

FUTURE EHT OT KCB

Texas City arms itself
against disaster using
age-old technology

by **Bruce C. Webb**
photography **Shannon Stoney**

TEXAS CITY IS A MOSTLY TIDY, STRIP AND SUBDIVISION SORT OF PLACE OF NEARLY 50,000 NESTLED BETWEEN TWO KINDS OF IMMINENT PERIL. The one, a frenzied petrochemical-industrial enclave on the south side of town that boasts several major plants and refineries, including Valero, Marathon Ashland, Dow Chemical, and BP, has coughed up disasters more than once. Most famously, the French ship *Grandcamp*, loaded with ammonium nitrate fertilizer, exploded in the harbor in 1947, setting off a chain of dock fires and igniting a second ship, which also exploded. It took a week to put out the fires; one third of all the houses had to be condemned; 576 people were killed; and the city suffered over \$61 million in damage. Remembering the *Grandcamp* disaster is the main attraction at the city's downtown historic museum. A more recent reminder of the volatility of the plants occurred in 2005, when an explosion at the BP refinery killed 15 and injured 170—the worst



A guillotine-style floodgate marks the outlet between Moses Lake and the bay.



Enhanced versions of the Archimedean screw can lift 125,000 gallons of water per minute over an 11-foot barrier.

industrial accident in the United States in 16 years.

The other threat comes from the city's adjacency to the waters of Galveston Bay, a generally docile but determined body of water that is capable of occasional tantrums. To make the bay behave, the city began tinkering with some of the realities of its nature-given situation back in the early part of the century, building an extensive dike to divert the currents that swept down from Galveston across the Texas City Ship Channel, filling it with silt. The Army Corps of Engineers began building the five-mile-long appendage out into Galveston Bay in 1914 as pile construction, replacing it between 1931 and 1934 with a rubble mound. The dike was a great success; not only did it prevent the silting problem, but it also protected the ship channel from the bay's tidal action and storms, giving Texas City one of the safest ports in the country. Locals call it the world's largest fishing pier.

Texas City has always been vulnerable to hurricanes, having survived five major ones. But not until Hurricane Carla hit the city in 1961, flooding it with

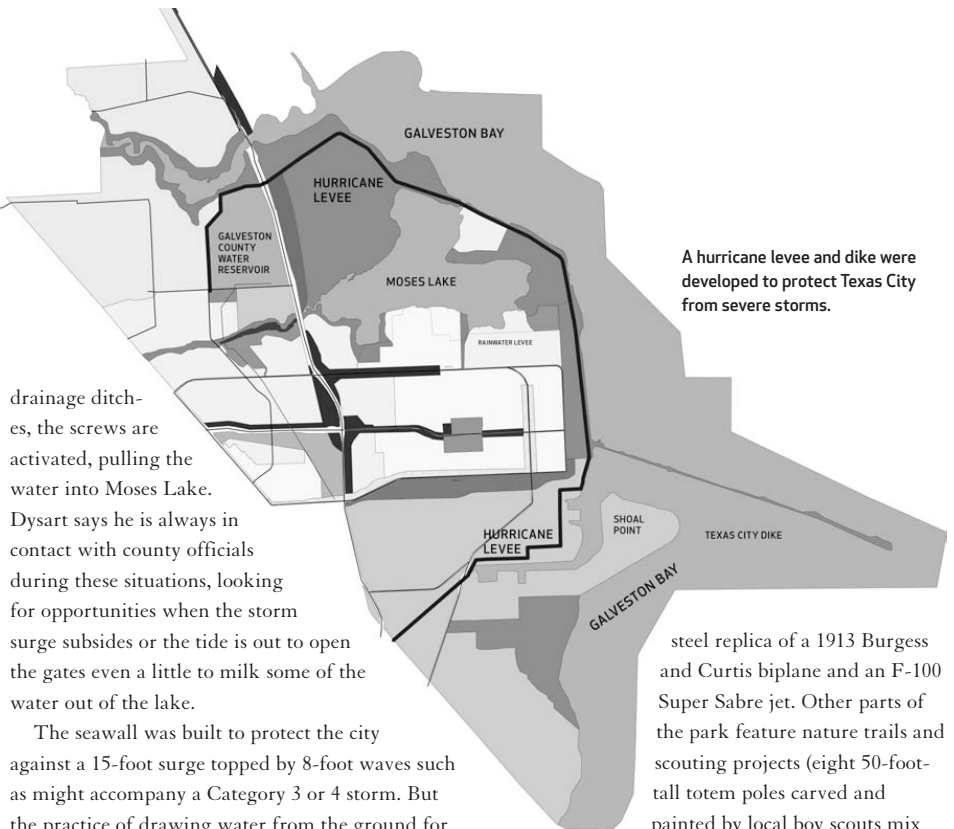
four feet of water, did the city begin working on improving its protection. Plans for a seawall had been on hold since 1949, but Carla was the impetus for activating them. A seawall or levee is conceptually simple: Like a child's sand construction on the beach, it is made of dredged material, earth, large rocks, and anything else that can be piled up to create a barrier to hold back or contain water. In Texas City, engineers scooped up sandy soil from the land side, creating an artificial pond locals refer to as the "blue hole" and piled it into a 17-mile-long barrier along the bay that is topped off with grass and a road called the Skyline Drive. A portion of the hurricane levee, about a mile in length, is a concrete wall.

The seawall protects the city from storm surges, but the runoff from the heavy rains that accompany coastal storms is another problem for the flat, low-lying coast. Toward that end, the city had an inner levee constructed around Moses Lake, inside the seawall, making the lake into a vast retention pond. Storm sewers and drainage ditches route water to the foot of the Moses Lake levee, and engineers have

installed an enhanced version of the Archimedean screw to pull water up and over the 11-foot-high barrier. Archimedean screws, long, cylindrical, corkscrew-shaped augers, have been used from the time of the pharaohs to move water efficiently from lower to higher elevations. In Texas City the pumps are 12 feet in diameter and 60 feet long and are located at two pumping stations: three in the Gottfried Moller Rainwater Pump Station in the northeastern part of town and five at the Captain A. B. Wolvin Pump Station, which handles the drainage from the west side of town. Each screw is powered by a 650-horse power Caterpillar diesel engine and can lift approximately 125,000 gallons of water per minute.

Another part of the technical landscape, which works in tandem with the screws, is the guillotine-style floodgate at the outlet between Moses Lake and the bay. Typically open to allow boat traffic, the gate can be closed during extremely high tides or storm surges.

Ron Dysart is in charge of the pump stations. A tall, energetic man with the confident manner of someone used to getting respect, he has been at his job for 18 years. Outside his office in the Wolvin sta-



A hurricane levee and dike were developed to protect Texas City from severe storms.

drainage ditches, the screws are activated, pulling the water into Moses Lake. Dysart says he is always in contact with county officials during these situations, looking for opportunities when the storm surge subsides or the tide is out to open the gates even a little to milk some of the water out of the lake.

The seawall was built to protect the city against a 15-foot surge topped by 8-foot waves such as might accompany a Category 3 or 4 storm. But the practice of drawing water from the ground for domestic use has resulted in substantial ground subsidence, so the seawall has sunk as much as three feet from its designed elevation. (Texas City now uses only surface water from the Trinity River.) But with many possible storm scenarios, it is never entirely certain that the seawall will prove adequate protection in a large storm. Hurricane Alicia in 1983 was the last major test of the hurricane levee system: A tidal surge of ten feet with an additional four feet

steel replica of a 1913 Burgess and Curtis biplane and an F-100 Super Sabre jet. Other parts of the park feature nature trails and scouting projects (eight 50-foot-tall totem poles carved and painted by local boy scouts mix with the trees), family play fields, and handicap-accessible recreation equipment. A replica of the Halfmoon Shoal lighthouse on Skyline Drive, similar to the one that used to be located two and a half miles off the Texas City shore, contains information on the hurricane levee, the port, and the pump drainage system. Inside the north end of the hurricane levee, just east of the storm gate, David Weekley Homes has created an infrastructure of

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tion is a banner that reads: "Whatever it takes. What we do affects everyone." Dysart's office adjoins the immaculately clean and orderly engine room where the six massive engines wait to be fired up. He says he tests them once a week to make sure they are in good working order. The pump station has the no-nonsense look of a military command post. When a weather event is predicted, Dysart and his team hunker down onsite to make sure everything operates smoothly. Usually there are three storms a year that require activating the pumps.

Since the county maintains and controls the bay-side hurricane levee and floodgate, and the city the screw pumps, Dysart coordinates operations with the county manager. Anticipating a tidal surge, the county closes the tidal gate to prevent inundation of Moses Lake. As rainfall fills the city's storm sewers and

of waves challenged the barrier, but it held.

Except for the pumps and floodgate, everything else connected with storm protection and water control has been absorbed into the city, often by creating impressive amenities. The five-mile-long dike is a regional attraction: Shrimp boats dock along its flanks, and the shoreline is usually busy with fisherman, bird watchers, wind surfers, and kiteboarders. At the end of the dike, the 600-foot lighted pier ("family fun since 1962") stretches into the bay for 24-hour-a-day deeper-water angling.

Skyline Drive, the narrow road built on the top of the hurricane levee, takes advantage of the views out to the bay. A 50-acre linear park extends along the leeward side of the seawall, a portion of which commemorates Texas City's role as the birthplace of military aviation, with an installation of a stainless

dredged canals and mounded-earth building sites for Grand Cay Harbour, a new subdivision.

Strategies for preventing flooding involve simple physics; the principles show up in children's beach construction, as discussed above, and mechanical toys. Added together, the provisions in Texas City create a hyper-engineered landscape, where the distinctions between what is natural and what is technical are obsolete and difficult to discern. Texas City is not quite The Netherlands, where much of the land is composed of reclaimed polders protected from the sea by an extensive network of dikes and pumps. But it's cyborglike nonetheless. These well-engineered modifications, along with the chemical plants and refineries, have become the most profound markers of the local landscape. ●