

Green roof initiative protects Elizabeth River

Petroleum Terminal's green roof initiative in the US state of Virginia continues to provide conservation benefits for the Elizabeth River. **Karl Schmidt**, General Manager Terminal Facilities and Pipeline, of CITGO explains how its partnership with The Elizabeth River Project has helped to significantly reduce stormwater runoff and prevent the contamination of river sediment.

Just 6 years ago, the Money Point Southern Branch of the Elizabeth River in the US state of Virginia was named a biological dead zone. Since then, The Elizabeth River Project, a non-profit organization leading community efforts to restore the environmental health of the harbor, has removed approximately 17.7 million kilograms of creosote, returned 25 species of fish to the river, and remediated contaminated sediment in more than 4.8 hectares of river space. The work of The Elizabeth River Project in Money Point is supported by volunteers, donors, and the neighborhood CITGO Chesapeake Terminal, located a quarter mile from the river's edge. CITGO Petroleum Corporation is a refiner, transporter, and marketer of transportation fuels, lubricants, petrochemicals, and other industrial products based in Houston, Texas, USA.

In 2009, the CITGO Chesapeake Terminal management team decided to expand upon its partnership with The Elizabeth River Project by pioneering water conservation and river cleanup in the Money Point area through the installation of a living green roof. This roof of approximately 279 square meters that extends over the Terminal's truckload area is believed to be the industry's only living green roof and is the first green roof to be installed in the Money Point area. A green roof structure is similar to that of a normal roof, with a rubber membrane and regular waterproof coating, but vegetation also covers its surface. This roof is equipped with seven layers of

such membranes, root barriers, and irrigation systems to collect water. One of the most important layers is a copper layer, which causes the roof greenery to spread out rather than grow into the roof.

On top of the roofing layers, a sand-like mixture is placed to foster hardy sedum plant growth. Sedum is a genus of the flowering plant family known as stonecrops, whose most notable quality is their leaves' ability to store large amounts of water, making these creeping plants the ideal base for a self-sustaining green roof. When the roof was installed in 2009, CITGO Chesapeake Terminal employees planted 5,000 sedum plants. At the time, the plants were the size of a thumb and planted 305 millimeters (mm) apart. Sedums are slow growers, and the roof took five years to fill in completely. Today, the fully-grown roof requires little to no maintenance, as the sedum plants thrive and serve as a water reservoir.

The green roof can prevent up to 76 mm of runoff over a 24-hour period of rainfall, which translates into approximately 189,000 to 227,000 liters of water runoff prevention per year. Since its inception almost 6 years ago, the CITGO Chesapeake Terminal green roof has prevented more than 1.14 million liters of stormwater runoff from entering the Elizabeth River and the Chesapeake Bay watershed.

Stormwater runoff prevention is a key part of The Elizabeth River Project initiatives to preserve the river sediment, which was previously contaminated by creosote dumping and a major fire in 1963. Creosote contamination,



The green roof installation at the CITGO Chesapeake Terminal in April 2011 is planted with sedum. Right: Planted with slow-growing sedum, the green roof achieved full growth capacity by 2014. Photo by CITGO

as thick as 1.5 meters in some areas, causes a toxic environment for fish and marine life. Through dredging these contaminated areas, The Elizabeth River Project applies clean backfill and enhances shallow areas with wetland grasses and oyster reef, or what is known as a living cap. The goal of this dredging is to restore approximately 10 hectares of the previous biological dead zone to its ecosystem function, and The Elizabeth River Project is more than halfway finished in cleaning up the entire area. Controlling roof runoff water after rain maintains these efforts by preventing road chemicals and petroleum from entering the river.

On top of its water conservation benefits and pollution prevention, the CITGO Chesapeake Terminal green roof also reduces energy use. By improving thermal qualities of the roof, the building better preserves heat and reflects or absorbs solar radiation. While a normal roof begins to see decline after 10 years, a green roof's waterproof membranes and vegetation shield from UV

radiation and physical damages, tripling the roof's lifespan.

The Elizabeth River Project has developed a River Star program that incentivizes businesses as they carry out wildlife habitat projects and pursue alternatives to pollution that benefit all involved. Through membership in the River Star program, the CITGO Chesapeake Terminal has surpassed its green roof initiative and received its fourth Sustained Distinguished Performance Award this year. Since partnering with The Elizabeth River Project in 2004, the CITGO Chesapeake Terminal has completed numerous environmental projects to achieve Model Level status, the highest level of achievement for pollution prevention and wildlife habitat enhancement efforts. Terminal employees assist in wetlands planting, mentor other facilities on conservation, and work to maintain wildlife habitat areas.

For more information on The Elizabeth River Project, visit www.ElizabethRiver.org and www.CITGOCaringForOurCoast.com.