



## Overview

RainStay grew out of an environmental initiative of the Charles River Watershed Association (CRWA) in response to threats faced by the Charles River and the citizens who rely on the river. Ongoing development within the watershed has increased demand for drinking water drawn from the watershed while an increase in impervious surfaces such as roofs, parking areas and roads has disrupted the natural replenishment of groundwater. In many towns, storm water that once sank through the soil now runs into street drains to be combined with sewage. The combined effluent is then treated and piped out of the watershed. Meanwhile residents water their lawns and gardens with water drawn from the ground or with municipal drinking water. The combined effect of these events is an increased volatility of stream flow and a general decrease in the quantity of water in the river.

After studying the river and documenting this trend for many years, CRWA developed a strategy to protect the river and its watershed. The principal goal is to keep water local, so that less water is piped to where it is needed and less water is piped away from where it originates. As the largest and oldest organization devoted to watershed protection in the country, CRWA has long been a leader in creating and exporting new protection methods and technologies. The result of the initiative was a design for a system to store and utilize rainwater that is flexible and well adapted for the harsh New England climate. A successful system:

1. Provides a “usable” amount of water for watering or other outdoor use by collecting and storing rain water, thus decreasing the demand on other sources of water.
2. Prevents runoff of roof water into storm drains or into rivers and streams thus decreasing combined sewer overflows or stream flow volatility.
3. Helps recharge groundwater sources so that more water is available to keep rivers running and wells producing during dry times.
4. Controls rainwater flow so that surface or basement flooding is prevented.

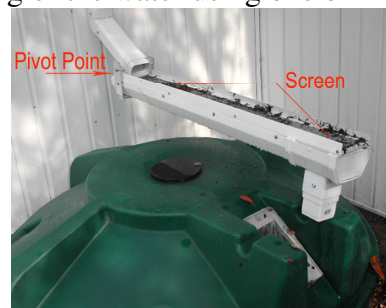
## How SmartStorm Works

Each RainStay System is customized for the location where it will be installed. However, each system includes the same basic components and has some of the same requirements. Rainwater is collected in gutters and is filtered before being stored either in individual 400 gallon tanks or in an underground vault. An electric pump connected to a garden hose is used to access and distribute the water. Any excess overflow as well as all water during the winter is directed to a drywell that discharges it underground. The siting and number of tanks or vault and the size of the drywell needed are dictated by the size of the roof and nature of the grounds. A RainStay system alone will not provide enough water to keep a typical lawn green all summer. It is intended to provide water for gardening, outdoor cleaning and to supplement regular lawn watering.

### Description of SmartStorm Components

- **Collection and cleaning**

Rainwater entering the system is collected from the roof. Gutters and downspouts are needed for this but are not included in the typical installation. It is best to site the storage tanks as near to a downspout as is practical. Modification of existing downspouts to redirect flow to the storage tanks is part of the installation process. Often a system will initially collect water from just one or two downspouts. Later on, additional rainwater can be directed to the system by modifying gutters and/or downspouts. Roof water typically contains a fair amount of large detritus from the roof such as leaves, as well as smaller particles such as pollen and dust. To prevent these contaminants from entering the system a number of cleaning steps must be taken. First off, if your roof is in close proximity to tall trees it is a good idea to have standard barriers installed on gutters to keep out the majority of leaves. The next step is a more thorough filtering of the water using one of several methods. The simplest is a self cleaning screen at the base of the downspout, (shown here in its raised position). Water exiting the downspout falls through into the tank while debris is washed off the open end. Finally, water enters the tank through a fine mesh bag sealed to the tank with an aluminum frame. This serves the added purpose of keeping insects such as mosquitoes from



entering the tank to breed. The advantage of the above- ground system is that it is easy to clean and all of the collected rainwater enters the system.

For underground vault installations, the drop through type of screen filter is not used. Instead, rainwater must first be collected from all downspouts into a single underground drainpipe. This water is fed into a self cleaning debris

separator. The debris and a small amount of water are piped away from the system while the majority of rainwater is directed into the buried storage vault. The advantage of this system is that all components are installed underground and out of sight except for a lockable access port at ground level.

- **Storage**

Rainwater is stored either in a series of interconnected 400 gallon SmartStorm tanks or in an underground vault. The tanks are each approximately six feet tall and four feet wide. The tanks are made from heavy duty dark green polyethylene, roto-molded and containing a UV inhibitor. The tanks were designed to be strong enough to stand alone above ground or be completely buried. Standard installation calls for the tanks to be buried five feet into the ground. The top section can be removed for inspection or periodic cleaning. For safety, each tank lid is attached with stainless steel tamper-resistant screws. Inside the tank a removable platform prevents anyone gaining access to the tank from falling to the bottom. The tanks are connected to each other with three inch PVC pipe and special seals to prevent leaks. Any number of tanks can be strung together and will fill simultaneously. These tanks were designed and manufactured in Massachusetts specifically for this application.

The vault system is even simpler. It consists of a block of RainTank® wrapped in Geotex fabric and then an impermeable membrane. The size and shape of the storage vault can be varied to suit the installation site. The material used is the same as that used in the drywell – as described below.

- **Water Retrieval**

Three types of pumps are available for use with the system. The first is a standard shallow well jet pump with a pre-charged pressure tank. This is the type of pump many homeowners use for domestic water wells. The pump automatically turns on whenever a faucet or hose end is opened for use. This pump works best where it can be installed indoors as it must be protected from the weather. A second type of pump is the all weather stainless steel sprinkler pump. It is smaller, lighter and less expensive. It does not include a precharged tank or pressure switch. Water flow is controlled by turning the pump on or off with its weather-proof switch. We also now offer a submersible two stage in-tank pump. This pump has the advantage of pushing the water rather than pulling it from the tank. It can be configured so that the piping to the faucet is well below the frost line, eliminating the need for seasonal disconnecting and storage.

For Standard tank installations, the pumps are controlled by a float switch in one of the storage tanks that prevents the pump from operating dry. For underground vault systems a special electronic pump control switch is used.

- **Groundwater Recharge**

After a rain event has filled the storage tanks, water is directed to an internal overflow system and is piped to a special drywell. The drywell is made from 85%

recycled polypropylene, formed into a structurally strong matrix. A drywell “unit” is approximately 1/2 cubic meter in size and is 94% empty space. A series of units form a larger block that is wrapped tightly in heavy duty landscaping fabric. The entire assembly is buried and connected to the storage tanks or vault with three inch PVC pipe. When properly covered with soil, the drywell is invisible, very efficient and can withstand the weight of vehicles above. A valve in a storage tank allows all water entering the system during the winter to flow directly to the drywell. For underground vault storage systems, only the overflow is directed to the drywell and the system remains filled during the winter.



Here is an Example of a really large drywell being assembled

### The Installation Process

Installation of a Smartstorm system generally takes two weeks from start to finish with all the work done by one person. I have all of the equipment and materials immediately on hand to complete an installation assuming no extraordinary circumstances are encountered. The first step is excavation of an area to hold the tanks. Each tank requires excavating an area five feet by five feet and 4 ½ feet deep. The tanks are usually placed in a line, but any configuration is possible. The tanks are adjusted to be level with each other so that they will fill and empty in unison. Connections are made at the bottom of the tanks – well below the frost line.

The next step is to excavate for placement of the drywell. The size and shape of the drywell will be determined by the expected



volume of water it will receive and the permeability of the soil where it will be sited. Typically, the entire drywell is assembled and transported as a unit. Then it is carefully



lowered into the prepared excavation site. An overflow and drain system is installed in one of the storage tanks and is then connected to the drywell with an underground pipe. All connections and fittings are tested prior to backfilling. A draw pipe and foot valve is installed in one of the tanks and one inch PVC piping is laid to deliver water to the pump.

Two options are available for pump placement. The draw pipe can be routed through the foundation to a jet pump located in the basement. A second outflow pipe is connected to a standard hose bib outside the house. The second option is to connect the draw pipe to an outdoor sprinkler pump. A hose can be connected directly to the pump. When water is needed the pump is simply turned on. Both types of pumps are controlled by a float valve that prevents operation when the tanks are empty.

The last phase of the installation is backfilling and landscaping the area. I will bring in loam and reseed any disturbed areas. There will be up to eight yards of left over soil from the excavations.