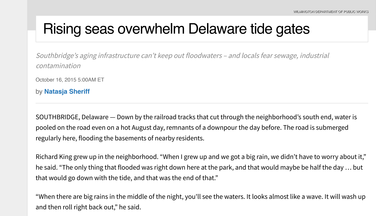
ENVIRONMENT



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Rising seas overwhelm Delaware tide gates

Southbridge's aging infrastructure can't keep out floodwaters – and locals fear sewage, industrial contamination

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by **Natasja Sheriff**

SOUTHBRIDGE, Delaware — Down by the railroad tracks that cut through the neighborhood's south end, water is pooled on the road even on a hot August day, remnants of a downpour the day before. The road is submerged regularly here, flooding the basements of nearby residents.

Richard King grew up in the neighborhood. "When I grew up and we got a big rain, we didn't have to worry about it," he said. "The only thing that flooded was right down here at the park, and that would maybe be half the day … but that would go down with the tide, and that was the end of that."

"When there are big rains in the middle of the night, you'll see the waters. It looks almost like a wave. It will wash up and then roll right back out," he said.

The Southbridge neighborhood is part of Delaware's largest city, Wilmington, at the northern end of the state. With a population of 72,000 people, the city sits on the Delaware River, where Brandywine Creek meets the Christina River, 65 miles from the ocean. Yet Southbridge, although far from the beaches of Delaware's bay and the Atlantic, is vulnerable to the effects of sea level rise. The neighborhood already faces chronic flooding, due to a combination of its low-lying location and aging infrastructure, and the flooding is likely to get worse as sea levels rise.

"The Christina River, which encircles all of South Wilmington, is subject to sea level rise, just like the rest of the tidal water bodies in the state," explained Susan Love, the leader of the climate and sustainability division at the Delaware Department of Natural Resources and Environmental Control (DNREC) and a former project manager for its sea level rise initiative. "Over the past 100 years, the average tide level has risen by about a foot, so that means that high tides are higher today, and the tides that affect flooding happen more often in this area. So the flooding that we're seeing is in part being exacerbated by the effects of sea level rise."

According to the DNREC's researchers, future rates of sea level rise on the Delaware coast could range from 1.6 feet to 4.9 feet by 2100, potentially submerging up to 11 percent of Delaware's land, putting roads, railroads and water wells at risk. More than 20,000 people in the state living less than 5 feet above sea level could be directly affected, about 10 percent of them in Wilmington, where many of them are socially and economically vulnerable.

Although income levels have risen in the neighborhood since 2010, about 30 percent of Southbridge households were below the poverty line in 2012. Limited economic opportunities and poor public transportation connections to the rest of the city have contributed to high unemployment in the neighborhood, which reached about 14 percent in 2012, almost double the national average. Many households don't have the option to leave the neighborhood when floodwaters rise and have less money available to rebuild after a storm or extreme weather. Flood insurance is out of reach for many of Southbridge's 1,900 residents.

"We've held flooding symposiums with [the Federal Emergency Management Agency]," said Rysheema Dixon, the chairwoman of the South Wilmington Planning Network. "We're trying to talk to them about how we can get some insurance for a lot of these residents, who have mostly has basements flooded and now have mold in their basement because it floods every time it rains."

During a light rain, road runoff and household wastewater are channeled through underground pipes to a treatment plant. When a heavy rain comes, water flows out to the Christina River through tide gates. But when the river runs high, those gates can't open, the system is overwhelmed, and water rushes back up onto the street through pipes and drains.

The floods get so bad, you're knee deep in water sometimes, said resident Shalonda Davis. "It's like you're swimming out of Southbridge."

"The buses can't get in," she added, "so people miss work." Residents have to wait until the water goes down, when the buses can make it through.

"The most dangerous time it would [flood] is when we have a full moon and a nor'easter comes," said Clarence White, who has operated his auto workshop in Southbridge for 49 years. "You've just got to cut your power off because you don't know how high it's going to come."

"When it starts raining, you can be inside your office and about an hour you look out and you can see waves coming down the street," he said. "It's been a way of life."

And when the floodwaters rise, Southbridge residents face the damaging effects of not only the water but also an industrial past and aging infrastructure.

Beginning in the late 1800s, Southbridge was transformed from an agricultural area to a major industrial center. Canning, lumber, tanning and iron industries moved to Southbridge to take advantage of available land and its proximity to water. Oil and coal companies moved into the area in the 1900s. When industry and manufacturing declined in the postwar years, Southbridge was left with their environmental legacy.

"Remnants of industry, arsenic, lead, chromium, heavy metals -- things that are byproducts of historical as well as contemporary commercial and industrial activities -- remain in the soil for quite some time," said Victor Perez, a sociologist at the University of Delaware who is part of a team of scientists there studying the effects of sea level rise on soil contaminants.

In the late 1800s and into the 1900s, there was a large tanning industry on the waterfront, said Donald Sparks, the director of the Delaware Environmental Institute at the university, who is leading the study. "They used arsenic and chromium to help tan the leather, so there are quite a few sites there that have elevated levels of [those] metals."

Some soils have properties that make them hold on to contaminants, preventing their release into the environment. What scientists don't yet know is whether repeated flooding with salt water will mobilize those contaminants and, if they do, whether that poses any risk to residents.

"We know a lot of the chemistry of the material. We know how they react in soils," he said. "But what we don't know is, what will happen under these rather dramatic conditions?"

"What we're trying to understand is, is it a potential problem?" said Sparks. "As long as these things are stabilized, it may not be a problem … The answers are just still out there. We don't know."

It's a problem that could affect communities throughout the mid-Atlantic. "We have a lot of old abandoned industrial sites and old brownfield sites that are contaminated with a whole host of different pollutants, including metals and organic chemicals," he said. "A number of these are in urban areas … There are obviously some environmental justice issues related to all of this as well."

While the prospect of hazardous contaminants seeping into the neighborhood is cause for concern, the public health risk from sewage in the floodwaters is greater.

"In this area, contaminants don't affect the drinking water supply, which is usually the key path of contamination," said the DNREC's Susan Love. "The human health issue in Southbridge is more that flooding sometimes has untreated wastewater in it. That is definitely a primary contact human health issue."

As with many old sewage systems along the East Coast — such as in New York, Philadelphia and Washington, D.C. — Wilmington's stormwater and sewage pipes are combined, creating a nasty mix of road runoff and sewage that floods the streets of Southbridge during rains.

"Usually, people who have basements would take [the flooding] in their stride, until it started mixing with the sewage. Then they were afraid for their kids and the health issue and the stench that's in the house," said White. "I have a drain right outside my business, and any day, you could just smell it."

Residents are hopeful that plans for a new 20-acre wetland park will bring some relief from the floods, keep sewage-laden waters off their streets and offer some protection from sea level rise.

In late September, local agencies and residents gathered at the Elbert-Palmer Community School in Southbridge for an open house event to view and comment on plans for the new wetland development as well as a new transportation project designed to connect the community to Wilmington's waterfront.

The wetland project, which will make use of an existing but degraded wetland in the neighborhood, has been 10 years in the making. New pipelines will direct runoff from Southbridge streets into the wetland, where many sediments and pollutants will fall out before the water makes its way to the Christina River. Designs for the park include raised walkways, bike paths, meadows and an upland forest area. Southbridge residents hope the park will bring new life to the community.

"They're not just worrying about the flood. They're bringing in a beautiful park, a bike park, a park for the dogs," said Davis. "I think that will also bring this community together. That's something that we need. This isn't going to just help the flood. It's going to help better our community and beautify our community."

The wetland can provide only a short-term fix in the face of sea level rise. Other strategies will be needed to protect the community in the future, said Love, but the wetland is a key part of addressing both the historic and some of the future flooding.

While plans for the park have been approved by the city, work has yet to begin on the project, and funding gaps remain.

As seas rise, financing adaptation strategies to build and maintain infrastructure will be a growing problem for many coastal states. State and federal agencies currently pick up the tab to protect Delaware's coastline, but resources are finite, and the state will increasingly be called upon to prioritize scarce funds.

Delaware's popular tourist beaches on the state's Atlantic coast, at Rehoboth and Lewes, are regularly replenished using state and federal funds, but maintenance costs are likely to rise as erosion becomes more severe and more frequent replenishment is needed. Upgrades in 2013 to six Atlantic beaches and the Indian River inlet cost $26 million, paid for by federal disaster relief funds.

Maintaining these beaches is considered beneficial to U.S. taxpayers, so the cost of beach replenishment is shared by the federal and state governments, with federal funding covering three-quarters of the cost. Delaware Bay beaches are dependent on state largesse, with replenishment covered by dedicated state beach replenishment funds.

For other environmental fixes — wetland restoration, dike construction and raising houses — the state needs to find funding from other sources.

"There's no dedicated funding source for that," said Love. Funding for those projects come from money "pieced together from federal grants, from local grants, from foundations, from private contributions … so it's really difficult."

That includes projects like the new wetland park at Southbridge.

"It's necessary and needed to stop an environmental justice community from going under water on a fairly routine basis and to fix some public health issues," she said. "We're cobbling funding together from a variety of sources, and there's still a shortfall. There's no designated pot of money for a $20 million project like that."

It's a problem that's not unique to Delaware, and it doesn't bode well for the large-scale infrastructure projects that could be needed to hold back the water in the future. Unless rising tides can be accommodated by improved drainage, raising buildings or other means that would allow people to live on the shore despite the threat of flooding, there are just two options available: retreat from the flooded shoreline and remove existing structures or protect and fortify the coast to hold back the water, at substantial cost.

"We can't adapt our way out of climate change," said Love. "We do need to reduce our greenhouse gas emissions, because there's only so much adaptation, particularly for sea level rise, before we just have to get out of the way."

"If we can mitigate our greenhouse gas emissions, we might be able to limit our level of sea level rise by the end of the century to 3 feet or less, and I think we could deal with that over time," she said. "When you start thinking about 5 feet or 6 feet to the end of the century, it becomes a much harder task to preserve what we have."