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## Ancient, Clean, Controversial

### Preserving deep reserves of water is LI's chief environmental issue

By Dan Fagin  
Staff Writer

The oldest stuff at Jones Beach State Park isn't the 1950s rock and roll at the oldies shows, the vintage 1929 bathhouses, or even the Jones name, which comes from a British privateer who established a whaling outpost on the beach 300 years ago.

It's the drinking water, which probably predates even the 11th Century Venetian bell tower that was the model for Jones Beach's water tower.

The water in the park's brick-and-stone tower originated as rain that fell somewhere near the current site of the Long Island Expressway about 1,000 years ago and then trickled downward and toward the South Shore through layers of sand, gravel and clay. The water's journey finally ended when it was captured 1,100 feet below Jones Beach by wells that pumped it all the way up to the tower for use in faucets and showers.

As the millenium-long odyssey of Jones Beach's water supply shows, Long Island's aquifer system is not only the region's most vital natural resource and its chief environmental concern, it is also our strongest link with the ancient past.

Events that occurred tens of millions of years ago built the interconnected layers of water-bearing sand and gravel that extend as deep as 2,000 feet and make up the aquifer system. The water in those buried reservoirs consists entirely of rain that seeps through the Island's sandy soil and slowly moves down and sideways for hundreds or even thousands of years until it either drifts off the Island or is pumped back up to the surface again by water wells.

It is a bountiful supply that holds roughly 70 trillion gallons -- enough to flood the entire surface of Long Island with more than 300 feet of water -- and can withstand long droughts that dry up surface-water reservoirs like the ones that supply New York City. But it is also a fragile system that has been measurably altered by the suburbanization of Long Island, and by the more than 1,000 wells that collectively pump about 390 million gallons of water out of the aquifers every day.

Sewers and intense pumping have lowered the water table by a few feet in Nassau and western Suffolk, diminishing or even eliminating many shallow streams and lakes and causing underground salt water to seep inland deep below the shorelines.

Portions of the shallow and mid-range aquifer system are now so tainted by fertilizers, pesticides, industrial chemicals, gasoline and cesspools that water companies must

either treat the water after they pump it up or abandon their shallow wells. Some of that contaminated groundwater also seeps into bays and harbors, contributing to pollution problems offshore.

The aquifer system's ability to renew itself with clean rainwater, meanwhile, has been diminished by the profusion of driveways, roads and parking lots. Drops that once fell directly on soil are now increasingly landing on concrete, where they pick up contaminants before trickling down into the aquifer system. Some of those contaminants can remain in groundwater for hundreds of years as droplets slowly seep downward.

The effects are so far-reaching that the concern over preserving the quality of Long Island's groundwater has become the single most important factor limiting the region's growth.

"The only true limit is water," said veteran planner Lee Koppelman, director of the Center for Regional Policy Studies at the State University at Stony Brook. "It is the limiting, controlling factor because we don't have any external sources of water -- unless we're all going to buy Perrier. If we have environmental interests that we care about protecting, we have to limit our use of the aquifers and protect the recharge areas."

Long Island depends on groundwater because of events that began 100 million years ago, when the Appalachians were still a towering mountain range and the future Long Island was part of a bedrock plain sloping southeast from the Appalachian foothills to the eastern edge of North America.

Over tens of millions of years, streams carried sediments from the eroding mountains and deposited them on the bedrock in a series of distinct layers that eventually resembled a lopsided lasagna. At the northwestern edge of Queens, where the bedrock is at the surface, these sandy sediments are only a few feet deep. But in southeastern Suffolk County the layers of sand, gravel and clay occupy more than 2,000 feet between the surface and the bedrock.

The deepest and oldest layer, just above the bedrock, is a wedge of water-bearing sand and gravel known as the Lloyd aquifer. On top of the Lloyd is a thinner layer of clay called the Raritan. The next layer of sand, gravel and silt is the Magothy aquifer, deposited about 60 million years ago and the region's most important source of drinking water. Another clay barrier called Gardiner's Clay is on top of the Magothy, but only near the South Shore. And the uppermost layer is the narrow and polluted Upper Glacial Aquifer, composed of sand and rocky rubble that was bulldozed into the area by at least two ice sheets, the last one just 22,000 years ago.

The layer-cake composition means groundwater moves in predictable patterns, slowing and changing course when it reaches clay and speeding up in sand and gravel. Near the North Shore, groundwater tends to move more quickly toward Long Island Sound, and near the South Shore it moves toward the ocean. But in the middle of Long Island, rainwater moves slowly into the deepest aquifers that are becoming increasingly important sources of drinking water as shallower aquifers are contaminated.

That's why planners worry the most about protecting Long Island's central spine, including the Suffolk pine barrens. The recharge zone for the Magothy aquifer is only five

miles wide, centered roughly on the Long Island Expressway. And only the middle half-mile of that zone recharges the deeper, cleaner Lloyd aquifer.

That's an immediate concern for the dozens of Long Island communities relying on rainwater that has been in the aquifer system anywhere from 10 to 50 years.

But even in places like Jones Beach, where the water is 1,000 years old, the quality of the water supply will eventually be determined by the way we treat our environment today. That is the unavoidable legacy of Long Island's aquifer system.

### **The Lowly Sump**

Sumps don't get much respect. Fenced-in eyesores, they take up precious space in suburbia. But the more than 3,000 basins on Long Island have at two big jobs: controlling floods and recharging underground aquifers. Sewers in roads and parking lots collect rainwater and send it to nearby sumps, so that storm water need not be piped to bays and harbors. As more land is paved, sumps are places where rain can still penetrate the soil and reach aquifers. The basins range in size from 10,000 square feet to more than 20 acres. The problem is, by the time storm water reaches sumps it has been tainted by fertilizer, gasoline and other pollutants, which then enter aquifers. That's why planners concerned about protecting the water supply say sumps are no substitute for preserving open space.

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