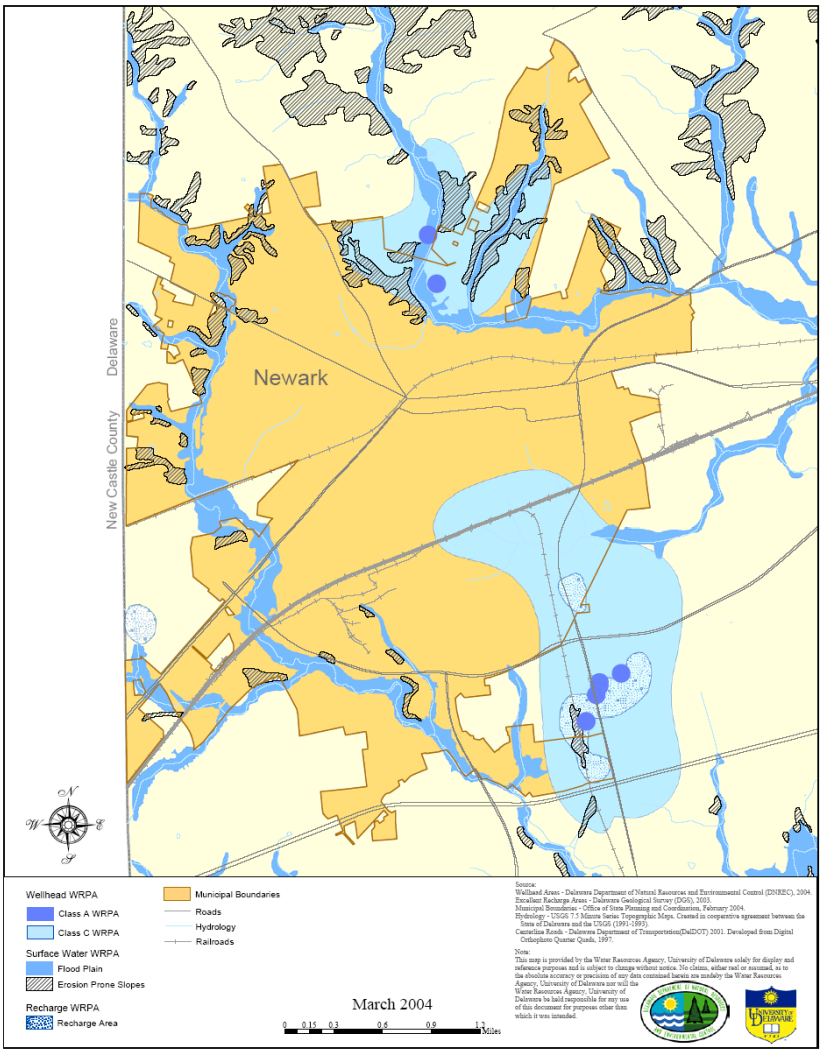
Source Water Protection*

The protection of source water resources (ground and surface water supplies used for drinking and food production) is critical to the economic and environmental health of Delaware and its citizens. Delaware has a finite, albeit renewable, supply of freshwater and as such, protection of public drinking water supplies becomes extremely critical as use increases. Delaware's Source Water Protection Law requires county governments and municipalities with year-round populations of 2,000 or more to develop maps delineating source water assessment areas including surface water, wellhead protection, and excellent groundwater recharge areas. An example of a water resource protection area map is shown at right.



City of Newark Water Resource Protection Area Map

The Source Water Protection Law also requires these governments to create regulations governing the use of land within those critical areas as part of the 2007 updates to their comprehensive land-use plans. While it is mandatory for these groups to regulate the use of land within source water protection areas, **all** local governments and private landowners have a responsibility to assure water quantity and quality is protected and available for future use.

Importance and Benefits of Source Water Protection

From a public health, environmental quality, economic development, public finance, and quality of life perspective, there are few things more important for local governments to ensure for their residents than source water protection. Threats to the quality and quantity of our drinking water sources are increasing, and potential pollution isn't easy to target. Today, our largest threat to drinking water no longer flows from a pipe but comes from materials found on the land such as fertilizer, septic tanks, and animal waste that is carried to our source water supplies by rainwater or snowmelt. From short-term disease outbreaks linked to contaminated drinking water to

*This chapter is taken from segments of the *Source Water Protection Guidance Manual for the Local Governments of Delaware,* "A Toolbox for Protection of Public Drinking Water Supplies in Delaware," written by the University of Delaware, Institute for Public Administration, Water Resources Agency in concert with DNREC.

restrictions on water use during drought periods, we can no longer take our drinking water for granted. Technology alone cannot ensure that our water supplies will meet our need for clean drinking water.

Good Practices For Local Governments

Due to the increasing threat to source water supplies from materials on the land, the following best management practices (BMPs) are a critical tool to protect these resources. Source water protection BMPs minimize the impact of land-use changes and other human activity on the natural environment by effectively reducing the volume of runoff leaving a site, maintaining the volume of natural recharge, and preventing the discharge of pollutants into the source water system.

Land-use tools, such as zoning ordinances and building codes, are often the most effective way to protect surface and groundwater sources. These tools provide flexibility to economically develop land parcels in environmentally sensitive ways given the unique opportunities and constraints of each property.

Zoning ordinances

Local governments can use a variety of alternative zoning tools in a zoning ordinance to protect surface and groundwater sources. These tools are usually implemented through the ordinance, but some may require state enabling legislation. Examples of zoning tools include the following:

Buffer and setback zoning designates linear or circular areas of land along the edges of streams, rivers, or reservoirs upstream of community water supply intakes. This tool is an important protection mechanism since land-use restrictions in the zones reduce the adverse impacts of surface water runoff on drinking water sources.

Cluster development provides options for grouping units in a portion of the total development area. This tool is implemented through cluster zoning and planned unit developments that maintain the overall density of land parcels, but provide flexibility where development occurs and what lands are left in more natural conditions.

Critical area zoning can protect highly vulnerable portions of the source water protection area. This type of zoning imposes restrictions or prohibitions and requires review standards for developments in water supply watersheds, areas with steep slopes, floodplains, wellhead protection zones, significant groundwater recharge areas, and similar sensitive areas.

Density or impervious cover standards protect water quality by limiting the impervious cover or concentration of facilities or activities generating or handling contaminants.

Impact fees collect money from new development applicants based on a formula that calculates impacts on natural resources and local infrastructure caused by development. The fee structure is typically codified within the zoning ordinance. The local government applies the fees to offset the impacts on water quality.

Overlay districts place additional zoning restrictions on top of underlying zoning. Land uses in overlay districts must then conform to the restrictions set for both zones. This approach can be used to identify and set additional protective measures such as impervious cover thresholds for

water supply watersheds, wellhead protection areas, floodplains, wetlands, and significant groundwater recharge areas.

Performance-based zoning uses an impact assessment approach to determine the limitations of the ability of the land to handle proposed development and/or to set design standards to be met by the potential land uses. Proposed developments must meet stipulated restrictions or standards. The regulations can be based on sewage capacity, acceptable volume of surface water runoff, or other relevant factors established for the area in which they wish to locate.

Building Codes

Building codes such as the following can also be used as tools to protect source water:

Building permit limitations are quotas on the number of permits issued in a specified time period or within a specified geographic area to limit the type, timing, distribution, or total amount of new construction.

Excavation, grading, and seeding codes regulate the amount and quality of surface runoff that leaves a site during and after construction.

Impervious surface codes control the proportion of a building site that can be covered by nonporous roads, roofs, parking lots, driveways, sidewalks, and other pavements without capturing and/or treating the runoff.

Porous pavement codes require the use of specific materials such as permeable asphalt, concrete, and crushed stone or gravel; open-celled pavers (such as concrete or plastic grids with voids that are filled with topsoil and seeded or filled with porous aggregate); grass; paving stones; and wood mulch. These materials can be used for street pavements, driveways, parking lots, sidewalks, bike and footpaths, pedestrian plazas, and courts where appropriate to increase the capture, infiltration, and treatment of runoff through the underlying soil.

On-site wastewater systems/septic system codes provide means to treat wastewater from larger lots in rural areas in an environmentally friendly way. Based on a review of nitrogen loading literature, the University of Delaware Water Resource Agency recommends that septic systems be permitted in Delaware source water resource protection areas provided the following conditions are met:

1) The minimum gross residential lot density is 2 acres per dwelling.
2) The minimum soil permeability is 0.5 inch per hour.
3) The depth from the ground surface to the seasonal high groundwater table is more than 5 feet.

Phased development codes regulate the timing of land-disturbing activities on a building site. This protection measure requires that construction be completed to a stage where exposed land is stabilized before another section of the site is placed under construction.

Underground storage tank codes do not permit underground storage tanks containing petroleum products or any hazardous substance in a certain quantity in designated source water protection areas.

It is important to note that nonregulatory approaches are also important in protecting drinking water sources. Pollution prevention, restoration of contaminated sites, acquisition of important

parcels of land or interest in that land, water conservation and reuse, public education, and emergency planning all help to ensure that local water sources provide safe drinking water. Nonregulatory measures also provide opportunities for improving quality of life and involving citizens in meaningful activities that better their communities.

Tradeoffs

Although source water assessment and protection programs can be very costly, the consequences of inaction, including public health, environmental, and economic impacts, are far worse. Local implementation of a source water assessment and protection program can help prevent contaminated public drinking water supplies and costly solutions throughout the state.

The examples in the box demonstrate the enormous public expense, the public health threat, and the environmental impact of addressing contamination through technological solutions after contamination has occurred rather than preventing contamination through a source water assessment and protection program. The threats to public drinking water supplies can be significantly decreased if a source water assessment and protection program is implemented in a community.

Costs of Contaminated Drinking Water Sources

In 2000 Artesian Water Company's Llangollen Wellfield was contaminated with bis (2-chloroethyl) ether (BCEE). BCEE is a chemical used to make pesticides, deodorants, and other products and is most likely a human carcinogen. BCEE contamination has public health, environmental, and economic impacts on the community. In order to correct the problem, Artesian installed a $1-million carbon filtration system to remove all of the organic contaminants, including BCEE, and restored two million-gallon-per-day wells in the Llangollen Wellfield. Artesian was forced to implement a costly solution to the BCEE contamination in order to protect the public drinking water supply.

In 2004, the city of Newark began operation of a treatment plant for its South Wellfield drinking water source. This $3-million treatment facility was built to remove the high levels of iron and manganese present in the water from this source. However, this wellfield is also located adjacent to an industrial park. Testing has found elevated levels of organic compounds in the raw water of a well adjacent to Newark's South Wellfield. Therefore, the city also had to construct an additional treatment unit to remove organic compounds at an additional cost of over $500,000.

These costs, plus additional expenses, could have been avoided if a source water assessment and protection program had been in place to prohibit industrial uses from locating in close proximity to the established wellfields.

Threats to our drinking water are increasing from both point and nonpoint sources of pollution. Technology alone cannot prevent these threats. The source water assessment and protection program is designed to complement the traditional water treatment approach by adding another layer of protection to ensure safe drinking water supplies. In order to ensure that the community water supply remains safe, targeting the most significant pollution sources and preventing the need for corrective action in a fair and equitable manner is necessary.

Important Questions to Ask

- What areas in my jurisdiction need to be protected?

- ∑ Why are the areas vulnerable?
- ∑ What are the sources of possible contamination?
- ∑ What does our current town legislation say in regard to source water protection?
- ∑ What changes to current town legislation are needed to protect our source water supplies?
- ∑ What type of public education is necessary for my residents to understand the need for source water protection?
- ∑ What government and nongovernment groups could be possible partners on source water protection practices?
- ∑ What are the funding sources available to us?

For Further Information

University of Delaware Institute for Public Administration Water Resources Agency
Source Water Protection Guidance Manual for the Local Governments of Delaware, "A Toolbox for Protection of Public Drinking Water Supplies in Delaware." Provides comprehensive instruction on source water protection in Delaware.

Department of Natural Resources and Environmental Control, Ground Water Protection Branch can provide information on the Source Water Protection Program and regulations. (302) 739-4793

***Source Water Protection: A Guidebook for Local Governments*.** Kundell, J. E., and T. A. DeMeo. 2000. National Association of Counties, Conference of Southern County Associations, Georgia Water Management Campaign, in cooperation with the Carl Vinson Institute of Government.