Township in Lancaster County elevated a road when it replaced a culvert a few years ago.

“Originally, the township left the east side of the culvert a little low so that water could run across the road if the culvert filled,” manager Dave Zimmerman says.

After several storms caused the culvert to fill and the road to flood, the township decided to consider options to address the problem.

“We took a look at the whole watershed and what happened during a major storm,” Zimmerman says. “This was a heavily traveled road, and water on it made it dangerous. We replaced the culvert with a larger one and raised the east side of the road so all the water would go through the culvert, rather than over the road.”

A contractor reclaimed the road by tearing up the blacktop and adding stone fill. The township then graded



**When East Earl Township, Lancaster County, replaced a culvert a few years ago (top), it also elevated the road to keep it from flooding. The township spread stone on the road, and then a reclaiming machine ground up the surface and stone together (above). More stone was added to increase the height, and then new blacktop was applied. (Photos courtesy of East Earl Township.)**

and rolled the mixture and added more stone in low spots. It applied a base coat last year and will have the road blacktopped this year. The resulting road is 1½ to 2 feet higher than it was, putting it well out of the path of flood waters, Zimmerman says.

This year, the township will perform

reclamation on another road, which runs along Black Creek and floods regularly, he says. In addition to installing a larger cross pipe and reclaiming the road surface, the township will raise the road and create a new road profile, adding a crown so the water flows off on either side.

**“The cost of raising or relocating a road is small compared to the costs from flooding.”**

## SAVING ROADS

“Addressing this problem is **critical** from the standpoint of **emergency access during and after a flood.**”

“We’ll spread stone on the road first, and a contractor will use a reclaiming machine to grind up the blacktop and the stone together,” Zimmerman says. “We’ll do the grading and possibly add more stone, create a crown, and then have the road paved. By raising the road, we will not only elevate it above flood level but will also end up with better ditches leading to Black Creek.”

Rapho Township, also in Lancaster County, elevated and relocated a road when it replaced a bridge last year that had been damaged during Tropical Storm Lee in 2011. Rather than put a new bridge and road in the same location, the township replaced it with a larger structure and moved it and the approaching road upstream, public works director John Haldeman says.

“The old road was basically on the bank of the creek,” he says. “We moved it about 50 feet away from the bank.”

The road was also raised about 1 foot at the bridge and as much as 6 feet in other places. It is still within the 100-year floodplain but is out of the direct floodway, he says.

### Raising other roads

A different kind of situation has Forest Lake Township in Susquehanna County elevating roads. The township, which has been hit hard by major storms the past few years, has roads that have become entrenched in hillsides and act as water channels every time there is a hard rain, supervisor Marvin Small says.

“We have started elevating these roads to their original profile, some as much as 7½ feet,” he says. “Once the roads are elevated, we put in cross pipes. We have probably done 10 miles so far; we don’t always have to do the entire road.”

The township has been able to purchase rubble from a local bluestone quarry for the fill, but that source may dry up. The quarries purchased crushers and are selling the rubble to natural gas drillers for use in creating drill pads, Small says.



**Rapho Township in Lancaster County relocated a road when replacing a bridge damaged by Tropical Storm Lee in 2011. The road originally ran along a stand of trees (top), with a creek just on the other side of the trees. During the reconstruction, the township moved the road about 50 feet away from the trees so that it is out of the direct floodway (bottom). (Photos courtesy of Rapho Township.)**

Because elevating the roads is considered a flood mitigation measure, the township has been able to secure funding from the Federal Emergency Management Agency for the work.

"You don't have to have flooding in Pennsylvania to get FEMA funds for mitigation projects," Small says.

**No time like the present**

Britt Bassett feels this is an opportune time for townships to think about raising or relocating roads out of floodplains because of the influx of Act 13 natural gas impact fee revenue.

"Townships often don't have time to go out and get easements, rights of way, and such to move a road after a flood occurs because they have more pressing matters," he says. "The time to think about it is before a flood. There is an unprecedented source of money coming into these municipalities that would give them the opportunity to do something like this proactively."

Several townships in Lycoming County are beginning to listen to



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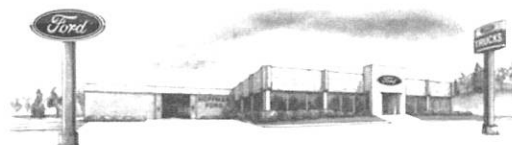


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Bassett's ideas. One is very enthusiastic and will likely approve a feasibility study, he believes. In such a study, the engineering firm will look at several new alignments for a road, perform topographical mapping, and provide cost estimates for each alignment.

"The goal is to whittle them down to the one or two best options," he says, "and then settle on the most feasible alignment and take it around to various agencies to try to get funding."

Bassett Engineering completed a feasibility study in Brady Township, Lycoming County, to address a roadside sinkhole/vernal pool that was 3 miles long and a quarter mile wide, he says. It flooded during the storms in 2011 and remained that way for eight months.

"We looked at eight or nine possible alignments for the road and also raised the option of draining the sinkhole," he says. "PennDOT is looking at raising the road, and the township is considering a drainage channel from the pool to a nearby creek. That will require a joint permit with the U.S. Army Corps of Engineers, however."

Bassett admits that the process of raising or relocating roads out of the floodplain, rather than rebuilding them in the same location, is not without its challenges. Current funding patterns encourage rebuilding in the same location, and acquiring permits, rights of way, and easements mean additional costs. He still believes it will save townships money in the long run, though.

"Although we've had major storms almost back to back the past couple of years, that is not always the case," he says. "An entire generation can pass before a road may be destroyed again, and people forget. The time to think about this is now, when money is coming in and before another storm takes its toll." ♦

WANT TO LEARN MORE? Contact Britt Bassett at (570) 368-2131, email [bbassett@bassetteng.com](mailto:bbassett@bassetteng.com).

## CHANGING ROADS

### Road elevation and relocation offer many benefits

Engineer Britt Bassett of Lycoming County-based Bassett Engineering Inc. says relocating or elevating roads out of a floodplain offers both obvious and hidden benefits. These are some of the positive outcomes:

- Eliminates future flood damage to road;
- Provides a permanent evacuation route; and
- Eliminates traffic delays and detours that would result from reconstruction.

In addition, relocating a road from its original site adjacent to a waterway provides the following benefits:

- Removes the previous road's function as an artificial levee;
- Reconnects the waterway to its natural floodplain;
- Allows for regrowth of a riparian buffer;
- Reduces flood depth and velocity; and
- Reduces erosion and scour of the creek bed and banks.

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