

Superstorm Sandy Spurs NJDOT to Construct Stormwater Pump Stations

In 2012 when Superstorm Sandy hit the New Jersey coastline, it devastated Route 35, a critical flood evacuation route, just north of Island Beach State Park.

Scope

Running along the Barnegat Peninsula in Ocean County—a thin sliver of land located between the Atlantic Ocean and Barnegat Bay—Route 35 is not just any road, it is the road. When Superstorm Sandy struck New Jersey on October 29, 2012, it left unparalleled devastation in its path, and this segment of Route 35 between Bay Head and Seaside Park was no exception.

The Barnegat Peninsula sits just a few feet above sea level. Flooding always accompanied typical summer storms. But Sandy redefined storm damage, breaching Route 35 in three places, cutting channels that connected the Atlantic Ocean with Barnegat Bay, and making the peninsula inaccessible for many weeks.

With this critical coastal evacuation route severely compromised, the New Jersey Department of Transportation (NJDOT), led by Project Manager Ahmad Qureshi, took immediate steps to restore safe travel; a complete reconstruction of a 12.5-mile section of Route 35 would be required. An investment of this scale demanded a solution for the routine flooding problems faced by the area.

Solution

Nabil Hourani PE, Associate and Project Manager for McCormick Taylor, tasked with the drainage and stormwater management re-design, concluded that the only way to provide real relief from flooding in this highly developed, low-lying area would be to incorporate stormwater pump stations into the design. The FHWA concurred and funded the project through its Emergency Relief Program, including a new drainage system with (9) nine pumping stations as part of a stronger, more resilient roadway.

With accelerated design and construction schedules, substantial completion of the Route 35 reconstruction was planned by the summer of 2015. A compact footprint was critical to expedite this project by keeping the pump stations within available rights-of-way. Dave Applegate, Associate Principal at PS&S, and his team designed the mechanical and electrical systems and provided architectural design



Route 35 devastation from Hurricane Sandy



Drainage System pipes

Customer: New Jersey Department of Transportation (NJDOT)

Challenge: Flooding and Destruction from Storm

Products: Slimline Propeller Pump, FSI, MultiSmart

coordination for the stormwater pump stations, with just 15 days to prepare the public bid documents, a process that normally would take months. Ana van den Hende from Pumping Services, Inc., the local Flygt representative, provided immediate technical assistance and guidance for pump selection and station optimization.

Slimline propeller pumps by Flygt (a Xylem brand) were selected for all nine underground stormwater pumping stations; the small profile of the Slimline propeller pumps reduced the required pump station footprint with smaller column pipe diameters and pump bay widths.

Slimline propeller pumps also utilize Flygt Formed Suction Intake (FSI) devices. The FSI inlet device provides optimal inflow to the propeller pump by gradually accelerating and redirecting the flow toward the pump inlet; its primary function is to condition the incoming flow into a uniform profile and redirect the flow. The Flygt FSI device is ideal for use when available space is limited; by providing a reliable pump intake in limited space, the Flygt FSI is able to achieve better hydraulic conditions within a smaller footprint than with standard inlet devices.

The largest pump stations are able to convey 36,000 gpm with a five-pump arrangement (each pump capable of 9,000 gpm, with one pump as a spare). Xylem's MultiTrode MultiSmart pre-programmed controllers were used for their ability to run multiple pumps without complications.

Among the challenges was minimization of the visual impact of the pump stations in scenic waterfront locations. Electrical components were positioned twelve feet above the Advisory Base Flood Elevation within gazebos, which visually conceal technical components and protect control systems from high water levels. Water quality treatment facilities were incorporated upstream of each pump station including an oil-water separator with bar screen and a manufactured treatment device to remove suspended solids from stormwater prior to discharge into Barnegat Bay.

Results

Route 35 was reconstructed as a state of the art roadway able to withstand the most intense storms in the future. The pump stations and drainage system improvements will prevent flooding for the 25-year frequency storm, enabling safe evacuation of the community during future storms, while relieving flooding from many local roads which formerly flooded on a frequent basis. Flygt applications engineering proved its ability to assist with a challenging coastal stormwater design.

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PS&S computer renderings of the gazebo pump stations



Drainage system pipes



Completed view of a gazebo on Route 35

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