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Protecting Water Sources

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This booklet is part of a series of educational brochures and slide sets that focuses on various aspects of water source protection. The series has been prepared jointly by the University of California Agricultural Extension Service and the California Department of Health Services.

For further information about this and other documents in the series, contact the project team leader (see below) or visit the following website:

www.dhs.ca.gov/ps/ddwem/dwsap/DWSAPindex.htm

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By developing a voluntary drinking water source protection plan, a public water system or community can build on work done previously as part of a drinking water source assessment.

The goal of a local source protection program is to identify, develop, and implement local measures that advance the protection of the drinking water supply. A local program should maximize use of existing data and develop more detailed information, drawing on local knowledge.

Local advisory committees and volunteer groups are important sources of information for any source-water protection program.

Implementing a Program

The following steps are recommended for drinking water systems or communities that choose to implement a voluntary source water protection program.

1. Review the state's DWSAP Program
2. Establish a local advisory committee
3. Review the initial drinking water source assessment and determine whether to expand and refine it. If expanding and refining seems necessary, then consider ways to accomplish that. Steps that may be appropriate include:
   a. Gathering additional information
   b. Revising delineations of the source area and protection zones
   c. Refining and updating the inventory of possible contaminating activities (PCAs)
   d. Reviewing the vulnerability analysis and vulnerability ranking
   e. Prioritizing the PCAs that need to be studied more closely based on vulnerability of the drinking water source
4. Prepare reports and maps
5. Develop a protection program based on revised assessment
6. Submit the protection program (and revised assessment) to DHS, other agencies, and the public
7. Implement the protection program and its management approaches
8. Conduct contingency planning

The sharing of information is encouraged, especially for drinking water systems or communities that have common delineated source areas or protection zones, or those that share aquifers or watersheds. DHS recommends that communities and systems with common interests work together on protection programs. DHS's local offices can provide examples of groups of water systems that have joined together to work on similar projects (e.g., watershed surveys).

Smaller systems whose source areas and protection zones lie within the source areas or protection zones of a larger system may be able to make use of the information developed by the larger system, as well as to provide information to the larger system.

More detail about some of the steps is provided below.

Forming a Local Advisory Committee

A successful source water protection program requires that drinking water systems or communities involve the public. Such involvement may be through local public advisory groups or the use of volunteers for information collection, to name two examples. When forming a local advisory group, it may be appropriate to include representatives from a variety of stakeholder groups. (A list of potential stakeholders is included in one of the other booklets in this series, "Overview of California's DWSAP Program.")

Reviewing the Assessment

The assessment for the drinking water source should be reviewed to determine whether it should be updated or revised. Revisions of the assessment, if appropriate, could be made to the delineation, the PCA inventory, the vulnerability analysis, or a combination of these elements.

Adjusting Delineations

Local drinking water systems or communities may revise the source areas or protection zones that were used in the initial assessment, to incorporate more detailed or more accurate data. Various methods for delineating source areas and protection zones are described in other

booklets in this series.

Modifying PCA Inventory

As was done when conducting the original assessment, the gathering of supplemental information should be coordinated with the work of various state, local, and federal agencies. It should also make use of the permits issued and the enforcement actions taken. Some communities have inventoried PCAs on a parcel-by-parcel basis, sometimes by using volunteers from the community.

When developing a local protection program, a community may wish to inventory additional PCAs associated with potential contaminants not normally subject to drinking water regulation. Those potential contaminants could include the following: US EPA's priority pollutants; chemicals that are subject to the Toxic Release Inventory; California's list of hazardous substances; chemicals identified as causing cancer or birth defects or other reproductive harm for purposes of California's Safe Drinking Water and Toxic Enforcement Act of 1986 ("Proposition 65"); or chemicals for which permits are issued by the Regional Water Quality Control Board.

Refining Vulnerability Analysis

The objective of the vulnerability analysis in a protection program is to determine more accurately which of the types of PCAs pose the greatest threat to the water supply. Vulnerability analysis procedures for the minimum assessment are described in a separate booklet in this series.

The determination of the effectiveness of a physical barrier—one of several steps in a vulnerability analysis—could be modified based upon more detailed information regarding the hydrology or hydrogeology of the watershed or aquifer and the source. Water systems may use a different method from DHS's to evaluate physical barrier effectiveness, provided that their method considers the same factors as the DWSAP method.

The vulnerability ranking could be modified by considering additional information regarding some or all of the PCAs. For example, the density (number of facilities) and the quantity or extent of the area that the type of PCA occupies in the protection zone could be included in determining potential risk. In addition, facility-specific information (compliance, construction, operation, etc.) could be considered. Appendix E or L of the DHS DWSAP document may be useful for this purpose.

Updating Assessment Maps

Results of the revised assessment could be illustrated on an updated map that identifies the drinking water source, source areas and protection zones, and PCAs to which the source is most vulnerable. Such a map is helpful in the development of a protection program and in describing the program to the public.

Iterating

Iterations (repetitive assessments) are valuable, particularly since, for many drinking water systems, a simple approach will be used for the initial assessment. A simple delineation and inventory may suggest that a drinking water source is at risk of contamination, while a more detailed approach may show that the "risk" initially identified reflected the assumptions used and not the actual situation.

Initiating Appropriate Measures

If the drinking water source is vulnerable to contamination, protection measures may be taken. These might include increased monitoring, abatement or remediation of contaminant sources, planning for an alternative source of supply, or other management activities, as described later in this booklet, in the section that outlines procedures for management and contingency planning.

Informing the Public

When the drinking water system or community decides to make the findings of its protection efforts available to the public, one or more of the following methods may prove useful:

- Provide documents for review in public libraries
- Provide documents for review at county health or environmental health departments
- Issue press releases that refer public to locations of documents for public review
- Mail notice to organizations, identifying locations of documents for public review
- Mail notice to customers, identifying locations of documents for public review
- Hold a public meeting that describes the findings of the protection program and refers to locations of documents for public review
- Mail assessment map and summary to customers or to the public
- Provide results or a summary in annual Consumer Confidence Report to customers
- Make results available by electronic access (e.g., Internet)

In all cases, copies of source water assessment and protection reports should be provided to the drinking water regulatory agency: either DHS or the county, if the county is a Local Primacy Agency (LPA).

Updating Protection Program

The public water system or community should develop a schedule for updating its protection program. To be consistent with source water assessments, the protection

program should be reviewed for possible update every five years.

Information for the public (via Consumer Confidence Reports) should be updated based on revised assessment maps and follow-up iterations. This will ensure that the public receives the most up-to-date and accurate information.

Choosing a Management Approach

Source water protection is not a mandatory element of the US EPA's Source Water Assessment Program. However, protection is a required element of a complete wellhead protection program. US EPA and DHS encourage development of protection programs for all sources, recognizing that prevention of contamination is of greater benefit to the public and to drinking water utilities than dealing with contamination after the fact, through expensive drinking water monitoring and treatment and other expensive environmental cleanup activities.

Refining and updating a preliminary inventory of PCAs often involves research of public documents. Some such documents may be on microfiche at local libraries or government agencies.

A drinking water system that has completed a source water assessment and which has initiated a protection program may be eligible for waivers from certain water quality monitoring requirements. As mentioned previously for the assessment program, the state could require protection programs to be in place prior to the granting of permits and waivers, particularly for water systems with sources that contain detectable levels of a regulated or unregulated chemical.

Drinking water systems and communities are encouraged to develop management strategies to mitigate the impact and minimize the risk of contamination of the drinking water supply. Another activity related to the DWSAP is contingency planning. It is discussed later in this booklet.

Management within source water protection areas is primarily the responsibility of local governments and public drinking water systems, supported and guided by State policies and programs. Source water protection activities in California can be divided into three categories:

- State programs related to drinking water source protection
- Recommended guidelines for management in protection areas
- Local management activities

Each type of activity is described below.

State Programs Related to Protection

Existing state programs to protect water supplies and to inventory, regulate, and clean up contaminant sources are described in another booklet in this series.

DHS will actively promote the development of local drinking water source protection programs. DHS's activities to promote protection of drinking water supplies include technical assistance, financial assistance, training, and education.

As each assessment performed by DHS is completed, the information will be shared with the public water system, along with guidance for local protection programs.

Technical Assistance

The DHS Drinking Water Program has a source water (wellhead) protection coordinator available to assist local agencies with their own protection programs. In addition, staff at DHS's Drinking Water Program district offices are available for assistance, if requested. These DHS personnel can make presentations to water suppliers and community groups about source water protection, and can review technical elements of proposed programs.

Financial Assistance

There are several sources of funding for source water protection activities from federal, state, and local

sources. Recently, DHS implemented a low-interest loan program for source water protection (SWP) projects under the Safe Drinking Water State Revolving Fund (SDWSRF).

DHS has set aside approximately $4 million of the SDWSRF for such loans each year. Additional funding may be allocated in future years if it turns out that there is considerable interest in SWP projects. The loans can be used to fund drinking water source protection projects for community water systems. They are also available to help fund the acquisition of land or easements by community water systems and by non-profit, non-community water systems. Water systems owned or operated by federal or state agencies are not eligible to apply.

SWP loan funds may be used for planning, preliminary engineering, detailed design, construction, education, land acquisition, conservation easements, equipment purchase, and implementing the elements of a source water protection program.

Types of eligible projects include: destruction of abandoned wells; hazardous waste collection programs; public education; fencing out cattle and other animals from intakes, tributaries and reservoir boundaries; restricting public access to critical sections of protection areas; installation of signs at boundaries of zones or protection areas; land acquisition; purchase of conservation easements; and structures to divert runoff away from sources.

Projects that are ineligible for funding include those for which other funding mechanisms already exist, such as the cleanup of identified hazardous waste sites and underground storage tanks.

Projects will be prioritized based on the type of contaminant to be addressed and the proximity of the contaminant to the drinking water source (i.e., the zone in which the project is located).

For more information on the DHS loan program, water systems should contact the local DHS district office.

Training and Education

DHS, in conjunction with US EPA, has prepared these training materials about source water assessment and protection. The materials are intended for use by utility operators, managers, board members, and other interested parties. DHS, with the assistance of other organizations, intends to offer classes about source water assessment and protection. When available, information about classes will be posted on DHS's website.

DHS will be preparing educational materials for use by water utilities, community groups, and other interested parties. These materials may include additional guidance documents for implementation of the DWSAP Program.

Directory of Protection-Related Activities

DHS has prepared a directory of agency programs to assist drinking water systems and communities in accessing pertinent information for drinking water source protection activities (see the section on PCA Inventory elsewhere in this series). The directory is available through the DHS website.

Recommended Guidelines

The protection areas and zones mentioned in the following subsections refer to those identified by using methods described in the Delineation booklet (one of the other booklets in this series).

Surface Water Sources

Surface water intakes and the land areas near surface water sources should be managed to reduce the possibility of contamination. Potential origins of contamination such as septic systems should be designed and used with appropriate precautions to ensure protection of surface water from microbial organisms. Chemicals capable of contaminating surface water should not be stored or used near surface water intakes or near reservoir boundaries or tributaries. Such chemicals should be stored and used with appropriate precautions, to eliminate the possibility of spills or discharges.

Establishing zones within a surface water source area (i.e., watershed) allows the community to plan appropriately and to site future high-risk and moderate-risk PCAs outside the zones. These zones also serve as an educational tool for industry, the general public, and others, to help them understand the source of their drinking water and the significance of their actions within a watershed or surface water source area.

Groundwater Sources

Where groundwater recharge areas can be identified, they should be managed in a manner similar to that described above for surface water sources, using primary and secondary recharge areas (defined in the Groundwater Delineation booklet in this series) to represent source areas and protection zones.

Protection Zones

By defining protection zones within the source area of a well or spring, a community can more appropriately plan and site future high-risk and moderate-risk PCAs outside the zones. These zones also serve as an educational tool for industry, the general public, and others, to help them understand the source of their drinking water and the significance of their actions within the protection zones of their drinking water sources.

The well site control zone should be managed to reduce

the possibility of vandalism or of surface flows reaching the wellhead and traveling down the casing. It is recommended that the water purveyor own this area, or have a permanent easement. Within this zone, the immediate vicinity of the well should be fenced and locked, or may include a well house or other building. It is not necessary for the entire zone to be fenced.

Within Zone A, the protection zone established on the basis of the two-year time of travel, activities that could be potential sources of microbial or direct chemical contamination should be strictly managed to eliminate or reduce the risk of contamination of the water supply.

A well-thought-out contingency plan includes provisions for installing treatment systems on water sources that have become contaminated. These Calgon granular activated carbon filters remove dibenzochlorophenol, commonly known as DBCP, at a groundwater well serving residents of Lodi, California.

Potential sources of contamination such as septic systems and animal facilities should be located outside of Zone A, or designed and used with appropriate precautions to ensure appreciable reduction in nitrates and microbial organisms before reaching groundwater or surface water.

Activities should be managed so that chemicals capable of contaminating groundwater would not be stored or used within Zone A, or would be stored and used with appropriate precautions to eliminate the possibility of spills or discharges.

Zone B5, the area between the two- and five-year time-of-travel boundaries, should be actively managed for control of potential chemical contaminants. Within Zone B5, chemicals capable of contaminating groundwater should be stored and used with appropriate precautions to eliminate the possibility of spills or discharges.

Zone B10, the area between the five- and ten-year time-of-travel boundaries, can be used by a community to plan and site future high-risk and moderate-risk sources of groundwater contamination at a distance from the source, where they are less likely to contaminate the water supply.

A buffer zone enables additional planning for particular activities that may be of significance to the community's groundwater supplies.

Local Management Measures

After identifying source areas, protection zones, and types of PCAs, and developing a vulnerability ranking, the local community or water supplier may choose to develop a management strategy for protecting the water supply. The strategy could identify measures to be accomplished at the local level, and it may affect agencies, districts, or other communities in addition to the community served by the water supply. The cooperation of the entire community is vital for source water protection management measures to work.

A source protection management strategy could include measures that are already undertaken, plus other ones to implement in the future. Protection activities may be undertaken by the water system, local agencies that have land-use authority, and other local, state, and federal agencies, as well as by other stakeholders.

Both non-regulatory and regulatory management measures can be effective as part of a source water protection program. The non-regulatory ones, such as public education, are the easiest to implement. Sometimes these are very successful by themselves. If, however, as a result of the PCA inventory and vulnerability analysis, a local community determines that the water supply is at significant risk of contamination, then regulatory measures, such as land use planning, permitting, and possibly more restrictive methods, may be necessary to ensure protection of the water supply. Potential local management measures are listed in Table 1.

A list of possible management measures for watersheds is shown in Table 2.

In assessing the merits of protection measures, consideration should be given to the costs that must be borne by the various parties when implementing the measures. Also important to consider: the probable effects of implementing the measures, and the benefits associated with those effects. Source water protection is a valuable tool in water quality management, but not all source water protection measures will prove to be cost effective.

A number of documents have been published to assist water systems and communities in developing local protection programs. In addition, several organizations can help with source water protection efforts. Water systems and communities are encouraged to review the resource documents listed in Table 3 and to contact the organizations listed in Table 4.

Creating Contingency Plans

Contingency planning to protect drinking water supplies is an essential element of a complete source water protection program. It is also required by the federal government's Safe Drinking Water Act (SDWA) and by the Emergency Planning and Community Right-to-Know Act of 1986, enacted as Title III of the federal Superfund Amendments and Re-authorization Act (SARA).

Local governments typically are given responsibility for implementing components of a drinking water source protection program. Though program requirements may vary, a public water supplier generally will be expected to develop a contingency plan to locate and provide alternate drinking water supplies in the event of contamination. A contingency plan should not be limited to planning for alternative supplies; it should also specify how to identify and prevent physical and

Table 1: Potential Management Measures for Local Source Water Protection Programs

Regulatory

Zoning

Overlay Source Water Protection Districts
Prohibition of Various Land Uses
Special Permitting
Large-Lot Zoning
Transfer of Development Rights
Cluster/PUD Design
Growth Controls/Timing
Performance Standards

Subdivision Control

Drainage Requirements
Impact Fees

Land Use Permit Conditions

New Uses: review for ground or surface water contamination potential
Existing Uses: review for change in chemical type/quantity/handling
Underground Storage Tank requirements

Other

Septic System Upgrades
Toxic and Hazardous Materials Handling Regulations
Private Well Protection
Sewer system hookups

Non- Regulatory

Land Transfer & Voluntary Restrictions

Sale/Donation
Conservation Easements
Limited Development

Other

Watershed Restoration Efforts
Storm Water Monitoring
Groundwater Monitoring:
  review existing monitoring wells;
  install new monitoring wells;
  conduct sampling of existing private wells
Contingency Plans
Hazardous Waste/Used Oil Collection
Public Education

Other *(continued)*

Identify Underground Injection Sources or Abandoned Wells
Notify Other Agencies with Land Use or Regulatory Authority
Groundwater Guardian *(contact Groundwater Foundation)*
Storm Drain Labeling
Fencing/ Access Restriction

Legislative

Regional Wellhead Protection Area Districts
Land Banking

Table 2: Possible Watershed Control & Management Practices

- Watershed Plan
- Land Use Planning and review
- Land ownership, easements, or right-of-way
- Access control
  - ~ Gates
  - ~ Permits
  - ~ Control of trespassing, loitering, etc.
- Septic system regulations
- Storm water runoff control and treatment
- Grazing practices
- Wildlife management
- Pesticide/herbicide application restrictions
- Domestic animal use/control
- Mining and mine runoff control
- Forest management and logging practices
- Erosion control (grading ordinances, etc.)
- Road maintenance practices
- Winter road salt storage practices
- Off-road vehicle use controls
- Recreational use controls
- Reservoir use restrictions
- Emergency response programs (sewage spill, hazardous material containment & spill)
- Water quality monitoring
  - ~ Intake
  - ~ Watershed
- Vegetation management
- Riparian management
- Wetland management
- Public education & public relations
- Routine watershed patrols
- Waste discharge requirements
- General plan policies
- Zoning regulations
- Development restrictions
- Fire Management

operational threats that can result in contaminating or entirely closing a public water supply. Doing so ensures adequate planning, encourages reliability and consistency, and creates uniform response protocols.

A contingency plan could be made a condition of a public water system's water supply permit. Such a plan is required for a complete wellhead protection program. Any local plan should be consistent with the Urban Water Plans required by the Department of Water Resources.

At a minimum, a local contingency plan should include an assessment of the water system's ability to function after a loss of its major supply. The plan should also address alternate supplies, in case such supplies someday are needed. Specific steps to be included are identified in the following sections.

Assessing Functionality with Loss of Supply

In order to assess the ability to function with the loss of the largest source of supply, the water supplier should do the following: (1) Identify the water system's maximum capacity, considering all sources, distribution system, and water rights or other restrictions; and (2) Re-evaluate (recalculate) this capacity after assuming that the largest supply source was lost.

Planning for Alternate Supplies

To develop a plan for alternate water supplies, the water supplier should determine both short-term and long-term supplies, the additional capacity that would be provided from the alternate supplies, and the associated costs. The plan should consider such alternatives as: increasing production from existing sources, identifying existing and potential inter-ties with other public water systems, and installing treatment on sources not currently used because of water quality problems.

Responding to Spills and Emergencies

Using the results of the PCA inventory, a plan for responding to spills and emergencies should be developed in conjunction with local emergency responders. Emergency response actions to be taken should consider protection of the water supply. For example, chemical spills within the protection area should be soaked up with absorbent materials rather than being washed away to drainage systems.

Table 3: Documents Related to Source-Water & Wellhead Protection

- *California Well Standards*, DWR Bulletin 74-90 and DWR Bulletin 74-81
- *A Guide to Wellhead Protection*, Witten, J. and Horsley, S., American Planning Association, Planning Advisory Service, Report #457/458, August, 1995,
- *Basic Ground-Water Hydrology*, USGS Publication #2220
- *California Groundwater Management*, Groundwater Resources Association of California
- *Delineation of Wellhead Protection Areas in Fracture Rocks*, EPA Publication EPA570991009
- *Ground Water and Wellhead Protection*, EPA Handbook EPA625/R94001
- *Guide to Groundwater Supply Contingency Planning for Local and State Government*, EPA Technical Assistance Document EPA4404690003
- *Guidelines for Delineation of Wellhead Protection Areas*, EPA Publication EPA440593001
- *Protecting Local Ground-water Supplies through Wellhead Protection*, EPA Publication EPA570991007
- *Wellhead Protection: A Guide for Small Communities*, EPA Seminar Publication EPA625R93002
- *Wellhead Protection in Confined, Semi-Confined, Fractured, Aquifer Settings*, EPA Publication ERIC: G-127, EPA813K93001, NTIS:PB94-109402
- *Wellhead Protection Programs: Tools for Local Governments*, EPA Publication EPA440/6-89/002
- *Wellhead Protection Strategies for Confined Aquifer Settings*, EPA Publication EPA570991008
- *Why Do Wellhead Protection? Issues and Answers in Protecting Public Drinking Water Supply Systems*, EPA Publication EPA813K95001
- *Groundwater and Surface Water – A Single Resource*, USGS Circular 1139

Table 4: Organizations Offering Assistance

Organizations that can assist with source-water protection efforts include the following:

- California Groundwater Association
  P.O. Box 14369
  Santa Rosa, California 95402-6369
  (707) 578-4408
- California Rural Water Association
  1215 K Street, Suite 930
  Sacramento, California 95814
  (800) 833-0322
- Groundwater Resources Association of California
  915 L Street, Suite 1000
  Sacramento, CA 95814
  (916) 446-3626
- Water Education Foundation
  717 K Street, Suite 517
  Sacramento, California 95814
  (916) 444-6240
- The Groundwater Foundation
  P.O. Box 22558
  Lincoln, Nebraska 68542-2558
  (402) 434-2740
- National Rural Water Association
  2915 South 13th Street
  Duncan, Oklahoma 73533
  (405) 252-0629
- Farm*A*Syst / Home*A*Syst
  (Assessment procedures for farms and homes)
  B142 Steenbock Library
  550 Babcock Drive
  Madison, WI 53706-1293
  (608) 262-0024