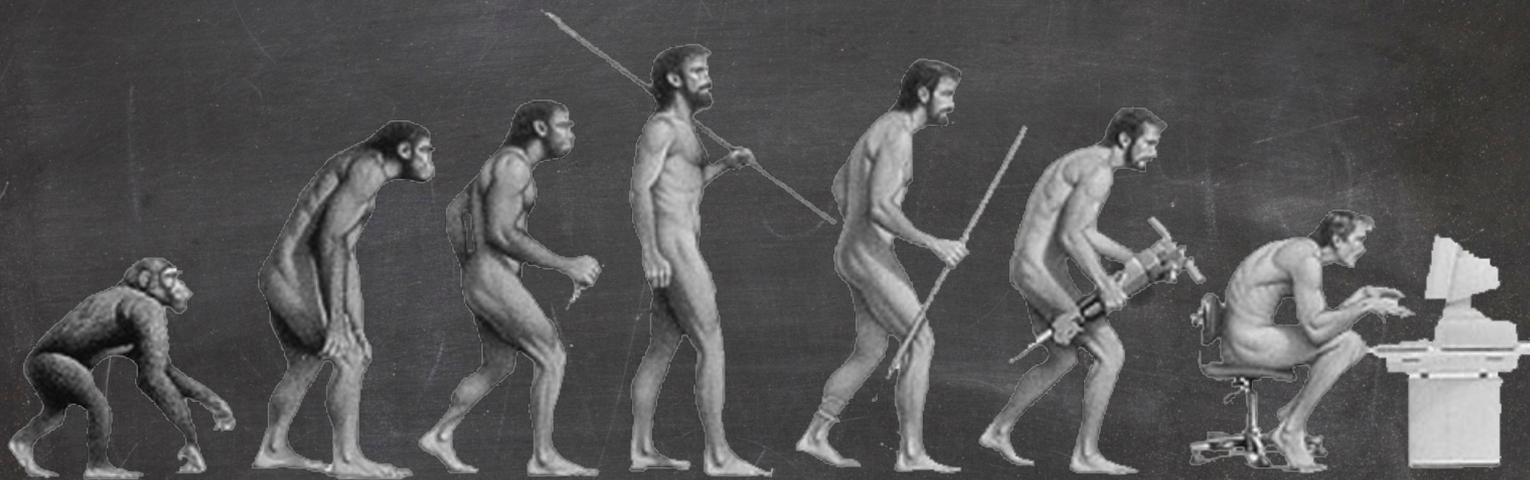


Virginia Beach City Public Schools



Sustainability and the 21st Century Learning Environment



Renaissance Academy
55,000 Gallon Capacity

Water Conservation

Water Harvesting Through Cisterns

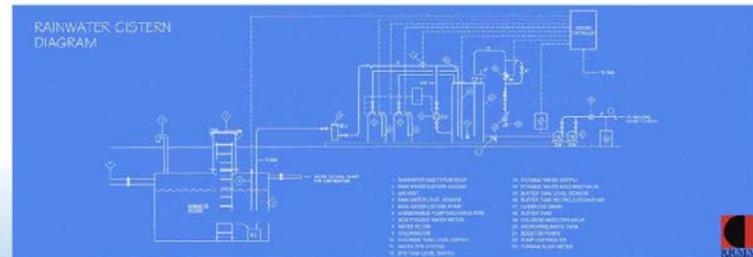
Look at the roof. It is sloped inward to collect rainwater for flushing toilets.

During a one-inch rainfall, Renaissance's 170,000 square feet of roof can catch 100,000 gallons of water!



RAINWATER CISTERNS IN THE GROUND

Using Rainwater will Save About
 1 Million Gallons of Drinking Water Each Year!





Pupil Transportation & Maintenance Facility
45,000 Gallon Capacity

Rainwater harvesting system - approximately \$220K initial cost

- Saves over 1M gallons/year - \$8500/year in municipal fees saved.
- Initial costs are primarily offset by the reduction in civil infrastructure
- elimination of storm water piping, structures, smaller BMP, etc. approximately \$130K or more in aggregate.
- ROI of approx. 10-11 years + continued savings after payback - (Note, increase cost of water supply over life cycle not taken into account.)



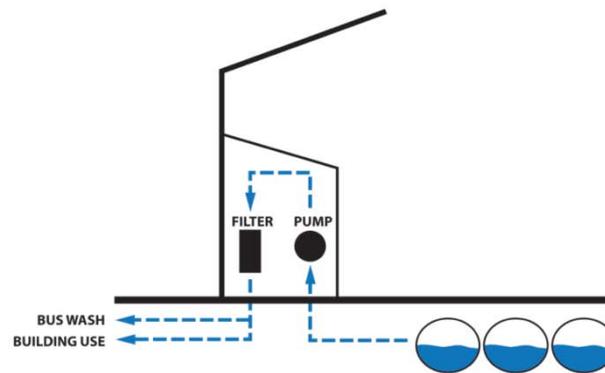
RAINWATER USE

How is the water distributed and used?

The rainwater collected and stored in underground cisterns is used for the buildings' toilets, urinals, non-potable sources, and bus washing.

The water is pulled by pumps from the cisterns and filtered with UV light. Water for use in the buildings' toilets and urinals is dyed blue.

By using rainwater for bus washing, toilets, urinals, and non-potable uses, this facility saves over 1,000,000 gallons of municipal water annually.





RAIN WATER HARVESTING

Rainy days can create a huge amount of water. You can see this when the streets and waterways overflow during or just after a rain storm. This happens because all of the water that falls off a typical house or building is normally directed into the storm sewer pipes and local systems. During a heavy rain, the system is overwhelmed. At Great Neck Middle School all the rain water that falls on the roof is collected into the storage tanks thereby resolving the storm water input of GNMS on the local storm systems.

How?

- Rain that falls on the roof flows down a series of pipes and is collected in two large underground 300,000 gallon rainwater cistern tanks under the bus loop and near the softball field.
- This water is then filtered and pumped from the storage tanks to where it is needed for irrigation and flushing toilets. Remember this every time you flush a toilet or see the sports field being irrigated!

Though water is a renewable resource, it is also a limited resource. It is projected that in the future as the freshwater dwindles, it will be more valuable because, like oxygen, it is vital for human life to exist.

It takes 0.002906 kWh (Kilowatt hour) for the local water treatment plant to treat and pump one gallon of water to a home or building. This means that each gallon of drinkable water has actual energy in it (embodied energy). By localizing this process and utilizing the rainwater to flush toilets, this energy is reduced thus decreasing the overall carbon emissions embodied in a gallon of water.

Great Neck Middle School saves 916,936 gallons of drinkable water annually. That's a 362.5% water savings compared to the same building with no rainwater harvesting.



Great Neck Middle
300,000 Gallon Capacity





College Park Elementary

45,000 Gallon Capacity

RAINWATER CISTERNS

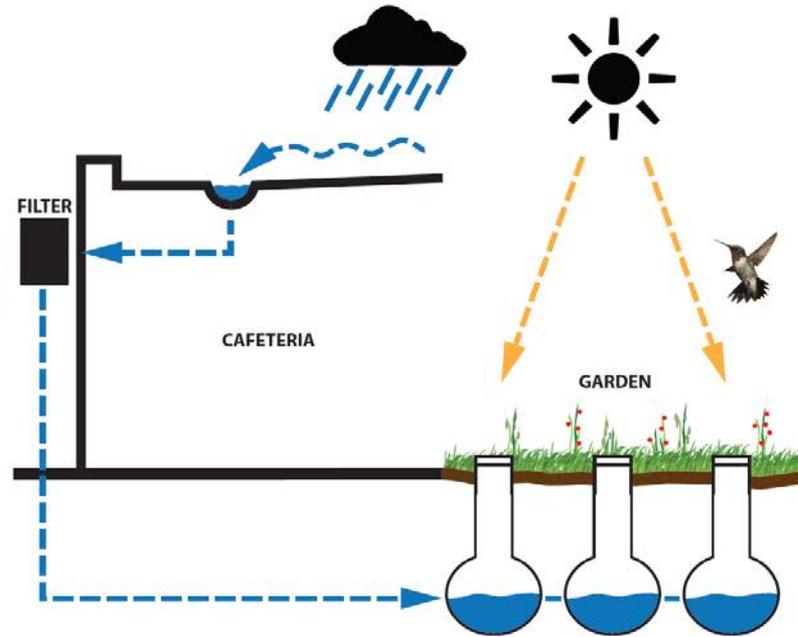
Where is all the rainwater stored?



The school's roofs collect rainwater to be reused in toilets and irrigation. When it rains, the water runs off the roof, through filters, and then into underground cisterns.

Try this! The next time you go to the cafeteria, go outside to the garden and look for three round lids on the ground. Right underneath those lids are where all the rainwater is stored in three big cisterns.

The three cisterns are as big as the cafeteria!



VIRGINIA BEACH CITY

Rainwater harvesting system - approximately \$150K initial cost

- Saves over 500,000 gallons/Year - \$4300/year in municipal fees saved.
- Initial costs are primarily offset by the reduction in civil storm water infrastructure and coupling the rainwater tanks for use with the geothermal system's energy reduction - \$105K total.
- ROI of approx. 10 years + continued savings after payback - (Note, increase cost of water supply over life cycle not taken into account.)



GROWING SUSTAINABLE CITIZENS

Using the Building as a Teaching Tool for Storm Water Retention

The **Educational Courtyard** is a living model of sustainable growth and irrigation, recycled materials, and bio-retention/water infiltration.



Rainwater Runnels



Infiltration Garden

100% Storm Water Retention and Infiltration for a 10-Year Storm



Site Aerial

Infiltration gardens in the parking islands reduce run-off.

Sloped roofs collect water like a leaf



Water collects in above-ground cisterns with visible monitors and is reused to irrigate playing fields.



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Kellam HS
103,400 Gallon Capacity

School Name	Year Opened	Const. Cost	Regional Average	LEED Status	LEED Cost	% of Project
Hermitage Elementary	2005	\$102/SF	\$130/SF	Certified		
Windsor Oaks Elementary	2010	\$158/SF	\$189/SF	Silver		
Renaissance Academy	2010	\$187/SF	\$203/SF*	Gold	\$1.45 Mill	2.2%
Virginia Beach Middle	2010	\$198/SF	\$232/SF	Silver	\$1.17 Mill	2.5%
Great Neck Middle	2011	\$156/SF	\$236/SF	Gold (Projected)	\$525,000	2.4%
Pupil Transportation	2011	\$176/SF	NA	Platinum	\$375,000	1.7%
College Park Elementary	2011	\$190/SF	\$234/SF	Platinum (Projected)	\$1.48 Mill	1.45%
Kellam High School		\$214/SF	\$232/SF	Gold (Projected)		

Regional Average Data provided by "School Planning & Management's" Annual School Construction Report.