

**STATE OF DELAWARE  
WELLHEAD PROTECTION PROGRAM**

**I. PURPOSE**

The purpose of this program is to protect the quality of public water supplies derived from public water wells by providing local governments with the knowledge and tools necessary to protect the land area surrounding those wells from activities or substances that might harm the quality or quantity of water derived from those wells. This purpose will be accomplished in part by the creation and implementation of a "Water Supply Protection Program," which incorporates the federal Wellhead Protection Program required by Congress in the 1986 Amendments to the federal Safe Drinking Water Act. This plan has been developed under the guidance of both the U.S. EPA and the State's Water Supply Protection Advisory Board (WSPAB). The assistance of these two organizations has been vital to the development of a meaningful and workable method for protecting the State's water supplies.

**II. OVERALL STRATEGY**

The Department of Natural Resources and Environmental Control (DNREC) is responsible for enforcement of Delaware's Environmental Protection Act (7 Del. Code Ch. 60) and as such is charged with the protection and management of water, air and other earth resources. Thus it is responsible for institution of the Wellhead Protection (WHP) Program. DNREC will develop and implement the WHP Program with the aid of a Water Supply Protection Advisory Board, and will seek cooperation from other state agencies, municipal governments and public water suppliers.

The WHP Program is one element of the State's overall Water Supply Protection Area (WSPA) Program. The WSPA Program is designed not only to protect Wellhead Protection Areas (WHPA's) but will also address Groundwater Recharge Protection Areas (GRPA's), Surface Water Resource Protection Areas (SWRPA's), and other areas within the state having exceptional water resource value.

The protection of groundwater quality and quantity derived from public water wells ultimately rests with an ability to control land use activities that may prove detrimental to the ground water resource. Authority for controlling land use decisions currently lies with counties and municipalities, as delegated to them by the State via 22 Del.C. Section 301, and 9 Del.C. Sections 2601, 4901, and 6902.

The DNREC will promulgate regulations for the delineation of WSPA's. These regulations will require that hydrogeologic, land use, and contamination source information be compiled and used for the protection of WSPA's. DNREC shall have the ultimate authority to designate and modify, after public notice and hearing, the boundaries of all WSPA's, however such boundaries will be subject to formal challenge, based on technical criteria that will be established in the forthcoming

regulations.

Once suitable boundaries are designated, DNREC shall notify the local authority(ies), in which the WSPA's are located, of the imposition of a WSPA. The governing locality should, after opportunity to comment upon DNREC's designation, revise zoning subdivision and land use ordinances to be in accordance with the DNREC's WSPA regulations.

Regulations governing WSPA's will be enforced by DNREC. Enforcement of local zoning, subdivision or land use ordinances will be the responsibility of the local authority. All those whose activities impact or could potentially impact Public Water Supply System groundwater quality through the introduction of contaminants will be governed by forthcoming regulations. Federal governmental agencies are required to abide by all state and local requirements under this program by Section 1428(h) of the 1986 Amendments to the Safe Drinking Water Act.

### **III. GENERAL APPROACH**

Delaware's WHP Program includes seven (7) elements. These elements are:

1. Specification of the duties of state and local agencies.
2. Delineation of WHPA's.
3. Identification of contaminant sources.
4. Development of management approaches for protection of WHPA's.
5. Protection of new wells/new wellfields.
6. Development of contingency plans for public water supply systems.
7. Ensuring public participation throughout program development.

These elements are described further in Section VI.

Upon approval of Delaware's WHP Program, WSB will begin performing an initial set of delineations, drafting regulations, developing model contaminant source identification procedures and contingency plans, and conducting public workshops. Phase I of the program will thus involve preparatory steps, and will require approximately one and a half years to complete. In the second phase, program implementation will be prompted by promulgation of the regulations. At that point, contingency plans will be required, investigations for new well sites will be required, delineations for major wells or wellfields will have been performed, and enforcement of the regulations will begin. It is expected that the WSP Program plan will be adjusted from time to time in the future, in response to funding, legislative actions, and other changes that affect the speed or priorities involved in implementation.

#### **IV. RESEARCH NEEDS**

A great deal of technical information will be required in order to develop and implement the WSP Program. A number of technical questions are currently unanswerable, and a number of such questions will require long-term investigation in order to be resolved. Therefore, the regulatory process will be an evolving one. The regulations that are promulgated may need to be revised at periodic intervals to account for ongoing changes in the technical field. In fact, some technical issues may need to be researched specifically with the goal of adjusting the regulations in mind. Therefore, the WHPP contains a provision for funding related research projects which directly advance or contribute to the refinement of the WSPA regulations. Anticipated research needs include:

1. Identifying the locations of primary recharge areas for the water table and confined aquifers.
2. Developing the most accurate, cost-effective method of defining WSPA's in Delaware, given its special hydrogeologic, social, political, and financial characteristics.
3. Defining the effects, if any, upon ground water quality caused by recharging road, parking lot, and roof top run-off.
4. Other research as needed.

## V. DEFINITIONS

The following terms have the following meanings in the context of this WHP Program:

- **ADMINISTRATOR** - means the Administrator of the U.S. Environmental Protection Agency, or his agent.
- **COMMUNITY PUBLIC WATER SUPPLY (CPWS)** - a public water supply which serves at least fifteen (15) service connections used by year round residents or regularly serves at least twenty-five (25) year round residents.
- **NON-TRANSIENT NON-COMMUNITY WATER SYSTEM (NTNCWS)** - means a public water system that is not a community water system and that regularly serves at least twenty-five (25) of the same persons over (6) months per year.
- **NON-COMMUNITY PUBLIC WATER SUPPLY (NCPWS)** - means a PWS which has at least fifteen (15) service connections or regularly serves and average of at least twenty-five (25) individuals daily at least sixty (60) days out of the year.
- **PUBLIC WATER SUPPLY (PWS)** - means any water delivered through a "public water well", as that term is defined in the Delaware Regulations Governing the Construction of Water Wells.
- **PURVEYOR** - means a person, corporation, partnership or other entity, including a county or municipal governmental unit, which is engaged in the business of supplying water for public use.
- **SECRETARY** - means the Secretary of DNREC or his agent.
- **WATER SUPPLY PROTECTION ADVISORY BOARD (WSPAB)** - means a committee impaneled by the Secretary of DNREC for the purpose of guiding the development and implementation of the WSPP.
- **WATER SUPPLY PROTECTION AREA (WSPA)** - means any surface and subsurface area designated by DNREC as possessing physical characteristics, related to water supply protection, that render it worthy of special protection.
- **WELLHEAD PROTECTION AREA (WHPA)** - means the surface and sub-surface area surrounding a water well or wellfield supplying a public water system through which contaminants are likely to move toward and reach such well or wellfield.

## VI. PROGRAM ELEMENTS

The following is a synopsis of each element within the WHP Program.

### 1. SPECIFICATION OF DUTIES

Creation of a successful WSP Program will require the coordination and assistance of many different agencies, organizations and individuals. Traditionally, cooperation between State agencies, local government and environmental groups in Delaware has been exceptional. Delaware's relatively small size and previous cooperative efforts, such as the Environmental Legacy Program, have fostered a helpful, cooperative attitude in planning endeavors as will be required by the WSP Program. Memoranda of Agreement (MOA) currently exist between numerous State agencies. Of specific relevance is an MOA between DNREC Divisions of Water Resources and Air & Waste Management, and the Department of Health and Social Services' Division of Public Health, which will be revisited shortly after approval of the WSPP to reflect pertinent changes. Also, an MOA may be needed between DNREC and the Delaware Department of Transportation, and the Department of Administrative Services.

Development and implementation of the WSP Program will be a diverse and complex undertaking from both an administrative and technical standpoint. Since development of this program will involve issues that cross-cut technical, legal, practical and administrative areas of various organizations, the WSPAB has been created in order to guide DNREC's program development and assist in the development of WSP regulations. The WSPAB has met three times to consider and provide feedback on the WHPP. Each of the issues upon which the Board reached a consensus has been incorporated into this plan. The financial capabilities of the various organizations involved in program implementation are generally not impacted by the addition of WSP duties as most of these duties involve coordination using mechanisms already in use. However, in some cases where additional resources are needed, such as the DGS's mapping of aquifer recharge areas, funding will generally be provided by the state and federal governments.

The WSPAB has met to consider the draft WHPP on three occasions prior to completion of the final document and provided specific feedback to DNREC at each of these meetings. The WSPAB is composed of representatives of the following organizations:

## **THE STATE OF DELAWARE**

DNREC, Division of Water Resources (DWR)  
DNREC, Division of Air and Waste Management (DAWM)  
Department of Health and Social Services (DHSS)  
Division of Public Health (DPH)  
Department of Agriculture (DOA)  
Delaware Geological Survey (DGS)  
Delaware Development Office (DDO)  
University of Delaware, Water Resources Center (WRC)

## **LOCAL GOVERNMENT**

New Castle County  
Department of Planning  
Water Resources Agency (WRA)  
Kent County, Planning Commission  
Sussex County, Planning Commission  
League of Local Governments

## **INTERESTED ASSOCIATIONS**

Delaware Nature Society (DNS)  
League of Women Voters  
Delaware Farm Bureau  
Delaware Home Builders Association  
Delaware Association of Realtors  
Local Civic Association (Greater Hockessin Area Development Association)

## **DNREC, Division of Water Resources**

The Division of Water Resources (DWR) is responsible for the management and protection of ground and surface waters within the State. DWR's Water Supply Branch (WSB) administers Delaware's ground water protection programs. WSB's duties as lead agency of the WSPP will include program development, regulation development and enforcement, delineation of WHP and RPA's, enforcement, administration of budget and grant funds, preparation of proposals, technical assistance, support and coordination for the WSPAB, and public information dissemination. A proposed budget has been placed in a draft Water Resource Protection bill which provides for increased staffing as well as general support from state tax dollars.

WSB is well prepared to perform technical aspects of the WSPP. In addition to being staffed by hydrogeologists with considerable experience dealing with groundwater problems, WSB is headed by a Professional Geologist who is responsible for reviewing all technical work of the Branch.

## **DNREC, Division of Air and Waste Management**

The Division of Air and Waste Management (DAWM) is responsible for the protection of air resources, regulation of hazardous waste, solid wastes, and underground storage tanks and coordination of emergency response activities. As such, its programs impact directly on water resources and contribute significantly to the State's knowledge of threats to ground water quality.

WSB will coordinate with the DAWM on the Hazardous Waste Inventory which DAWM regulates under SARA Title III Sec. 302 (c). Facilities located within WSP zones which store hazardous substances (as defined in the aforementioned regulations) will be identified by the DAWM and a listing will be submitted to the GWMS. WSB will make this information available to purveyors who are responsible for identifying sources of contamination in the vicinity of their wellfields, and will also use this information to evaluate threats to confined aquifers through recharge areas.

The Environmental Response Branch (ERB) of DAWM coordinates Delaware's response to all types and levels of environmental emergencies. The State of Delaware Oil and Hazardous Substance Incident Contingency Plan documents the coordination actions necessary to manage releases involving hazardous substances. WSB does coordinate with the ERB on all aspects of contamination incidents involving contamination to groundwater including operation incident information and use of a tracking system. The ERB's contingency plans will be used by WSB in developing the model contingency plan for PWS's.

Water quality control responsibilities are presently specified under a MOA established between DAWM, DWR and DPH. The DAWM is charged with notifying the DPH and DWR of any potential contamination of raw water sources.

## **DHSS, Division of Public Health**

The DHSS, Division of Public Health (DPH), is the state agency responsible for protecting public water supplies from the point of intake through distribution. DPH has obtained primacy from EPA to administer the Public Water Supply Systems Program for Delaware. DPH performs routine water quality monitoring of public supplies. DPH's input will be sought in the development of Resource Protection Area regulations, and it is expected that technical cooperation will be provided throughout the administration of the WSP Program. For example, in the event that a public water supply does become contaminated, characterization as "contaminated" will necessarily be defined in terms of the "Delaware Regulations Governing Public Water Systems", which the DPH is responsible for establishing and enforcing. Therefore, any determinations concerning the safe quality of drinking water would involve the DPH in at least an advisory, and sometimes in a regulatory capacity. Finally, DPH may be called upon to provide Community Right-to-Know information to water purveyors. Any work on the WSPP that DPH may be expected to perform will simply be an extension of programs currently in operation. Therefore extra financial support will

not be needed or provided.

### **Department of Agriculture**

The Department of Agriculture's (DOA's) role in the WSP program will be considerable. The WSB will seek DOA's assistance in developing WSP regulations which deal with pesticide use, pesticide runoff, agricultural chemicals and other forms of non-point source pollution. DOA will also contribute technical and educational assistance to Delaware residents on Best Management Practices (BMP's) regarding many different agricultural issues. For example, DOA's educational program "Ag-In-The-Classroom" for K-6 grades is tentatively scheduled for implementation in all Delaware Schools by State fiscal year 1991. WSB is in the process of developing a WSP section which is expected to be incorporated into the program.

WSB will also pursue coordination agreements with the DOA on it's Land Acquisition and it's Purchase of Development Rights Programs. WSB will request that the DOA use WHP and RPA designations as criteria in evaluating acreage for purchase.

### **Delaware Geological Survey**

The Delaware Geological Survey's (DGS) activities include investigation of the geology of Delaware and exploration and research pertaining to the water, mineral and other earth resources of the State. In addition to participating on the Advisory Board, DGS has an integral role in the program's technical delineation of WSPA's. DGS's assistance is expected to continue throughout program development and implementation.

### **University of Delaware**

The University of Delaware, Water Resources Center (UDWRC) conducts ground water related studies, and also encourages independent ground water research by means of financial assistance authorized through the Water Resources Research Act of 1984. Their technical and research-related assistance in development and implementation of a WSP Program will be essential. Therefore, they will be asked to participate on the WSPAB, and perhaps to support associated research activities.

### **Delaware Nature Society**

The Delaware Nature Society and other interest groups representing contractors, agriculture and local government may be asked to provide forums on the WSP Program, and to provide information about the program to interested individuals.

### **Delaware Development Office**

The Delaware Development Office in consort with DNREC will be advised of the

locations of WSPA's so that they can take DNREC's regulations into consideration as they advise potential corporate citizens of potential site locations. DDO may also play a role in helping certain businesses relocate from WSPA's to less environmentally sensitive areas. Therefore, WSB must keep DDO well informed about WSPA locations and regulations. However, DDO's role will not otherwise be an active one in the development or implementation of the WSPP.

### **County Planning and Zoning Commissions**

County Planning and Zoning Commissions will coordinate with DNREC on land use decisions within protection areas. Local land use authorities may control land use within these areas by emplacing "overlay zones" that correspond to DNREC's delineated Protection Areas. Land use restrictions for these areas would be developed after DNREC's regulations are promulgated and would reflect State requirements to be enforced through local ordinances. New Castle County, for example is presently availing itself of an advisory committee to help guide the implementation of the County's Comprehensive Zoning Plan so as to protect natural resources. "Water Resource Protection Areas" are on the committee's agenda. In addition to the ongoing coordination mechanisms that exist between the State and local governments, DNREC will pursue the establishment of Memoranda of Agreement (MOA) with these parties. Such MOA's would identify the respective roles of the governmental units, existing and future mechanisms for coordination, and procedures for coordination on the topic of Water Supply Protection.

The provisions contained in the Quality of Life Act (9 Del. C. Sections 2651-2661) require the counties to adopt and amend comprehensive plans for future development and growth. Coordination of the comprehensive plan with applicable state regulations and policy is an objective of the comprehensive planning process. The comprehensive plan must include a conservation element for the conservation, use and protection of natural resources, including geologic and hydrologic resources. DNREC considers WSPA's to be hydrologic resources worthy of special consideration in local land use plans.

### **Other Agencies**

The other organizations represented on the WSPAB are invaluable to the process of developing and implementing the WSPP through participation on the Advisory Board. Because these organizations are not required to perform specific implementation roles, a discussion of their technical and financial resources is not provided.

Other agencies not serving on the WSPAB, but who have or may have a role in the implementation of the program, include the U.S. EPA, the U.S. Department of Agriculture (USDA), and the U.S. Geological Survey (USGS). The EPA, of course, is intimately involved in the development of the program plan through technical and financial assistance. EPA will continue to play a major role in the implementation of the program as well. The roles of the USDA and USGS have not been finalized,

however the WSB expects to request technical advisory assistance from these organizations.

## 2. DELINEATION OF WELLHEAD PROTECTION AREAS

### A. Water Resource Protection Delineation Methods & Criteria

Delaware has considered six different methods for use in delineating WHPA's. The following is a brief description of each delineation method along with the strengths and weaknesses of each method as it applies to Delaware.

- a) Arbitrary Fixed Radius Method (AFR) - The use of the AFR involves drawing a circle of a specified radius around a public water supply (PWS) or wellfield. The radius may be based on an arbitrary distance corresponding to state or local regulations (i.e. siting restrictions, sanitary isolation distances, etc.), generalized hydrogeologic conditions and/or professional judgment. Using the AFR has many advantages including that it is relatively simple, requires minimal or no hydrogeologic information and allows for the delineation of a large number of WHPA's in an extremely short amount of time. Because the radius of the WHPA is not based on site specific scientific data, a large degree of uncertainty exists regarding the ability of the delineated area to adequately protect the PWS from contaminants.
- b) Calculated Fixed Radius Method (CFR) - A radius is calculated using an analytical equation which contains pumping rates and basic hydrogeologic parameters. Criterion thresholds which may be used include time of travel (TOT), and drawdown. This method is easy to apply, relatively inexpensive and because the CFR requires the use of hydrogeologic data to define criteria thresholds and parameters used in the flow equations, it offers a considerable increase in accuracy over the AFR method. The CFR does not take into account site specific heterogeneities in the aquifer or hydrologic boundaries that may be present at a given site, thus allowing for the over or under protection of the WHPA.
- c) Simplified Variable Shapes (SVS) - The SVS method uses analytical models to generate standardized shapes which are then oriented around a well according to ground water flow patterns. Flow boundaries and TOT are typically used as criterion. Input data required for the models include basic hydrogeologic information and well pumpage rates. Once the standardized shapes are developed, it is a relatively easy task to delineate the WHPA's by matching a standardized shape to a well/wellfield with similar pumping rates and hydrogeologic conditions. This method requires site specific data collection in order to calculate the shapes of the standardized forms. The SVS may not be accurate where the aquifer is not homogeneous, where boundary conditions are varied, or where the ground water flow direction near a well differs from those inferred from other studies.
- d) Analytical Methods - Using analytical methods, WSPA's are delineated through use

of equations which define ground water flow and contaminant transport. Analytical methods require input of hydrogeologic parameters such as aquifer thickness, hydraulic conductivity, transmissivity and gradient. WHPA's may be delineated using a drawdown criterion and the Theis equation, a TOT criterion and the volumetric flow equation, or the use of the uniform flow equation in defining the zone of contribution. Costs of using analytical methods are generally low if site specific hydrogeologic data has already been collected. Because analytical methods require the use of site specific hydrogeological data, they tend to provide a higher degree of accuracy than some of the previously discussed methods. In many cases computer models are available to perform these types of calculations. However, models used to perform these types of calculations typically do not take into account hydrologic boundaries, aquifer heterogeneities or evapotranspiration. If site specific data has not been previously collected by way of site investigations, pump tests, historical well record checks, etc., this method may be moderately expensive to implement. Analytical methods may be appropriate for Delaware in some instances where extension data is available.

- e) Hydrogeologic Mapping - Using geologic, geophysical, and dye tracing methods, flow boundaries and TOT criteria can be mapped and used as WHPA's. This method is especially well suited for hydrogeologic settings which are highly influenced by near surface flow boundaries, and to anisotropic aquifers such as fractured carbonates. Flow boundaries may be defined by permeability contrasts and lithology changes. Use of geologic and geophysical data will aid in determining lithology, formation contacts, fracture patterns, and thickness. The use of the hydrogeologic mapping method does require considerable experience in geologic and geomorphic mapping, a good understanding of the flow boundaries for a given setting, and a great amount of site specific hydrogeologic information. If much data acquisition (i.e. drilling of test wells, dye tracer tests, pump tests, etc.) is required, cost and time involved for delineation of WHPA's using this method will be high.
- f) Numerical Flow/Transport Models - WHPA's can be delineated using computer models that approximate ground water flow and/or solute transport equations numerically. These models are extremely useful in areas where boundary and hydrogeologic conditions are complex. A great amount of input data is required in order to simulate the flow system. Input data required may include permeability, porosity, specific capacity, aquifer thickness, dispersivity and a description of the boundary conditions. Criteria such as drawdown, flow boundaries and TOT may be mapped using numerical methods in a two step procedure. Using a set of hydrogeologic parameters and boundary conditions, a hydraulic head field is generated by the numerical model. Then a transport model uses the calibrated hydraulic head data to calculate the WHPA based on a pre-selected criteria. Assuming boundary conditions and input data have been accurately described, numerical models offer a high degree of accuracy and can be applied to most types of hydrogeologic settings. However, costs of developing and implementing a numerical model can be relatively high, and a considerable degree of expertise in

hydrogeology and computer modeling is required.

Delaware has considered five (5) criteria for use in delineating WHPA's. The criteria establish conceptual standards for WHPA delineations. The following briefly defines and describes each criterion considered.

- a) **Distance:** The distance criterion established a set radius or dimension measured from a pumping well in delineating WHPA's. This criterion is an arbitrary assessment, and is not based on site specific hydrologic data.
- b) **Drawdown:** The drawdown criterion for WHPA delineation is determined by (1) selecting a value (in feet) of hydraulic head loss in the water table, and (2) determining the maximum distance from the pumping well where this value is achieved. The drawdown criterion is determined from site specific hydrologic parameters and the construction of the pumping well.
- c) **Time of Travel:** The time of travel (TOT) criterion assumes steady state hydrologic conditions around a pumping well in assessing the distance a contaminant travels in water to a pumping well in a set time period. When available, site specific hydrologic data is used to establish TOT WHPA delineations.
- d) **Flow Boundaries:** Flow boundary criterion establishes WHPA delineations by determining ground water divides and/or other physical hydrologic features that control ground water flow (EPA's Guidelines for Delineation of Wellhead Protection Areas, EPA, June, 1987). Flow boundary WHPA delineations are determined by the hydrogeologic mapping method.
- e) **Assimilative Capacity:** The assimilative capacity criterion incorporates factors controlling contaminant movement (physical, chemical and biological processes and contaminant properties) in determining the distance required from a pumping well for the concentration of the slowest moving contaminant to attenuate to within the drinking water standard or acceptable threshold concentration. Site specific hydrologic data and a two (2) dimensional solute transport model are required to determine the assimilative capacity criterion in the unconfined aquifer.

## B. WHPA Delineation in Delaware

WHPA delineations are broken up into two phases; the first phase providing preliminary, "notice" WHPA boundaries, and the second providing accurate, enforceable zones of protection. The WSPAB has determined that this notice provision will be an important tool in letting potentially affected land users plan for future regulation. Because this phase is designed to provide notice of an approximate future boundary only, the delineation method will be simple and the completion date is set for three months after approval of the WSP Plan. Accompanying the Phase I WHPA maps will be written information sheets which describe the general nature of the WSPA program and which educate potentially affected landowners as to the general type of

restrictions that may be imposed on contaminant source uses. This Phase I stage is intended to provide the citizens of Delaware with fair notice and opportunity to provide feedback to DNREC with regard to future regulation. It will be emphasized in the Phase I information sheet that it would be unwise to rush the installation of potentially contaminating facilities since such facilities would later be subject to operational standards and other possibly costly management controls.

The second phase delineation will be technically defensible. It is therefore expected to take a considerably longer amount of time to complete. The present estimated date for completion is in 1992, however the time needed to complete this task is highly dependent upon WSB's ability to staff and fund the effort.

The Phase I delineation will be performed in Kent and Sussex Counties using the WHPA Code, and the simplified variable shapes method. The WHPA code is a modular, semi-analytical ground water flow model designed to assist state and local technical staff with the task of WHPA delineation. A five (5) year TOT criteria threshold will be used for Phase I delineations and they will be digitized into the DNREC's Multimedia Advanced Identification System (MAIS). These maps will be distributed to all WSPAB members, and will be made available by DNREC for review to any member of the public. A press release will be issued, followed by at least one public meeting to announce the locations of the WHPA's.

The Phase I "notice" portion of New Castle County's delineations is currently being satisfied by the County's use of Resource Protection Area Maps, which were published in 1987. The WRA and DNREC use these maps when making recommendations to the NCC Planning Department regarding environmental effects of rezoning and development proposals. The WHPA's were defined using a hydrogeologic mapping method.

Phase II delineations in New Castle County are currently underway. The County has contracted with DGS to refine the Phase I boundaries using more site-specific data. Based on DGS's initial findings, decisions will be made concerning the most suitable delineation method to use. WSB agrees that the County's approach is well designed for determining the most efficient and technically defensible method available, and will continue to coordinate with the County and DGS as they develop their delineation system. The NCC WRA has agreed to work with DNREC in establishing criteria and methods that are consistent with State objectives.

For Kent and Sussex Counties CPWS wells tapping the unconfined aquifer, Phase II delineation will be performed using the WHPA code or other analytical methods and numerical flow/transport models. The criteria threshold which will be used for these delineations will be the larger in land area of a one (1) foot drawdown or a five (5) year TOT.

All Phase II delineation results will be digitized into MAIS.

Non-Community Public Water System wells will be delineated using the CFR method with a one (1) foot drawdown criterion, or 150 foot radius, whichever creates the larger protection zone. These wells do not present the same public health concerns as public water supply wells that are used for large, residential drinking water supplies because they are not depended upon by the same people on a daily basis for home bathing and drinking. Similarly, the number of people exposed to any potentially contaminating substances with regularity is lower than is the case with public water supply systems. Furthermore, a NCPWS purveyor can respond to exigencies with a great deal more flexibility than most PWS (or Non-Transient Public Water Supply purveyors) since well relocation, use of alternative water supply sources, and temporary disuse are all options that are available to the owner of a small temporary - use well owner, but not to a PWS well owner. By preliminary calculations, most small capacity, non-community wells create zones of influence on the order of 100 feet or less in radius. The Well Regulations currently require that PWS wells be located at least 150 feet from any source of contamination. Therefore, 150 feet is used as a default radius for non-community wells.

Because non-transient non-community public water wells supply essential needs, and usually affect the primary needs of many people on a regular and repeated basis, these supplies will be afforded the same level of protection as CPWS's. The larger of the one foot drawdown criterion or five - year TOT criterion will ensure that the supply is safe from immediate sources of contamination, and that if a threat arises, there will be adequate time to respond. The requirement (as discussed in the Management Controls section) that potential contaminant source owners prepare contingency plans will help ensure that any response time needs are met.

The primary threats to wells screened in confined aquifers are (1) possible tampering or accidental introduction of contaminants directly into the well, (2) the introduction of substances into primary recharge areas of the unconfined aquifer, and (3) human induced or natural breaks in confinement. The WSB will direct its efforts towards eliminating these threats as much as possible. With regard to direct contamination, the confined aquifer wells will be protected by a fenced, sanitary buffer zone, to surround the immediate vicinity of all PWS wells. Primary recharge areas will be delineated in Kent and Sussex counties over the next four (4) years. Maps of New Castle County recharge areas are being refined at present. Human induced breaks in confinement are presently regulated under the "Delaware Regulations Governing the Construction of Water Wells." According to Sec. 407(E2), "for wells penetrating confined, unconsolidated sand and gravel aquifers, the annular space shall be completely filled with grout from at least two (2) feet into the confining bed immediately above the aquifer being used to ground surface. The depth of grouting may not be less than 20 feet". To insure compliance, the WSB retains staff personnel (well inspectors) to oversee the proper construction of wells which are screened in the confined aquifer.

The WSB is also responsible for regulating the timely and proper abandonment of wells. According to Sec. 2.01 of the "Delaware Regulations Governing the Construction of Water Wells", "A well is considered abandoned when the pump has

been disconnected or removed for other than repair or replacement or a well valve has been permanently discontinued". From Sec. 9101B-C wells which are classified as abandoned must be "fitted in such a way that they will not produce water or act as a conduit for the interchange of waters of undesirable quality with those whose quality is desirable or present a hazard to the safety and well being of people and of animals. All wells to be abandoned shall be sealed only by a well contractor, well driller, or a well driver licensed by the Department".

The determination of whether a given well is pumping water from a confined, semi-confined or unconfined aquifer shall be made by the WSB. Factors which the WSB will consider in making this determination are:

- (1) Lithology of confining unit
- (2) Thickness of confining unit
- (3) Lateral extent of confining unit, and
- (4) Known hydrogeologic conditions (e.g.: data from some confined aquifer wells include potentiometric surfaces and other parameters which demonstrate the nature of the hydraulic relationships between aquifers).

CPWS and NTNCPWS wells screened in a semi-confined aquifer will be given the same level of protection (the larger of the one foot drawdown criterion or five-year TOT criterion) as counterparts screened in the unconfined aquifer.

#### C. Saltwater Intrusion

Presently water supply development in traditionally vulnerable coastal areas is extensive, yet saltwater contamination resulting from recent activities has not proved to be as troublesome as once expected. The Water Allocations Program within WSB is designed to consider the possibilities of intrusion and adjust pumpage accordingly. Therefore, we intend to delineate WHP zones for all coastal wells in the same fashion as other wells in Delaware and use the Allocations Program to "control" the salt water contaminant source.

### 3. IDENTIFICATION OF CONTAMINANT SOURCES

The potential sources of groundwater contamination are numerous and varied, but they are also generally identifiable. Many can be identified through discovery of general land use classifications, such as "industrial" or "residential" designations on local governments' land use maps. More precise determinations may require aerial photograph analysis, door-to-door surveys, and inspections of hazardous waste and business inventories.

Delaware's WSP Program will require source identification surveys for all WHPA's to be conducted either by the purveyor or by an outside contractor. DNREC will compile guidelines for the preparation of source identification reports. The first step of this process however, involves the designation of certain activities or facilities as

identifiable contaminant sources. A comprehensive list of these sources will be developed and included with the WSP Regulations. Table 2 identifies sources of contamination that were considered in Delaware's Ground Water Management Plan (DNREC, 1987) and will serve as the preliminary basis to which other potential sources may be added or some sources deleted. A revised (if necessary) list of contamination sources that are not addressed by current regulations will be developed within Phase I of the program. Appendix A contains a description of the minimum procedures for identifying potential sources of contamination. WSPA regulations will specify procedures for updating these surveys on a yearly basis.

All source identification surveys will be considered public information in keeping with the Delaware Freedom of Information Act, where source identification surveys fall within other Federal laws (such as the Right-to-Know Act of 1986) the Federal law will be adhered to. In fact, the Community Right-to-Know Act will be incorporated into the procedure for identifying contaminant sources. The information provided through this law is maintained by the Division of Public Health (DPH). The DPH also addresses the vulnerability assessments for both CPWS and NCPWS systems. Section 22.6333 (H) states that the "Division of Public Health (DPH) must certify the vulnerability status at least every three (3) years (five (5) years for smaller systems - i.e. less than 500 connections). The term 'vulnerable' is defined as 'subject to contamination, a determination which shall be made by the Division based on previous monitoring results, the number of persons served by the public water system, the proximity of a smaller system to a larger system, the proximity to commercial or industrial use, the disposal or storage of VOC's, and the protection of the water source(s)." This will serve as an excellent source of information, to be followed by field verification.

It is anticipated that some sources of contamination for which a "responsible party" can either not be identified or for which the owner or responsible party lacks assets necessary to stabilize or remediate will be discovered. Probably the best way to address these cases would be to establish a fund which could be spent to properly secure and/or remediate such sites. WSB will be investigating the feasibility of establishing such a fund through the imposition of "potential contaminant source user fees", or other methods that may be suggested by the WSPAB or members of the public.

**TABLE 2**

**CLASSIFICATION OF POTENTIAL SOURCES AND CAUSES  
OF GROUND WATER CONTAMINATION**

CATEGORY I - Systems, facilities, or activities designed to discharge waste or waste waters to the land and ground waters.

- Land application of wastewater - spray irrigation, infiltration-percolation basins, overland flow
- Sub-surface soil absorption systems - (septic systems)
- Waste disposal wells and brine injection wells
- Drainage wells and sumps
- Recharge wells

CATEGORY II - Systems, facilities or activities which may discharge wastes or waste waters to the land and ground waters.

- Landfills and other excavations - landfills for industrial wastes, sanitary landfills for municipal water and waste water treatment plant sludges, other excavations (e.g., mass burial of livestock)
- Surface impoundments - waste holding ponds, lagoons and pits
- Animal feedlots
- Manure storage

CATEGORY III - Systems, facilities, or activities which may discharge or cause a discharge of non-waste contaminants to the land and ground waters.

- Agricultural activities - misapplication of manure, fertilizers and pesticides, irrigation return flow
- Stockpiles - highway deicing salt, ore, coal
- Buried product storage tanks and pipelines
- Application of highway deicing salts
- Spills
- Product storage ponds

CATEGORY IV - Causes of ground water pollution which are not discharges.

- Salt water intrusion - sea water encroachment, upward coning of saline ground water
- River infiltration
- Improperly constructed or abandoned wells
- Sinkholes

#### 4. MANAGEMENT APPROACHES

Management of contaminant sources may require the use of a combination of techniques, including zoning ordinances, site plan reviews, operating standards, source prohibitions, purchase of property or development rights, public education, and/or ground water monitoring. Each of these management tools is already used in association with other programs, and their incorporation into the WSP Program will therefore only involve modifying the existing procedures. A discussion of each technique and its utility in the WSP Program follows.

##### a. **Zoning**

Under Titles 9 and 22 of the Delaware Code, counties and municipalities are vested with powers to zone and regulate development in their respective jurisdictions. With the advent of the WSP Program the State will delineate WHPA's and, by regulation, specify potential contaminate use criteria within them. Such criteria will be formulated with the assistance of the WSPAB and will be subject to public notice and hearing. Local governments may align their zoning criteria with the State's WSPA requirements. This may be done in the form of "overlay zones," for example, where more restrictive zoning requirements are imposed and which take precedence over existing zoning requirements. However, the ultimate decision regarding the method for bringing land - use controls in conformity with DNREC regulations lies with the local governments.

##### b. **Site Plan Review**

Site plan review is currently used to ensure that developers are well informed of, and are planning to adhere to applicable regulations and preferable environmental practices. Coordination of these reviews is performed by DNREC's Planning and Support Section. Two types of review are presently utilized: subdivision advisory reviews and the Development Advisory Service.

Subdivision advisory reviews are performed upon documented subdivision plans, as required by Delaware's Land Use Planning Act. Local governments circulate the development plans and any supporting technical reports to various agencies, such as the Department of Transportation, and DNREC, and written comments are submitted to the local government for its consideration in deciding whether or not to approve the proposed development. The procedure involves circulation to a committee, which is called the Subdivision Advisory Committee, Development Advisory Committee and Technical Advisory Committee in New Castle, Kent and Sussex Counties, respectively. Under the WSP Program, proposals for developments within WSPA's will be reviewed specifically by the WSB for conformity with forthcoming WSP Program regulations.

The Development Advisory Service (DAS) is a voluntary program designed to inform developers of the types of environmental impacts, and hence the types of regulations their proposed activities involve. This service provides an additional vehicle for educating developers on state and local requirements.

c. **Operating Standards**

Operating standards are tools used to ensure that activities with a potential to contaminate public wells do not release contaminants. Operating standards will be extremely critical for activities already within a newly defined WHPA and for other cases as appropriate. Examples of standards include maximum permissible storage of contaminating substances, waste load reporting requirements, ground water monitoring, and effluent quality standards. Any existing potential sources of contamination discovered by the source identification activities or by other means will be subject to new operating standards. For such sources not in compliance with those standards, upgrading will be required in accordance with the forthcoming WSPA regulations. Facilities claiming financial inability to meet operating standards will not be permitted to continue operating within a WSPA.

An example of operating standards currently in use and of the cooperation established between DNREC divisions is the DAWM's management of underground storage tanks. The Underground Storage Tank (UST) Branch of the DAWM currently requires special precautions for fuel storage in areas surrounding wellheads. This requirement is presently enforced in areas identified by the UST Branch as being vulnerable, using a simplified CFR type of "delineation" method. However, the double containment requirement will be merged into the WSPP proper, and will be required in WSB-delineated areas once program implementation begins.

d. **Public Education**

Public education is an integral management tool in Delaware's WSP Program. Several activities are planned to provide public education about the WSPP. One effort involves distributing written information about the need for, and chosen methods of performing WSP. DNREC published one general information pamphlet about groundwater as part of the Groundwater Protection Program in 1988. 2000 copies of this pamphlet were produced, and nearly all have been distributed. Increasing knowledge about hydrogeology and groundwater will help people understand the WSPP, therefore funds from the Groundwater Protection Program will be expended on reprinting the general information pamphlets for additional circulation.

Another information pamphlet, concentrating specifically on WSP, will be published and circulated. This material will be made available in DNREC office lobbies. By far the most important aspect of DNREC's public education campaign will involve in-person meetings. In addition to the three standard (one in each county) public workshops on the WSP plan and regulations, presentations will be made to various groups or organizations. For example, Delaware has numerous civic associations that

are interested in issues involving their communities. One meeting is being planned through Delaware's League of Local Governments in an effort to gather these organizations to describe the WSP Plan, and discuss specific concerns they may have. Also, as delineations are performed, and neighborhoods within WSPA's are identified, DNREC will seek to arrange a meeting with members of the community to explain what measures they must take in order to protect the water supply. This will be an ongoing procedure that commences with the publication of the first statewide map of WSPA's.

Finally, the public education element will include the incorporation of a WSP segment into the State's curriculum for public schools. This effort is being coordinated through the Department of Public Instruction, and the Department of Agriculture.

#### **E. Ground Water Monitoring**

Ground water monitoring will be performed as part of the WSP Program, and may involve the monitoring of both ground water quality and water level data.

Ground water quality monitoring will be required in the following circumstances:

- (1) Potential contaminant sources existed within a designated WHPA in the past.
- (2) Potential contaminant sources presently exist within a WHPA (including underground storage tanks, landfills, etc.).

In case (1) monitoring shall be conducted by the owner of the well(s) for which the WHPA is designated. In case (2) monitoring shall be conducted by the owner(s) of the potential contaminant source(s). In either case, DNREC will establish an active quality control program to assure that contaminants do not go undetected. This program will include requiring that sampling results be delivered to DNREC for active, continuous screening, and a schedule for DNREC personnel to accompany samplers on rounds and split samples with those responsible for procuring such data. No monitoring data will be accepted by WSB unless the sampler signs a statement saying that the methods used to procure samples conforms to the State's Manual for Groundwater Sampling (Custer, 1981). WSB currently requires samplers to fill out and submit sampling logs that describe the sampling methods used in support of the On - Site Wastewater and Waste Utilization Programs. These same standards will apply to samplers under the WSPP.

In addition, groundwater level data may be required within WHPA's to confirm the validity of the WHPA boundaries. Such monitoring shall be performed by the owner of the well(s) within such a WHPA. Well owners will be asked to submit results of their measurements, and a statement of how the measurement was taken to DNREC for monitoring purposes. Monitoring of water levels in NCPWS and CPWS is regulated by the Groundwater Management Section.

Purveyors who withdraw greater than 50,000 GPD of water are required to obtain an Allocation permit. These permits require that either continuous water level recorders be attached to the well or a drop port be provided to allow for water level determination. The GWMS routinely makes field checks of wells permitted under the Allocations Program. During site visits our personnel provide instruction on water level determination to the purveyor.

**(f) Contaminant Source Contingency Plans**

For owners of sources of contamination, contingency plans dealing with actions to be taken to abate, mitigate, and correct releases of substances that threaten water supplies will be required. The WSPA regulations will require these source owners to develop and submit such contingency plans within a specified period of time after the regulations are promulgated. DNREC will review the plans for adequacy and invoke Chapter 60 penalties when needed to obtain compliance. In addition to the contingency plans themselves, source owners will be required to demonstrate financial capability to activate such contingency plans. Financial assurance may be satisfied through documentation of insurance policies, bond arrangements or other such provisions, and specific requirements will be described in WSPA regulations.

Plans themselves will have to address the following questions at a minimum.

- (1) Who owns or is legally responsible for the facility?
- (2) Where can the legally responsible owner be reached in case of emergency?
- (3) Who is authorized to take action on behalf of the facility if the primary authority or owner cannot be reached?
- (4) What types of potential contaminants, and in what quantity are they stored on site?
- (5) Under worst case conditions, such as that which might be caused by a disaster or Act of God, how much of what contaminants could reach the groundwater?
- (6) What immediate measures would need to be taken to arrest the discharge, prevent it from soaking into the ground, and/or otherwise prevent damage to the water supply?
- (7) What type of equipment, including personal safety gear, would be needed to undertake such abatement actions?
- (8) What company, if any, has been retained to perform emergency environmental work at the site, and where

can they be reached?

Regulatory requirements for storage, treatment or disposal of existing sources of contamination will, of course, also be used to safeguard PWS wells. Table 3 provides a synopsis of regulatory controls and appropriate laws for each of the contaminant sources listed in Table 2. Where uncontrolled sources or weaknesses in existing laws or regulatory programs are identified, the DNREC, in consultation with the WSPAB, will recommend strategies to correct the problem(s). Management approaches for existing or proposed contamination sources will be developed during Phase I of the Program and incorporated in the WSP Regulations.

<u>ACTIVITY</u>	<u>STATUTORY AUTHORITY</u>	<u>REGULATORY CONTROLS</u>
CATEGORY I		
Land Application (Spray Irrigation, Infiltration/percolation, Overland flow)	7 Del. C. Ch. 60	All activities require a permit. Loading rates limited to agronomic rates. How regulations on Land Applications Waste Utilization were promulgated 12/08.
Septic Systems	7 Del. C. Ch. 60	Ground water monitoring required. Activity requires a permit. Permitting based on soil determination of seasonably high water tables. New regulation adopted 7/85. Ground water monitoring required for “large” systems.
Waste disposal wells and brine injection wells	7 Del. C. Ch. 60	All activities prohibited by regulation (UIC) except injection of treated municipal effluents (none presently existing). UIC regulations adopted 8/83
Drainage wells and pumps	7 Del. C. Ch. 60	All activities require a permit as UIC Class V wells
Recharge Wells	7 Del. C. Ch. 60	Activity requires a permit as UIC Class V well. Primarily ground water source heat pump installation. Heat pump supplies required to be reinjected into producing aquifer

Table 3: Regulations governing Category I sources of pollution

<u>ACTIVITY</u>	<u>STATUTORY AUTHORITY</u>	<u>REGULATORY CONTROLS</u>
CATEGORY II		
Landfills (industrial and municipal wastes, sludges, etc.). Hazardous and non-hazardous	7 Del. C. Ch. 60 and 7 Del. C. Ch. 63	All activities require a permit. Regulations prohibit contaminated discharges. Groundwater monitoring required. Solid waste regulations were adopted 12/80. Hazardous waste regulations adopted in 7/83 (amended as needed).
Surface Impoundments	7 Del. C. Ch. 60 and 7 Del. C. Ch. 63	All activities require a permit. Regulations prohibit contaminated discharges. Ground-water monitoring required. Solid and hazardous waste regulation apply as appropriate.
Animal feedlots and brine injection wells	7 Del. C. Ch. 60	Activity requires a permit. New agricultural waste utilization regulations based on use of BMP's are under development and due for completion in late 1988.
Leaky sanitary sewer lines sumps	7 Del. C. Ch. 60	Activity prohibited. Replacement of lines requires construction permit.
Manure storage	7 Del. C. Ch. 60	Discharge of contaminants prohibited by regulation. Agricultural BMP's utilized to prevent discharges.

Table 3 (Cont): Regulations governing Category II sources of pollution

<u>ACTIVITY</u>	<u>STATUTORY AUTHORITY</u>	<u>REGULATORY CONTROL</u>
Category III Agricultural activities (manure, fertilizer and pesticide application)	7 Del. C. Ch. 60	Discharges of contaminants prohibited by regulation. Manure, fertilizer and pesticide applications do not require a permit. Registration of pesticide use and applicators required by DOA. All applications subject to BMP's. Manure applications are included in draft waste utilization regulations.
Stock piles (salt, ore, coal)	7 Del. C. Ch. 60	Discharges of contaminants prohibited by regulation. Construction/siting permits not required. Groundwater monitoring required on case by case basis.
Buried product storage tanks and pipelines	7 Del. C. Ch. 60 and 7 Del. C. Ch.. 74	Discharges of contaminants prohibited by regulation. Existing tanks must be retrofitted/replaced with monitoring and/or secondary containment by 1991.
Highway deicing salts sumps	7 Del. C. Ch. 60	Permit not required. Exceedance of sodium or chloride drinking water standards requires replacement of water supplies.
Spills	7 Del. C. Ch. 60, 7 Del. C. Ch. 63, and 7 Del. C. Ch. 74	Discharges prohibited by Statute and regulation. State Emergency Response Team (SERT) on call for all accidents. Cleanup/remediation required of responsible party.
Product storage ponds sumps	7 Del. C. Ch. 60	Discharges prohibited by regulation. Permits required. Ground water monitoring required as appropriate.

Table 3 (Cont): Regulations governing Category III sources of pollution

<u>ACTIVITY</u>	<u>STATUTORY AUTHORITY</u>	<u>REGULATORY CONTROLS</u>
CATEGORY IV		
Salt Water Intrusion	7 Del. C. Ch. 60	Permits required for all ground water withdrawals. Ground water monitoring required as appropriate. Pumping levels and rates subject to change given water quality constraints. Well placement and depth subject to permit approvals.
River Infiltration	7 Del. C. Ch. 60	Permits required for activities that may induce river infiltration (salt water intrusion). Corrective action accomplished thru permit modifications.
Improperly constructed or abandoned wells.	7 Del. C. Ch. 60	Permits required for all wells. Construction standards included in new Regulations Governing the Construction of Water Wells (1/87). Abandoned wells must be properly abandoned in accordance with regulations. Intermixing of aquifers prohibited.

Table 3 (Cont): Regulations governing Category IV sources of pollution

## 5. NEW WELLS AND WELLFIELDS

Protection of new wells is an essential element of Delaware's WHP Program, and encompasses three main concepts:

- (1) Siting criteria for new wells will include the preliminary analysis of past or existing sources of contamination. Where a choice between two or more otherwise equally suitable well sites exists, the site with the least potential for having contaminants present will be chosen over site(s) with greater potential for contamination.
- (2) The purveyor will be responsible for locating the potential new well site, conducting a preliminary investigation as to the potential for previously and presently existing contaminant sources, and for providing the necessary information for the delineation of the WHPA.
- (3) New wellfields may not interfere with established protection zones. If a new well is proposed for a location where the proposed withdrawal rate could create a cone of depression that will interfere with a previously established site, the new well must be relocated or the proposed pumpage must be adjusted so as to not cause such interference. However, new wells may be established in designated recharge areas, and new WHPA's will take precedence over old recharge designations.

DNREC will incorporate into the WSP Program regulations criteria governing the delineation and protection of new wells and wellfields.

Assurance that the siting standards DNREC prescribes are met will be obtained through the Delaware "Regulations Governing the Construction of Water Wells" ("Well Regulations"). These regulations are enforced by the same entity in DNREC that maintains the WSP Program - the Water Supply Branch. The Well Regulations will specify (current regulations are under revision) that permits will not be granted for public wells until a WHPA is defined by DNREC. Although a test well may be needed in order to procure data necessary for the delineation, test wells may not be converted to public wells until the delineation is completed.

Upon completion of the delineation, DNREC will notify the appropriate county that the WHPA has been defined and that any new development proposals for the WHPA from that moment on must conform to WSP regulations. Plans and proposals that were recorded prior to the county notification have preserved development rights which will not be denied by WHPA overlay zoning restrictions. However, they will be required to conform to appropriate operating standards and other control measures required by the forthcoming regulations. If any of the local governments should enact "sunset laws" that would destroy development rights for latent construction operations for recorded development plans, then WSP regulations will preclude "grandfathering" of affected developments in accordance with the spirit of such sunset law in that particular

jurisdiction.

## 6. CONTINGENCY PLANS

In the event that a harmful contaminant is found to threaten a public water supply well, a plan of action is needed to assure that the ensuing activities that are undertaken to abate the threat or minimize the damage are performed in an orderly and efficient manner. The WSP Program will require that each public water supply purveyor prepare and submit to DNREC a copy of this plan for evaluation. This requirement will be included in the WSP Program regulations, and will include standards by which DNREC will assess the adequacy of such plans.

The first step toward enacting the contingency plan requirement is for DNREC to prepare a model plan against which purveyors' submissions will be compared. At a minimum, the plan will address the following:

- Short and long-term supply alternatives, in the event that the well water may not be used for public supply purposes.
- Mechanisms for coordination or notification between DNREC, the purveyor, and users.
- Financial considerations, for the above-noted procedures, well replacement, remediation, etc.

Currently, Delaware's statewide contingency plan for environmental emergencies includes consideration of a given site location's proximity to public water supplies. DNREC's State Emergency Response Team (SERT) coordinator possesses maps which illustrate the location of public water wells and surface water intakes. Although emergency abatement procedures are not altered drastically upon determination of a public water supply threat (emergency abatement measures are always geared toward the immediate minimization of threats to public health and the environment), special notification procedures are activated when PWS threats are identified. DNREC's SERT coordinator maintains a list of PWS contacts and telephone numbers for use in emergency situations.

The Delaware "Regulations Governing the Allocation of Water", which are enforced by the WSB, require that public water suppliers (municipal or privately owned systems withdrawing greater than 50,000 gallons per day of ground or surface water) submit drought and system emergency contingency plans. These plans may be used as addenda to the WSP contingency plans, as they address actions to be taken to reduce water consumption, and are required of certain regulated purveyors. In any case, the content of these plans serves as a model component of the contingency plans that will be required of all purveyors.

The requirements for contingency plans are divided into long term and short term actions. Short term actions are designed to deal with droughts or other system emergencies. It is this portion of the Allocations contingency plan that may be incorporated into the contingency plans for WSP purposes. Such actions include voluntary and mandatory restrictions, pricing policy, rationing, and emergency water supplies.

For emergencies involving threats to public water quality, these plans will obviously also be activated upon notification that a threat in fact exists. At a minimum these restrictions shall include those described in the State Comprehensive Water Resources Management Plan element on water conservation (Appendix B).

### Emergency Water Supplies

The Contingency Plan shall contain provisions for a temporary emergency water supply. Such provisions might include agreements with other utilities for water transfers, relocation of water intakes, use of untapped creeks or ponds, new or reactivated abandoned wells, temporary groundwater mining, relaxation of minimum streamflow requirements and the like as may be applicable to the particular utility.

### Major Requirements

In addition to the above the contingency plan should contain the following information.

1. Number of people in the service area.
2. Number of connections in the service area.
3. Annual rate of new connections since 1983.
4. Annual average daily water use (mgd) for the past 10 years by user category.

Residential  
Industrial/commercial  
Public/institutional  
Unaccounted for  
Entire system

5. Minimum and peak season's average daily water use for the past 10 years by user category. Also show the month of the year when the peak and minimum occur.

Residential  
Industrial/commercial  
Public/institutional  
Unaccounted for  
Entire system (include peak and minimum day's usage also)

6. Peak to average use ratio by user category for the past 10 years.

7. System safe yield (mgd)
8. List of major customers (users of 50,000 gallons per day or more of purveyor supplied water) and the average daily, peak season, and minimum season water delivery to each user for the past 5 years.
9. The name, title, address, and phone number of the individuals designated by these major customers to work with the state and the water supplier in preparing and implementing contingency plans.
10. Map of the distribution system, raw and finished water storage capacity, sustainable pumping and/or treatment capacity, water sources including interconnections and the limitations placed on withdrawals from these sources.
11. A description of interconnection agreements with other utilities and the conditions under which the agreements are effective and the conditions under which they can be terminated.
12. List of critical use customers and their minimum water use requirements (include their contact persons, addresses, and telephone numbers).
13. List of high volume water users and their minimum water use requirements (include their contact persons, addresses, and telephone numbers).
14. List of high volume water users which have service interruption agreements or which can be shut off during an emergency (include their contact persons, addresses, and telephone numbers).
15. Detailed analysis of the system describing what would be done in the event of contamination of a major water source, including written operating procedures which would enable the smooth transfer or receipt of alternate water sources. A similar analysis should be conducted for potential equipment malfunction.
16. List of federal, state, and local emergency personnel and their telephone numbers.
17. A description of the media alert system.
18. Legal impediments to shutting off customers who refuse to comply with mandatory water use restrictions.
19. Names and telephone numbers of utility employees which DNREC can use in the event of an emergency.
20. A list of potential substances, derived from the identification of contaminant

sources, that could potentially reach the well through accidental release.

21. A description of treatment methods that may be used to renovate contaminated water to bring it into alignment with appropriate State Drinking Water Standards.
22. A description of the purveyor's ability to procure (if necessary) and install such treatment systems, including an estimate as to how long it would take to install and produce potable water.

## 7. PUBLIC PARTICIPATION

Public participation in Delaware's WSP Program is the most important measure that can be taken to assure the program's effectiveness. Without public cooperation and input, the WSP Program effort is likely to encounter considerable opposition. The public's participation is an interactive function; the WSP Program objectives include both public education concerning water quality and the public's input in developing the program.

Several forums will be used to gain public participation, including public workshops, the WSPAB, publications, and public notices and hearings.

Three activities designed to increase public participation have already been performed or are in the process of being performed. In September of 1988, DNREC, EPA, and the Delaware Nature Society conducted a public workshop on the topic of Wellhead Protection. Similar workshops, also to include panels of experts, open discussions and question/answer segments, will be conducted during Phase I of the WSP and at the time of adoption of the WSP Regulations. Workshops and hearings will be held in all three (3) counties.

Another activity designed to promote public interaction is the incorporation of WSP in an environmental representative's presentation to homeowners. Under Delaware's Non-Point Source Program, an environmental representative visits homeowners in certain localities to discuss the impacts of non-point contaminant sources. The representative currently discusses potential impacts of non-point contaminants on public water supplies and describes how the WSP Program will help ensure the safety of those supplies.

Another public workshop was held on November 1, 1989, in Dover. The June 19th Draft Workplan was distributed along with the Water Resource Protection bill that had been introduced in the General Assembly during the summer of 1989. Comments from the attendees were recorded, and are presented in Appendix C. Appendix C also contains a list of invitees.

Finally, the WSPAB has been activated, and has met three times to discuss the WSP

plan thus far. Because this Board includes representatives of the environmental, civic league, and development communities as well as the government, it serves as an element of public participation in the process of developing the WSPP plan.

## **VII. TIMETABLE**

Phase I activities are anticipated to commence upon EPA approval of the WSP (WHP) Program. Table 4 depicts an estimated timetable for completion of key tasks within Phase I. Phase II activities (final WHPA delineations for all PWS, contaminant source list updates, new well WHPA delineations, contingency plan reviews, modification of regulations, etc...) will continue indefinitely.

## **VIII. SUMMARY**

The above workplan charts an ambitious course for the protection of public water supplies which can only be enhanced by Delaware's overall WSPA Program. Once Phase I activities are initiated it is conceivable that modifications will be made in the mechanics of the program.

**TABLE 4**  
**ESTIMATED TIMETABLE**  
**For Completion of Phase I of the**  
**WELLHEAD PROTECTION PROGRAM**  
**3/1/90 -- 6/30/92**

	M J S D M J S D M J
"Notice" Delineations	*_*
Finalize Contaminant Source List	*_____*
Development of New Well/Wellfield Procedures	*_____*
Model Contingency Plan Formulation	*_____*
Purveyor Contingency Plan Deadline	(1 year from completion of Phase II Delineations)
Development of WHPA Regulations	*_____*
Public Workshops (Regulations)	*_____*
Public Hearing (Regulations)	*_____*
Final Delineations of WHPA's Source Inventory Completion	*_____*
	(1 year from completion of Phase II Delineations)

## APPENDIX A

### PROCEDURE FOR IDENTIFYING POTENTIAL SOURCES OF CONTAMINATION

Persons required to identify potential sources of contamination under the WSPP must complete the following source identification procedures, at a minimum, and submit the results of such survey within six months of promulgation of WSP regulations.

1. Contact DNREC's CERCLA Branch for information required under the SARA Title III, "community-right-to-know" law.
2. Contact DPH's Bureau of Environmental Health for information collected under the Vulnerability Assessment provision of the SDWA.
3. Check the most recent aerial photograph available to confirm information found in Steps 1 and 2, and to identify any sources that would not be discovered in those steps.
4. If feasible, perform a visual survey of the site in question.

## **APPENDIX B**

### **RESTRICTION OF NON-ESSENTIAL WATER USES**

The following uses of water are considered to be non-essential and are to be curtailed during a period of declared water shortage emergency:

- A. The use of fresh water for non-agricultural irrigation and watering of outdoor gardens, landscaped areas, trees, shrubs, and outdoor plants with these exceptions:
  - 1. Water applied by hand-held containers or hand-held hoses with manually operated flow control nozzles for irrigation of domestic vegetable and fruit gardens;
  - 2. Water used by commercial nurseries at the minimum amount necessary to maintain stock;
  - 3. Water applied in the minimum amount necessary to implement revegetated land following earth moving where it is necessary to prevent soil erosion; and
  - 4. Water applied in the minimum amount necessary to allow new lawns and shrubs to survive or for application of fertilizers and herbicides to existing lawns.
- B. The use of water for washing paved surfaces such as streets, roads, sidewalks, driveways, garages, parking areas, tennis courts and patios;
- C. The use of water for watering any portion of golf courses except for tees and greens;
- D. The use of water for ornamental purposes including fountains, artificial water falls, and reflecting pools;
- E. The use of water for non-commercial washing or cleaning of automobiles, trucks, or other motor vehicles and trailers, except domestic washing from hand-held buckets and hand-held hoses with manual flow control nozzles where use is restricted to the minimum necessary;
- F. The use of water from a fire hydrant for any purposes (including the use of sprinkler caps) except for fire fighting;
- G. The use of water for flushing sewers or hydrants except as deemed necessary in the interest of public health and safety;
- H. The serving of water in restaurants, clubs, or eating places unless specifically requested by a customer.

**APPENDIX C-1  
DNREC  
WORKSHOP ON WATER RESOURCE PROTECTION LEGISLATION  
NOVEMBER 1, 1989**

**PUBLIC COMMENTS & DNREC RESPONSES**

**PUBLIC COMMENT**

**DNREC RESPONSE**

Bernard Dworsky-Inquired if DNREC was intending on placing special protections in the Cockeysville Marble area.

The area where the Cockeysville Marble subcrops will be designated as a protection zone.

Blackie Nygood- Stated that HB 264 does not require municipalities or counties to adhere to DNREC land use recommendations in WHP areas. She suggested the legislation be amended to include provisions for penalties assessed to municipalities and counties which do not comply.

No action possible.

Delores Slatcher-Expressed concern that the WHP program would severely curtail development in the State.

No action was taken.

Delores Slatcher-Noted that a great deal of cooperation and coordination between the local government and DNREC on zoning issues in WHP zones would be required.

DNREC agreed to work closely with the municipalities and counties on DNREC also stated that it would be having many workshops in the coming months which would address coordination issues with local governments.

Steve Stevenson-Questioned how the agricultural industry would be affected by WHP.

DNREC suggested that Best Management Practices would be required in protection zones. DNREC stated that it would be coordinating with the Department of Agriculture on developing guidelines for farmers to use in applying fertilizers or pesticides to land situated in WHP zones.

**PUBLIC COMMENT**

Paul Morrill-Questioned the need for regulating the density of development In protection zones.

Dwight Meyer-Asked if irrigation wells required.  
Would regulated under the WHP program

**DNREC RESPONSES**

DNREC noted concerns from septic systems being located too close to wells (a potential source of contamination). In addition, recharge protection zones should not be covered with structures. Otherwise

No response

## **APPENDIX C-2**

### **WHPA WORKSHOP MAILING LIST**

Public notice of the November 1, 1989 WHP Workshop was included in the October edition of the DNREC Register. The DNREC Register is published monthly by the Department of Natural Resources and Environmental Control. Approximately 5600 citizens of the state of Delaware receive the publication.

Notice of the November 1, 1989 WHP Workshop was also provided to the following groups:

#### **WHPA ADVISORY BOARD**

DGS

DWR

DAWM

DPH

DOA

WRA

Water Resource Center

NCC Planning

KC Planning

SC Planning

Del. Farm Bureau

Del. Home Builders

DDO

DNS

Sierra Club, SC

League of Local Gov'ts

League of Women Voters

Del. Assoc. of Realtors

Del. Bar Assoc.

NCC Civic League

Pike Creek Civic League

North Mill Creek Assoc.

Civic League for NCC

C.J. Seitz-GHADA

Secretary Eichler

Div. of Public Utilities Control-Bob Kennedy

PSC

#### **WATER SUPPLIERS**

AWWA

Tidewater

Wilmington Suburban

WATER SUPPLIERS (cont)

Bayview Improvement Co.  
Broadkiln Beach Water Co.  
Cedar Creek Water Co.  
Prime Hook Water Co.  
Cantwell Water Co.  
Crestfield Water Co.  
Midway Utility Co.  
Public Water Supply Co.  
Slaughter Beach Water Co.  
Sussex Shores Water Co.  
Water & Supply Co  
Artesian Water Co.  
Milford PWS  
Lewes PWS  
Millsboro PWS  
Milton PWS  
Rehoboth Beach  
Wilmington PWS  
Blades PWS  
Bridgeville PWS  
Clayton PWS  
Dagsboro PWS  
Delaware City PWS  
Middletown PWS  
New Castle PWS  
Newark PWS  
Smyrna PWS  
Dewey Beach PWS  
Dover PWS  
Greenwood PWS  
Harrington PWS  
Laurel PWS  
Seaford PWS  
So. Bethany PWS

DEVELOPERS

Committee of 100  
Blueball Properties  
Home Builders of Del.  
Home Builders of Lower Del.  
James Eversman  
Land Surveyors, State Board of Regis.

Stuart Kerzner, EPA

Virginia Thompson, EPA  
Edwin H. Clark, II  
William B. Chandler, Jr.  
Kermit H. Justice

**ADDITIONAL GROUPS**

Legislators DNREC  
Legacy Steering Committee  
Civic Associations  
Consultants/Engineers  
Mayors  
Regulatory Agencies  
Legacy Water Working Committee  
State/Local Coordinating Committee-Legacy  
Consultants  
City/Town Managers