PHOTO COURTESY PRAKASH PATEL

WATER PETAL CASE STUDY

THE CHESAPEAKE BAY FOUNDATION BROCK ENVIRONMENTAL CENTER

When the Chesapeake Bay Foundation decided to build a new environmental education center, they wanted to create a building that both reflected their values and catalyzed change in the building industry. The Foundation assembled a team of industry-leading practitioners from SmithGroupJJR, Hourigan Construction, and Skanska to design and build the Brock Environmental Center – the first commercial building in the mainland United States permitted to capture and treat rain for use as drinking water.

LOCATION
VIRGINIA BEACH, VA

TYPE
OFFICE BUILDING + ENVIRONMENTAL CENTER

SIZE
10,518 SQUARE FEET

DAILY OCCUPANTS
27 FULL-TIME, 83 VISITORS

RAINWATER HARVESTED/YEAR
15,600 GALLONS

WATER USE INTENSITY (WUI)
1.48 GALLONS/SF/YEAR

AVERAGE WUI*
14.2 GALLONS/SF/YEAR

CLIMATE
HUMID SUBTROPICAL
48 inches of rain/year
102 days of precipitation/year

**Average WUI by building type according to Seattle 2030 District data*

SYSTEMS

RAINWATER HARVESTING

The design uses two standing seam metal roofs to capture rainwater in two 1,650-gallon cisterns (enough to withstand six weeks of drought). Rainwater is filtered through four log filters and disinfected by ozone and UV to supply all water for the building.

STORMWATER MANAGEMENT

Stormwater is managed entirely on site, without reliance upon municipal infrastructure. All hardscape is composed of permeable pavers and gravel, with adjacent raingardens and bioswales to treat and infiltrate runoff. Rainwater that is not captured for use within the building is diverted into raingardens for infiltration.

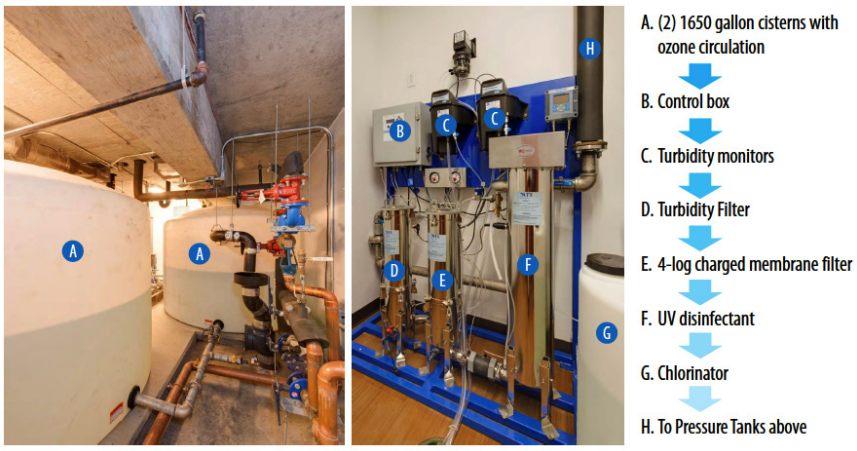
GREYWATER REUSE

Greywater from sinks and showers is piped to an elevated rain garden for treatment, raised above sea level to allow infiltration despite the high water table.

BLACKWATER TREATMENT

Composting toilets treat waste on site while reducing water demand to an absolute minimum. Composted solids are used on site, while liquid leachate is stored and sent to a local struvite reactor to be converted into fertilizer via secondary treatment.

BROCK RAINWATER SYSTEM



PHOTOS COURTESY DAVE CHANCE
DIAGRAM COURTESY SMITHGROUPJJR

WATER PETAL CASE STUDY
POLICY SOLUTIONS

RAINWATER HARVESTING

Drinking water regulations in Virginia are predicated upon the federal Safe Drinking Water Act, but are implemented and enforced by the State's Department of Health. These regulations govern the design and operation of 'public water works', which serve several thousand people on average, but can serve as few as 25. Because of the Brock Center's projected occupancy, the project was compelled to register as a public water works in order to harvest rainwater for potable use on site. This designation requires a purification system and an operations plan that guarantees the safety of building occupants, visitors, and the general public.

In addition to the complexities of designing a public water works appropriate to the scale of the building, the operational component was also a significant hurdle. Receiving a permit to drink rainwater was unprecedented on a building scale, but devising a way to operate the water system that was cost-feasible for a system of this size initially seemed insurmountable. Virginia typically requires a certain class of operator be consistently present at water works; these operators are highly specialized and expensive to employ.

To reduce expense without sacrificing safety or quality, the project team pursued and was granted a variance that allowed a lower classification of operator to do daily and weekly testing at the Brock Center, supplemented by monthly testing to be conducted by a qualified professional. Their building operator completed coursework at a local university to receive the appropriate designation, and the Brock Center retained an external consultant to satisfy the requirements of the variance.

BLACKWATER TREATMENT

Blackwater treatment at the Brock Center is complicated by the delicate salty marsh ecosystem surrounding the building. The treatment process is fairly straightforward: composting units turn human waste into solid compost and liquid leachate, both of which are fantastic soil amendments.

The challenge at the Brock Center is using the liquid resources on site: the salty marsh ecosystem would be harmed by supplemental fertilization. Luckily for the team, there is a struvite reactor within five miles of the site that converts leachate into organic fertilizer. The project team designed a septic tank that stores the leachate until it can be trucked twice a year to the nearby struvite reactor.

PROCESS

The Brock Center project team realized early on that the regulatory hurdles to achieving net-zero water were significant and would require substantial lead time to overcome. They organized their first meeting with regulatory officials during early schematic design. As the team advanced into the design development phase and began to leaf through the 300-page document governing water works in Virginia, they decided it was time to bring in the experts.

They hired BioHabitats, a consulting firm rooted in place-based design and specializing in sound science and ecological democracy. BioHabitats was instrumental in finding and understanding the regulations that would impact their project. They are well-versed in regulatory jargon, which facilitated improved communication between regulatory authorities and members of the project team. The project team's early engagement paid off — the regulators, initially sceptical, now proudly host retreats at the Brock Center for drinking water officials from around the country.

LESSONS LEARNED

- Engage regulatory officials early in the design process
- Bring in experts who speak the same language as regulators, and may have pre-existing relationships
- Consider the financial implications to the long-term building operations