



Capturing the Sun's Heat

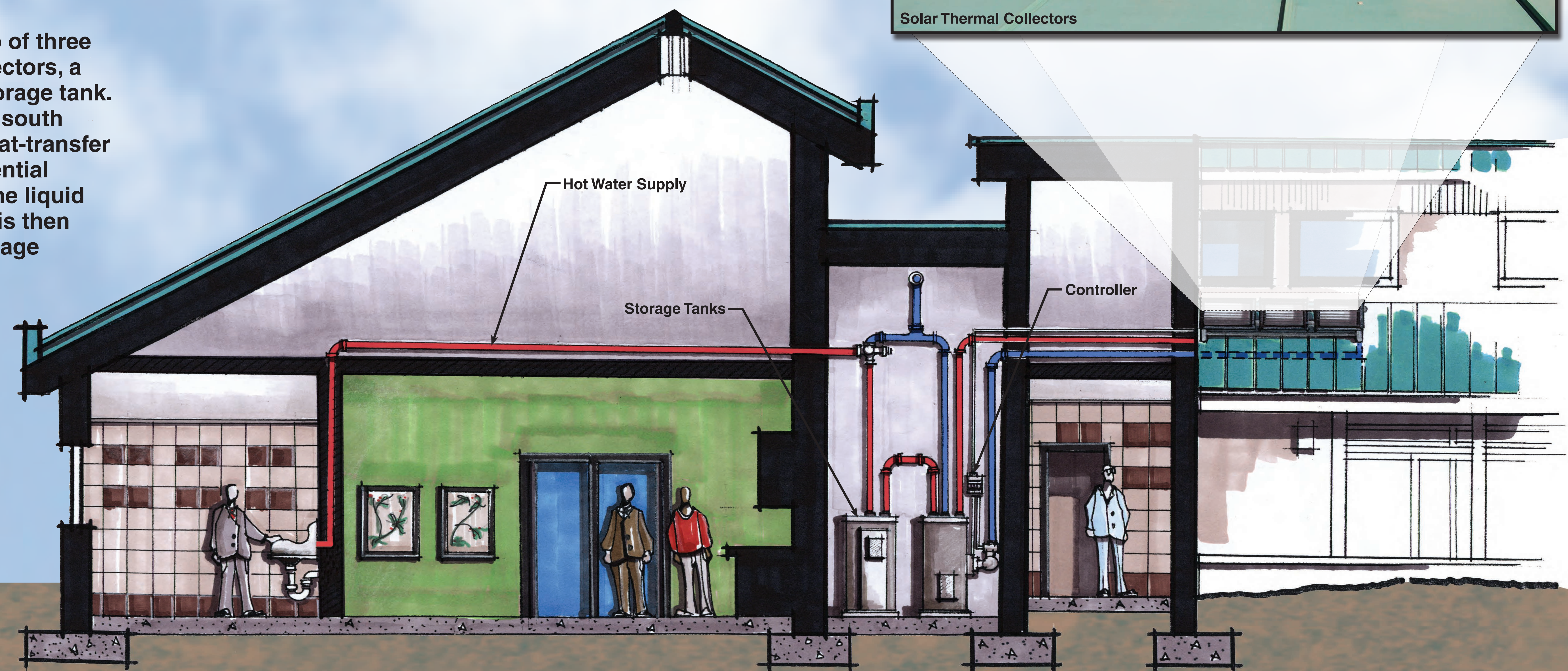
Solar Hot Water

Solar hot water systems are perhaps the most widely used green energy technology. They can provide year-round hot water for homes and commercial buildings and are one of the most cost-effective solar energy technologies available.

Solar thermal energy is the use of sunlight to produce heat. Much like the way the sun heats a parked car on a sunny day, solar thermal energy is collected and used to heat water.

The solar hot water system used here is made up of three basic components: a series of solar thermal collectors, a differential temperature controller, and a solar storage tank. The three solar thermal collectors located on the south facing roof capture the sun's rays causing the heat-transfer liquid inside each collector to heat up. The differential controller switches on a circulation pump once the liquid reaches a certain temperature. The heated liquid is then pumped to a heat exchanger inside the solar storage tank where the water to be used in the building is heated. When the heat-transfer liquid moves through the exchanger inside the solar storage tank it cools and is then pumped back to the collectors to be reheated.

Although our solar hot water system only operates during daylight hours, the solar storage tank is large enough to provide the hot water typically used in a 24 hour period. Whenever there is heat available in the solar thermal collectors, the differential temperature controller keeps the heat-transfer liquid circulating. During cold nights, the heat-transfer liquid is drained back inside the building to avoid freezing. A traditional water heater provides back-up during extended periods of cloudy weather.



Harvesting Rainwater

Rain Catchment System

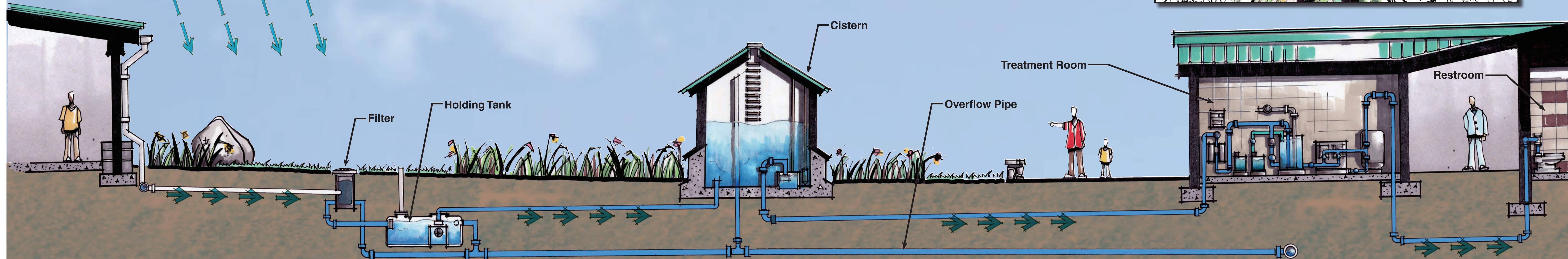
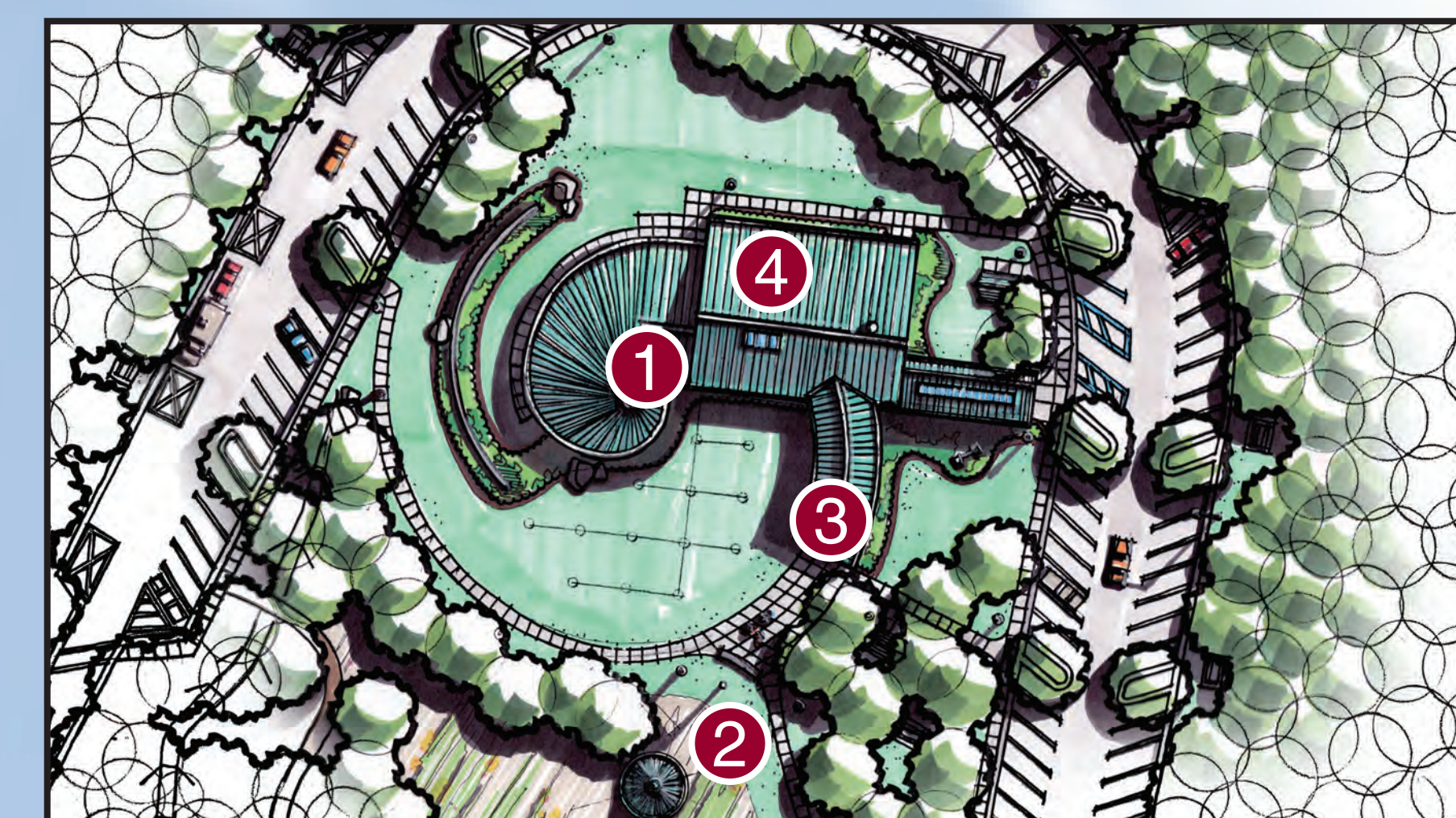
Harvesting rainwater and storing it is an ancient practice that is becoming more common as water conservation efforts increase. Harvested rainwater can be used many ways. It can be used for irrigation, laundering, and general cleaning. If it is properly treated, it can even be made potable and used as drinking water.

At the rest area, harvested rainwater is used to flush toilets and urinals. Using rainwater for this purpose is beneficial because it reduces the total amount of potable water required by the facility. Early estimates indicate there is significant reduction in the amount of municipal water needed when harvested rainwater is used as a substitute.

Rainwater harvesting also has a positive impact on the surrounding environment. When rainwater is harvested, less runoff enters our storm drainage systems. This in turn reduces the amount of sediments and pollutants that are deposited into nearby rivers, lakes and streams.

The rainfall harvesting system at the rest area uses the building's gutter system to capture rainwater from the 10,000 square foot roof. Once captured, this rainwater is piped to a catchment system where it is filtered and stored in a 26,100 gallon above ground cistern. As water is needed for flushing, the harvested rainwater is pumped from the cistern to a water treatment room. There it is filtered again, chlorinated and pumped back to the building for use.

Because rainwater has so many uses, rainwater harvesting has become especially appealing to homeowners, businesses and governmental agencies. Rainfall harvesting systems can be sized to fit most any application and budget. Storage vessels can be found for above or in ground applications and in a huge array of sizes from large cisterns to the simple rain barrel.



① COLLECTION

② STORAGE

③ TREATMENT

④ REUSE



Converting the Sun's Energy

Photovoltaic System

Due to the demand for renewable energy resources, solar power is becoming a valuable part of the world's energy mix. Businesses and homeowners are using the sun's energy to supplement or replace conventional power sources. This is possible with the use of photovoltaic technology.

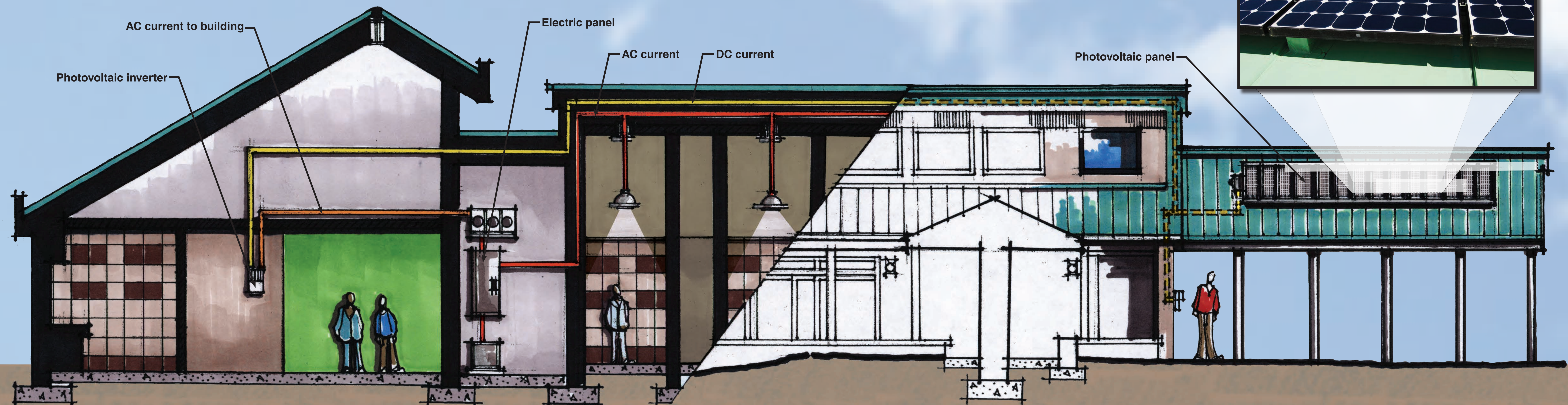
Photovoltaic technology was discovered in 1954 by scientists at Bell Telephone. The scientists discovered that an element found in sand, known as silicon, created an electric charge when exposed to sunlight. Photovoltaic technology was first used to power space satellites and small consumer electronics like calculators and watches. Today, individual photovoltaic systems create power for homes, schools, office buildings and businesses throughout the world.

Solar power systems convert sunlight into electricity using photovoltaic cells. PV cells are made up of at least two layers of semiconductor material. One layer has a positive charge, the other negative. When sunlight enters a cell, some of the photons from the light are absorbed by the semiconductor atoms. This frees electrons from the cell's negative layer allowing them to flow through an external circuit and back into the positive layer. This flow of electrons produces electric current that can be drawn off and used by the rest area.

The PV cells mounted on the covered walkway were installed at a fixed angle facing south. Correct positioning and orientation of these cells was important so that the maximum amount of sunlight might be captured. Of equal importance were the number and arrangement of PV cells. This determines the amount of electricity the system is capable of producing. The photovoltaic system utilized here at the rest area is

capable of producing on average 12 kWh of power per day, which supplements the total amount of power used at this site.

Because photovoltaic technology gives man the ability to harness sunlight, the earth's most available energy source, photovoltaic systems will play an even larger role in future energy production. They are a clean and environmentally sound means of collecting solar energy as they produce no hazardous waste or air pollution and require no gas or liquid fuels be combusted or transported.





Utilizing Daylight

Daylighting

Daylighting is a technical term given to the practice of using natural light to illuminate building spaces. A renewed interest in daylighting has been seen in recent years as a means to appropriately illuminate spaces while practicing energy conservation.

Daylighting capitalizes on natural light by placing windows and reflective surfaces within a building so that efficient natural light is provided during the day. Utilizing a combination of art and science, as well as architecture and engineering, will create the most successfully designed daylighting strategy.

The rest area has been designed to make use of several daylighting strategies. Orientation of the building such that the majority of its windows and

openings face south introduces daylight to public places and provides the opportunity for passive solar heating to temper the building during winter months. Overhangs above windows and openings provide shade to help protect the building from heat gain during summer months. Light colored walls provide reflectivity, magnifying natural light. Daylight sensors, motion detectors and dimming ballast help keep electric lighting use to a minimum.

Energy consumption at the rest area is significantly reduced by daylighting techniques. Daylighting illuminates the building at a fraction of the cost of electric lighting alone, and the natural light creates a more pleasant environment indoors while connecting visitors and occupants to the great outdoors.



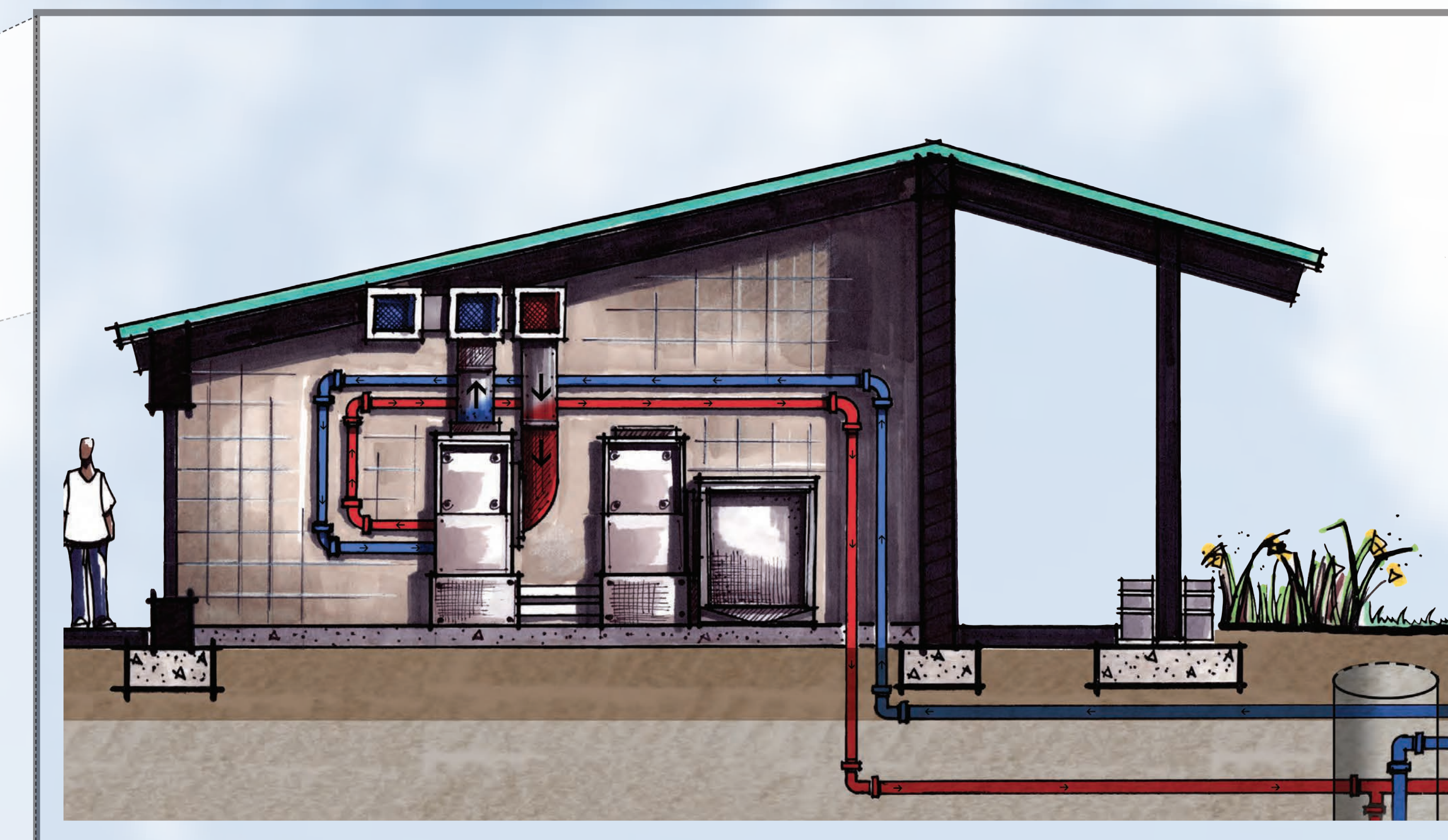
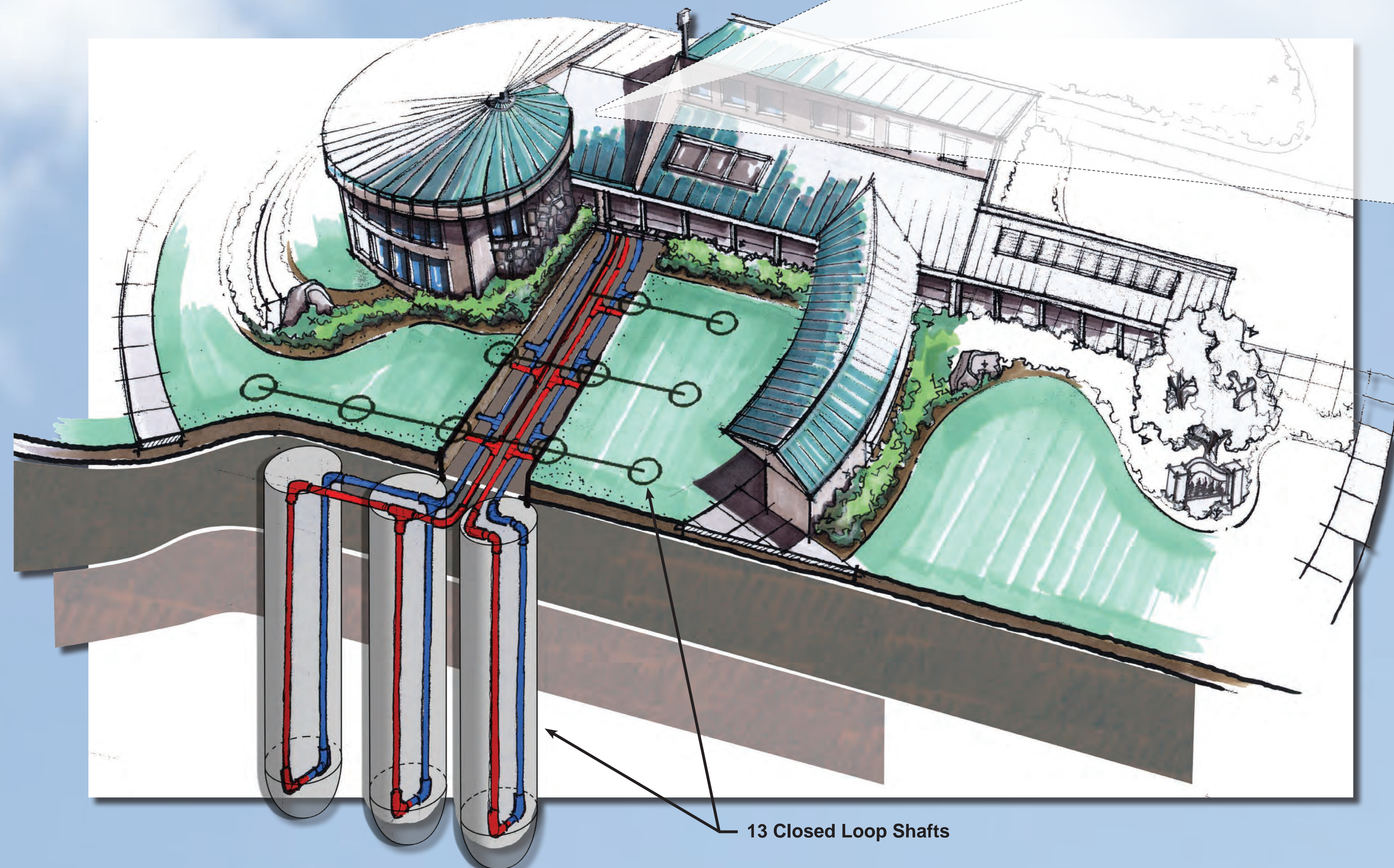


Absorbing the Earth's Energy

Geothermal Heating and Cooling

Worldwide, temperatures below the earth's surface remain constant throughout the year. Man used this knowledge early on by choosing to dwell in caves to take advantage of the geothermal cycle, using the earth as a heat source in the winter and a cool refuge in the summer.

Modern day geothermal heating and cooling is the process by which heat stored in the earth is transferred to a building during the winter months and heat from the air in the building is transferred to the ground during the summer months. This process allows for maximum comfort levels with minimal energy expenditure.



The system utilized at this facility places a series of interconnected pipes, commonly referred to as a “closed loop” in narrow shafts near the building. Water circulating through the loop moves heat between the building and the earth. The water absorbs heat from the earth, or relinquishes heat to the earth, depending on the air temperature in the building.

During winter months, a geothermal heat pump transfers the building's cold air into the system. The cool water circulates through the loop into the ground where it is warmed by the heat from the earth. As it circulates back, the heat pump extracts and concentrates the warmth from the water, and distributes heated air into the building.

To cool the building, the process is reversed. The geothermal heat pump transfers the heat into the water circulating in the loop. The warm water makes its way through the pipes into the earth where the lower ground temperature chills it. The heat pump extracts the coolness, concentrates it and distributes cool air through the building.

It is important to note that since electricity use is only for moving heat, not for generating or removing it, geothermal heating and cooling systems reduce traditional energy consumption, protect the environment and provide a comfortable setting for our travelers.

Make it Clean

Bioretention and Hazardous Spill Basins

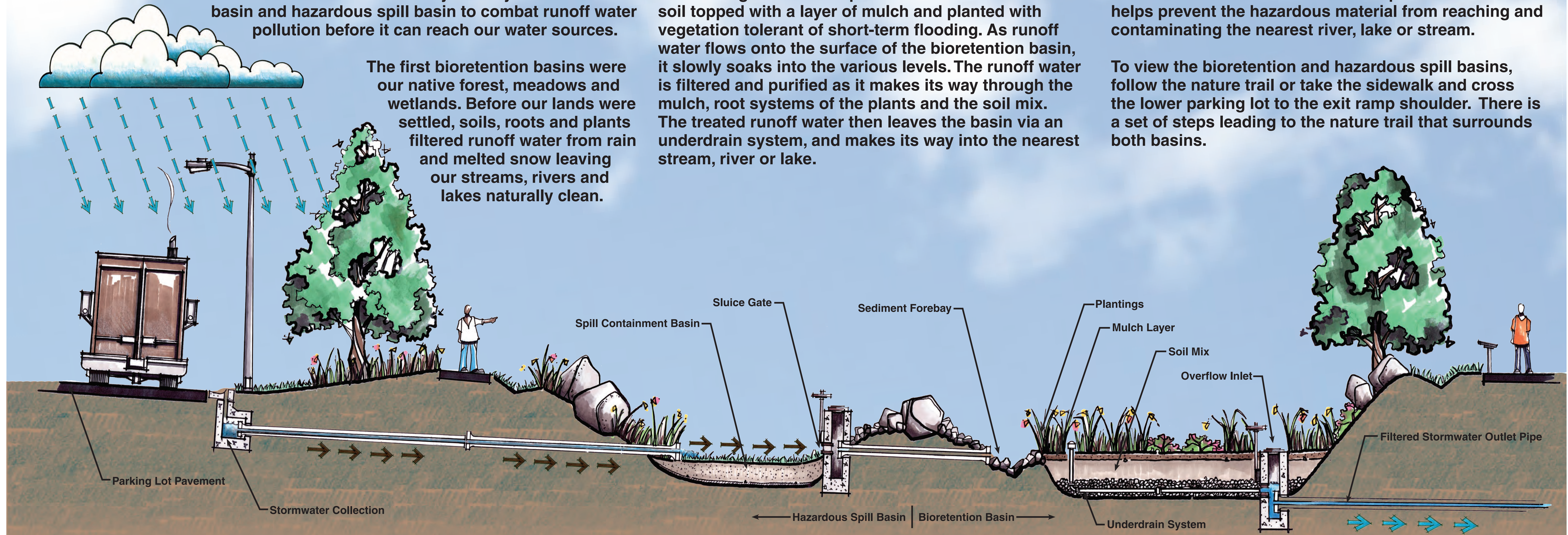
Our native wetlands have been subjected to destruction due to development since the time of early European settlement. Once, stormwater runoff was filtered by nature's water-cleaning systems, but now runoff from roadways, parking lots, and lawns often discharges untreated into our streams, rivers, and lakes. Pollutants found in runoff water, such as silt, oil, and fertilizer, can be harmful to the environment if not removed. This rest area utilizes an environmentally friendly bioretention basin and hazardous spill basin to combat runoff water pollution before it can reach our water sources.

Man-made bioretention basins were first conceived of in 1990 by stormwater specialists in Maryland. Since that time, homeowners, municipalities and organizations have influenced and enhanced the bioretention movement in the United States.

Bioretention basins mimic the function of a native forest ecosystem. They retain, filter and treat runoff water using a shallow depression of well-drained soil topped with a layer of mulch and planted with vegetation tolerant of short-term flooding. As runoff water flows onto the surface of the bioretention basin, it slowly soaks into the various levels. The runoff water is filtered and purified as it makes its way through the mulch, root systems of the plants and the soil mix. The treated runoff water then leaves the basin via an underdrain system, and makes its way into the nearest stream, river or lake.

Hazardous spill basins are containment structures that are used to trap hazardous materials that have been accidentally spilled onto rest area truck parking lots during transport. Under normal conditions, rainwater or melted snow from the truck parking lot is allowed to enter and pass freely through the basin. In the event of a spill, a mechanical control valve known as a sluice gate is closed. The hazardous material is then trapped and stored in the basin until clean-up occurs. This helps prevent the hazardous material from reaching and contaminating the nearest river, lake or stream.

To view the bioretention and hazardous spill basins, follow the nature trail or take the sidewalk and cross the lower parking lot to the exit ramp shoulder. There is a set of steps leading to the nature trail that surrounds both basins.





Keeping Streams, Rivers & Lakes Clean

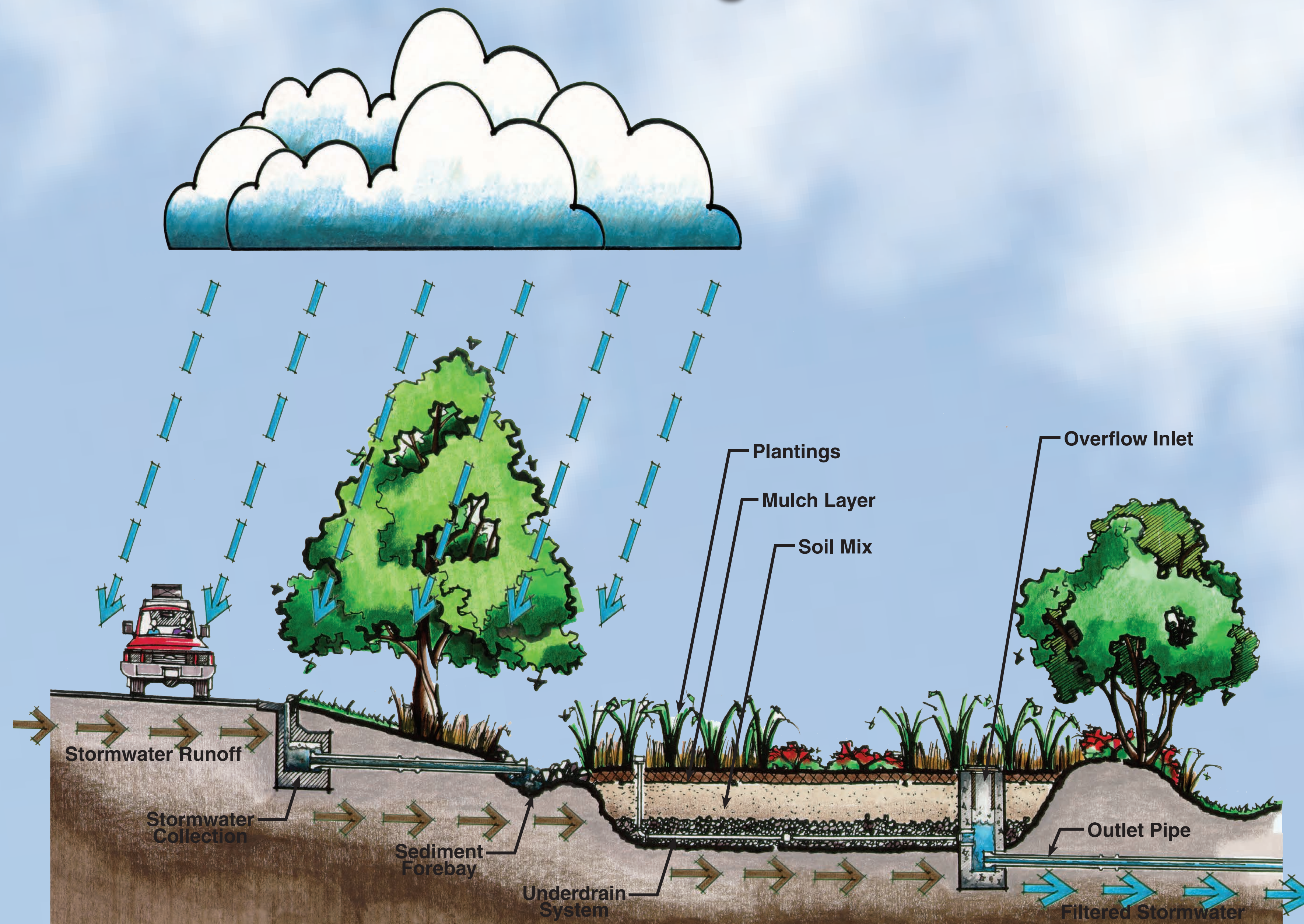


Treating Stormwater Runoff

BIORETENTION BASIN

Pollutants found in rainfall runoff can be harmful to the environment. In an effort to reduce the amount of pollutants found in runoff water, stormwater treatment devices are being utilized on this rest area site. One such device is a bioretention basin as illustrated to the right.

A bioretention basin is a shallow planted depression designed to retain, filter and treat runoff water prior to its discharge into the nearest stream, river or lake. During rainfall events, runoff water collected from the sidewalks, parking lots and roadway surfaces is piped into a sediment forebay where water flow is slowed and heavier particles are allowed to settle. As runoff water flows from the forebay into the basin it slowly soaks through layers of soil and mulch. Pollutant removal takes place by way of absorption, microbial activity, plant uptake and filtration. Once treated, the water is released from the basin



through an underdrain system and outlet pipe.

Bioretention basins are better known as rain gardens. While the two terms may be used interchangeably, rain gardens are usually built on a much smaller scale and do not have an

underdrain system. Rain gardens are especially appealing to homeowners and small businesses because of their ease of installation, beauty and low maintenance requirements. They can be sized and shaped to fit any application and landscaped with a variety of plants to compliment any surrounding.

BIORETENTION PLANTS

Landscaping is critical to the function and appearance of all bioretention basins. Plants are needed to encourage biological and bacteriological activity in the soil and to establish a diverse vegetative cover that will aid in the treatment of stormwater runoff through the capture of pollutants. Plants used in bioretention basins are selected for their ability to adapt to periods of both wet and dry conditions while surviving high levels of pollutant build-up.

Since most bioretention basins are designed to replicate the functions of a native forest ecosystem, a combination of trees, shrubs, grasses and herbaceous plants are used. Plants tolerant of short-term flooding are used in the shallow depression area of the basin where runoff water is retained, filtered and treated. At the basin's edge and on its side slopes that remain primarily dry, upland species are most suited. Pictured are a few of the native plant species typically used in our bioretention basins.



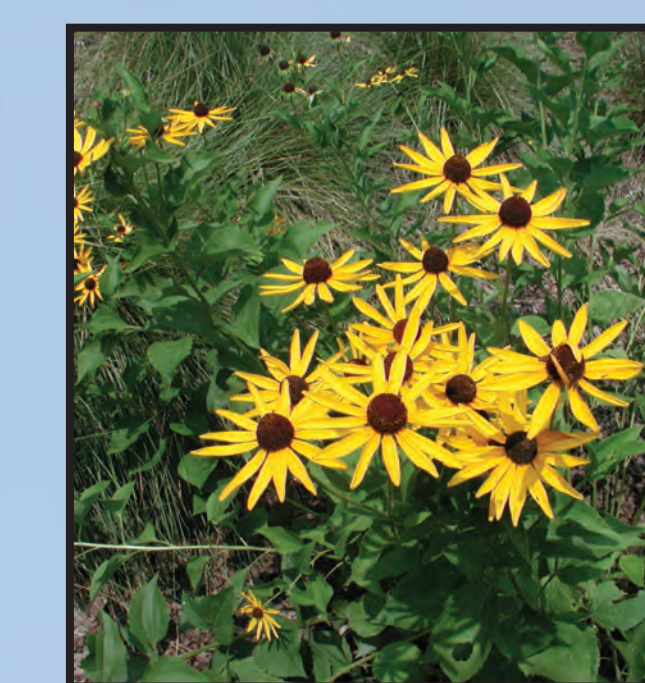
Winterberry



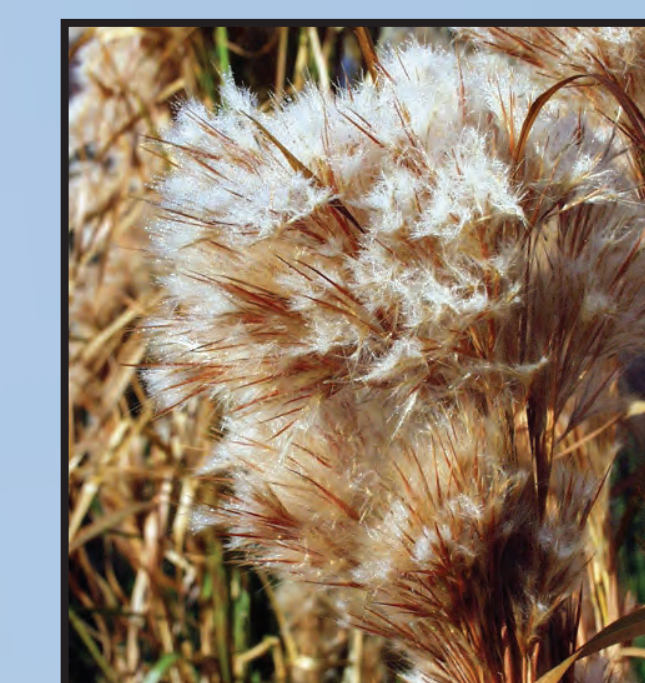
Woolgrass



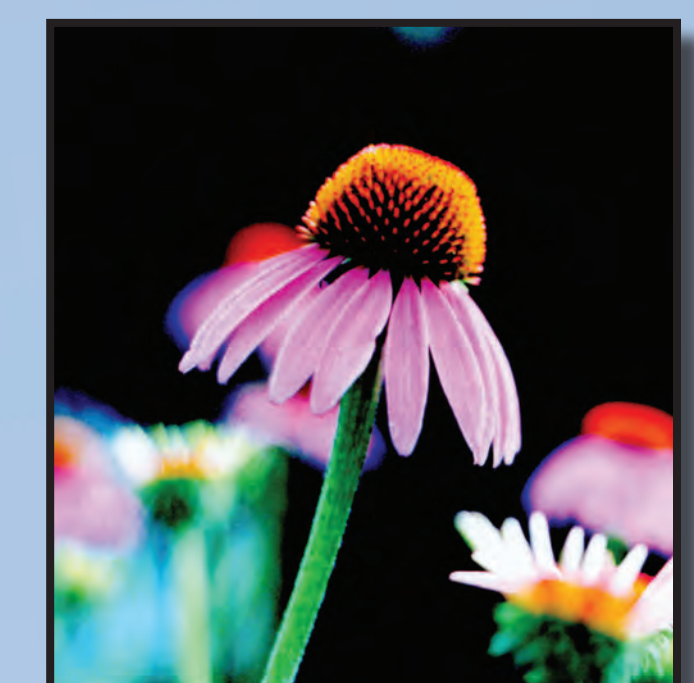
Joe Pye Weed



Rudbeckia



Bushy Bluestem



Echinacea



Walk with Nature

Nature Trail

A 0.6 mile nature trail has been provided at the rest area so that travelers might take the opportunity to relax, exercise and see some of the sustainable initiatives that are being utilized at this site. It was constructed to follow the existing terrain of the site so that no additional wooded



areas would be disturbed. As a result, only small saplings and underbrush were removed to establish the trail footprint. Due to the sloping topography of the rest area site, a series of steps have been provided to give access to the upper and lower trail sections. Log benches located

along the trail provide a place to relax and enjoy the day or take a needed rest. They were made by hand from several large hardwood trees that had to be removed in order to build the entrance and exit drives.

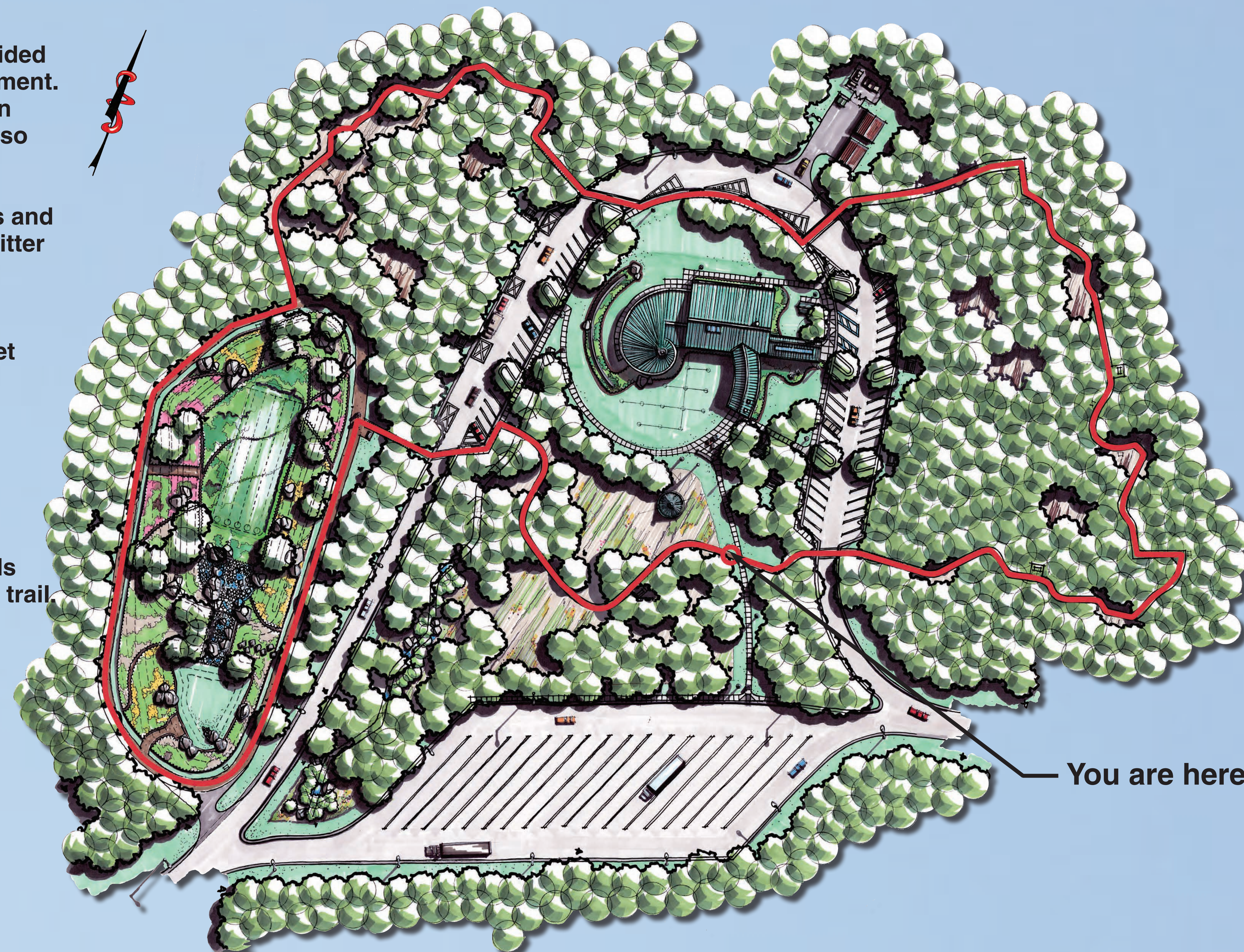
Approximately 2000 cubic yards of wood chips were created on the site from trees that had to be cleared for the construction of the roadway, parking lots and building. These chips were used as the walking surface of the trail. These recycling efforts significantly reduced the amount of clearing debris that normally would have been hauled off site for disposal.

While walking the trail one will find a collection of informative signs containing information on nature topics. Test your knowledge with the questions at each location and see if you answered correctly at the next sign.

The nature trail is provided for your use and enjoyment. Please help us maintain it so that others may also enjoy it.

- Please recycle bottles and cans and place your litter in the nearest waste container.
- Clean up after your pet and keep it leashed.
- Leave the plants and flowers for others to also enjoy.
- Respect all wildlife. Do not disturb animals you encounter on the trail.

ENJOY YOUR WALK!





Look and Learn

Site Plan



GEOTHERMAL HEATING AND COOLING

Ground temperatures just below the earth's surface remain relatively moderate and constant throughout the year. The geothermal heating and cooling system used at this rest area takes advantage of the earth's moderate ground temperatures as it transfers heat stored in the earth to the building during the winter months and transfers heat from the building to the earth during the summer months.

NATIVE PLANTS

As a part of the 'green initiative', native plants were selected to revegetate the rest area site. Native plants possess certain traits that make them uniquely adapted to the local climate and soils. They exist harmoniously with other plant and animal species within their local community maintaining a balanced ecosystem.

BIORETENTION BASIN

Pollutants found in stormwater runoff can be harmful to the environment. In an attempt to remove pollutants found in runoff water a bioretention basin is used at the rest area. As stormwater enters the basin it slowly soaks through the mulch and soil layers where pollutant removal takes place by way of absorption, microbial activity, plant uptake and filtration. Treated water is then released from the basin through an underdrain system and outlet pipe.

HAZARDOUS SPILL BASIN

Hazardous materials can be introduced into the environment when accidents occur. To reduce this risk, hazardous spill basins are installed at rest areas. A hazardous spill basin is a containment structure used to trap a hazardous material that has been accidentally spilled in the rest area truck parking lot.

SOLAR ENERGY

The photovoltaic panels used at the rest area convert sunlight into useable electricity and reduce the amount of conventional energy needed. Solar thermal collectors are used to capture the sun's heat to produce cost effective hot water and reduce the amount of electricity needed to heat water.

PET WASTE STATIONS

Pets provide their owners much comfort and companionship however few pet owners realize that bacteria, parasites and viruses found in pet waste can be harmful to water quality and human health. Pet owners are encouraged to pick up after their pet using the disposable bags provided at each station and dispose of the waste in the nearest trash receptacle.

CISTERN

Harvesting rainwater and storing it for later use not only reduces the demand on the earth's fresh water supply but helps reduce run-off, erosion, and the contamination of surface waters. The rainwater catchment system at the rest area captures and stores rainwater in a 26,100 gallon above-ground cistern. This rainwater is filtered, pumped back to the building and used to flush toilets and urinals.

NATURE TRAIL

Taking frequent breaks while traveling can increase one's alertness and make the road a safer place for all to use. The nature trail that encircles the rest area provides travelers the opportunity to relax, exercise and see some of the sustainable initiatives that are being utilized at this site.

NIGHT SKY FRIENDLY LIGHTING

Around the world the excessive use of inefficient outdoor lighting has created an epidemic of light pollution that threatens our nighttime environment. The energy efficient and night sky friendly light fixtures used at the rest area direct light to the ground and prevent the spread of light into areas where it isn't needed or wanted.

