# CASE STUDY

## Hilton Head Airport Runway 21 Extension & Taxiway 'F'

Hilton Head, SC

**Bed 1**

| | |
|---|---|
| **Storage Provided:** | 82,420 CF |
| **Model:** | Recharger® 330XLHD |
| **Number of Units:** | 1000 |

**Bed 2**

| | |
|---|---|
| **Storage Provided:** | 68,080 CF |
| **Model:** | Recharger® 902HD |
| **Number of Units:** | 652 |

| | |
|---|---|
| **Total Area:** | 18,681 SF |
| **Installed:** | May 2017 |
| **Engineer:** | Ward Edwards Engineering<br>Port Royal, SC |
| **Contractor:** | Quality Enterprises USA, Inc.<br>Chesapeake, VA |

Beaufort, County, South Carolina was founded in 1769 and covers 923 square miles, 38 percent of which (347 square miles) are covered by water. As described by the county's official website, "Nestled between Charleston, South Carolina and Savannah, Georgia — Beaufort County is rich with history, culture and outdoor beauty. Beaufort County is composed of hundreds of barrier and sea islands and its warm climate, pristine beaches, vibrant Gullah traditions and true southern hospitality welcome visitors from all over the world throughout the year."

Beaufort County has been one of the South's high-growth counties over the past few decades due to its substantial U.S. military presence, its climate, and location —which make it an exceptionally desirable resort and golf area. Its population of around 86,000 in 1990 nearly doubled to 170,000 by 2015, and it is expected to increase by another 35 percent to 230,000 by 2035. In addition, the local chamber of commerce estimates that nearly 2.7 million people visit Hilton Head Island each year.

The county is served by three airports; Savannah-Hilton Head International Airport (SAV), located 40 miles south of Hilton Head Island in Savannah, Georgia; Charleston International Airport (CHS), located 115 miles north of Hilton Head Island in Charleston, South Carolina; and Hilton Head Island Airport (HXD/HHH), located on the northeast part of the island. Both SAV and CHS feature runways in excess of 9,000 feet, while the HXD runway was 4,300 feet. Of the three airports, only HXD is physically situated in Beaufort County.

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Beaufort County and the Town of Hilton Head developed a master plan to provide direction and guidance regarding airport sustainability for future development priorities and justification for improvements. In an effort to allow the airport to accommodate more modern planes — which would attract more airlines which in turn would give locals and visitors more travel options — the decision was made to increase the length of the runway by more than 16 percent to 5,000 feet.

As one would expect of an island, water is very important to Hilton Head. The airport is located in a watershed area that includes the Calibogue Sound and the May River, Cooper River, Broad Creek and other tributaries and lakes. Comprising nearly 81,000 acres, waters in this watershed area are classified as Outstanding Resource Waters (Class ORW), Shellfish Harvesting Waters (Class SFH), Tidal Saltwaters (Classes SA and SB) and Groundwaters (Class GB).

The airport project's impact on long-term water quality is addressed in detail in the master plan, specifically the pollution wash off. As stated in the plan, "The primary components of pollutant wash off include the following potential contaminants: biochemical oxygen demand, chemical oxygen demand, volatile suspended solids, oil, grease, pesticides, polychlorinated biphenyls, total and suspended solids, algal nutrients, heavy metals, salts, asbestos, and coliform bacterial indicators. Pollutant concentration and discharge rates of runoff are dependent on rainfall rates. Rainfall energy dislodges deposited particles on the impervious surfaces, which are then conveyed in stormwater runoff to the receiving drainage appurtenances."

The plan goes on to say, "Prior to development of the proposed projects outlined on the ALP on currently undeveloped areas within the HXD property or additional property to be acquired, compliance with the Clean Water Act will be necessary, as well as coordination with appropriate federal and state agencies regarding potential water quality impacts." In February of 2015, the FAA approved an environmental study on the runway extension project, enabling the County to begin the 18-month, $9.25 million project.



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"This project had some particular challenges" said Paul Moore, Project Manager for Ward Edwards Engineering, a civil engineering firm out of Bluffton, S.C. "There were some dry detention basins and a very large canal that held water. The function of the airport made it necessary to fill in the canal and eliminate standing water onsite. The option of underground detention was very valuable to the design of the site."

"We considered products from three plastic storm chamber manufacturers as well as concrete arch chambers," continued Moore. "We chose CULTEC upon which to base the design knowing that theirs had been the lowest cost solution from other projects we've designed in the area that utilized large-scale underground detention systems. The grant funding for the project required us to allow for 'equivalent but equal' designs, so we were open to contractors supplying equivalent designs using other manufactured chamber systems, but the cost ended up being more than the CULTEC system. From a design point of view, we liked the CULTEC feed connector that allowed rows to be connected at intervals along the linear length. Given that the project called for very long rows, the feed connectors will allow flow to go from one chamber row to the next without adding in additional storm drain junction boxes and headers."

"On one hand," said Jon Shell of CULTEC, "this was a fairly typical project for us, in the sense that they needed 150,000 cubic feet of storage. On the other hand, this job was the most unorthodox installation we've seen. Because of its location next to the runway, work could only be done at night when the airport was closed. It was a short window between 10 p.m. and 5 a.m.that the contractor had to do his work and it had to be covered up as if nothing ever happened during the day. Typically, our systems are installed over a few days and are only closed up when the job is completed," continued Shell. "This installation actually involved two systems; one with our model 330XLHD chambers and the other using our 902HD chambers. The systems are designed to infiltrate as much water as they can, but have an overflow to an existing swale."

"When it rains here, it rains a lot" said Terry Jakovac of Quality Enterprises USA, Inc., the contractor that installed the stormwater system. "That means that there can be a lot of standing water during and after big rainstorms. The idea here was to have a place to store all that water, and the CULTEC systems we installed should do exactly that."

"We had worked with similar products before but had not worked with CULTEC," said Jakovac. "This was a very unique project, being that we had to work at night and close everything up. CULTEC was great to work with; their rep Jon Shell even showed up the first night to make sure we had everything we needed and to answer any questions we might have. We would absolutely work with CULTEC again."

"Another unusual aspect of this installation," added Moore, "is that we needed the chamber system to function both as a conveyance and as a detention system. The system was designed as a long, liner system that would store water during low-flow conditions to help with water quality treatment, but then convey water downstream during high-flow periods. The permeable nature of the system also allowed for continued interaction with the groundwater and temporary surface storage in the swale above the system."

"There are other BMPs in use at the site such as wet detention, permeable paving, and dry detention. These other BMPs are located outside of the Runway Safety Area (RSA). The chamber system was



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needed for use within the RSA where BMPs with standing water are not permitted," said Moore. FAA regulation FAA AC 150/5300-13, Change 17 requires, among other things, that RSAs be drained by grading or storm sewers to prevent water accumulation.

"We had used CULTEC on another large-scale redevelopment project in the Bluffton-Hilton Head area so we were familiar with the products," said Moore. "We used their spreadsheet calculator tool to estimate the total number of chambers needed, and the overall footprint. We then used the chamber tools built into ICPR V3 to hydraulically model the chamber system and the interactions with the other drainage structures proposed for the project."

"We wanted our systems to feature the largest storage-volume chamber we could fit with sufficient cover for each system," said Moore. "While the runway is flat, the elevations drop as you move south to north. This meant we could use the taller chambers on the south end where the surface grades were higher, and the shorter chambers on the north end."

The Southern system used 646 of the 48-inch high CULTEC Recharger® 902HD™ chambers arranged in a bed area of 18,681 square feet with an effective storage depth of 5.75 feet (before additional cover). The chambers were placed on a 9-inch base of stone, covered by an additional 12-inches of stone, and, similar to System #1, is surrounded by a 12-inch stone border around the system perimeter. Total storage capacity exceeded 68,000 cubic feet, with more than three-quarters of the water storage being provided by the stormwater chambers and CULTEC's unique internal manifold system and the balance of storage provided within the stone voids.

The Northern system featured the 30.5-inch high CULTEC Recharger® 330XLHD™ chambers. One thousand pieces of the 330XLHD chambers were configured into a narrow five row wide system 1403-feet long. They occupied an area of just over 36,000 square feet. The chambers lay above and beneath six-inch layers of stone and the outside perimeter of the system is surrounded by a 12-inch wide stone border. With an effective storage bed depth of 3.54 feet (without additional cover) this system has a total storage capacity of 84,420 cubic feet, with 63 percent of the storage accomplished by the chambers and manifold and the balance stored within the stone voids.

Said Moore, "We had to design to the South Carolina SCDHEC NPDES standards, the Beaufort County water quality standards, the Beaufort County volume control standards, and the FAA requirement of no standing water within the runway safety area. The design tools were very useful, especially the spreadsheet/sizer tool combined with the ICPR tool," Moore said. "All in all, our overall impression of CULTEC is positive. They seem to offer the best value in underground detention systems."



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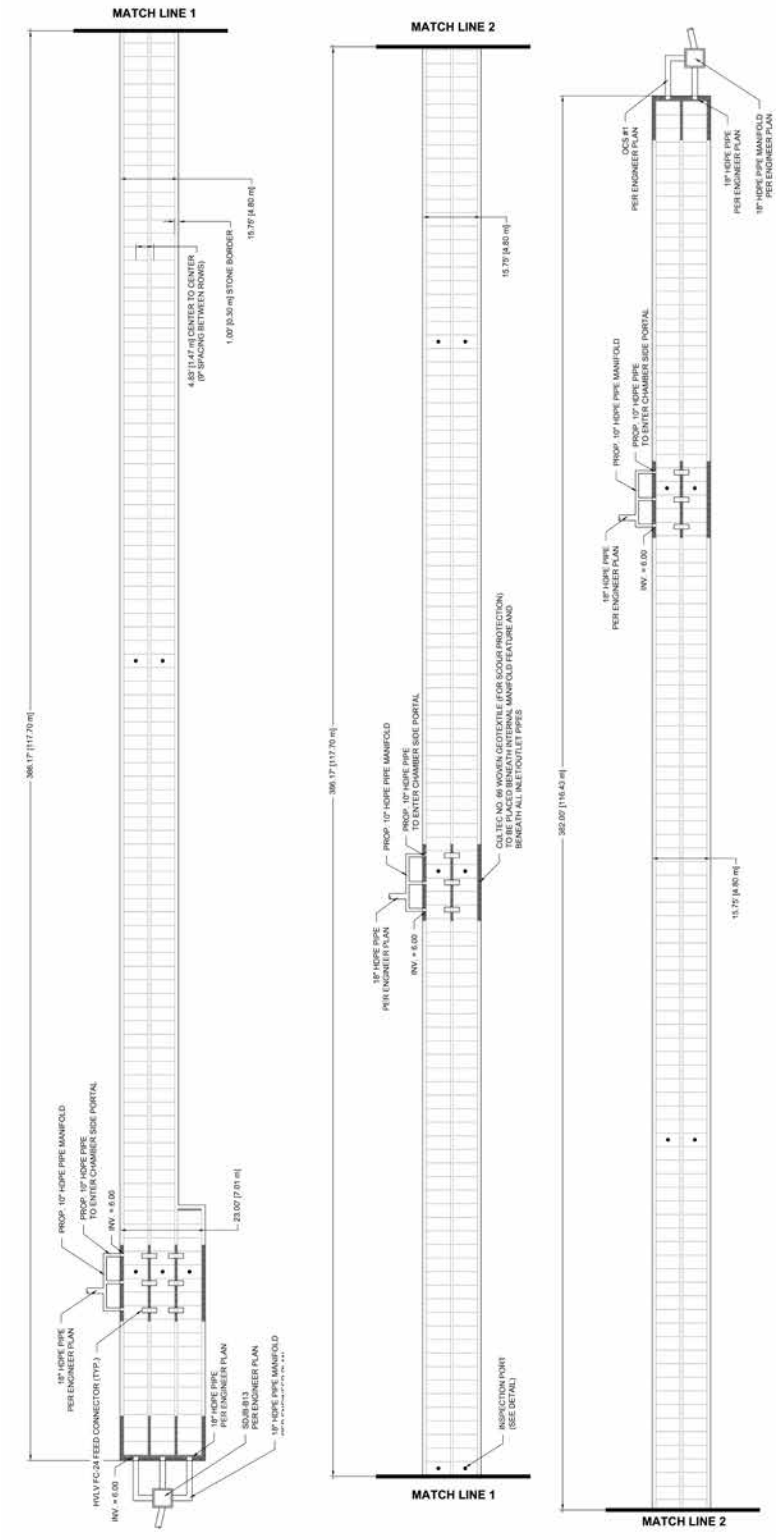




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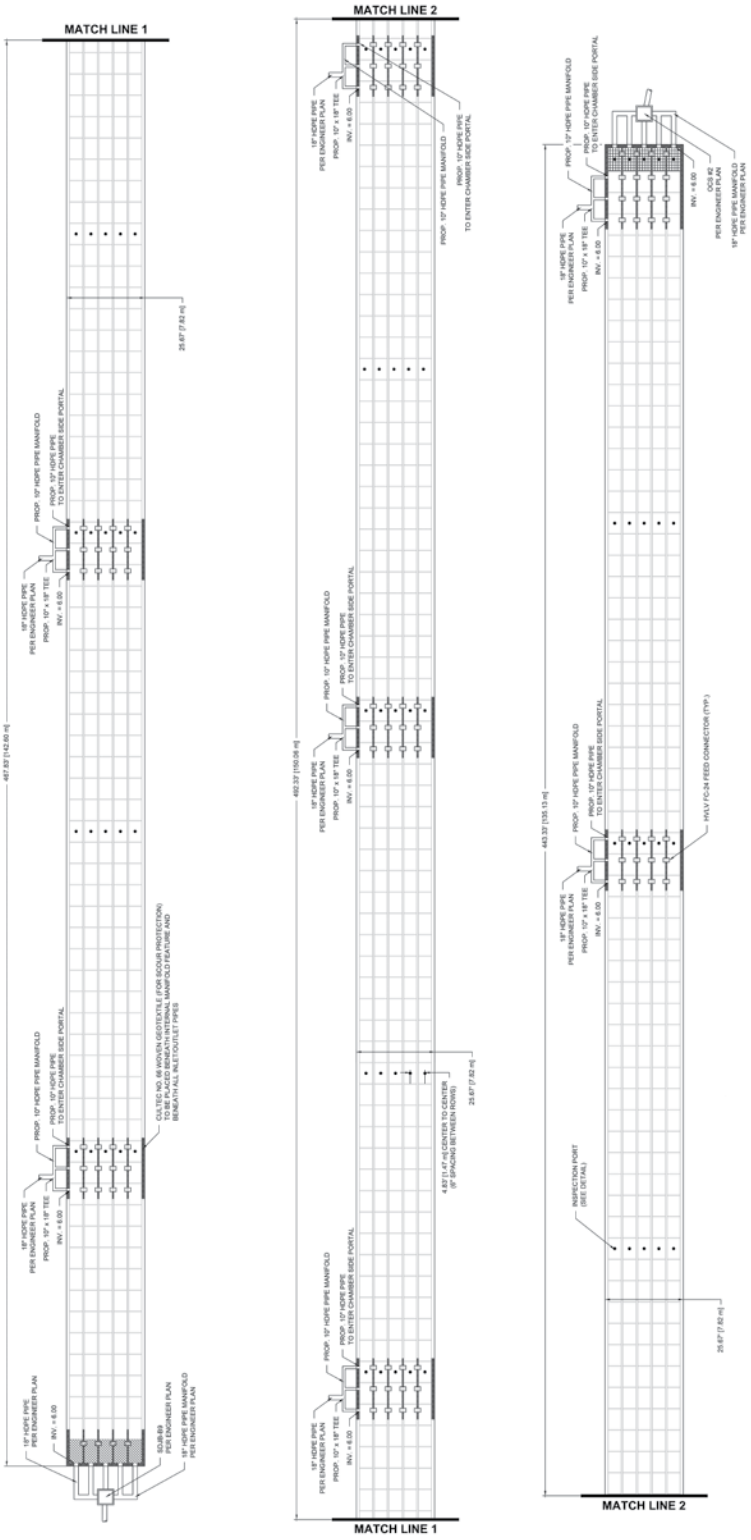


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