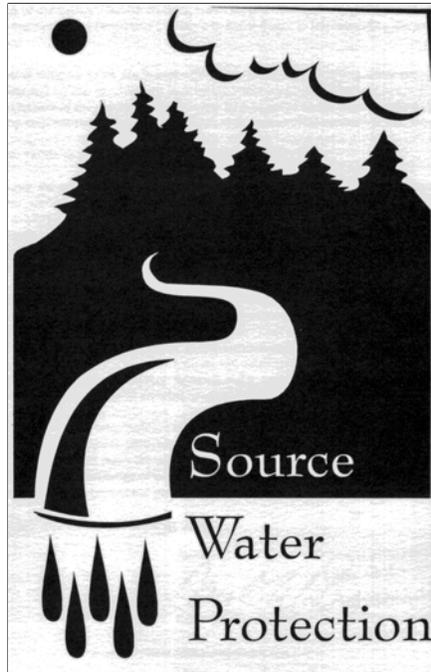


STATE OF CONNECTICUT SOURCE WATER ASSESSMENT PROGRAM

WORK PLAN



September, 1999

Prepared by:

Connecticut Department of Public Health
and the
Connecticut Department of Environmental Protection

Approved by EPA November 1999

State of Connecticut Source Water Assessment Program (SWAP) - Work Plan

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SOURCE WATER ASSESSMENT PROGRAM FOR THE STATE OF CONNECTICUT

EXECUTIVE SUMMARY

This document details Connecticut's new Source Water Assessment Program (SWAP) prepared pursuant to Section 1453 of the federal Safe Drinking Water Act. The goal of the SWAP is to evaluate the susceptibility of all of Connecticut's public drinking water supply sources, both surface water reservoirs and ground water supply wells, to potential contamination for the protection and benefit of the public water systems. Assessments will include delineation of source water protection areas, inventory of potential contaminants, and a determination of susceptibility for each water supply source. Completion of these assessments is a critical step in ensuring the protection of the state's public drinking water supplies. The State is required to submit the SWAP work plan to EPA, by February 6, 1999.

Connecticut is a state with numerous existing source water protection programs in place, and these programs are sufficient to satisfy many of the requirements of the SWAP. These include a water supply watershed protection program and an Environmental Protection Agency (EPA) approved wellhead protection plan. In addition Connecticut has a total prohibition of wastewater discharges within a public water supply watershed area. This total prohibition of wastewater discharges, along with Connecticut's numerous other drinking water source protection mechanisms (e.g. Wellhead Protection, Water Quality Standards, Water Company Land Regulation, etc.), provides a high level of protection to Connecticut's sources of public drinking water. The SWAP has been built on these existing protection programs and has been fashioned to best utilize and enhance existing resources and to address local concerns and priorities.

The Department of Public Health (DPH) and the Department of Environmental Protection (DEP) have formed a partnership to develop and implement the new Safe Drinking Water Act SWAP mandate. The DPH/DEP Development Team worked with a broad-based, 32-member Advisory Committee over an 8-month period to develop a work plan. This Advisory Committee helped define the scope of the SWAP and ensure that the assessments provide meaningful information to the water suppliers and the public to further source water protection efforts. A public hearing was then held on January 21, 1999 on the draft work plan to gather additional input and comment from the public at large. These comments were carefully considered and incorporated into the work plan as appropriate.

Table A on the following page summarizes Connecticut's approach. The overall strategy is to:

- (a) Delineate the source water areas as accurately as possible given the existing data available for the source.
- (b) Inventory the significant potential contaminant source (SPCS) threat to the water supply source using available data to define potential point and non-point sources of contamination based on specific land use (e.g. wastewater discharges (groundwater), chemical manufacturing plant, landfill), known spills or releases (e.g. underground fuel tank release), and general land use cover information. The type of system and availability of state and local data will determine the level of detail utilized in this inventory.
- (c) Assess the relative susceptibility of the water supply source through consideration of three major factors: (i) the inherent sensitivity of the source to certain contaminants based on source characteristics such as intake integrity, (ii) the vulnerability of the source to certain contaminants based on the presence or potential presence of those contaminants in the source water area, and (iii) the need for additional protection measures that may prevent contaminants from impacting the water supply. The three factors are ranked "high", "moderate", or "low" based on a several indicators for each factor. The indicators considered differ for surface water and ground water sources. Available data will determine the level of detail utilized in these assessments.

Draft assessments will be completed by DPH in partnership with DEP, utilizing data available at the state level for each drinking water supply source. The draft assessments will then be distributed for review through local agencies (e.g. local health departments, regional planning organizations) and the public water systems. Recommended modifications to the draft assessments will be evaluated by the DPH and DEP, and modifications made as necessary. The final assessments will summarize the sensitivity, vulnerability, and need for additional protection measures.

The assessments will be made available to the public through a variety of means: at municipal town halls, libraries, and the DPH; through the public water systems, and via the DPH internet web site. Workshops may be held to help local stakeholders and public water systems understand the assessments and to provide input. Based on local feedback other methods will also be considered.

The assessments will be utilized by the State to prioritize protection and remediation efforts and upgrades to public water supply systems. The information generated will be used in state-wide resource planning efforts and will aid municipalities in local land use planning and resource management efforts.

SOURCE WATER ASSESSMENT PROGRAM (SWAP) FOR THE STATE OF CONNECTICUT

INTRODUCTION

Development of a work plan for Connecticut's Source Water Assessment Program (SWAP) was initiated in 1997. The goal of the SWAP is to evaluate the susceptibility of all of Connecticut's public drinking water supply sources, both surface water reservoirs and ground water supply wells, to potential contamination for the protection and benefit of the public water systems. These assessments will provide information that can be used to reduce the potential for contamination and to plan for emergencies.

1. SDWA Requirements for State Source Water Assessment Programs

This document constitutes Connecticut's Work Plan for development and implementation of a SWAP pursuant to Section 1453 of the Safe Drinking Water Act (SDWA). The SDWA requires states to develop a SWAP which delineates source water protection areas for public water systems (PWSs) and identifies the origins of contaminants to determine the susceptibility of the PWS to contamination. EPA's goal is to implement full Source Water Protection Programs for at least 60 percent of the population served by community water supplies by the year 2005. EPA encourages states to actively help their PWSs develop full source water protection programs. Thus, developing a SWAP program that is meaningful on the state and local level and assists communities in implementation is a major focus of the work plan.

The SWAP for each state must be developed in accordance with guidance issued by EPA entitled "State Source Water Assessment and Protection Programs Guidance", dated August 1997. A completed assessment for a PWS consists of the following steps:

- (1) Delineating the source area surrounding the public water supply that contributes water to the well(s) or reservoir.
- (2) Developing a potential pollution source inventory to identify significant potential sources of contamination or activities within and around the delineated protection area that pose a threat to the public water supply.
- (3) Performing a Susceptibility Analysis.

Assessments must be completed for every PWS in the state, however, the level of precision and detail of the delineation and assessments may differ with the size or type of system. Both the SDWA and the EPA Guidance Document afford each state considerable flexibility in developing a program that suits the needs and resources of the individual state, and allow the states to build on their existing source protection programs. The SDWA also mandates extensive public participation in development of the SWAP, including requirements to convene an advisory committee, and to make the results of the assessments readily available to the public.

A work plan must be submitted to EPA by February, 1999, to describe how the requirements of the SWAP will be achieved. The assessments must be completed for all PWS's within two years after EPA approval of the State's program, although an 18 month extension of the deadline may be granted by EPA.

2. Participants in SWAP Development

The Department of Public Health (DPH) is responsible for the development of a SWAP in Connecticut. The program will be built upon and expand the State's existing surface water and wellhead protection programs. These programs are administered by the DPH and the Department of Environmental Protection (DEP), respectively, and the two departments have formed a partnership to develop and implement the SWAP. The DPH/DEP Development Team worked with other state agencies, a broad-based Advisory Committee, and the public to fashion a SWAP that best utilizes Connecticut's existing programs and resources, and addresses local concerns and priorities. A detailed discussion of public participation follows in Section A of this work plan, and the roles of the various government agencies are presented in Appendix I.

3. Overview of Public Water Systems and Sources in Connecticut

Connecticut is one of the smallest and most densely populated states in the United States (Table 1). Over 3.2 million people inhabit the state's 3.1 million acres. Approximately 84% of this population, 2.8 million people, are served by PWSs. A PWS is defined by state statute as a water company serving 25 or more persons or 15 or more customers.

Table 1. STATE PROFILE - CONNECTICUT

Total State Population (1990 census)	3.2 million
Connecticut Total Land Area	3.1 million acres (4,884 square miles)
Population density	655 persons per square .mile
Population served by public water supply	2.8 million
Percent of population served by public water supply	84 %
Number of Municipalities	169 townships

Connecticut is home to over 4,400 PWSs. These systems are categorized by type and size in Table 2. Community PWSs serve twenty-five or more residents throughout the year. Note that the majority of Community PWSs (81%) serve less than 500 people. While they are many in number, these smaller systems serve only about four percent of the state's population. In contrast, more than seventy percent of the population is served by just thirty-five very large systems which each serve more than 10,000 people. Connecticut has thousands of non-community PWSs. These non-community PWSs do not serve residential populations, and are categorized into two types - Transient and Non-transient. Non-transient non-community PWSs regularly serve the same population over six months a year (e.g. schools and office buildings). Transient non-community PWSs, such as restaurants and parks, provide service to transient populations.

Table 2. Public Water System Profile

<u>Public Water Systems in Connecticut</u>	<u>4,455</u>	
<i>Community Public Water Systems</i>	<i>605</i>	
Serving less than 100 people		240
Serving 101 to 500 people		250
Serving 501 to 1000 people		20
Serving 1001 to 3300 people		40
Serving 3301 to 10,000 people		20
Serving more than 10,000 people		35
<i>Non-Community Public Water Systems</i>	<i>3,850</i>	
Non-Transient Non-Community Systems		650
Transient Non-Community Systems		3,200

Connecticut's PWSs utilize surface water and ground water sources (see Table 3). Seventy percent of the population served by PWSs receive water from surface water reservoirs. The majority of reservoirs are located near stream headwaters, with two or three tributaries. Ground water supplies the remaining thirty percent of the population. The highest yielding ground water wells (over 1 mgd) are located in stratified drift deposits (glacial melt water deposits of sand and gravel) along major river valleys. Wells in fractured crystalline bedrock, and to a lesser extent in sedimentary and carbonate bedrock, are lower-yielding and are primarily utilized by small community and non-community systems.

Table 3 - Public Water Supply Source Profile

<u>Surface Water Sources</u>	<u>173</u>	
Active		137
Emergency		14
Inactive		22
<u>Ground Water Sources (estimated)</u>	<u>~ 5,500</u>	
<i>Community wells</i>	<i>~ 1,600</i>	
Stratified drift wells		455
Bedrock wells		1,015
Other		~ 130
<i>Non-Community Wells</i>	<i>~ 3,900</i>	

SECTION A - PUBLIC PARTICIPATION IN DEVELOPMENT OF CONNECTICUT'S SOURCE WATER ASSESSMENT PROGRAM

1. Overall Approach

Connecticut's established procedures have long encouraged public participation in program development, with Advisory Committees regularly being convened for input, and public hearings provided for regulatory and permitting processes. To meet the requirements for public participation for SWAP, the Development Team drew on these established procedures. The overall approach was to form a broad-based, diverse Advisory Committee of interested parties to assist in drafting the SWAP Plan, and then to bring the Plan to the general public for comment through a public hearing process.

2. Generating Interest in SWAP

Formal outreach efforts began on November 20, 1997, with a Source Water Assessment Program Open Forum. Approximately 4,800 notices were mailed directly to water suppliers, health officials, land use officials, environmental groups, state agencies, past members of other (related) Advisory Committees, consumers and businesses across the state. The mailing contained an announcement of the Forum, an introduction to SWAP, and a summary of program objectives (Appendix II). In addition, a press release was issued on November 12, 1997, inviting any interested groups or citizens to attend the Forum. The press release (Appendix II) was distributed to 20 major Connecticut newspapers, 20 weekly or local editions of daily newspapers, and 12 Connecticut radio stations. The Forum was held in the City of Hartford, which is centrally located, and no more than 1 1/2 hours from any point in the state. Approximately one-hundred people attended the Forum.

Basic information on the scope and goals of the program were presented, and comments were solicited on Connecticut's general approach and the Advisory Committee structure. An evaluation form was provided to attendees, allowing further opportunity to comment. Thirty-two people volunteered for the Advisory Committee. A meeting summary, and a summary of the evaluation forms completed by attendees, are also included in Appendix II. The most significant outcome of the meeting was that most attendees felt that a single Advisory Committee was the best way to deal with both citizen and technical issues, as this would facilitate coordination and communication between the different interests. In addition, there was consensus that the program should be conducted at the state level, without delegating any major responsibilities to the PWSs or municipalities.

DPH and DEP staff attended two additional meetings, the Second Annual Connecticut Section AWWA Technical Conference and Vendor Exposition, and a workshop entitled Protecting Your Drinking Water - A Wellhead Protection Workshop for Small Water Suppliers, in an attempt to educate people about the SWAP and solicit volunteers for the Advisory Committee. (Conference summaries, Appendix II). Two Fact Sheets (Appendix III) were developed and distributed at these meetings, as well as at other DPH and DEP programs, to try to generate interest in, and introduce the public to, the program. These fact sheets are titled: "Connecticut's Source Water Assessment Program (SWAP) What it is and How it will be Developed", and "Protecting Drinking Water Sources, The Role of the Department of Public Health."

3. The Advisory Committee

The initial outreach efforts discussed above generated a list of volunteers interested in being on the Advisory Committee. This list was carefully evaluated. To keep the size of the committee workable, one volunteer was selected to represent each interest group. Where there were multiple volunteers representing the same interest group (e.g. large public water systems), the additional volunteers were placed on an "Interested Parties" list. Some groups recommended in the EPA Guidance were not represented on the list of volunteers, so DPH directly solicited participation from these groups. For example, the Yale Aids Program, the Connecticut Petroleum Council and the Connecticut Conference of Municipalities were directly solicited through phone calls. A list of the invitees and their affiliations is attached in Appendix IV. From the responses to the invitations, a thirty-two member SWAP Advisory Committee was established. It should be noted that participation by wastewater treatment plant operators was not solicited because Connecticut does not allow wastewater treatment plants in water supply watersheds. The list of Interested Parties was comprised of forty-eight people. They received notice of all Advisory Committee meetings and were invited to attend and participate.

Four Advisory Committee meetings were held between May 8, 1998 and September 23, 1998 to provide input into development of a draft SWAP Plan. The DPH/DEP Development Team met every two weeks to develop white papers and proposals for the Advisory Committee. Various experts, including the United States Geological Survey (USGS), several DPH and DEP units, University of Connecticut's Water Resources Institute and the Environmental Research Institute, were called in to assist in this work as needed. Materials generated included the Connecticut Public Water Supply Profile; Summary of Existing Source Water Protection Programs; Source Water Delineations - Considerations for the SWAP Advisory Committee; Contaminant Source Inventories Draft Discussion Paper; and Susceptibility Analysis Considerations for the SWAP Advisory Committee (See Appendix V). These materials, along with previous meeting notes, were distributed to the Advisory Committee members and interested parties before the meetings to allow time for preparation, and were reviewed, discussed, and modified during Advisory Committee meetings.

Advisory Committee meeting agendas and detailed notes, including meeting summaries, are attached in Appendix VI, documenting the discussions and concerns. Attendance at the meetings was modest, however, the attendees were active participants and significantly affected the direction and scope of the SWAP plan. A subset of "key issues" directly from the EPA SWAP Guidance were addressed at each meeting and the results are summarized on the agendas and in the meeting summaries. These results were used by the Development Team when drafting the SWAP Plan.

4. Public Comment Period and Public Hearing

A public hearing was held on Thursday, January 21, 1999 to accept public comment on the draft SWAP Work plan dated December 1998. The public hearing took place at 9:22 a.m. in Conference Room C Annex Building located on 470 Capitol Avenue in Hartford, Connecticut. The public hearing legal notice is attached as part of Appendix VII. Lori Mathieu presided as hearing officer for the above referenced hearing. A verbatim transcript of the public hearing is included within the Hearing Officers Report.

Prior to the January 21, 1999 Public Hearing, a statewide public notice mailing took place to announce the existence and availability of the SWAP draft work plan. This statewide public notice, ending with the public hearing, set a formal thirty day public comment period for the draft SWAP Workplan. The 200 page draft SWAP Workplan was directly mailed to forty-five SWAP Advisory Committee members and fifty-eight Interested Parties list. A statewide mailing was sent on December 17, 1998. This notice of the existence and availability was mailed to all Community and

Non-Transient Non-Community public water systems, planning and zoning commissions, local health directors, town sanitarians, regional planning agencies, chief elected and administrative officials, and town clerks for posting in Town Halls. Therefore, over two thousand notices were mailed to potential interested parties. In addition, a legal notice (Appendix VII) was published in eleven Connecticut newspapers. See the Hearing Officers Report for a newspaper listing, and for the Waterbury Republican American Legal Notice.

In addition to the above mentioned direct mailing, the draft SWAP workplan was published on the Connecticut Department of Environmental Protection internet web-site (without appendices), along with the public hearing notice. These items were published on the web-site on December 19, 1998.

In response to the statewide draft SWAP Workplan notification, the state received ninety-four direct requests for the draft SWAP Workplan or summary. Written correspondence received in total included nine letters, six of which were received at or prior to the January 21, 1999 public hearing. These letters were acknowledged during the public hearing. Three letters were received by fax before the close of the official public comment period. The public comment period closed at the end of the business day on January 21, 1999. See the Hearing Officers Report for a listing of correspondence with a copy of all nine letters received.

At the public hearing, of the fourteen people in attendance, two provided verbal testimony. See the Hearing Officers Report for the Public Hearing sign-in sheet. Those two speakers were Mr. Eric Brown representing the Connecticut Business & Industry Association (CBIA), and Mr. Fred Hanssen representing the Redding Planning Commission. The CBIA also submitted written comments by fax prior to the end of the comment period after the public hearing. Mr. Hanssen's comments are noted on the public hearing transcript (See Hearing Officers Report). After the close of the public hearing at 9:42 a.m., the record was held open until the end of the business day Thursday, January 21, 1999.

A response to all comments received is included as part of the Hearing Officers Report. All relevant comments and suggestions were addressed as appropriate. Please see Section C of the Hearing Officers Report for the detailed responses.

5. Ongoing Public Input

Public input in the assessments will not end here. The Advisory Committee will continue to be appraised of additional developments in the program, and subcommittees will still be needed to draft the details of some processes not yet completed. In addition (as will be discussed under

Section B of this report), draft assessments will be prepared for each source and sent to the municipality through the local health director, regional planning agencies, and to the public water system for comment and revision. Additional information obtained at the local level will then be evaluated and incorporated into the individual assessments.

SECTION B - STATE APPROACH

1. Overall Approach and Philosophy

a. Definition of Susceptibility

Connecticut has adopted EPA's suggested definition of susceptibility: Susceptibility is defined as the potential for a PWS to draw water contaminated by inventoried sources at concentrations that would pose concern.

Connecticut's drinking water sources are either surface water or shallow ground water sources (typically <200 feet deep) with primarily urban/suburban development and a fairly high population density with an historic reliance on manufacturing. Human activity encroaches on many of our PWSs. Given this setting, it was necessary to develop a relative susceptibility ranking of the PWSs in the state, to allow prioritization of the sources for upgrades and protection measures, and of source areas for remediation and enforcement. It was also necessary to generate an awareness at the state, town, and individual citizen levels of how land use activities may affect sources of drinking water, and to help the PWSs focus their efforts on protection strategies that will do the most to protect their sources of supply.

Three primary factors will be considered in the susceptibility analysis for each source: sensitivity, vulnerability, and need for additional protection measures. Consideration was given to summarizing these three factors into a single susceptibility rating, but this is not as informative as presenting the three factors separately. The separate factors help target the types of protection measures most appropriate for the individual supply, and guide the stakeholders toward the appropriate actions.

b. Differential Approach

For every PWS, the same three primary factors will be considered in the evaluation. However, there are inherent differences in susceptibility for surface water and ground water sources, both in the path that contaminants take to the source, and in the types of contaminants that are of concern. Additionally, there are inherent differences in ground water movement and contaminant paths in unconsolidated (stratified drift) aquifers versus consolidated (fractured bedrock) aquifers. These differences in source type necessitate different approaches and will be treated separately in this work plan.

c. Level of Exactness and Detail

The level of exactness and detail utilized for the assessments is dependent upon the data available for each source. Generally, more data is available for the larger systems, and for community PWSs vs. non-community PWSs. It was determined early in the development of the SWAP that there is simply not enough time or funding available to collect a great deal of new data for the assessments.

Existing data available at the state level will therefore be the initial source of information for the assessments. To expand the data utilized, individual draft assessments will be prepared using data available at the state level, and then the draft assessment information will be reviewed and modified or supplemented at the local level. The details on what data will be utilized for each type of system, as well as default rankings to be used if an indicator is unknown, will be discussed later.

As the program progresses, it is anticipated that the level of detail and exactness will likely increase - both as additional data is collected on individual PWSs, and as the state's GIS capabilities and access to electronic data improve.

d. Area-wide Assessments

The vast majority of the 3,200 Transient Non-Community PWS's in Connecticut are low yielding bedrock well systems, for which little site-specific data are available (for example, in many cases the well log is unavailable, or the pumping rate is unknown). Collecting such data for thousands of these small wells in order to complete SWAP delineations is not feasible within the SWAP time frame.

We must therefore take a more generalized approach, grouping these wells into larger area-wide protection areas and conducting a single assessment for the whole group of wells. This approach is termed an "area-wide" assessment.

The delineation approach is discussed further with an example provided in Appendix XVIII, but essentially, hydrogeologic mapping techniques will be applied to a group of wells rather than an individual well. A single assessment will then be completed for each delineated area-wide protection area, utilizing available SPCS's, water quality, and land use information and reasonable assumptions as to well type and yield based upon the hydrogeology of the area and any available well logs. Due to the physical proximity of these wells, the relative uniformity of geology within these areas, the unavailability of site-specific data, and the fact that these are transient systems (and so are not the primary water supply for any population), the area-wide approach is appropriate.

The area-wide assessments will be provided to each individual TNC within the assessment area. A site-specific GIS map will be provided to each TNC within the assessment area, with educational materials allowing the PWS to conduct a more detailed, voluntary self-inventory and to translate the self-inventory into appropriate protection measures. The area-wide assessments will also be provided to the municipality to allow municipal-level protection measures to be promulgated if appropriate.

e. Links to Existing and Future Programs

As will be discussed later, Connecticut's existing source protection programs are fairly extensive and comprehensive in scope, however, they are heavily weighted toward the larger community systems that serve the vast majority of the state's population. The assessments provide an opportunity for the state to evaluate where additional protection measures are needed, and to prioritize systems for further attention. The SWAP will link to existing protection programs in that it will utilize data from all of these, and will provide feedback to these programs on ways of prioritizing further actions. The SWAP will identify areas where additional data are necessary (such as locational data for non-community systems), and what individual systems can do to improve protection.

2. Existing Water Supply Protection Programs

The state of Connecticut has had a long-term goal and commitment to the protection of public health and the environment through the protection of drinking water sources and provision of adequate treatment. The state's well-developed regulatory and statutory provisions have been in place for many years, providing a high degree of source protection. All PWSs are afforded a certain level of protection from these programs, although additional protection is focused on the larger community PWSs. Connecticut's major existing source protection provisions are summarized below. Further detail, with statutory references, are provided in Appendix VIII.

It is a state policy that neither treatment nor source protection, alone, can effectively protect public health and prevent source water degradation. Connecticut uses a multiple barrier approach to protecting and preserving PWSs consisting of five essential barriers: (a) source protection; (b) treatment systems (including mandatory surface water filtration and disinfection); (c) water quality assurance; (d) water supply planning; (e) and distribution system maintenance (including mandatory cross connection and flushing programs). This is a source-to-tap approach that recognizes that treatment technology alone cannot guarantee the provision of clean drinking water. Statutory and regulatory jurisdiction for these multi-barrier programmatic elements primarily falls within the DPH and DEP. DPH is the lead agency responsible for the adequacy and purity of drinking water. Responsibility for the protection of drinking water sources, and achievement of statewide water quality goals, falls to the DEP.

The most fundamental element of Connecticut's multi-barrier approach is the prohibition of direct point source discharge of waste (landfills) and wastewater (municipal sewerage, industrial wastes), regardless of treatment, into existing or potential public surface water supplies. In ground water supply areas, point wastewater discharges to the ground are prohibited by DEP except for approved domestic sewage disposal. This is a powerful anti-degradation prohibition that affords protection to all PWSs in the state. In addition, Connecticut has adopted Water Quality Standards which set the overall goals for the restoration and management of surface water and ground water quality in the state. Through this DEP program, all waters of the state have been classified. The classification system establishes designated uses and sets water quality criteria necessary to support the designated use. Waters used for drinking water supply receive the highest classification (AA for surface water or GAA for ground waters). This has significance in numerous DEP programs, guiding permitting and priorities for inspections and remediation.

Connecticut's Wellhead Protection Plan was approved by EPA in 1990. The foundation of the program is the State Aquifer Protection Act, administered by DEP. Pursuant to this Act, regulations requiring water companies to map the wellhead protection areas for systems with stratified drift wells that serve more than 1,000 people were promulgated. Once additional regulations are adopted, municipalities are required to adopt the map of the protection area and impose land use regulations to these public water supply wells. Eighty-one of Connecticut's 169 municipalities must comply with these regulations.

On an annual basis, the DPH inspects one-third of all active community water PWSs and one-fifth of the NTNC PWSs. During these sanitary surveys, staff perform a physical on-site review and inspection of the facilities, checking the conditions of the systems, recording violations of the Public Health Code, and providing technical assistance for improvement of system deficiencies and correction of violations.

Public water suppliers also shoulder a large responsibility for preserving and protecting critical PWS owned land. The sale, lease, or change of use of critical PWS owned land is controlled by the

DPH to ensure that the purity and adequacy of a public water supply is not compromised. Regulatory control of PWS land effectively protects an estimated twenty to thirty percent of all lands associated with a surface water public drinking water source. Annually, PWSs with surface supplies conduct comprehensive inspections of their water supply watersheds and take action against activities identified as harmful to supply. Some PWSs also voluntarily perform inspections within aquifer areas. The PWSs also have responsibility for maintaining water quality through treatment and other operating procedures.

Water supply planning regulations require water suppliers and other governmental and regional organizations with vested interests in drinking water, to develop long-term regional planning documents with sections devoted to the preservation and protection of existing and potential drinking water supplies (through the Water Utilities Coordinating Committee Process). In addition, long-term individual water supply plans with a source protection element must be submitted to DPH by all community PWS serving more than 1000 people. Also, the Connecticut Plan of Conservation and Development includes numerous source protection goals and policies.

Municipalities and local health departments are also involved in a number of different activities related to source protection. State statutes require local planning and zoning commissions, and inland wetlands agencies to consider protection of present and potential public water supplies in their local land-use plans and regulations. The development of local source protection plans using both regulatory and non-regulatory strategies is encouraged through technical guidelines and direct assistance. Municipalities have the authority to pass protection ordinances and many municipalities have voluntarily taken such measures.

Source protection strategies by their very nature are proactive and preservation based. However, there is also a need for enforcement mechanisms to be in place to ensure that threats to a water supply can be expediently dealt with and that persons within critical aquifer and watershed areas are accountable for any adverse conditions resulting from activities on land. The ability of the state agencies to respond to actual contamination or pollution threats must also be considered an integral part of any comprehensive source protection program. The DPH and DEP have broad authority under state law to issue orders against actual or potential polluters to protect water supplies. State law authorizes local health directors to assess penalties for potentially polluting activities within watersheds and aquifer areas and to seek remedies for polluting activities. PWSs may also seek remedies against polluters. There are also a number of related mechanisms such as protection of public water supplies from pollution by sewage disposal, storm water, cemeteries, and other land development practices, which also protect the integrity of Connecticut's public water supply watersheds.

These programs and laws afford a high level of protection that is comprehensive in scope. Additional details on these programs are provided in Appendix VIII.

3. Delineation Approach

Delineation of source protection areas is a very important first step in the SWAP process, as it defines the area of focus for the remaining aspects of the assessment. In order to provide meaningful information, it is important to utilize the most accurate method of delineation allowed by the data available. Being overly conservative in estimating source areas may negatively impact the business and local community, and create undue concern about the susceptibility of a source to potential pollution. Likewise, to under-protect the source area, thus neglecting areas that may present potential contamination sources to the PWS, may negatively impact PWSs. It is therefore important to be as accurate as possible in delineating source protection areas.

a. Ground Water Sources

For ground water sources, differential levels of delineation will be employed. The PWSs are grouped based upon the following considerations: (1) system types, including community PWS (which serve residential consumers), non-transient non-community PWS, and transient non-community systems; (2) population (systems serving larger populations affect the greatest percentage of the population, have more responsibilities under various state and federal laws, and typically have larger financial resources, and thus have more extensive data); and (3) aquifer type (stratified drift vs. bedrock) and pumping capacity of the well.

It is important to note that Connecticut's ground water sources are mostly shallow (typically less than 200 feet deep) and unconfined (or semi-confined by discontinuous clay layers in glacial lake deposits). Non-adjacent recharge areas are therefore considered a negligible concern.

The number of wells cited below does not necessarily correspond to the number of delineations required, because a single delineation can be performed for a well field with multiple wells.

COMMUNITY SYSTEMS

PWSs Serving > 1000 people with Stratified Drift Wells (~ 250 wells in 128 wellfields)

These wells are regulated under the DEP Aquifer Protection Program, which is part of the state's EPA-approved Wellhead Protection Plan. Source water areas have already been delineated to "Level B standards", and are in the process of being refined to "Level A standards".

The Level B mapping methodology utilizes available site-specific information and the pumping rate of the well field to calculate a fixed radius using the Theis equation. The resulting circular area is then modified using hydrogeologic mapping to extend the source area to the basin divides where appropriate (see Appendix IX for an example, and Appendix XXI for the Guidelines For Mapping Stratified Drift Aquifers To Level B Mapping Standards). The simplifying assumptions inherent in this method are reasonable in extensive areas of stratified drift, however, the method typically over-estimates the source area for the well.

The Level A mapping methodology utilizes extensive site-specific data and three-dimensional numerical ground water modeling to provide a much more accurate source water area (See Appendix IX for an example). However, Level A mapping for all of these wells will not be completed within the SWAP time frame. At a cost of approximately \$100,000 per well field, it is not feasible to use SWAP funding to accelerate the Level A mapping process. Therefore, the Level A mapping will be utilized for the assessments where it is available, and the Level B mapping will be utilized where Level A is not available.

PWSs Serving < 1000 people with Stratified Drift and/or Dug Wells (~ 170 wells)

Currently, the only defined areas for these wells are the sanitary radius (a variable fixed radius ranging from 75 to 200 feet in accordance with the Connecticut Public Health Code). The sanitary radius is based upon bacterial decay rates, and does not take any other contaminants into consideration. While the sanitary radius is perhaps appropriate for determining the siting distance between a well and a domestic septic system, it is not appropriate for assessment purposes. The source areas for these wells will be delineated using the Level B methodology described above.

The necessary data is available, or can be obtained using available information, and although somewhat conservative, it provides a reasonable approximation of the source area for this type of well.

PWSs using Bedrock Wells (~ 1,077 wells)

An appropriate delineation methodology for bedrock wells has not yet been determined. The Advisory Committee and the DPH/DEP Development Team have expressed concern that utilizing porous media delineation methods is not appropriate for the state's bedrock wells, particularly those in the crystalline bedrock. Very little published research is available on the hydrogeology of Connecticut's bedrock.

In order to complete assessments for bedrock wells, a two phase approach is planned. Phase I includes utilization of a calculated fixed radius equation. These delineations will be completed and utilized for finalizing the assessments. This calculated fixed radius is based upon the volumetric flow equation provided below:

$$\text{radius} = \sqrt{Qt/\pi nH}$$

- where
- Q = pumping rate of the well (gallons per minute)
 - t = time of pumping (minutes. Assume to be 180 days (259,200 minutes))
 - π = pi (~ 3.1415926)
 - n = porosity (expressed as a decimal. For fractured crystalline bedrock, it is assumed to be 0.0022)
 - H = saturated thickness (feet. Assumed to be 200 feet)

Applying this equation results in the relationship between pumping rate and source area radius displayed on Chart 1, with the source area radius ranging from 350 feet at 5 gallons per minute (gpm) to 2,850 feet at 325 gpm.

Phase II includes utilizing an approach developed by the U.S. Geological Survey (USGS). This USGS study once completed is planned to be utilized to refine the calculated fixed radius delineation for bedrock wells. A copy of this USGS proposal is included (See Appendix X). The proposed study would investigate fracture patterns across the state and relate them to methods of delineation. The state would be divided into 5 - 10 map units based on physiography, rock type, yield, and other factors. Detailed investigations would be conducted at selected, representative wells in these areas. A method and the supporting data for each area will be developed that can be used to transfer results of the detailed investigation to other wells in similar settings, creating a "toolbox" of bedrock delineation methods that would be appropriate to Connecticut's bedrock aquifer conditions. The Program Implementation Schedule for completion of this study is included on Page 29.

An agreement between the USGS and the DPH to implement this study is planned to be signed in calendar year 2000.

NON-COMMUNITY SYSTEMS

Non-Transient Systems (~ 600 wells)

NTNC systems include schools, day care centers, businesses, etc., where the same people drink the water every day. Due to the importance of these systems to the affected population, these wells will be treated in the same manner as comparable small community wells. Therefore, for stratified drift or overburden wells, Level B methodology will be utilized and for bedrock wells, the two phase approach will be utilized. When there is no metered rate of withdrawal or no known pumping rate, a default rate of 10 gpm will be used, unless a higher number can be estimated using typical values for similar systems based on number of employees, building size, industrial codes, etc.

Transient Systems (~ 3,300 wells)

As discussed on Page 8, the vast majority of TNC systems in Connecticut are low-yielding bedrock wells. For these systems, very little of the site-specific data necessary to delineate individual source protection areas (such as pumping rate, yield, well depth...) are available, and it is not feasible to collect such data within the SWAP time frame. We must therefore take a more generalized approach, grouping these wells into larger area-wide protection areas and conducting a single assessment for the whole group of wells. This approach is termed an "area-wide" assessment.

The basic starting hydrogeologic unit for grouping TNC wells together and for defining the delineation of area-wide protection area will be the sub-regional drainage basins. There are 337 sub-regional basins in Connecticut (shown in Appendix XVIII), ranging in size from approximately 1000 acres to 3000 acres. All the TNCs within the basin will be assessed as a group with respect to the SPCSs and land use/land cover within the basin, and a single assessment for the group of TNCs will be prepared. With the shallow ground water systems in Connecticut, it is reasonable to assume that ground water divides are coincident with surface water divides in most cases. This may not be an appropriate assumption where a pumping well is located close to the divide. In such a case, SPCSs and land use on the other side of the divide will be taken into consideration in the assessment. An example of an areawide susceptibility assessment is presented in Appendix XVIII. This includes the groundwater susceptibility analysis work sheet flowcharts, sub-regional basin mapping and the data layers available for use.

The sub-regional basins can be quite extensive, so where possible, the sub-regional basin will be subdivided into smaller protection areas. Such subdivision will be done by a state hydrogeologist or other trained state professional using best professional judgement. The state hydrogeologist will consider the following GIS data in delineating area-wide protection areas within a sub-regional drainage basin: (a) Location of local drainage basin divides; (b) Surficial and bedrock geology; (c) Location of major hydrologic features such as a major river or fault system; and (d) Distinct changes in land use that may affect the susceptibility ranking. All available data will be considered in attempting to delineate the most appropriate area-wide protection area for the TNCs, given the general lack of site-specific data for these systems.

If the detailed hydrogeologic data are available for a TNC system, an individual delineation may be completed (if time and resources permit), using the same delineation methods detailed earlier for NTNC wells. However, it is anticipated that few TNC systems have such data available.

A critical set of data for the area-wide assessments is having GPS locations for the TNCs. Such data are proposed to be collected as part of the SWAP. (Locations for all Community PWS and NTNCs are already entered into Connecticut's GIS.) Where GPS locations are unavailable, address matching through the GIS will be utilized.

b. Surface Water Systems

For all surface water sources (173), the entire watershed area will be delineated as the source area. Although segmentation of the watersheds was considered, a complete watershed approach is more consistent with Connecticut's anti-degradation and waste discharge prohibition policies which protect the entire drinking water watershed regardless of distance from the intake. In addition, most of the watersheds are less than 5 square miles in total area (only 6 watersheds are in excess of 20 square miles), so assessment of the entire watershed is a feasible task. The watershed boundaries for the entire drainage basin flowing to the intake have already been determined and digitized into DPH's GIS for all surface water sources.

c. Springs

Topography will be used to delineate the immediate, local upland area draining to the spring.

d. Conjunctive Delineation

EPA recommends consideration of conjunctive delineation for all sources. The consideration of surface water contribution areas and zones of ground water contribution during the delineation process is termed "conjunctive delineation".

Surface water contributions to ground water sources: Many of Connecticut's wells, particularly wells located in the stratified drift along the major river valleys, induce infiltration of surface water into the ground water. These wells have been identified by DPH staff as potentially under the influence of surface water, and have been required to complete monitoring studies. Over 135 wells were investigated, and only a handful were shown to be potentially under the influence. In addition, the state has never had a documented occurrence where contamination of the surface water has impacted a properly constructed ground water source of supply. Therefore, only those wells determined to be under the influence of surface water, as regulated by the SDWA, will be conjunctively delineated. Such wells will have the drainage basin from the well upstream to the drainage divide delineated and considered in the assessment.

Ground water contributions to surface water sources: With Connecticut's shallow ground water systems, it is reasonable to assume that ground water and surface water divides are coincident (except where affected by pumping ground water). Since the entire watershed will be delineated for surface water supplies, ground water contributions are inherently included in the delineation.

e. Recognition of Previously Identified Protection Areas

Some PWSs have, of their own initiative, established wellhead protection areas around their wells or watershed protection overlay zones in cooperation with local towns. For those PWSs who have voluntarily and proactively established a source protection area, the delineated area will be recognized under the SWAP program if it meets the minimum delineation area criteria, or has been shown to be effective to the satisfaction of the DPH.

4. Contaminant Source Identification

The contaminant source inventory is an important element of the assessments. It determines the vulnerability of the source to pollution and helps direct protection strategies. Significant potential sources of contamination will be inventoried to the extent practical in source protection areas using existing core state and federal information and local supplemental information where appropriate and available. Contaminants of concern will be all contaminants regulated in the Connecticut Public Health Code, plus Giardia and Cryptosporidium. The approach for determining the significance of potential sources will consider the characteristics of potential contaminants, likelihood of release, and general susceptibility of the resources. Based on these criteria, a list of significant potential sources of contamination will be compiled by land use categories. The level to which these sources will be inventoried is based on water system type and the availability of state and local information. The significance of a potential source in relation to the location within the source protection area will be further qualified in the susceptibility determinations. In addition to point locations of significant sources, an evaluation of general land use conditions will also be used in the susceptibility determinations.

The end product will be a uniform statewide inventory data base compiling existing statewide information and supplemental local information that will be useful in the assessments and be used in existing state and local source protection programs and efforts.

a. Contaminants and Sources of Contamination

Contaminants of Concern

The inventory will identify sources of contaminants regulated under the Connecticut Public Health Code Water Quality Standards for Public Water Systems, and will also include Giardia and Cryptosporidium. The Public Health Code includes all Federal SDWA contaminants (Appendix XI).

Where possible, the assessments will link the inventoried pollution source to a particular contaminant category based on physical, chemical, and biological properties. The four basic contaminant categories are:

- i. Physical: particulates, solids that can carry other contaminants, color, odor.
 - ii. Inorganic Chemicals: metals, other dissolved elements such as sodium and nitrate.
 - iii. Organic Chemicals: pesticides, numerous synthetic compounds, VOCs (gasoline, solvents).
- Microbiological: bacteria, viruses, protozoa.
Radiochemicals

Description of Contaminant Sources

Potential contaminant sources were identified from previous pollution source lists and rankings developed for Connecticut. Pollution source information was reviewed from the State Non-Point Source Management Plan Connecticut, State Water Quality Reports, State Aquifer and Wellhead Protection Program Reports, Ranking of Land Use Categories by Risk to Ground Water Quality, USGS water quality reports, historic monitoring and other reports. The SWAP Guidance list of potential sources was also reviewed. Appendix XII includes a list of point and non-point pollution sources in Connecticut. Potential sources of contamination include all facilities and activities that could release contaminants or that may be judged potentially harmful to ground or surface water sources. It includes both lower and higher risk activities.

Approach for Determining Significant Potential Contaminants Sources (SPCS's)

Appendix XIII includes a ranking of contaminant sources based on land use categories. SPCSs will be considered based on the pollution source ranking, historic knowledge of known and potential pollution sources, water quality monitoring, initial susceptibility of sources, and statewide institutional source controls and management measures. It will not include specific management controls by the facility or local management controls, however these are considered in the susceptibility determinations. A Significant Potential Contaminant Source (SPCS) is defined as "any facility or activity that stores, uses, or produces as a product or byproduct, the contaminants of concern, and has a sufficient likelihood of releasing contaminants within a source water protection area in an amount which could contribute significantly to the concentration of the contaminants in the source waters of the supply".

Specific high risk pollution activities such as waste disposal, chemical use/storage/handling, and stormwater runoff potential were used to develop a list of SPCSs based on the level of risk or ranking of the pollution source. The approach for determining SPCSs was based on general susceptibility information (from past documentation) that indicates most of our source waters are fairly sensitive (unconfined, shallow aquifers, etc.). However, this is offset to a large extent by the fact that many significant point sources of pollution do not exist in active source areas because of statewide pollution source controls. For example, industrial wastewater discharges are prohibited to both surface or ground water drinking sources in Connecticut. However, potential non-point (diffuse) sources of pollution from these industries may still be significant. These include: urban and agricultural runoff; chemical and petroleum storage; chemical spills and leaks; and miscellaneous releases. Therefore, SPCSs will primarily consist of historic or pre-existing waste disposal sites, contaminated sites, and sites of significant potential non-point sources from high risk land uses and activities. The list of SPCSs is in Appendix XIV.

Because site-specific information may be limited in some cases, general land use/ land cover (LULC) information generated from satellite imagery will be used as additional SPCS information. A detailed and accurate layer of LULC information is available statewide in digital form and has been used by DEP in non-point source assessments. LULC categories and aggregation are listed in Appendix XV. General land use conditions will be inventoried in source protection areas as percent "urban" and percent "agricultural". The general land use conditions will be used as a separate indicator of source vulnerability in the assessments, in conjunction with the SPCSs.

The following is the proposed land use vulnerability ranking to be used in susceptibility determinations:

Percent cover	Agricultural land cover	Urban land cover
0 - 10%	low	low
> 10% - 30%	medium	medium
> 30%	high	high

b. Inventory Approach, Data Sources

The inventory approach is to use existing statewide pollution information as the core data and to supplement that with local information where it is available. Appendix XVI describes SPCS information that currently exists, who has the data, and if it is in GIS format. The information is divided into “core data” that is readily available and useable statewide and “supplemental data” which, if available and in usable form, may be used on a case by case basis.

The primary information source to be used statewide will be the Leachate and Waste Water Discharge Sources (LWWDS) inventory. This is available in digital GIS format. This is the best existing statewide database of known or suspected pollution sources, is maintained by DEP, exists as GIS data and is updated periodically. It shows the following surface and ground water pollution source information: wastewater discharges, historic and now defunct waste disposal sites, and locations of accidental spills, leaks or discharges of a variety of liquid and solid wastes. It contains most information from a number of state and federal lists including: State Waste Water Discharge Permits, CERCLA (Federal EPA Superfund Program), DEP Site Discovery and Assessment, DEP Inventory of Hazardous Waste Sites, DEP Solid Waste Landfills, and DEP Contaminated Wells. The maps distinguish between ground and surface water discharge sources. Locational information is currently being improved through a coordinated DEP/EPA effort by obtaining accurate GPS locations and eliminating duplicate points. Appendix XVII includes an example of the LWWDS inventory. This information is used to assign surface and ground water quality classifications in the state, and is used by many water suppliers and towns to assess pollution threats. This information in itself could serve as a complete inventory in some cases.

The primary source of supplemental information will be information provided by the PWSs in existing plans, surveys or inventories, and voluntary local information provided by local officials.

The following approach will be used to determine the level of detail and completeness of the inventory:

Community PWSs (surface and ground water), and NTNC PWSs:

All SPCSs listed will be inventoried within delineated areas using the statewide core data. Useful supplemental data will generally be available, but will vary in accuracy and form on a source by source basis depending on the type and size of the system. General LULC information will also be mapped for use in the vulnerability determination.

TNC PWSs:

As described in the delineation approach, these sources will be delineated as part of “area-wide assessment areas”. In keeping with that approach, all SPCSs listed will be inventoried within the entire area using the statewide core data. General LULC information will also be mapped for the entire area. Both will be used to determine susceptibility for the entire area.

Self-inventory information may be provided to the individual PWS based on the area-wide assessment, to assist them in addressing potential on-site pollution sources. This may include a detailed scale map of their site, a potential pollution source inventory check list, and a set of best management practice fact sheets as an educational tool to address identified site concerns.

5. Susceptibility Determination

As discussed previously, “susceptibility” is defined as the potential for a PWS to draw water contaminated by inventoried sources at concentrations that would pose concern. Three major factors will be considered in assessing the relative susceptibility of each water supply source: (1) The inherent sensitivity of the source to certain contaminants based on source characteristics. (2) The vulnerability of the source to certain contaminants based on the presence or potential presence of those contaminants in the source water area, including considerations of fate and transport of contaminants associated with the SPCS’s activities. And (3) the need for additional protection measures that may prevent contaminants from impacting the water supply. The three factors are ranked “high”, “moderate”, or “low” based on several indicators for each factor, and the indicators differ for ground water and surface water sources. These three (3) factors will help target the types of protection measures most appropriate for the individual supply. Contaminant transport and environmental fate are considerations embedded in the three susceptibility determination factors discussed above. These three factors will then be synthesized into one final ranking of either “high”, “moderate”, or “low”. These final rankings are determined utilizing a chart provided on the last page of Table B.

The proposed methodology and considerations for ground water and surface water susceptibility are discussed below. Note that at this point in time, ground water susceptibility is further developed than surface water susceptibility. This is due, in large part, to previous consideration of many of the ground water concepts during the development of Connecticut’s Aquifer Protection Area Program. For surface water, the proposed specific indicators for the susceptibility analysis have been drafted. A subcommittee of the SWAP Advisory Committee has been established to complete the details of the surface water susceptibility analysis. This information has been included in Appendix XIX. This will be one of the first tasks to be finalized as part of the work plan.

a. Ground Water Susceptibility

A flow chart with accompanying text has been prepared which provides the details for analyzing ground water susceptibility. See Table B on Page 19.

Source Sensitivity. Source sensitivity is a qualitative evaluation of the likelihood that contaminants will impact the water supply due to the physical construction of the well and the characteristics of the geologic materials it is in. Three indicators will be used to assess source sensitivity - water quality (with respect to microbiologics and physical contaminants such as particulates), intake integrity, and geologic sensitivity. The supporting data needed include water quality monitoring data for the source, available through SDWIS and paper files; information on the construction of the well and well seal, available through sanitary surveys of the PWS by DPH (currently in paper files); and information on the geologic materials or rock type the well is screened in, available

through the DPH “wells” GIS coverage. These indicators are considered together to determine a “high”, “medium”, or “low” source sensitivity. Sources which require more information will receive a High* rating. The asterisk denotes the need for more information, and will be carried forward with the source for its final rating. This will help identify the sources which require more information.

Source Vulnerability. This is an indication of the likelihood that contaminants will impact the water supply due to the presence of SPCSs within the delineated source area. Three indicators are used, water quality (with respect to all contaminants in addition to microbiologics and physical contaminants), identified SPCSs, and land cover. The supporting data needed include water quality monitoring data for the source, available through SDWIS and paper files; a number of GIS layers of point data on significant potential sources that were discussed under Section B(4) of this work plan (including the Leachate and Wastewater Discharge coverage, RCRA facilities, Underground Storage Tank layer...); and the Land Use/Land Cover GIS satellite imagery data. In Table B, Page 20, Tier I and Tier II have been designed with consideration of contaminants fate and transport.

The number of SPCS's are considered in the determination of source vulnerability, however, several fate and transport factors, referred to as “Tier 1” and “Tier 2” factors, will be taken into consideration by the analyst that may modify the existing vulnerability determination. Tier 1 factors are items that may increase the vulnerability of the water supply source, resulting in a higher existing vulnerability than would be expected from the number of SPCSs. These include (a) having the SPCSs located very close to the water supply source (closer than 1/3 the distance from the source to the boundary of the source area); (b) If the water supply source is a large producer, pumping greater than 500 gpm, and/or if the water supply system has no storage capacity (thus the time to respond in the event of a spill is minimal); (c) If the SPCS has a history of spills or enforcement problems; or (d) If ground water monitoring at or near the SPCS indicates elevated concentrations of contaminants in the ground. Tier 2 factors are items that may decrease the vulnerability of the water supply source, resulting in a lower existing vulnerability than would be expected from the number of SPCSs. These include (a) having the SPCSs located far from the water supply source (farther than 2/3 the distance from the source to the boundary of the source are); (b) If the water supply source is a small producer, pumping less than 50 gpm, and/or if the water supply system has significant storage capacity (thus there is some time available to respond in the event of a spill); or (c) If the SPCS has a good compliance history, or BMPs in place to reduce the potential threat from the facility. Where this type of information is not available, “Tier 1” will be conservatively assumed. These indicators are considered together to determine a “high”, “medium”, or “low” source vulnerability, and what contaminants the source is considered vulnerable to.

Need for Additional Source Protection Measures. Many water suppliers and/or municipalities have source protection measures in place. These need to be documented and included in any susceptibility analysis and in determining what other measures are needed for an individual source. For community systems, three indicators are considered: Land control/ownership, adequacy of Local (municipal) protection measures, and adequacy of Water Company protection measures. For non-community systems, two indicators are considered, (because it is extremely unlikely that these small systems have taken protection measures): Land control/ownership, and adequacy of Local (municipal) protection measures. These indicators are considered together to determine a “high”, “medium”, or “low” need for additional protection measures.

The three rankings for source sensitivity, vulnerability, need for additional source protection measures will then be synthesized into one final ranking for each source. The last page of Table B is a chart which shows the methodology to determine the final source ranking.

The susceptibility information and rankings will be compiled into an Assessment report. The report will summarize the results for each indicator and factor in the assessment, and will then

discuss a series of standardized recommendations that would decrease the susceptibility of the source. For example, if the PWS only owned a small percentage of the sanitary radius, one recommendation would be to work to obtain ownership or control through easements of additional lands within that area. A subcommittee of the Advisory Committee will work with the SWAP Development Team to develop the recommendations. Finally, the assessment report will include an area map.

Available data will determine the level of detail utilized in these assessments. The data necessary to evaluate each indicator will not always be available, particularly for the smaller systems. A default ranking of HIGH* will be utilized when there is a need for more information. An initial draft assessment will be prepared using the data available at the state level, and default rankings where necessary. Draft assessments will then be distributed to the PWS and the local health director and/or the local planning department for comment, supplementation, and possibly modification. This is the step where missing data will be solicited from the public water system, and local health director as appropriate. Rankings may be adjusted where missing information has been provided. This will expand the base of knowledge to the local level, and ensure that the assessments are understandable and usable to both the supplier and the municipality. The local responses will be evaluated by DPH in consultation with DEP, new data entered into the state databases as appropriate, and a final assessment prepared for distribution.

b. Surface Water Susceptibility

Surface water sources are assessed in a manner very similar to ground water sources. The same three major factors considered are source sensitivity, source vulnerability, and the need for additional protection measures. A draft Surface Water Susceptibility is included in Appendix XIX.

These rankings will then be synthesized into one final source ranking consistent with the methodology for ground water susceptibility. As outlined above for groundwater sources, the default for missing information will be a HIGH* ranking. The asterisk will note the need for more information.

A subcommittee of the SWAP Advisory Committee has been formed to finalize the susceptibility assessment determination. The surface water susceptibility is planned to be finalized by the end of the first quarter calendar year 2000. The format of the assessments, with preparation of a draft assessment, review at the local level, and then development and distribution of the final assessments, will parallel the ground water assessments.

SECTION C - MAKING ASSESSMENTS AVAILABLE TO THE PUBLIC

An important component of the SWAP is to ensure the widespread availability of results of the assessments to Connecticut's citizens in a clear, concise, and understandable manner. Citizens will also be provided several ways to access the detailed information associated with each assessment.

1. CONTENT AND FORMAT

The content of assessments provided to the public will be presented so that it is understandable to the lay person and not too technical in language. The information will consist of a one to two page summary report of the assessment results, recommendations to decrease the susceptibility of the source, and an area map. The map will show the delineated source area and the location of significant potential contaminant sources (SPCS). SPCSs within the assessment area will be identified by generic type (e.g. gasoline station) and street address. A discussion concerning the source's susceptibility to contamination will be provided. While results of each assessment will be presented in a summary form, detailed information collected during the assessments will be made available to the public if requested. Assessment maps will be created using Geographic Information System (GIS), or other appropriate software.

The SWAP Advisory Committee will help the state in creating assessment information that is understandable and informative to the public. Their input in regards to the lay person's relative understanding of assessment information will be particularly important and a key consideration in the assessment report content.

2. PROVIDING ASSESSMENT RESULTS

After the assessments are complete, the DPH will disseminate the results to the public. (See Timeline, Page 29-30) Information regarding the assessment summary report, delineated area map, and susceptibility discussion will be on a DPH Internet web site once available in a finalized format. Internet availability is estimated to be the first and second quarters of CY 2003. The present DPH web site address is: <http://www.state.ct.us/dph/> and the DPH Water Supplies Section telephone number is (860) 509-7333. This web site will be designed to link to other relevant web sites such as: "Surf Your Watershed", the index of watershed indicators, and DEP's web site. Copies of the assessments will be available through the public water supplies, town planning officials, local libraries, and the DPH.

Regional planning organization staff, municipal officials and public water supply officials, including town planners, health directors and elected officials, will be offered workshop training opportunities to discuss methodologies, procedures and assessment results with DPH and DEP staff. Town officials will be provided copies of the assessments for local distribution and use. All households within the delineated areas will be contacted through a local outreach process.

In addition to the distribution methods described above, the DPH proposes to seek modification of existing source protection legislation under Connecticut General Statute Section 25-32k to require that *PWSs* provide customer notification of assessment results. Consumer confidence reports will also be required to include information on how to obtain a copy of the water system's complete source water assessment.

The DPH will be the agency responsible for the availability and provision of assessment results.

Ongoing periodic reminders of the availability of the assessments will include public notices in newspapers, annual bill stuffers and DPH Internet updates. A partnership between PWSs and local and state authorities will ensure the dissemination of current information to the public.

SECTION D - PROGRAM IMPLEMENTATION

1. Source Water Assessment Program Completion Timeline

Completion of the federal SWAP requirements as outlined in the EPA's 1997 final guidance document is estimated to require a full three and one half years. The numerous tasks are outlined in the attached Program Implementation Schedule (see Pages 29-30). As is readily apparent from the schedule, a great deal of preliminary work, which includes computerizing data from paper files and linking existing databases, is necessary. Therefore, the State of Connecticut requests an eighteen-month extension of the two-year SWAP time frame allowed for in the federal requirements.

Critical to the SWAP is complete computer automation of the assessment reports and background information. This project involves the gathering of manually stored file data; creation of an access database; linking to existing databases, including Geographic Information System (GIS) mapping; and assessment determinations of over 4,400 public water systems.

The SWAP requirements dictate a phased approach. Connecticut's sequential approach includes delineation of the source water protection areas, gathering and automation of required inventory data, and completing susceptibility determinations. The specific timing and completion of the assessment determinations are outlined in the following paragraphs and are shown on the attached Program Implementation Schedule (see Pages 29-30).

a. Surface Water Assessments

The watershed boundaries have already been delineated for all PWSs using surface water. This information is available on GIS. A differential or segmented approach is not being recommended due to the existing watershed approach and the relatively small size of the majority of watersheds within Connecticut. For watersheds that extend outside of Connecticut into neighboring states, the boundaries have been delineated for the entire drainage area. See map in Appendix XX. Connecticut plans to work through the New England Interstate Water Pollution Control Commission (NEIWPCC) to obtain inventory information for a full assessment determination for all border sources of supply which serve Connecticut PWSs.

Contaminant source inventories and susceptibility analyses will be prioritized based on source status as follows:

1. Active reservoirs and surface water diversions
2. Proposed reservoirs and surface water diversions (planned within five years)

The initial focus will be on assessing all active surface water supply sources. This will be completed within the initial three and one-half year time frame. The second priority will be proposed surface supplies identified within a PWS's approved individual water supply plan and scheduled to be online within five years. This will be an ongoing project as plans are approved. Only proposed sources with a DEP classification of A or AA will be delineated. Any other proposed surface water sources are not permitted for use as potable water supply sources at this time. Therefore, conducting assessments for such sources would not result in additional source protection.

b. Ground Water Assessments

All known active ground water sources will be delineated and contaminant source inventories and susceptibility analyses will be prioritized based on system type, source type and source status. The first priority will be to inventory and assess community wells, then stratified drift or large-producing non-community wells, and then other sources. The lowest priority will be given to small non-community sources, except where water quality problems exist or wells are determined to be of socio-economic importance to a rural area because alternative sources of supply are not readily available.

The priority ranking for completing ground water assessments is as follows:

- Community Water Systems - Existing stratified drift wells serving >1,000 persons (currently completed under APA program).
- Community Water Systems - All other stratified drift wells
- Community Water Systems - Large active bedrock wells (>50 gpm)
- Community Water Systems - All other active and emergency bedrock wells
- Non-Community Systems - Active stratified drift wells or large producing bedrock wells (>50 gpm)
- Non-Community Systems - Active wells with existing water quality concerns
- Non-Community Systems - Wells that are socio-economically important to the community
- Non-Community Systems - Remaining Non-Transient Non-Community Wells
- Non-Community Systems - Remaining Transient Non-Community Wells

The first eight categories above will be targeted for completion within the initial project period. New and proposed sources and the transient non-community wells in category 9 will be addressed over time as they are identified.

2. State Resources Allocated to the SWAP

The State of Connecticut is committed to implementation of the SWAP. Although Connecticut has numerous PWS, the Plan has been designed to make the most of existing data and staff resources to complete assessments for all PWS within the given timeframe. Further refinements of the assessments will take place as additional funding, time and data become available.

a. Drinking Water State Revolving Fund

The DPH has applied to EPA for 10 percent of the Drinking Water State Revolving Fund (DWSRF) under the Local Assistance Set-Aside for the SWAP (\$2,140,820) as allowed under the SDWA and consistent with the DWSRF Intended Use Plan and the DPH Performance Partnership Agreement (PPA) with EPA. The DPH will also utilize DWSRF money from the Local Set-Aside for implementation of a Wellhead Protection Program for SWAP activities. This additional funding is a renewable grant fund which may be used to continue source protection efforts beyond the initial project period.

b. Staffing Levels

Phase I - SWAP Work Plan Development (August 1997- February 1999)

State funds are presently utilized for existing DPH staff involved in the SWAP. Existing DEP staff (1.75 FTEs) are being funded by the DWSRF set-asides.

Phase II - SWAP Assessment (February 1999-May 2003)

Projected DPH staff resources to implement the SWAP work plan include 3.0 FTEs. At least one of the positions will require special knowledge in information management, including GIS. The current 1.75 FTE staffing level for the DEP will continue through the entire funding period.

Phase III - Future Source Protection Program (Beyond May 2003)

Continued source water protection efforts beyond completion of this work plan is strongly recommended in the EPA Guidance. A total of five FTEs are planned for a DPH source protection program to continue under this work plan. This program will be responsible for maintaining and updating data, and for coordination of local source water protection efforts. The DPH's reorganization plan and Performance Partnership Agreement with the EPA both include this new program. Staffing for the full program will rely on a combination of state and federal funds.

3. SWAP Project Responsibilities

The majority of the SWAP projects will be completed by either the DPH or the DEP, or jointly by both agencies. An interagency Memorandum of Understanding (MOU) will be entered into which will outline DPH and DEP SWAP development responsibilities. DPH is responsible for the overall SWAP development coordination, planning, projects and reporting requirements. The DPH will also be responsible for completion of the assessment determination projects. The specific roles of the two agencies are currently being negotiated. The MOU is expected to be completed by September, 1999 and will be submitted to EPA at that time.

Although project delegation is not planned at this time, one area where delegation may be considered is public participation. Contracts with local health departments or regional planning agencies may be considered to conduct local workshops for stakeholders to discuss and comment on local source protection issues.

4. Coordination and Partnerships**Stakeholder Partnerships**

The SWAP development team has worked over the last year to include a variety of groups (local, state, and federal) in the development of the SWAP work plan. This team approach is planned to continue throughout project implementation. Outreach efforts to local town commissions, environmental groups, watershed associations, Federal Soil and Water Conservation groups, etc, seeking local input concerning potential or existing contamination sources will be ongoing throughout the entire assessment process. This should help build support and develop commitment for drinking water source protection at the local level.

Tribal Nation

In Connecticut, there is one Tribal Nation which controls and owns its drinking water supply source. The SWAP team will cooperate with this Tribal Nation in a SWAP assessment determination, if requested. If portion of this program (i.e., wellhead delineated area) affects Tribal

National Reservation land, Connecticut will cooperate with that Tribal Nation and the EPA as appropriate to gain necessary information.

c. Interstate

The Connecticut SWAP development team will work with appropriate staff from the neighboring states of Massachusetts, Rhode Island, and New York, staff of EPA Region I and the NEIWPC, in order to complete consistent assessments for border sources of supply. Connecticut will complete the assessments for Connecticut supply sources, which have drainage areas delineated in other states, dependent upon agreements yet to be decided.

One effort has been ongoing since 1994 with the City of New York for the protection of the City's surface water sources that have portions of their watershed drainage areas in Connecticut. Under a Connecticut state statute, an applicant to a local planning and zoning commission, local zoning board of appeals, or local Inland Wetlands Agency, is required to send notice of their application to a water company if that proposed activity is located within a drainage area to that water company's source of public water supply. The DPH has worked with the five municipalities impacted by this law in order to satisfy this statutory requirement for the protection of the New York City watershed areas. This effort will continue and may be extended to Massachusetts and Rhode Island, as appropriate.

5. Progress Reports to EPA

The SWAP development team plans to issue quarterly reports to the EPA concerning SWAP progress, including DWSRF expenditures. These quarterly reports will include at a minimum:

- The number of systems, categorized as ground water, surface water, or combined, as consistent with SDWIS.
- The number of systems by category with "completed" delineations, source inventories, and assessment.
- The population served by the systems in source protection areas.
- How completed assessments have been made available to the public.
- General and specific project tracking and progress (timeline).
- Discussion of project problems/issues.

SWAP progress, where appropriate, will also be reported by the DEP as a part of the Wellhead Protection Program.

6. Future Assessment Updates

a. Regulatory Alignment Process

The Connecticut SWAP team recognizes the need to periodically update the assessment data. The assessment determinations will be designed to easily incorporate newly regulated contaminants and rules expected to be promulgated by EPA during the SWAP development process. These rules include the Ground Water Disinfection Rule, the Chemical Monitoring Reform Rule and Alternative Monitoring Rule, the Consumer Confidence Reports, the Underground Injection Class V Rule, and the Enhanced Surface Water Treatment Rule.

The process that will be utilized to update the assessments will include: an in-house evaluation of any new rules; an evaluation of necessary SWAP changes; consultation with the EPA, the Advisory Committee, and local stakeholders; redrafting of the SWAP; and submission to EPA for approval.

b. Periodic Updates

A Source Water Protection Program in the DPH is planned to continue after this project is completed. This program will be responsible for updating assessment information.

SECTION E - Source Water Protection Programs

The State of Connecticut Department of Public Health and the Department of Environmental Protection are fully committed to drinking water supply protection through preventative and proactive measures. Connecticut has a long history of recognizing that public drinking water supply sources, including associated drainage areas, must be protected from adverse impacts and water quality degradation. The State Plan of Conservation and Development (C & D Plan) clearly sets statewide policies and goals to ensure protection and preservation of drinking water sources, as well as DEP's approved Wellhead Protection Program and the water supply programs administered by the DPH. The Source Water Assessment Program has been designed to build on and bridge together the numerous existing drinking water supply protection programs to provide for the protection and benefit of all public water systems.

The Connecticut SWAP will link together a number of ongoing statewide planning programs. The Connecticut C&D Plan of 1998-2003 has specifically recognized the SWAP process under its drinking water supply section. The C&D Plan will utilize the delineated areas in future land-use planning decisions. Assessment information will also be utilized to guide proposed projects under the Connecticut Environmental Protection Act, which outlines requirements for environmental impact studies for major state projects and funding.

The SWAP is expected to provide links to a number of existing and future DEP programs. The following protection programs are expected to use the assessments: water quality standards and classifications, wellhead protection plan, aquifer protection area program, non-point source pollution program, watershed management program, and local technical assistance. It is also expected that various assessment information may be useful to several programs in the Permitting, Enforcement and Remediation Division, and the Inland Water Resources Division.

The Department of Public Health, Water Supplies Section, plans to create a source water protection program are outlined in the DPH's Performance Partnership Agreement with the EPA. This program will be responsible for all SWAP activities. As new SDWA rules are promulgated, the source protection program will be in place to address any SWAP program links and initiate adjustments, as appropriate. In linking existing source protection programs with the SWAP, proactive preventative measures for drinking water supply protection will be enhanced.

The SWAP will lead to modifications to a number of existing drinking water supply protection programs. Regulations concerning well siting, sanitary surveys, watershed surveys, and regional and individual water supply planning, may require updating to utilize the completed assessment information. Local land-use planning may also require updating so local land-use decisions consider the impact to drinking water supply sources and their associated delineated areas.

Outreach efforts are planned to continue beyond completion of the assessments. In order to actively utilize the completed SWAP information, the local entities which have control over local land-use decisions, must be educated and actively involved. Partnerships formed with local town governments and the public water suppliers will continue under active DPH and DEP source protection programs. Key local groups include: regional planning agencies, watershed associations, town sanitarians, local health directors, town planning and zoning commissions, town inland-wetland commissions, and local chief elected and administrative officials.

The DPH and the DEP are committed to utilizing the SWAP assessment results for the continued and enhanced protection of public drinking water supply sources. Key to the success of the SWAP in Connecticut is the link between the assessment determinations and the local land use decision

makers and stakeholders. Use of the assessment results by all associated programs in the federal, state, local, tribal, citizen groups, and business associations is critical for proactive source protection. Linking the assessment information to the existing comprehensive drinking water source protection measures in place in Connecticut, will provide for the protection and benefit of public water systems and associated drinking water supply sources.