

# Beneficial Use of Reclaimed Water in Delaware

## WHAT IS RECLAIMED WATER?

Reclaimed water is water that has been recovered through the treatment of wastewater at wastewater treatment facilities (WWTF's). Reclaimed water routinely contains macronutrients (nitrogen, phosphorus and potassium), suspended solids, and small quantities of bacteria, salts and metals. Before it can be reused, however, wastewater must undergo significant levels of treatment and disinfection to eliminate odors and destroy pathogens (disease causing organisms), in order to protect public health and the environment.

## WHERE IS RECLAIMED WATER USED?

Depending on the level of treatment provided, reclaimed water can be applied to agricultural fields, golf courses, forests, parks, roadway medians and cemeteries. Currently, every county in Delaware has facilities that reuse reclaimed water, primarily through spray irrigation onto crops.

## WHAT ARE THE BENEFITS OF USING RECLAIMED WATER?

There are numerous benefits of using reclaimed water. By irrigating reclaimed water on the land, the water table is recharged, and the amount of wastewater being discharged directly into Delaware's rivers, streams and bays is greatly reduced. This helps to improve water quality by reducing nutrient loads to our waters.

As development pressures place an ever-increasing demand on Delaware's water supply, many communities are looking at reclaimed water use as a method to conserve and make the most efficient use of Delaware's water supply. In lieu of using potable ground or surface waters, reclaimed water can be used to irrigate golf courses, highway medians, parks, commercial and residential developments. Even during drought emergencies, there are no restrictions on the amount of reclaimed water that can be used.

By applying reclaimed water onto cropland, the need to use commercial fertilizers is reduced or eliminated, saving the farmer both time and money. The nutrients in reclaimed water replace the commercial fertilizers the farmer would typically purchase. The nutrient levels in reclaimed water are more crop balanced than manures, with an average N:P ratio of 3:1. In 2001, over 450,000 pounds of nitrogen and 143,000 pounds of phosphorus were supplied to fields in Delaware from reclaimed water in lieu of using commercial fertilizer.

Use of reclaimed water on farmlands using conventional spray irrigation equipment also helps to preserve agricultural lands and improve on-farm profitability. For example, at dedicated agricultural reuse sites, the farmland is explicitly set aside for the purpose of receiving reclaimed water to grow crops. Virtually all of the nutrients needed to produce the crops are supplied by the reclaimed water. Dedicated agricultural sites are often contracted for use for a 20 to 40 year period. At voluntary reuse sites, on the other hand, highly treated reclaimed water is made available to farmers for routine agricultural purposes, saving the farmer the cost of installing and operating an expensive irrigation system, while supplying supplemental nutrients.

## HOW IS RECLAIMED WATER USED FOR AGRICULTURAL PURPOSES?

In many ways agricultural reuse of reclaimed water is very similar to fertigation (the use of irrigation equipment to apply fertilizer at precise rates). After the sewage is treated at a wastewater treatment

facility, the reclaimed water is tested for a variety of parameters to ensure that the reclaimed water meets appropriate treatment standards. Then, when weather conditions are suitable for irrigation, the reclaimed water is applied to the field at agronomic rates. Agronomic loading rates are determined by the nutrient levels of the reclaimed water and the nutrient needs of the crops being grown, and should be incorporated into the farm managers Nutrient Management Plan.

Reclaimed water is applied onto agricultural fields using conventional agricultural irrigation systems like center pivots, traveling guns or solid set sprinklers. The equipment used to apply the reclaimed water onto agricultural fields depends on several factors including the size and shape of the field, terrain, and proximity to residential developments.



*Beneficial reuse of reclaimed water through agricultural irrigation.*

## IS BENEFICIAL REUSE OF RECLAIMED WATER PRACTICED IN DELAWARE?

Delaware has a long history of promoting beneficial reuse of reclaimed water. Some fields in Delaware have been receiving reclaimed water since the 1970's with no adverse effects to the fields, crop yields or the water table beneath the field. As of 2002, there are 23 facilities permitted in Delaware to apply reclaimed water onto 2200 acres of land. Most of the land used for beneficial reuse is agricultural, but reclaimed water is also used to irrigate two golf courses and several tracks of wooded land.

## WHAT LEVEL OF WASTEWATER TREATMENT IS REQUIRED IN DELAWARE BEFORE RECLAIMED WATER CAN BE USED?

The level of treatment required depends on two primary factors: how the reclaimed water will be used, and the degree of public contact the site may receive. For example, at golf course developments where homes abut greens, fairways are irrigated with reclaimed water, and public access is not restricted. At these sites since public access is not restricted, the highest level of treatment (tertiary treatment) must be provided to guarantee public health protection. Under this scenario, solids and organic concentrations must be below 10 mg/l, fecal coliform levels must be below 10 colonies/100 ml, and a disinfection residual must be constantly maintained. However, on restricted access agricultural sites where buffers from the spray fields are at least 150 feet, and public access is restricted, treatment levels are not as stringent. At restricted access agricultural sites, solids and organic levels should average less than 50 mg/l, fecal coliform levels must be below 200 colonies/100 ml, and disinfection must be provided.

Reclaimed water used at agricultural sites, nurseries, cemeteries or on home lawns as part of a regional distribution and reuse program, must meet the same treatment levels as golf course developments. However, buffers on sites (including agricultural sites) using reclaimed water meeting tertiary treatment levels may be reduced to 50 feet or less, based on the level of treatment provided and the surrounding land uses.



*Reclaimed water used to irrigate golf courses must receive the highest degree of treatment since public contact with aerosols may occur.*

#### **WHAT RESTRICTIONS OR LIMITATIONS ARE PLACED ON SITES USING RECLAIMED WATER?**

Loading rates to sites using reclaimed water are limited both hydraulically (the amount of water that can be applied) and by the amount of nutrients that can be applied. Maximum hydraulic loading rates are based on soil permeability rates determined by field testing. Nutrient loading rates are limited to the nutrient requirements of the crops being grown. Typically, the nitrogen loading rate is the overriding factor which limits the amount of reclaimed water that can be applied to a site.

There are also limits on what type of crops can be grown on fields using reclaimed water. Crops for direct human consumption that receive no processing prior to human consumption, and may be eaten raw, such as strawberries or tomatoes sold at local produce stands, may not be grown on sites receiving reclaimed water. However, any feed crops, ornamental flora, or vegetable/fruit crops that will be processed prior to consumption may be grown using reclaimed water.

Depending on the level of treatment the reclaimed water received, it may be necessary to establish buffers between the wetted field areas and water bodies or property boundaries. The extent of the buffer depends primarily on the level of treatment provided. For example, if secondary treatment is provided, buffers of 100 feet to surface waters, and 150 feet to property boundaries are usually required. However, if the reclaimed water receives tertiary treatment, buffers could be reduced to 50 feet or less.

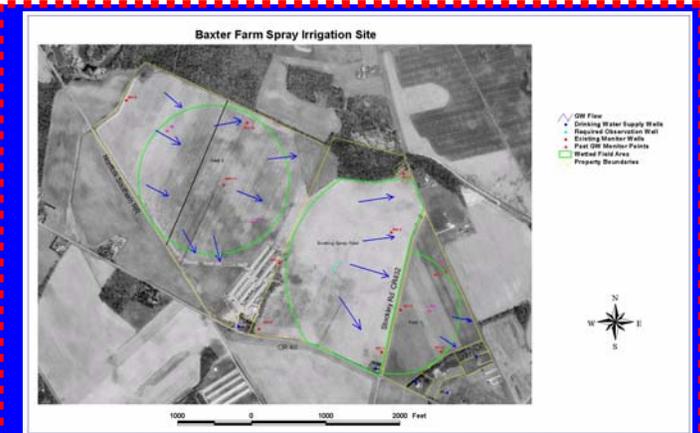
#### **WHAT ARE THE HEALTH AND ENVIRONMENTAL RISKS ASSOCIATED WITH USING, OR COMING INTO CONTACT WITH RECLAIMED WATER?**

If properly managed, reclaimed water poses a minimal impact to the environment. Substances of environmental concern that may be present in reclaimed water include nutrients, dissolved solids, trace

metals, microorganisms and trace organic compounds. These substances are routinely sampled for in order to ensure that their levels are low enough to pose no adverse impact to the environment at approved irrigation application rates.

Also vegetated buffers are placed between the wetted field areas and water bodies to prevent runoff or soil erosion from entering water bodies. Reuse of reclaimed water has been practiced in Delaware for over 25 years. Monitoring data from sites using reclaimed water show that ground water quality is well protected at sites using reclaimed water.

Health concerns arise primarily from concerns of potential contact with pathogenic (disease causing) organisms that may be in reclaimed water. However, if properly treated and disinfected, the use of reclaimed water poses virtually no risk of disease or infection, regardless of how the reclaimed water is used. Numerous epidemiological studies have been conducted on sites receiving reclaimed water. These studies concluded that aerosols from reclaimed water pose no increased health concerns than conventional agricultural practices. However, to provide additional safeguards in Delaware, buffers are established between the edge of the wetted field and residential areas to retain aerosols on site.



*At dedicated reclaimed water sites ground water flow patterns are determined and monitoring wells are installed to verify that drinking water resources are not adversely impacted.*

#### **WHAT DOES THE FUTURE OF RECLAIMED WATER REUSE LOOK LIKE IN DELAWARE?**

The future of beneficial reuse in Delaware looks very promising. For example, several existing wastewater treatment facilities that discharge treated wastewater to Delaware's surface waters are considering land application of reclaimed water as an alternative to stream discharges in an endeavor to reduce nutrient loads to surface waters. Nutrient loadings have been identified as a significant contribution to the degradation of Delaware's surface waters. Some wastewater treatment facilities have even expressed interest in establishing a reclaimed water distribution program, making tertiary treated reclaimed water available to residential developments to water lawns, or to golf courses or agricultural sites for irrigation purposes.

For further information on use of reclaimed water, please contact the Division of Water Resources, Ground Water Discharges Section at (302) 739-4762.

**WATER REUSE: IT JUST MAKES \$EN\$E**