Date Completed: Source Water Protection Program (originally named Well Field Protection Program) legislation was enacted in 1988.

Description: The Source Water Protection Program continues to provide drinking water protection for over 400,000 customers in Dayton and Montgomery County. Dayton’s drinking water comes from the Great Miami Buried Valley Aquifer, one of the most productive aquifers in the country and a designated Sole Source Aquifer. Dayton’s water resources are marketed to enhance business growth and support revitalization efforts.

Project Size: Delineated well field protection areas encompass 6,280 acres in six jurisdictions, and the two well fields serve over 400,000 people.
Ohio: Dayton - Innovative Approach Balances Source Water Protection and Economic Development

Background

Dayton, Ohio and much of its surrounding metropolitan area are situated above the Great Miami Buried Aquifer, which is part of a larger system that was designated as a sole source aquifer in 1988. This aquifer provides drinking water for nearly 100% of the 900,000 residents in the Miami Valley region of southwestern Ohio, including Montgomery County. The Great Miami Buried Aquifer consists of interconnected buried valley and upland systems, with the majority of the water drawn from the buried valley aquifer that underlies the region’s river and stream valleys. The buried aquifers are characterized by sand and gravel deposits, which extend over 250 feet down, and overlain with thin layers of soil covering them, which makes them particularly vulnerable to contamination at the surface.

DID YOU KNOW?

By far, the greatest threat to our groundwater/drinking water supply is from solvents such as trichloroethylene (TCE), tetrachloroethylene (PCE or perc), and other solvents used for degreasing and parts cleaning.

A 21 story building will hold 50 million gallons

40 ounces of TCE in 50 million gallons = drinking water too contaminated to drink

(Power point slide courtesy of the Dayton Dept. of Water)

The two well fields used for Dayton’s public water supply serve over 400,000 people in the metropolitan area, including some jurisdictions outside of the city limits. Dayton’s well fields are located within the urbanized core of the area, amidst industrial and commercial land uses. Land uses in the Dayton area range from highly urban and industrialized to rural and agricultural uses and include such things as highways, railroad lines, petroleum pipelines, an air force base, and an airport. Potential contaminants of Dayton’s source water include:

- Organic chemical contaminants, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, dry wells and septic systems;
• Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, uncovered salt piles, industrial or domestic wastewater discharges, oil and gas production, mining, or farming;
• Pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses;
• Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife;
• Radioactive contaminants, which can be naturally-occurring or result from oil and gas production and mining activities.

Of these contaminants, industrial hazardous substances such as chlorinated solvents pose the largest threat to Dayton's drinking water. Within the well field protection area, there are approximately 300 businesses that handle or store a total of 150 million pounds of hazardous material.

Priority Contamination Threat

The priority contamination threats to the aquifer are from highly urban and industrialized uses including manufacturing and degreasing operations, plating, subsurface petroleum pipelines and oil terminals, highways, railroad lines, and an air force base.
Local Involvement and Developing the Protection Plan

Concern for Dayton's drinking water began in the early 1980's, following several incidents of ground water contamination near the well fields. In 1985, the city took several steps to initiate its ground water protection efforts. First, the city hired a consultant to delineate Dayton's Well Field Protection Area (WFPA) and identify potential sources of contamination -- nearly 700 sources were identified, most of which were affiliated with industrial hazardous substances. Second, the city signed a Memorandum of Understanding (MOU) with the Ohio Environmental Protection Agency (OEPA) that focused on protecting the city’s well fields from incompatible development. The MOU did not specify how this objective should be accomplished, although it did suggest regulation of land use in recharge areas.

Dayton's Well Field Protection Program (WFPP) was enabled through the Well Field Protection Program legislation passed in 1988. (Since 2006, the program has been called the Source Water Protection Program - SWPP - this is the acronym used in the remainder of this document.) The program is operated through the city's Division of Environmental Management, in the Department of Water. Public education and involvement were important factors in developing and enacting the Well Field Protection Program legislation. The Miami Valley Regional Planning Commission (MVRPC) developed an education and outreach program to inform the public about ground water protection, including a slide presentation and an accompanying brochure. These tools were utilized in meetings with citizen groups, business groups and local officials concerned with expanding Dayton's source water protection program. The slide presentation was also shown on a local public television channel and cable stations, which considerably broadened its exposure.

As a result of this outreach effort, the business community became a key stakeholder in developing the SWPP legislation. In response to the concerns of the business sector, the SWPP legislation includes an innovative zoning ordinance that is based on chemical “use intensity” rather than targeting a specific type of commercial activity. Media support in educating the public was an important factor in getting the legislation passed. This ordinance and other components of Dayton's SWPP legislation are described below.

As the city's delineated well field protection areas encompass 6,280 acres in Dayton, Harrison Township, Riverside, Vandalia, Huber Heights, and Wright-Patterson Air Force Base, the SWPP is a multi-jurisdictional program. From 1989 to 1990, the other four political jurisdictions passed ordinances that paralleled Dayton's. In 1990 Wright-Patterson Air Force Base entered into a Memorandum of Understanding with Dayton with provisions similar to the ordinances, the first-ever agreement between a Department of Defense facility and a local government for the protection of the local government’s well fields.

Many risk reduction activities of the program are funded by a customer surcharge on public water rates,
initially $1 per 1000 cubic feet of water. This amounted to about $10 per year for an average household, although it can cost considerably more for some businesses and industrial customers. The Well Field Protection Fund Board was created through the 1988 SWPP legislation to administer this fund. The Board is comprised of the city’s Director of Water, Director of Planning, Director of Finance, and the Montgomery County Administrator. The ordinance specifies a $10 million cap on unencumbered funds, so when the ceiling was reached no funds were collected from fall of 1994 through fall of 1999. Collection was then resumed at $.50 per 1000 cubic feet, half the original rate and is currently at $.60 per 1000 cubic feet. At this rate, about $1.5 million is generated each year. (Dayton SWPP personnel costs and routine operating expenses are borne by the water utility through water rates, not taken from the Well Field Protection Fund.)

Management Measures

The goal of Dayton’s SWPP is to balance a safe, abundant drinking water supply with continued economic development. Some of the most innovative components of the program include land use regulations, assistance and incentives for business owners, and education/outreach efforts.

Land Use Regulations

The 1988 SWPP legislation enacted several separate ordinances to enhance source water protection efforts, including the creation of two new zoning districts. The wellhead operation district (WO) is defined as the property under control of the water supplier, where water supply wells are located. Permitted uses in this area other than water supply, treatment, and operations facilities include parks, playgrounds, golf courses and community centers. The second district is the well field protection overlay district (WP), and includes all property within the well field protection area other than those identified as a WO. The city’s 2,630 acres within the WO and WP make up 7.3% of the entire area of the City of Dayton.

The WP regulations primarily supplement, rather than replace, the uses permitted in the underlying zoning ordinance. Landfills, demolition debris disposal, new underground storage tanks, and dry wells are prohibited in the WP, and there is a required review and permitting process for mineral extraction and mining. The key feature of the WP regulation is the “use intensity” of each site. When the Source Water Protection Program was established in 1988, businesses were required to report their inventory of Regulated Substances based on Material Safety Data Sheets. Businesses were to report the maximum amount of Regulated Substances that they ever anticipated having at their site at one time, and this amount (in pounds) was established as the business’s Total Maximum Daily Inventory (TMDI). According to the 1988 SWPP legislation, a new business seeking to locate in the WP can only do so if
the established limits of the new business do not exceed that of the former occupant of that parcel.
Ordinances in the other jurisdictions contain the same provisions.

**Assistance and Incentives for Business Owners**
To assist potential business owners who wish to locate in the WP, Dayton’s Department of Water has published a “Guide to Starting a Business in Dayton’s Multi-Jurisdictional Source Water Protection Area.” The guide lists substances that are regulated in the WP, lists non-regulated and exempted substances, outlines the steps that new businesses must do in order to obtain a permit (supplemented with an easy-to-read flow chart), explains economic incentives such as the Risk Point Buy Down policy and 0% interest loans (described below), and answers frequently asked questions about the regulations. This guide is available on-line at [http://www.daytonwater.org/uploads/docs/Guide to Starting a Business in the SWPA.pdf](http://www.daytonwater.org/uploads/docs/Guide to Starting a Business in the SWPA.pdf).

To provide property owners in the WP with a financial incentive to reduce their amount of chemical inventory, Dayton developed the Risk Point Buy Down (RPBD) program. To be eligible to receive RPBD funds, an existing or a prospective new property owner must agree to permanently reduce the TMDI for the site. Business owners must also agree to a deed restriction or a conservation easement assuring that the lower TMDI is permanently established for the site. The amount of RPBD funds granted to the business owner depends on the availability of funding, the percent of reduction, and the appraised value of the property. RPBD funds are awarded by the Fund Board in the form of a five-year forgivable loan. Property owners in any jurisdiction in the WFPA are eligible to apply for a RPBD.

Other forms of financial assistance that are available to new or existing businesses in the WP include grants and 0% interest loans for projects that will reduce the risk to the ground water from the business’ operation. Some examples have been ground water investigations, ground water remediation, underground storage tank removals and upgrades, dry well removals, and a building addition to house hazardous waste formerly stored outside.

**Education/Outreach**
One highlight of the Dayton SWPP’s education and outreach program is the Children’s Water Festival, a one-day event held every May for about 1,500 area students in grade 4. The Festival also requires about 400 volunteers to help the day run smoothly. The mission of the festival is to heighten children’s awareness about water resources and their role in helping to protect them. The day is filled with fun and memorable activities that are designed to encourage the adoption of sound environmental values and stewardship roles. Activities include games, experiments, exhibits, and entertaining presentations on ground water, surface water, conservation, land use, and other water-related topics. About 20% of the cost of the Festival is funded by the SWPP Fund, and the remainder is funded by private sponsors (either through financial donations or in-kind support). Sponsors’ names are listed in all Festival publications, and are displayed in exhibit halls and buildings. In recognition of their support, representatives from donor organizations are also invited to a luncheon and given a guided tour of the festival.

The SWPP Multi-Jurisdictional partners are also recognized at the luncheon for their continued support of the SWPP. Since 1995 the Ground Water Foundation has designated Dayton and the jurisdictional partners as a Ground Water Guardian Community.
Another highlight of the Dayton SWPP education and outreach program is a newsletter titled PROGRESS (Promoting Regional Opportunities for Growth Recognizing Environmentally Sensitive Settings) News. Since 1996, Dayton's SWPP has published this newsletter for citizens, businesses, organizations, and jurisdictions affected by Dayton's well field protection program. The newsletter profiles businesses that have reduced their risk of contamination through SWPP programs, highlights Source Water Protection Program staff and events such as the Children's Water Festival, provides risk reduction and pollution prevention information, and provides details on the funding opportunities available through the program. PROGRESS News won a Bronze Quill Award from the Dayton Chapter of the International Association of Business Communicators in 2000, followed by the organization's Silver Quill Award for District 7, which includes all of Ohio, Indiana, and Michigan. In 2003 PROGRESS News received the Best of Show Award in the Technical Publications Category from the Southwestern Ohio Chapter of the Society for Technical Communication.

Contingency Planning

Dayton currently has 104 production wells in operation, but not all are pumped at the same time. They provide operational flexibility in case contamination renders some of them unusable. For example, due to the fire and resulting chemical release at a Sherwin-Williams paint facility in 1987, four nearby production wells were temporarily disconnected from the production system and converted to use for remediation. By 1992, remediation was complete, and the wells were restored to use.

For long-range quantity planning, Dayton is developing a third well field, known as the Miami North Well Field, or the Rip Rap Road well field. When the delineation was done in developing Dayton's SWPP, this well field was included in the model and therefore is already protected by the program. For very long-range contingency planning, Dayton has purchased suitable land along the Mad River in Clark County, Ohio, about seven miles northeast of its Mad River Well Field. No piping exists to this area, thus it would take several years to put this well field into production.

Most experts agree that strategic importance of ground water for global water and food security will probably intensify under climate change as more frequent and intense climate extremes (droughts and floods) increase variability in precipitation, soil moisture and surface water. Dayton is brainstorming on ways that will enable them to be more resilient into the future. The Department of Water is involved in emergency planning at many levels. From assisting the Regional Hazmat Team, Fire Department and
Ohio EPA during environmental responses to disaster preparedness exercises focusing on continuity of operations during extreme weather events and cyber attacks to supporting mutual aid efforts in the Ohio Water/Wastewater Agency Response Network (Ohio WARN), Dayton is looking for smarter and more energy efficient ways to deliver the highest quality product to their customers. Dayton recently hosted a workshop with the Great Lakes Adaptation Assessment for Cities (GLAA-C) and local experts providing an understanding of potential impacts and developing strategies with the intent of making Dayton more resistant to episodes of extreme weather and a warmer climate.

Measuring Program Effectiveness
Dayton’s source water protection program has been widely recognized in the United States for its innovative approach to balancing ground water protection with economic development. An important indicator of its success is the fact that new businesses have located in the WP since the legislation went into effect. During the first eighteen years of the program, businesses in Dayton were approved for over 1,200 building plans with a construction value exceeding $57 million. This level of activity indicates that Dayton’s program has not had an adverse effect on its economic base, despite early dire predictions about loss of businesses and declining tax bases. Further, the occupancy rate in Dayton’s portion of the WFPA remains at 90%. Another indicator of success is that many WP businesses have voluntarily adopted ground water protection measures that exceed what is required by regulation.

An instrumental force in establishing Dayton’s source water protection program was Dusty Hall, Dayton’s former Environmental Manager and Assistance City Manager. In December of 1999, Hall was one of seven people in the nation to be recognized an EPA “Drinking Water Hero” at the 25th anniversary of the Safe Drinking Water Act. The EPA has commended Hall for setting an excellent example for cities throughout the nation to follow.

Dayton’s Multi-jurisdictional Source Water Protection Program has received considerable recognition from national organizations. In 1997, it was given the Distinguished Local Government Service Award by the Ground Water Protection Council. In 1998 the American Water Works Association honored the program with its first-ever National Exemplary Wellhead Protection Award in the large system category.
Above: Riverscape Fountains, Confluence of the Mad and Great Miami Rivers
(Photo above and page from brochure below both courtesy of the Dayton Dept. of Water)
Developers:  
Well Field delineation, monitoring and identification of potential sources paid for and created by City of Dayton in collaboration with multi-jurisdictional partners, City’s Environmental Advisory Board, Miami Valley Regional Planning Commission Public Health – Dayton Montgomery County (formerly Montgomery County Health District), Dayton Area Chamber of Commerce, Sierra Club, local business community.

Designers / Consultants:  
Initial delineation and monitoring well installation was performed by CH2M Hill and Geraughty & Miller. Post-legislation work was managed by the City of Dayton and carried out by various consultants and include computer modeling, ground water investigations, monitoring, production and reproduction of informational materials include AMEC Environment & Infrastructure, CH2M Hill, Terran Corp., SRW Environmental Services, Chisano Marketing, and The Ohlmann Group.

Key Features / Lessons Learned:  
Funding opportunities for Well Field Protection Area businesses through the Well Field Protection Fund; repetition of educational material, outreach and spill response training; early warning monitoring and ground water investigations which identify water quality issues and mitigate risks to the drinking water supply; and streamlining ordinances and allowing for chemicals which do not present a risk to ground water through exemptions and exclusions from reporting.

Initial Project Cost: > $2 million


Funding Sources / Incentives:  
The Well Field Protection Fund provides financial incentives for Source Water Protection Area business for projects which reduce risk to the ground water. The Fund also provides funding for emergency response, ground water investigations, ground water remediation, and education and outreach.

Zoning note: Legislation for the Source Water Protection Program is through both Zoning and Water Ordinances.

For further information contact:  
Jim Shoemaker, Hydrogeologist  
City of Dayton, Department of Water  
(937) 333-3727  
james.shoemaker@daytonohio.gov