What is Source Water Protection?

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The quick and simple answer is prevention. The cornerstone of a source water protection plan is identifying ways of preventing contamination of our drinking water sources – groundwater and surface water.

In Pennsylvania, PRWA participates in two source water protection programs. One is funded by the U.S. Department of Agriculture (USDA) and the other by Pennsylvania Department of Environmental Protection (PADEP). I am going to focus on the program managed by PADEP, which is the program I coordinate in PADEP's South Central Regional Office (SCRO). Each of PADEP's regional offices employ a Source Water Protection Geologist, who manages the program for the Community Water Supplies (CWS) in that region. The Program is voluntary. There are no regulatory requirements for CWS to enter the Program. PADEP has a Source Water Protection (SWP) Plan written for each individual CWS that decides to participate in the Program and PADEP pays for preparation of the Plan. Yes, the Plans are free to every CWS that participates in the Program.

Possibly you have heard the acronym SWPTAP in association with source water protection planning. This acronym stands for Source Water Protection Technical Assistance Program. PADEP, with the assistance of PRWA, and the consulting firm Spotts, Stevens and McCoy (SSM), provide assistance to CWS.

Steering Committee

The only thing that PADEP asks of the CWS is the formation and engagement of a Steering Committee. We like to see the Steering Committee guide the Plan preparation to ensure that the community and the CWS's needs and concerns help to shape the Plan.

The makeup a Steering Committee will vary depending on the needs of the CWS and the community, but typically PADEP prefers Steering Committees composed of representatives from at least some of the following organizations:

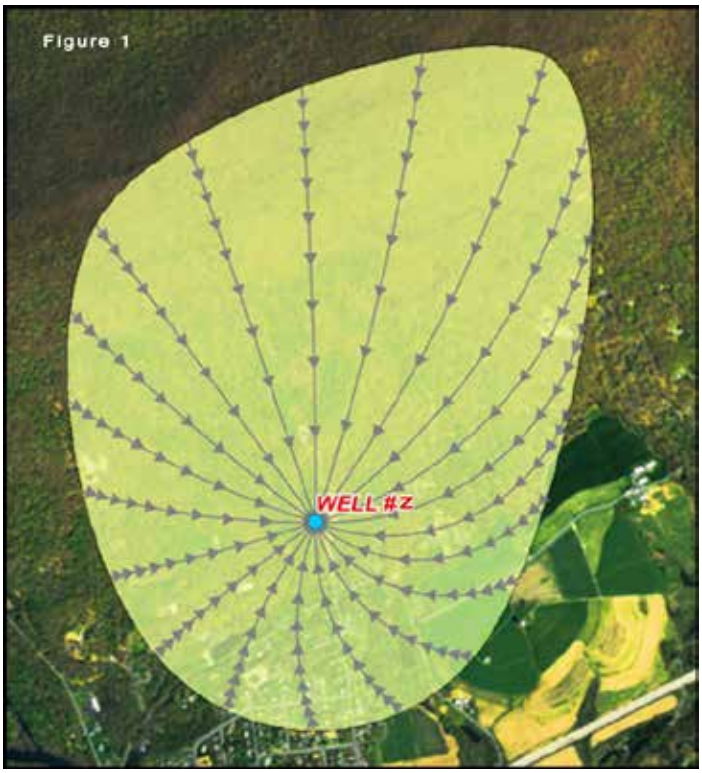
1. Municipal representatives
2. Water supply / authority staff
3. Conservation district specialists
4. County and/or municipal emergency management representatives
5. Planning Commission specialists
6. Watershed or other environmental groups
7. School or university teachers, professors, and students
8. Local business representatives

Development of a SWP Plan

For the purposes of this article, I am going to describe the preparation of a SWP Plan for a CWS that utilizes groundwater as its drinking water source. The process of planning for surface water sources is very similar, however, the science is a little different and typically a bit more complicated for groundwater. The first step is to delineate the paths by which groundwater flows to a pumping well. These flow paths are delineated using pumping test and other well data from the CWS, published geologic and hydrogeologic data, and groundwater modeling.

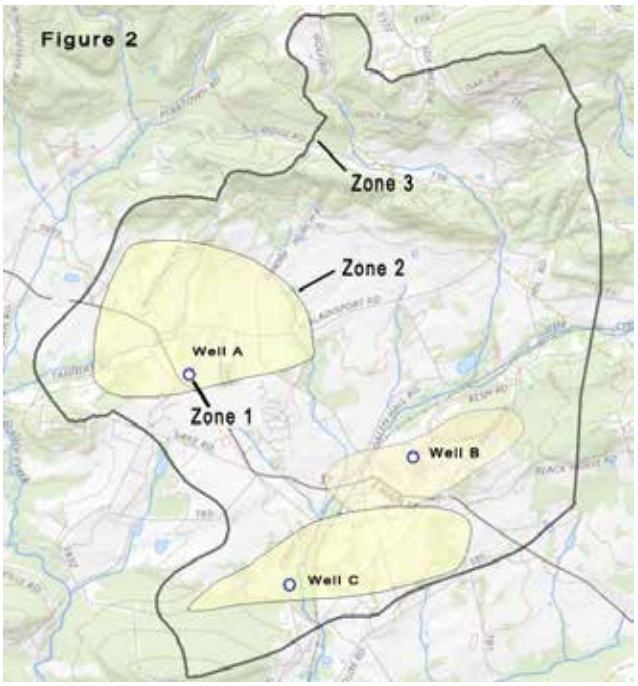
Although one might assume that groundwater is drawn into wells equally from all directions, typically this is not the case. Many factors including topography, rock types and

heterogeneity, the presence of faults and other geologic features impact the movement of groundwater in the subsurface. Figure 1 depicts groundwater flow paths to Well Z.



Groundwater flow information is then used to develop Source Water Protection Zones. The smallest and potentially most critical zone referred to as Zone 1 is a fixed radius around a well between 100 and 400 feet. *Refer to Figure 2.* Zone 2 is the area hydrogeologists refer to as the recharge or capture zone. The zone from which groundwater is drawn into the well. It is important to understand that these zones are depicted on SWP maps in aerial view, but, they extend into the subsurface and are therefore three dimensional. Zone 3 is the zone of contribution. This water is not drawn directly into a pumping well, but, contributes to the water resources of the area. Zone 3 is often the watershed in which the well or wells are situated.

Having delineated protection zones, the next step is to consider activities that could POTENTIALLY impact the quality or quantity of water in the protection zones, in the future. We define these as Potential Sources of Contamination (PSOCs). PSOCs may fall into the category of point sources of contamination which would have a specific location and possibly occur at a specific time. An example of a point source of contamination is an underground storage tank that could develop a leak. PSOCs may also be categorized as non-point sources of contamination, which might occur over a longer period of time and might not have a specific location. Salting of roads occurring throughout the winter over a stretch of road is an example of a non-point source of contamination.



Point source PSOCs are identified by evaluating a myriad of environmental databases that list facilities having environmental permits, as well as facilities that have experienced an environmental incident in the past. For example, a facility may have a permit to use an underground storage tank for storing gasoline. Having that permit does not signify that a gasoline release has occurred, but that there is a potential for a release. Conversely, an environmental cleanup database lists facilities that have had releases and have completed or are in the process of completing remediation efforts. All types of environmental databases are evaluated using Geographic Information Systems (GIS) to identify the facilities located within the CWS protection zones.

The point source PSOCs are tabulated and given a Facility ID. They are also ranked by susceptibility. The susceptibility ranking indicates how susceptible a CWS well is to a release of chemicals from each facility. Susceptibility is determined by evaluating a number of factors using a susceptibility matrix, developed by PADEP. These factors include such concerns as the time required for a chemical to travel from the facility to a CWS well, persistence of the particular chemical in the environment, quantity of the chemical stored or in use, and the potential for a release of that chemical. Facilities are given a ranking from "A" to "F", with A indicating the highest level of susceptibility. The facilities are plotted on a map showing the CWS protection zones. Facility IDs are used to identify each facility, and each facility's susceptibility ranking is depicted graphically with a colored triangle. Figure 3 is an example of a point source PSOC map for a single well. Zone 3 is not shown in this example, however, facilities within Zone 3 are typically identified and mapped.

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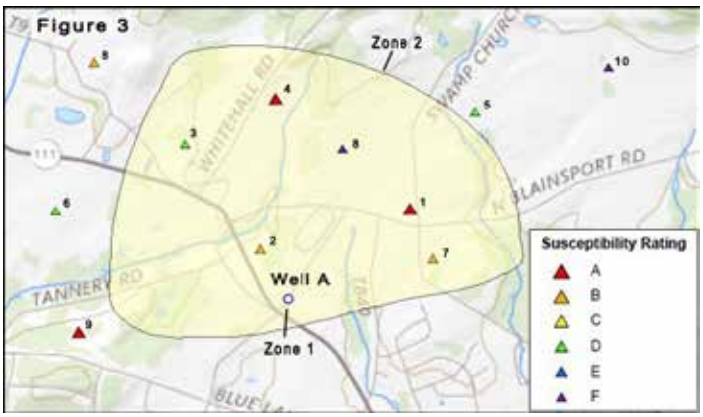

Non-point source PSOCs are evaluated using land cover and transportation corridor maps. This evaluation is less specific, but can be used to identify particular areas of potential concern. Transportation corridors are given susceptibility rankings based on concerns such as the amount and type of traffic utilizing the particular corridor. Heavily used highways that experience truck traffic are ranked with a higher level of susceptibility than less traveled roads. Included in transportation corridor mapping are rail and pipelines.

Knowing where impacts to the water system may occur, we ask the CWS and Steering Committee to initiate communication with point source PSOC facility owners and operators. Hence, in the event of an incident at one of these facilities, the facility would contact the CWS with information about aspects of the incident that could impact the water supply. Similarly, open communication between emergency responders and the CWS should help both parties to be better informed should an incident occur. Understanding of non-point source PSOCs will help the CWS have a clear picture of where these activities potentially have the greatest impact on the CWS.

I have touched on the key aspects of SWP Planning, however, there is a wealth of information and assistance the SWP Program provides to CWS that I have not discussed. I encourage anyone who is interested in the SWP Program to contact me or the Source Water Protection Specialists at PRWA. My contact email is RHakundyJo@pa.gov. ♦

References:

1 Freeze, Allan R. and Cherry, John A. 1979. Groundwater. Prentice Hall.

2 Pennsylvania Department of Environmental Protection. December 2005. Recommended Zone 1 Wellhead Protection Area Delineation Methodology, Bureau of Safe Drinking Water Compliance Assistance Document 3920-BK-DEP4033.

3 Pennsylvania Department of Environmental Protection. December 2000. Susceptibility Analysis of Drinking Water Sources to Contamination.