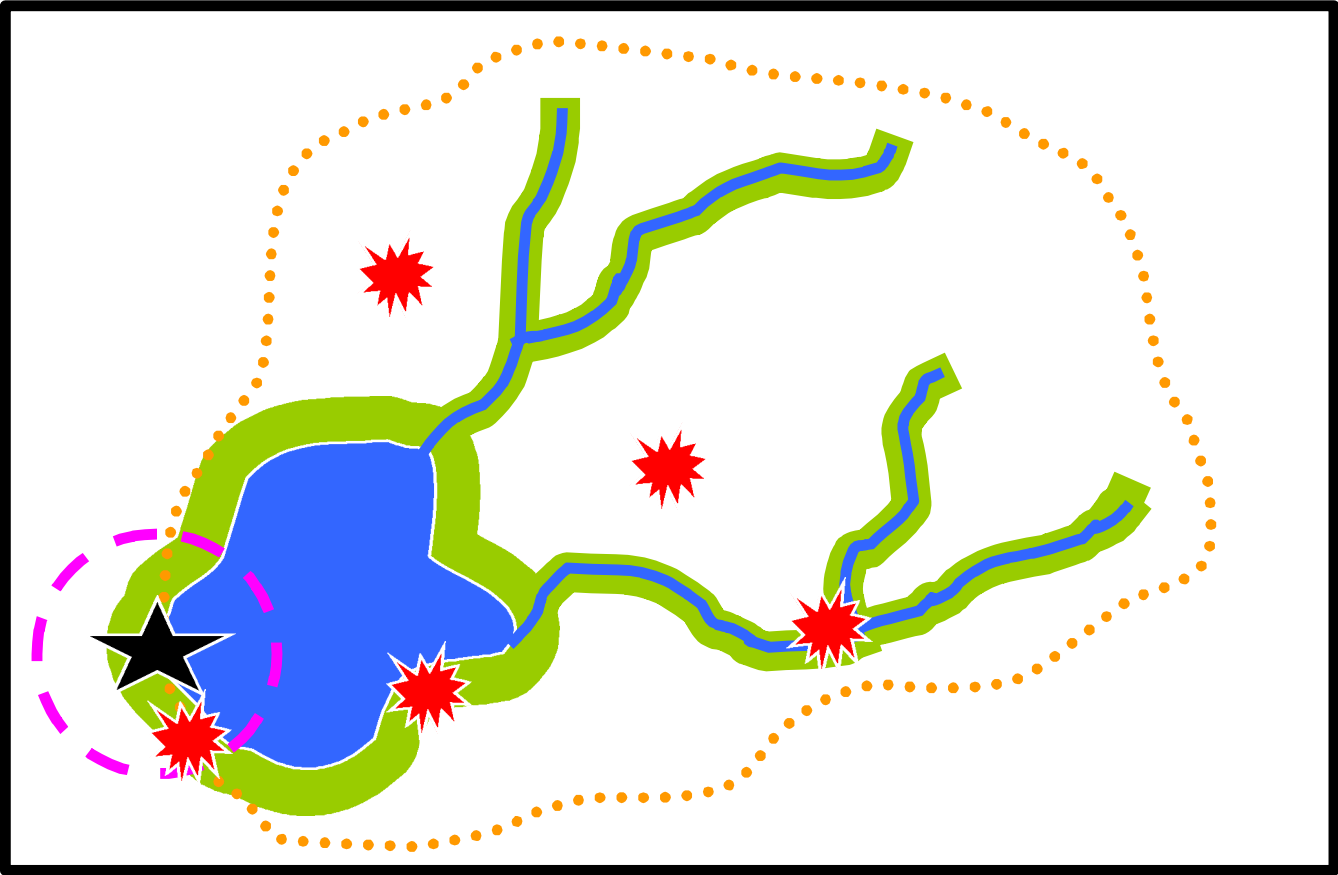


**California Drinking Water Source Assessment and Protection  
Program  
Interim Guidance for Staff**

**DRINKING WATER SOURCE ASSESSMENTS FOR SURFACE  
WATER SOURCES**

**AUGUST 18, 2000**



## Drinking Water Source Assessments for Surface Water Sources

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# **Drinking Water Source Assessments for Surface Water Sources Interim Guidance for Staff**

## **Introduction**

This Document summarizes Drinking Water Source Assessment and Protection (DWSAP) program requirements for surface water sources. It is intended to be used by persons doing a DWSAP assessment in conjunction with a Watershed Sanitation Survey. For a complete discussion of the DWSAP Program, readers are directed to the DWSAP Program document dated January 1999 with revisions dated January 2000.

DHS recommends using information that is the functional equivalent of all or some components of the source water assessment to fulfill the DWSAP when such information exists. In other words, if a watershed sanitary survey for a surface water source has been prepared, that information should be used for the DWSAP Program. A public water system that is conducting its own drinking water source assessment and intends to use information that it believes is the functional equivalent of a component of the DWSAP Program, should work with DHS to assure that the intended approach satisfies components of the DWSAP Program.

## 1.0 Minimum Components of Drinking Water Source Assessments

This section includes a brief listing of the minimum components of a drinking water source assessment, with references to pertinent sections and appendices of the document.

A comprehensive checklist for the submission of the assessment is presented in Appendix G for surface water sources.

- **Location of the Drinking Water Source.** Appendix A.

Determine the location (latitude, longitude) of the surface water intake by a global positioning system (GPS) with accuracy of 25 meters, or by another method with equivalent accuracy. An interim location may be obtained through use of a USGS quad map (7.5 minute series), or another method with similar accuracy.

- **Delineation of Source Area and Protection Zones.** Section 2.1, and Appendix B.

Identify watershed boundaries.

Zones are not required, but if they are established, the distances listed below may be used. For large water bodies, the zones may be limited to the area within an appropriate travel time distance from the intake.

400 feet from banks of reservoir, or primary stream  
200 feet from tributaries  
2,500 feet from intakes

- **Drinking Water Physical Barrier Effectiveness Checklist.** Section 4.2.1 and Appendix C.

Evaluate the drinking water source and its site characteristics in terms of the effectiveness of the physical barriers in preventing contaminants from reaching the source:

Complete form and make determination of the effectiveness of the source's physical barriers to contamination, based on geology and hydrogeologic considerations: Low, Moderate, or High.

- **Inventory of Possible Contaminating Activities (PCAs).** Section 3.0 and Appendix D.

Use checklists to identify the types of PCAs that occur in the source area (watershed) and in zones, if zones are established.

- **Vulnerability Ranking.** Sections 4.0 and Appendix F.

Evaluate each PCA in terms of its risk ranking, location (on watershed or in zones), and the Physical Barrier Effectiveness of the source. Prioritize PCAs to identify those to which the source is most vulnerable. Prepare a prioritized listing of PCAs. That

identifies the PCAs to which the source is most vulnerable, including those associated with contaminants detected in the water supply.

- **Assessment Map.** Section 2.2 and Appendix G.

Prepare an assessment map (based on a USGS quadrangle map, 7.5 minutes series) that shows:

1. Location of the drinking water source (surface water intake)
2. Source area (watershed boundaries)
3. Zones (optional)

- **Completion of Assessment and Summary.** Section 5.0 and Appendix G.

Complete the assessment and prepare a summary. Submit to the regulating agency (DHS Drinking Water Program district office or Local Primacy Agency county).

The completed assessment should include the assessment map, delineation calculations, physical barrier effectiveness checklists, PCA inventory forms, vulnerability ranking, vulnerability summary and other information presented on the checklist in Appendix G. The summary includes a brief description of the assessment procedures and findings and a vulnerability summary.

The Vulnerability Summary is a narrative description of the PCAs to which the source is most vulnerable.

- **Public Notification.** Appendix G.

The following information on the assessment must be included in the water system's annual Consumer Confidence Report:

- A statement that a drinking water source assessment has been conducted.
- The date of the assessment.
- Location where assessment is available for review (regulating agency's office and, when feasible, at the public water system's office).
- A statement that a summary of the assessment can be mailed upon request.
- A vulnerability summary of the assessment identifying the PCAs to which the system is most vulnerable.
- A contact phone number.

## 2.0 Delineation of Source Areas and Protection Zones

The delineation step in the assessment defines the boundaries of the areas to be evaluated. It includes determining an accurate location of the intake (Appendix A – Source Location Form). Documentation of the delineation should be shown on Appendix B.

### 2.1 Delineation for Surface Water Sources

The overall protection area (source area) to be delineated for surface water sources in the DWSAP assessment is the area within the topographic boundaries of the watershed that is tributary to the surface water intake. This is consistent with California Code of Regulations, Title 22, Chapter 17, Section 64665, which requires each public water system with a surface water source to conduct a watershed sanitary survey. In December 1993, a Watershed Sanitary Survey Guidance Manual was prepared by the American Waterworks Association (AWWA), California/Nevada Section, Source Water Quality Committee, in conjunction with the DHS Division of Drinking Water and Environmental Management. The guidance specifies that the area to be surveyed should include the entire watershed boundary.

As an option, in addition to the source area, a public water system may desire to establish zones closer to the surface water intake. The purpose of these zones is to define portions of the watershed where activities have a higher risk of contaminating the water supply. Within the zones, there could be a more thorough evaluation of activities that occur. The zones would aid in establishing both the appropriate levels of surveillance, and management (or voluntary protection) approaches.

Zones can potentially reduce the effort involved in conducting source water assessments. California surface water treatment regulations require water purveyors to survey the entire watershed. If zones are established, DHS may allow a less detailed review on portions of the watershed outside the zones. In addition, in the vulnerability analysis (Section 4.0), surface water sources that have zones defined will be able to assign less risk to possible contaminating activities (PCAs) located on the watershed, but outside of the zones. If zones have not been defined, PCAs are considered to be of equal risk, regardless of their location on the watershed or proximity to the intake.

To establish zones for surface water sources of drinking water, a variety of methods may be used. These include:

- 1. Fixed Distance:** In this method, an example of which is shown in Figure 2-1, setbacks from reservoir boundaries, tributaries and/or the intake may be established by using fixed distances. This method, while not technically sophisticated, is relatively simple to implement.
- 2. Time-of-Travel:** In this method, the protection zone is actually a stream reach rather than an area. This method is typically used for determining response times for spill events. The time-of-travel between an upstream monitoring point and the point of interest is calculated. Potential contaminants with a certain time-of-travel would be of primary concern.

**3. Modeling:** Surface runoff and ground water discharge models can be used to assess the impact of individual contaminants from possible contaminating activities (PCAs), and to identify areas within the watershed with the greatest potential impact on drinking water source quality.

**4. Combination:** This method uses travel time to identify a stream reach upgradient of the intake, then uses fixed distances upon either side of the stream within the reach to establish zones.

Regardless of the method used, factors that may be considered in determining zones include topography (slopes), soils, geology, vegetation, precipitation, hydrology and land uses.

Establishment of zones, if done by public water systems or communities, should be done in consultation with DHS.

Interested water suppliers, communities or groups that require additional information may wish to refer to the EPA document, *State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water* (US EPA, 1997).

If zones within the watershed are established for a surface water source, DHS suggests distances of 400 feet from reservoir or primary stream boundaries, 200 feet from tributaries, and 2,500 feet from intakes. The zones may be limited to that portion of the watershed within a travel-time distance from the intake that allows adequate time to respond to spill events.

### **Ground Water Under the Influence of Surface Water**

For drinking water sources that have been classified as ground water under the direct influence of surface water (GWUDI), the source area should include the land area within the watershed boundaries. This is consistent with DHS regulations, because GWUDI wells are considered surface water sources and are subject to surface water treatment regulations. Zones within the source area for these sources may be established by ground water methods (as described in the Drinking Water Source Assessment and Protection document, dated January 1999) and/or surface water methods.

For drinking water sources that are indirectly under the influence of surface water (e.g. where the source of water is underflow of a surface water body, and the source has not been classified as GWUDI) it is appropriate to include the land area within the watershed boundaries in the source area. The recharge area, if different than the watershed area, may also be included in the source area. Zones are to be established using ground water methods as appropriate. The areas to be assessed should be determined in consultation with DHS.

## **2.2 Assessment Map**

After the delineation of the source area and protection zones has been completed, the locations should be shown on the assessment map. The map should be based on a USGS quadrangle 7.5 minute series topographic map, and should also show the location of the drinking water intake. For large watersheds, the intake and adjacent protection zones should be shown on a USGS quad map, but the entire watershed may be shown on other maps.

## **2.3 Transmission Facilities from Drinking Water Intake to Treatment Plant**

When a drinking water intake is located at a different site than the treatment plant (if there is one), the untreated water may be conveyed through an aqueduct, canal, pipeline or other transmission facility. There is the possibility that an activity may exist within the vicinity of the transmission facility that could contaminate the water supply. In California, the threat of contamination to the water supply through this means is reviewed in two ways:

1. Water systems using surface water sources that utilize open channel transmission facilities are required to include the drainage area that contributes to the channels in the watershed sanitary survey for the source. As part of the DWSAP program, the transmission facilities will be assessed using the information from the watershed sanitary surveys.
2. Closed transmission facilities (pipelines) are reviewed and evaluated by DHS during water system inspections (sanitary surveys).



### 3.0 Inventory of Possible Contaminating Activities (PCAs) within Source Areas and Protection Zones

An essential element of the drinking water source assessment program is an inventory of possible contaminating activities, industries, or land use. PCAs are considered to be potential origins of contamination in drinking water source areas and protection zones.

An inventory of PCAs can serve at least three important functions:

- Identify past and present activities -- and others that are proposed (to the extent feasible) -- that may pose a threat to the drinking water supply, based on their potential for contamination of surface water. These activities may include transporting, storing, manufacturing, producing, using, or disposing of potential contaminants. Historic activities are also important to include, as are activities that may contribute to a cumulative impact by a potential contaminant that may otherwise be considered somewhat innocuous.
- Provide information on the existence of PCAs and their proximity to the drinking water source, especially those that present the greatest risks to the water supply.
- Provide an effective means of educating the local public about potential problems.

Although there are various steps in developing the PCA inventory, the process should be viewed as an iterative one. If a type of activity occurs within a zone, then there is a potential origin of contamination, and this would be indicated in the initial phases of the source assessment. Additional review may provide site-specific information that indicates that the activity is not a potential origin of significant contamination. For example, a septic system that is far away from a well may be of less importance than one nearby, in terms of its microbiological significance. A PCA may be important even though it is a great distance away from the source because of the particular contaminant(s) associated with it, other characteristics of the PCA, or characteristics of the drinking water source.

The information obtained in the PCA inventory may be helpful in refining the delineation process described in Section 2.0. In addition, iterations of the PCA inventory and delineations of the source area and protection zones are important in the vulnerability analysis and voluntary protection programs.

**Contaminants of concern.** If any of the following contaminants of concern are associated with an activity, then that activity needs to be in the PCA inventory.

- Microorganisms of drinking water importance, including fecal coliform bacteria, *Escherichia coli*, viruses, *Giardia lamblia*, and *Cryptosporidium*.
- Chemicals for which maximum contaminant levels (MCLs) or California drinking water action levels have been established, and unregulated chemicals in drinking water for which monitoring is required.

- Turbidity and total organic carbon (TOC). Turbidity can affect treatment and monitoring for microbiological contaminants, while TOC can influence the presence of disinfection byproducts, which have an attendant carcinogenic concern.

### **3.1 Alternative Approaches for Conducting a PCA Inventory**

For the minimum program, a PCA inventory focuses on identifying whether a type of activity (PCA) exists within a source area or protection zone. Neither the exact location nor the number of sites of that type of PCA need be determined for the minimum assessment. For a more detailed assessment, specific PCA locations and the density (number of facilities) for a PCA type can be included in the inventory. This is particularly useful if a source protection program is anticipated.

### **3.2 Information for PCA Inventories**

DHS has included on its Internet site (<http://www.dhs.ca.gov/ps/ddwem/dwsap/DWSAPindex.htm>) a list of agencies and other locations that have or may have pertinent data, and DHS will have Internet links to them when possible. DHS will update and maintain the listing, but will not be responsible for the quality of, or for updating the data of, other agencies. Accessing this listing and the data other agencies have available could be an initial step in conducting a PCA inventory.

Information from the state-wide data sources will need to be supplemented with local information: septic systems, land application of biosolids (sewage sludge), livestock operations, wildlife refuges, storm water runoff, recreational bathing beaches, and various hazardous substances data bases maintained by local fire departments, county environmental health departments, and county agricultural commissioners.

PCA inventories could be coordinated with work done to comply with requirements of various state, local and federal agencies.

Information for PCA inventories could be obtained through research of written documents, review of land use data, conducting surveys, and field reconnaissance. Each of these methods is described in more detail below.

Written documents include those maintained by federal, state, and local agencies, such as lists, inventories, records and other items that would identify the following: underground or above ground storage tanks, federal Superfund sites, contamination sites, landfill locations, septic systems, and other state and locally regulated activities. PCA inventories may be coordinated with work done to comply with requirements of various state, local and federal agencies.

Other written documents include telephone directories, business records, property tax records, news articles, and historical or archival information.

Land use data can help identify possible contaminant activities or sources of pollution. These can often be identified from information that may be available from the local planning or

building departments. These may include aerial photographs, topographic maps, zoning maps, and building permits.

Surveys may also be done to confirm or supplement information collected by other means. The surveys can be prioritized by type of PCA or by zone. Types of surveys include mail questionnaires, telephone surveys, personal interviews, and automobile windshield (“drive by”) surveys.

A field review may be done to identify land uses and to look for potential sources of contamination not clearly identified by the previous methods. Items to document could include: abandoned or improperly destroyed wells, closely spaced septic systems, point source and non-point source contaminants, unauthorized activities and changes in business use.

### **3.3 Steps in Developing an Inventory of PCAs**

The purpose of the PCA inventory is to identify the existence and proximity to the water source of past, present and proposed activities that might be a potential threat to the water supply.

The steps involved in a PCA inventory are detailed below.

#### **3.3.1 Review the DWSAP List of Types of PCAs and Assemble Resources**

The initial list of types of PCAs should include known sources of contamination, significantly high risk activities within or near the recharge area or watershed, and other activities that should not be overlooked in the inventory process. The DWSAP program document Table 7-2, entitled “Potential Sources of Surface Water and Ground Water Contaminants”, is a list of activities that may possibly release contaminants.

Before proceeding with the inventory, resources should be assembled that will assist in locating activities: the DHS Internet site data directory, land use maps, files, and contacts for people that may have current and historical knowledge of the area.

#### **3.3.2 Prepare a PCA Inventory Form or Use DWSAP Forms**

DHS has developed PCA Inventory Forms for surface water sources (Appendix D). The PCA inventory forms presented in the appendices should not be considered complete lists of all potential origins of contamination. If a type of PCA of concern from the initial list (Section 3.3.1) is not on an inventory form, it may be added to the appropriate inventory form. Note, however, that there are over 100 PCAs listed in the DWSAP PCA inventory forms. Most activities of significance could be incorporated in the PCAs on the form without adding additional PCAs. Other forms may be acceptable for the PCA inventory; this should be determined in consultation with DHS.

Tables 3-1, 3-2, 3-3 and 3-4 list activities differentiated by potential risk to a water supply (very high, high, moderate, and low). The lists in those tables provide a means of ranking types of PCAs for the vulnerability analysis (Section 4.0). The inventory forms (Appendix D for surface water sources) incorporate the information from Tables 3-1, 3-2, 3-3 and 3-4.

The list of PCAs and the associated risk rankings were developed based on EPA guidance materials, other state programs, input from advisory committees and comments on the program. The risk ranking for a type of PCA is based on the relative risk of a drinking water supply to the contaminants associated with that PCA. The risk ranking may change based on the zone in which the PCA occurs. For example, PCAs associated with microbiological contamination (septic systems, animal facilities, sewer lines) are a very high risk if located within Zone A. Outside of this area they are considered less of a risk because the bacteria and viruses die off over time.

### **3.3.3 Conduct the PCA Inventory within the Source Area and/or Protection Zones**

The initial review of the PCA inventory may be best performed by an individual or group with knowledge of activities around the drinking water source. The initial review could be done with the Assessment Map (showing drinking water source, source area and zones) and additional maps that may be available.

The initial review allows those doing the assessment to narrow the PCA inventory lists, eliminating types of PCAs that do not occur, and noting the proximity (zone) of types of PCAs whose existence is known.

After the initial review, the PCA inventory should be completed using readily available resources. This may include consultation with various government agency or water system staff (especially for historical information), review of maps and files, access to electronic data sources, and field visits.

Again, it is not the intent of the assessment program to identify the exact location of each and every PCA within the source area and protection zones. The assessments are intended as a first step in an on-going iterative process. The initial PCA inventory should be considered an identification of the types of PCAs that exist within the delineated area(s). A water purveyor may desire to do a more detailed PCA inventory for purposes of a protection program. When more detailed information is available it is useful to include this in the assessment.

### **3.3.4 Complete the PCA Inventory Checklists**

The next step is to complete the PCA Checklists, noting the area or zone(s) in which PCAs occur. The DWSAP minimum PCA inventory is a "Presence/Absence" review. For this level assessment the intent is only to determine whether a type of PCA exists within a zone, not how many facilities or the exact location.

It should be noted that the PCA inventory may be based on general information and approximations. It should not be used as an endpoint for targeting source protection efforts and resources but as a starting point for further investigation. It should never be assumed that an assessment map and PCA Checklist contains all possible contaminating activities or activity types, nor should it be assumed that all possible contaminating activities on the list are actual contamination sources.

### **3.3.5 PCA Information on the Assessment Map**

As an option, if the information is available, the locations of some PCAs may be shown as points or symbols on the assessment map. If a water system has a map that more clearly indicates the location of PCAs (e.g., parcel, land use, or service area maps) this may be submitted in addition to the assessment map.

### **3.3.6 Names and Addresses Associated with PCAs**

Specific identification of a PCA in terms of name and address is not needed for the minimum DWSAP assessment. For example, if one or more gas stations are located within Zone A, B5 or B10 of a well, for purposes of the assessment, the presence of the facilities and the general proximity to the water source are the most significant.

Information about ownership and other specifics about any property site or business activity can be accessed from other public agencies, if it is needed for local protection programs or other reasons.

Concern has been expressed about lumping together all facilities of an activity as one PCA without taking into account whether an individual facility is small or large, or whether it poses an actual risk (based on historical contamination), or a potential risk, based on its specific business operations. For the minimum DWSAP assessment, the source is considered just as vulnerable to a type of PCA whether there are ten facilities or one.

**Table 3-1. Possible Contaminating Activities (PCAs) associated with Very High potential risks.** Very High risk PCAs are considered to have the highest potential for drinking water contamination, greater than those designated High risk (Table 3-2), Moderate risk (Table 3-3), or Low risk (Table 3-4). The risk rankings are based on the general nature of activities and the contaminants associated with them, not on facility-specific management practices. Instead, such management practices may be considered in the vulnerability analysis, and should be considered in a protection program. (An asterisk [\*] indicates PCAs that may be associated with microbiological contamination.)

**COMMERCIAL/INDUSTRIAL**

Automobile-related activities  
- Gas stations  
Chemical/petroleum processing/storage  
Dry cleaners  
Metal plating/ finishing/fabricating  
Plastics/synthetics producers

**RESIDENTIAL/MUNICIPAL**

Airports - maintenance/fueling areas  
Landfills/dumps  
\*Septic systems - High density (>1/acre)  
(VH if in Zone A, otherwise M)  
\*Wastewater Treatment Plants (VH in Zone  
A, otherwise H)

**AGRICULTURAL/RURAL**

\* Animal Feeding Operations (VH in Zone  
A, otherwise H)  
\* Concentrated Aquatic Animal Production  
Facilities (VH for surface water in Zone  
A, otherwise H)  
\* Managed Forests (VH for surface water in  
Zone A, otherwise H)

**OTHER**

Underground injection of commercial/  
industrial discharges  
Historic gas stations  
Historic waste dumps/landfills  
Injection wells/dry wells/sumps  
Known contaminant plumes  
Military installations  
Mining operations  
- Historic  
- Active  
Underground storage tanks  
- Confirmed leaking tanks

**Table 3-2. Possible Contaminating Activities (PCAs) associated with High potential risks.**

High risk PCAs are considered to have less potential for drinking water contamination than those designated Very High risk (Table 3-1), but greater potential for contamination than those designated Moderate risk (Table 3-3), or Low risk (Table 3-4). The risk rankings are based on the general nature of activities and the contaminants associated with them, not on facility-specific management practices. (An asterisk [\*] indicates PCAs that may be associated with microbiological contamination.)

**COMMERCIAL/INDUSTRIAL**

## Automobile related Activities

- Body shops
- Repair shops

## Boat services/repair/refinishing

## Chemical/petroleum pipelines

## Electrical/electronic manufacturing

## Fleet/trucking/bus terminals

## Furniture repair/manufacturing

## Home manufacturing

## Junk/scrap/salvage yards

## Machine shops

## Photo processing/printing

## Research laboratories

## Wood preserving/treating

## Lumber processing and manufacturing

## Wood/pulp/paper processing and mills

- \*Sewer collection systems (H, if in Zone A, otherwise L)

**RESIDENTIAL/MUNICIPAL**

## Railroad yards/maintenance/fueling areas

- \*Sewer collection systems (H, if in Zone A, otherwise L)

## Utility stations - maintenance areas

- \*Wastewater Treatment Plants (VH in Zone A, otherwise H)

**AGRICULTURAL/RURAL**

- \* Grazing (> 5 animals/acre) (H in Zone A, otherwise M)

- \* Animal Feeding Operations (VH in Zone A, otherwise H)

- \* Other animal operations (H in Zone A, otherwise M)

## Concentrated Aquatic Animal

Production Facilities (VH in Zones for surface water, otherwise H)

Other aquatic animal operations (H in Zones for surface water, otherwise M)

Farm chemical distributor/ application service

## Farm machinery repair

\*Septic systems- low density (<1/acre) (H if in Zone A, otherwise L)

\*Lagoons/liquid wastes

## Machine shops

Pesticide/fertilizer/petroleum storage and transfer areas

Managed Forests (VH in Zones for surface water, otherwise H)

Agricultural Drainage (H in Zone A, otherwise M)

Wells- Agricultural, Irrigation

**OTHER**

NPDES/WDR permitted discharges

Illegal activities/unauthorized dumping

Mining – Sand/Gravel

Wells- Oil, Gas, Geothermal

Salt water intrusion

\*Recreational area - surface water source

Underground storage tanks:

- Non-regulated tanks (tanks smaller than regulatory limit)

- Not yet upgraded or registered tanks

Snow Ski Areas (H in Zones for surface water, otherwise M)

Recent (< 10 years) Burn Areas (H in Zones for surface water, otherwise M)

Dredging (H in Zones for surface water, otherwise M)

**Table 3-3. Possible Contaminating Activities (PCAs) associated with Moderate potential risks.** Moderate risk PCAs are considered to have a lower potential for drinking water contamination than those designated Very High risk (Table 3-1) and High risk (Table 3-2), and a greater potential for drinking water contamination than activities designated Low risk (Table 3-4). The risk rankings are based on the general nature of activities and the contaminants associated with them, not on facility-specific management practices. (An asterisk [\*] indicates activities that may be associated with microbiological contamination.)

### **COMMERCIAL/INDUSTRIAL**

Car washes  
 Parking lots/malls (>50 spaces)  
 Cement/concrete plants  
 \*Food processing  
 Funeral services/graveyards  
 Hardware/lumber/parts stores

### **RESIDENTIAL/MUNICIPAL**

\*Septic systems - High density (>1/acre)  
 (VH if in Zone A, otherwise M)  
 Drinking water treatment plants  
 Golf courses  
 Housing - High density (>1 house/0.5  
 acres)  
 Motor pools  
 Parks  
 Waste transfer/recycling stations

### **AGRICULTURAL/RURAL**

\* Grazing (> 5 animals/acre) (H in Zone A,  
 otherwise M)  
 \* Other animal operations (H in Zone A,  
 otherwise M)  
 Other aquatic animal operations (H in  
 Zones for surface water, otherwise  
 M)  
 Crops, irrigated (berries, hops, mint,  
 orchards, sod, greenhouses,  
 vineyards, nurseries, vegetables)  
 NOTE: Drip-irrigated crops are  
 considered Low risks.

\*Sewage sludge (biosolids) land  
 application

Fertilizer, pesticide/herbicide application  
 Managed Forests (M for ground water)  
 Agricultural Drainage (H in Zone A,  
 otherwise M)

### **OTHER**

Above ground storage tanks  
 Wells – water supply  
 Construction/demolition staging areas  
 Contractor or government agency equipment  
 storage yards  
 Managed forests  
 Transportation corridors  
 - Freeways/state highways  
 - Railroads  
 - Historic railroad right-of-ways  
 - Road right-of-ways (herbicide use  
 areas)  
 Hospitals  
 Storm drain discharge points  
 Storm water detention facilities  
 Artificial recharge projects – non-  
 potable water (includes recycled,  
 storm, and untreated imported water)  
 - Injection wells  
 - Spreading basins  
 Snow Ski Areas (H in Zones for surface  
 water, otherwise M)  
 Recent (< 10 years) Burn Areas (H in Zones  
 for surface water, otherwise M)  
 Dredging (H in Zones for surface water,  
 otherwise M)



**Table 3-4. Possible Contaminating Activities (PCAs) associated with Low potential risks.**

Low risk PCAs are considered to have a lower potential for drinking water contamination than those designated Very High risk (Table 3-1), High risk (Table 3-2) or Moderate risk (Table 3-3). The risk rankings are based on the general nature of activities and the contaminants associated with them, not on facility-specific management practices. Instead, such management practices may be considered in the vulnerability analysis, and should be considered in a protection program. (An asterisk [\*] indicates PCAs that may be associated with microbiological contamination.)

**COMMERCIAL/INDUSTRIAL**

\*Sewer collection systems (H, if in Zone A, otherwise L)  
Appliance/Electronic repair  
Office buildings/complexes  
Rental yards  
RV/mini storage

**RESIDENTIAL/MUNICIPAL**

\*Sewer collection systems (H, if in Zone A, otherwise L)  
Apartments and condominiums  
Campgrounds/Recreational areas  
Fire stations  
RV parks  
Schools  
Hotels, Motels

**AGRICULTURAL/RURAL**

Crops, non-irrigated (e.g. Christmas trees, grains, grass seeds, hay) (or drip-irrigated crops)  
\* Septic systems – low density (<1/acre) (H if in Zone A, otherwise L)

**OTHER**

Underground storage tanks  
- Decommissioned - inactive  
- Upgraded and/or registered – active  
Roads/Streets  
Artificial recharge projects - potable water  
- Injection wells  
- Spreading basins  
Medical/dental offices/clinics  
Veterinary offices/clinics  
\*Surface water - streams/lakes/streams  
Wells – Monitoring, test holes, borings

## 4.0 Vulnerability of Drinking Water Sources to Contamination

After the initial inventory of Possible Contaminating Activities has been completed (Section 3), a vulnerability analysis is conducted to determine the types of PCAs to which the drinking water source is most vulnerable by prioritizing the list of activities identified in the inventory. The analysis considers the source and/or site characteristics that may affect the vulnerability of the source to contamination from the types of PCAs identified in the inventory.

### 4.1 Definition

**Vulnerability:** A determination of the most significant threats to the quality of the water supply that takes into account the physical barrier effectiveness of the drinking water source. The vulnerability determination also considers the type and proximity to the water supply of activities that could release contaminants.

Vulnerability, as defined in the DWSAP Program, is consistent with existing California regulations.

### 4.2 Vulnerability Analysis Procedures

The vulnerability analysis evaluates the types of PCAs identified in the inventory within the context of the characteristics of the source and its site. The first step in the analysis is to determine the Physical Barrier Effectiveness (PBE) for the drinking water source. The PBE can be determined using site-specific information on hydrogeology, hydrology, construction and soils.

#### 4.2.1 Physical Barrier Effectiveness

Physical Barrier Effectiveness is essentially an estimate of the ability of the natural geologic materials, hydraulic conditions, and construction features of the surface water intake to prevent the movement of contaminants to the drinking water source.

A qualitative rating of low, moderate or high Physical Barrier Effectiveness, based on the drinking water source and site characteristics, is determined for each source. A simple approach to determining PBE for surface water is shown in Appendix C. In the DWSAP approach, the reviewer collects some basic information on the water body and watershed for surface water. This information is then evaluated with parameters that indicate the relative effectiveness of the source and site in preventing the migration of contaminants to the water supply.

In general, the intent of the Physical Barrier Effectiveness determination is to highlight the sources that have “high” or “low” effectiveness. Most surface water sources will have “low” PBE. A more detailed review of the Physical Barrier Effectiveness at a site can be done during the development of a local source water protection program.

The information needed to determine the Physical Barrier Effectiveness should be compiled using readily available data and reports. A minimum level of information is necessary to make the initial determination, but additional information may be useful in refining the determination.

For surface water sources, Appendix C shows the minimum water body and watershed information necessary to determine Physical Barrier Effectiveness. Most of this information can be found in the Watershed Sanitary Survey for the source.

The surface water PBE evaluation considers several parameters including the size of, and detention time in, the reservoir, topography, geology, soils, vegetation, precipitation and ground water recharge. The size of the watershed is also important to consider, in terms of its potential for dilution or retardation of contaminants.

Surface water, by virtue of its open exposure to the elements, is considered particularly vulnerable to contamination. This is reflected in the PBE analysis as shown in Appendix C. By design, most surface water sources will have “low” PBE. In order to get a high PBE ranking, all the parameters for a source must have values that indicate an effective barrier. For example, a source with a high PBE would be in flat terrain, with low precipitation and non-erosive soils covered by grassland.

A source is considered to have low PBE (i.e. high potential for contamination), if any of the parameters have values that do not indicate an effective barrier. For example, a source would be considered to have a low PBE if the watershed has steep slopes or if the soils are erodible or have high runoff potential.

For surface water, all sources that do not clearly have a low or high PBE are considered to have a moderate PBE. To be conservative (i.e., health protective), if any of the parameters is unknown, the drinking water source is considered to have low physical barrier effectiveness.

#### **4.2.2 Modifying the Risk Ranking for a PCA**

As described in Section 3.0, the PCA inventory includes a ranking of the potential risk or threat of contamination to a drinking water source for each type of PCA. In the inventory, activities that are considered to have a high potential for pollution of drinking water sources are designated “very high” or “high” risk. Other activities having lower potential for drinking water pollution are designated “moderate” or “low” risk.

The risk ranking provides a simple approach to comparing the relative risk of types of PCAs. The risk rankings are based on the general nature of the activities and the contaminants associated with them (refer to “Potential Sources of Surface Water and Ground Water Contaminants”), not on the density (number of facilities) or facility-specific information, such as management practices.

Concerns have been expressed regarding the ability to modify the risk ranking for an individual facility for a type of PCA. The DWSAP program is intended to be a simple, first-cut screening tool. Further detail, such as modifying the risk ranking of types of PCAs (Appendix E), is an

optional part of the drinking water source assessment. Evaluation of site-specific information may best be performed during the development of a local protection program.

#### **4.2.3 Determination of Vulnerability**

DHS has developed a simple approach to substitute for a detailed vulnerability determination. The vulnerability analysis uses the PCA inventory and the Physical Barrier Effectiveness determination to prioritize the list of types of PCAs in order to determine to which the drinking water source is most vulnerable.

The vulnerability ranking process is shown in Appendix F for surface water sources. The process involves reviewing each type of PCA identified in the inventory (and those types of PCAs whose presence is unknown) and assigning points based on the risk ranking of the type of PCA, the zone in which it occurs, and the Physical Barrier Effectiveness of the drinking water source. The points are added together, and the types of PCAs are prioritized according to points from highest to lowest, with the highest points representing the types of PCAs to which the source is most vulnerable. Finally, a cutoff point is identified, and the source is not considered vulnerable to types of PCAs with points below the cutoff.

The vulnerability points in and of themselves do not have a quantitative value. Rather, the points are used to relatively rank the types of PCAs for an individual source. The ranking is intended as a preliminary tool to facilitate local source water protection programs that are site-specific.

The steps in the vulnerability ranking are listed below. The points for each element and the process for adding the points and assessing the relative vulnerability can be found following the steps.

1. Determine if any contaminants have been detected in the water supply (the information collected for use in the Consumer Confidence Report may be used for this purpose).
2. Determine, to the extent practical, the types of PCAs associated with the detected contaminants.
3. Using the PCA checklists, for each type of PCA identified as existing in the protection zone(s), or as unknown, determine the number of points for the associated risk ranking (VH, H, M, L).
4. For each type of PCA, determine the zone in which it occurs and add the points associated with that zone. If that type of PCA exists within more than one zone, repeat the process for each zone.
5. For each drinking water source, determine the Physical Barrier Effectiveness (PBE) and add the points associated with that PBE (these points are for Low, Moderate and High PBE as shown below).
6. Prioritize the types of PCAs by the vulnerability points, from the most points to the least.

7. The drinking water source is vulnerable to all types of PCAs with vulnerability points above the cutoff. (equal to 11 points for surface water). Refer to the appropriate Vulnerability Matrix below.
8. The drinking water source is most vulnerable to PCA types with the highest vulnerability points, and to those PCA types associated with a contaminant detected in the water source, regardless of the vulnerability points.
9. The drinking water source is considered vulnerable to types of PCAs whose existence is Unknown, if the vulnerability points are equal to or greater than the cutoff.

### **4.3 Uses of Vulnerability Analyses**

The results of the vulnerability analysis are used in preparing the vulnerability summary, which is to be included in the Consumer Confidence Report (CCR). The CCR is a report on water quality each public water system must distribute to its customers on an annual basis.

The prioritized list from the vulnerability analysis may be used by a water system in developing protection measures to address activities that are most significant to the water supply.

In addition, the prioritized list will be useful to DHS to determine drinking water sources that may be eligible for chemical monitoring relief.

The prioritized list may also be useful on a statewide basis in determining the types of activities that represent the greatest threats to drinking water supplies, their proximity to drinking water sources, and an estimate of their prevalence.

The PBE determination may be useful for a water system in comparing water sources to each other, and identifying the ones that are at greater risk. The PBE determination may be useful on a state-wide basis in determining areas where sources with high or low effectiveness may be concentrated.

**Points for Vulnerability Analysis**

**PCA Risk Ranking Points:**

Very High	7
High	5
Moderate	3
Low	1

**Zone Points:**

<u>Surface Water (Zones defined)</u>		<u>Surface Water (Zones not defined)</u>	
Zone A	= 5	Watershed	= 5
Zone B	= 3		
Remainder of Watershed	= 1		
Unknown	= 0	Unknown	= 0

**Physical Barrier Effectiveness points:**

Low	5
Moderate	3
High	1

**Vulnerability Matrix for SURFACE WATER SOURCES**

The cutoff point for vulnerability is **11**. The drinking water source is considered Vulnerable to all PCA's with Vulnerability Score greater than or equal to **11** (shaded boxes). Source is considered vulnerable to types of PCAs that are Unknown, if the Vulnerability Score is 11 or higher.

PCA points	Zone points		PCA + Zone points	PBE Points			Vulnerability Score PCA + Zone + PBE points		
	Zones Defined	Zones Not Defined		Low	Med	High	PBE Low	PBE Med	PBE High
VH (7)	A (5)	Watershed (5)	12	5	3	1	17	15	13
VH (7)	B (3)		10	5	3	1	15	13	11
VH (7)	Watershed (1)		8	5	3	1	13	11	9
VH (7)	Unknown (0)*	Unknown (0)*	7	5	3	1	12	10	8
H (5)	A (5)	Watershed (5)	10	5	3	1	15	13	11
H (5)	B (3)		8	5	3	1	13	11	9
H (5)	Watershed (1)		6	5	3	1	11	9	7
H (5)	Unknown (0)*	Unknown (0)*	5	5	3	1	10	8	6
M (3)	A (5)	Watershed (5)	8	5	3	1	13	11	9
M (3)	B (3)		6	5	3	1	11	9	7
M (3)	Watershed (1)		4	5	3	1	9	7	5
M (3)	Unknown (0)*	Unknown (0)*	3	5	3	1	8	6	4
L (1)	A (5)	Watershed (5)	6	5	3	1	11	9	7
L (1)	B (3)		4	5	3	1	9	7	5
L (1)	Watershed (1)		2	5	3	1	7	5	1
L (1)	Unknown (0)*	Unknown (0)*	1	5	3	1	6	4	2

## 5.0 Completion of the Assessment

After the delineation, PCA inventory and vulnerability ranking have been completed the final parts of the assessment can be prepared.

### 5.1 Vulnerability Summary

The vulnerability summary is a narrative description of the PCAs to which the source is most vulnerable. The PCAs to which the source is most vulnerable include activities associated with contaminants detected in the water supply, and PCAs with the highest points from the vulnerability ranking.

For example, if there are five types of PCAs in the vulnerability ranking with 17 points, these five PCAs are the ones to which the source is considered most vulnerable, and these are listed in the vulnerability summary in any order. If however, there is only one activity with 17 points, that one PCA is the only one to which the source is most vulnerable, and is the only one that must be stated in the vulnerability summary, along with any PCAs associated with detected contaminants. Similarly, if the highest points on the vulnerability ranking is 13 (or any number above the cutoff), then the PCAs with the highest points are listed in the vulnerability summary. The only time that the source is not considered vulnerable to anything is if there are no PCAs above the cutoff and no contaminants have been detected.

Water suppliers preparing their own vulnerability summary may wish to include additional PCAs that are lower on the vulnerability ranking. This is acceptable, so long as no PCAs in the ranking are skipped; that is, the vulnerability summary can't include PCAs with 13 points unless all the PCAs with higher points are also listed.

The vulnerability summary is to be brief, written in readily understandable language. The vulnerability summary must be included in the water system's annual consumer confidence report (CCR), along with information on the availability of the assessment. The vulnerability summary must be included in the CCR every year after the assessment is completed.

The standardized language for the vulnerability summary is as follows:

*"An assessment was completed of the \_\_\_\_\_ water source for the \_\_\_\_\_ water system in month and year. A copy of the complete assessment is available at DHS District Office or Water System Office address. You may request a summary of the assessment be sent to you by contacting DHS District Office or Water System Contact phone number.*

*"The source is considered to be most vulnerable to the following activities associated with contaminants detected in the water supply: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.*

*“In addition, the source is considered most vulnerable to these activities, for which no associated contaminant has been detected: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.”*

### 5.1.1 Vulnerability Summary for Multiple Sources

A combined vulnerability summary that includes multiple sources may be prepared if the following criteria are met:

- All sources are the same type of water (i.e., all ground water or all surface water)
- All sources are in close proximity to each other (i.e., protection zones overlap)
- All sources have the same Physical Barrier Effectiveness (PBE) (low, moderate or high)

The combined vulnerability summary must include all the PCAs to which the sources are most vulnerable (i.e., the PCAs with highest points from the vulnerability ranking for each source) and the PCAs associated with detected contaminants for any of the sources.

For example, consider a vulnerability summary for two sources: Source A has PCAs with 17 points, and Source B has PCAs with 13 points maximum. The combined vulnerability summary would list all the PCAs with 17 points for Source A and all the PCAs with 13 points for Source B. Some of the PCAs for the sources may be the same; the PCA only needs to be listed once in the vulnerability summary.

## 5.2 Assessment Summary

The assessment summary should include a brief description of the water system and the water source, the procedures and information used to complete the assessment, the vulnerability summary, and, if desired, additional discussion of the vulnerability of the source. Some of this information may already be prepared for the water system’s CCR.

The summary should be no more than one to two pages. The assessment summary may be similar to the following:

*“The XYZ water system is located in \_\_\_\_\_ County and serves the community/city/business name, etc. There are approximately \_\_\_\_\_ service connections serving a population of \_\_\_\_\_.*

*“The drinking water source for XYZ water system is name of lake, river or aquifer or wells located in general description. The watershed or recharge area for the source includes approximately \_\_\_\_\_ acres/square miles. General land use in the area is agricultural, urban, residential, undeveloped, forested, etc.”*



*“The assessment of \_\_\_\_\_ source was conducted by DHS District office, County, Water System, etc. The following sources of information were used in the assessment: water system files, DHS files, County records, previous study, etc.”*

*“Procedures used to conduct the assessment include: review of files and reports, meetings with water system staff and/or public, GIS mapping, field reviews, other general procedures, unique or specialized procedures, etc.”*

*“Vulnerability Summary (as described in Section 5.1)”*

*“Vulnerability Discussion (optional). This section may include more information about the source’s vulnerability to contamination, such as:*

- *Elaboration on PCAs in the vulnerability summary*
- *Description of mitigating information about PCAs*
- *Actions that the water system is taking or will take to deal with identified threats*
- *Other PCAs in the vulnerability ranking that are above the cutoff*
- *Description of detected contaminants, likely sources of contamination, and monitoring results*
- *Suggestions or plan for more detailed investigation”*

### **5.3 Completion and Submission of the Assessment**

After completing all of the assessment forms, map, vulnerability summary and assessment summary, the information is to be compiled into a finished report for submission to the regulating agency (DHS District Office or Local Primacy Agency county).

A copy of the complete report should be kept in the office of the regulating agency for review by the public. The water system has the option of keeping a copy available for public review. A brief abstract should be prepared that can be mailed upon request. This brief abstract should include the assessment summary, the map, and the vulnerability ranking.

DHS is currently developing computer software for producing assessment forms. When this software is available water systems will be asked to submit a disk with the assessment forms to the regulating agency. This will allow DHS to track information for reporting to US EPA.

DHS will review assessments prepared by or on behalf of a water system. If DHS finds a problem in the assessment the water system will be asked (but is not required) to revise the assessment. However, if DHS believes there are inaccuracies in the vulnerability summary, the water system must resolve this with DHS before putting the vulnerability summary in its CCR.

#### **5.4 Updates of the Assessment**

Updating the assessment is not required, but is recommended once every five years. If an assessment is not updated by a water system, DHS will update the assessment in conjunction with water system regulatory work as time permits.

The vulnerability summary must be included in the CCR every year after the assessment is completed. If the assessment is not updated the CCR will continue to reflect an assessment date from several years past.

## **6.0 Integrating Source Water Assessments with Watershed Sanitary Surveys**

In California, a water system using a surface water source must complete a watershed sanitary survey, and must update the survey every five years. Guidance for conducting watershed sanitary surveys has been developed by the California-Nevada section of the American Water Works Association.

A watershed sanitary survey is similar to a DWSAP source water assessment, though a watershed sanitary survey requires more detail. DHS has prepared a detailed comparison of watershed sanitary surveys and source water assessments that is included as Appendix H.

DHS recommends that the elements of a source water assessment be incorporated into a watershed sanitary survey, either as part of the original survey or during an update. The source water assessment forms can be attached as an appendix to the watershed sanitary survey, and the vulnerability summary can be included in the text of the survey.

Some information from existing watershed sanitary surveys cannot be directly translated to source water assessment forms. For example, DWSAP checklists include approximately 100 PCAs that are fairly specific, such as gas stations, dry cleaners and sewer lines. The watershed sanitary survey guidance included a checklist with approximately 30 activities and land uses that are fairly general, such as “urban areas”.

To complete the PCA checklists with information from the watershed sanitary survey, different methods may be used, such as:

- “Urban Areas” can be considered to include all (or most) activities in the “Commercial/Industrial” and “Residential/Municipal” PCA checklists.
- The detailed PCA checklists can be used in zones, and the more general watershed sanitary survey checklist can be used for the rest of the watershed (this is only acceptable if zones are defined). Using this method may require modifications in the DWSAP vulnerability ranking procedures.
- The PCA checklists may be used for the entire watershed.

Note that while the source water assessment does not require the exact location or number of PCAs, the watershed sanitary survey should describe specific locations of significant activities. Refer to Appendix H for more details.

## Appendices

Drinking water systems and communities that choose to perform their own source water assessments as part of a drinking water source assessment and protection program should contact their regional DHS drinking water office to make sure they are using the up-to-date version of the forms and checklists contained in the Appendices.

### **APPENDICES TO BE USED FOR A SURFACE WATER SOURCE**

Appendix A — Drinking Water Source Location

Appendix B — Delineation of Surface Water Protection Zones

Appendix C — Physical Barrier Effectiveness Checklist – Surface Water Source

Appendix D — Possible Contaminating Activity (PCA) Inventory Form – Surface Water Source

Appendix E — Possible Contaminating Activities Evaluation – Surface Water Source

Appendix F — Vulnerability Analysis Procedures – Surface Water Source

Appendix G — Checklist for Drinking Water Source Assessment – Surface Water Source

Appendix H — Comparison of Source Water Assessments and Watershed Sanitary Surveys

## Appendix A

### Drinking Water Source Location

---

Public Water System Name: \_\_\_\_\_ System No.: \_\_\_\_\_  
7-digit integer

Name of source: \_\_\_\_\_ Source No.: \_\_\_\_\_  
3-digit integer

*or* PS Code: \_\_\_\_\_  
15 characters

State Well Number: \_\_\_\_\_ *(if applicable)*

Date: \_\_\_\_\_ Name of person completing form: \_\_\_\_\_

---

#### LOCATION OF WELL/INTAKE: (decimal degrees)

Latitude: \_\_\_\_\_ Longitude: \_\_\_\_\_  
10-digit signed decimal      sample: 41.209483      11-digit signed decimal      sample: -121.573421

Horizontal Datum:    ( )    NAD27 (preferred)

                          ( )    NAD83

                          ( )    WGS84

                          ( )    Other: \_\_\_\_\_  
7 characters

                          ( )    Unknown

---

#### DESCRIPTION:

(e.g., plant entrance, well, intake, center of facility, etc. *Limit 50 characters.*):

---

#### METHOD OF DETERMINING LOCATION:

*(If your method is not listed choose "other" and describe on next page)*

---

**USGS quadrangle (topographic map)**

Coordinates were determined:    ( )    Digitally (computer assisted)

  ( )    Manually

Scale:                   ( )    1:24,000 (7.5 minute series)

                              ( )    1:62,500 (15 minute series)

                              ( )    1:100,000 (1 x 1/2 degree series)

                              ( )    Other: \_\_\_\_\_

Year of map publication: \_\_\_\_\_

Year of map photorevision: \_\_\_\_\_

---

**Global Positioning System (GPS)**

Unit (manufacturer/model): \_\_\_\_\_

Grade of GPS unit:            ()    Recreational (e.g., Garmin)  
  ()    Mapping (e.g., Trimble Geo Explorer)  
  ()    Survey (e.g., CORS, carrier-phase)

Differential correction:    ()    Yes  
  ()    No

- 
- Other Method**            ()    Cadastral survey  
  ()    Parcel map  
  ()    Address matching  
  ()    PLSS System  
  ()    Other: \_\_\_\_\_  
  ()    Unknown

Accuracy, if known: +/- \_\_\_\_\_ meters

Scale of data source, if known: 1: \_\_\_\_\_

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**NOTE: Indicate location of the surface water intake on the drinking water source assessment map. Map should also indicate the source area (watershed) and protection zones, if established (See other Appendices).**

## Appendix B

### Delineation of Surface Water Protection Zones

Public water system: \_\_\_\_\_ ID No.: \_\_\_\_\_

Name of source: \_\_\_\_\_ ID No.: \_\_\_\_\_

Delineation date: \_\_\_\_\_ Delineation conducted by \_\_\_\_\_

The delineation of protection zones for a surface water source is optional. The source area for a surface water source is the watershed.

If protection zones are established, the recommended distances are as follows:

- Zone A: 400 feet from reservoir banks or primary stream boundaries  
200 feet from tributaries
- Zone B: 2,500 feet from intakes

Protection zones established for this source are:

- Zone A: \_\_\_\_\_ feet from reservoir banks or primary stream boundaries  
\_\_\_\_\_ feet from tributaries
- Zone B: \_\_\_\_\_ feet from intakes

## Appendix C

### Physical Barrier Effectiveness Checklist -- Surface Water Source

Public water system: \_\_\_\_\_ ID No.: \_\_\_\_\_

Name of source: \_\_\_\_\_ ID No.: \_\_\_\_\_

Assessment date: \_\_\_\_\_ Assessment conducted by \_\_\_\_\_

#### Drinking Water Source/ Watershed Information

Note: Most of the following information should be available from the Watershed Sanitary Survey of the water source.

1. Is the source an impounded reservoir or a direct stream intake?
  - a. Reservoir
  - b. Stream intake
  - c. Other, describe: \_\_\_\_\_
  
2. Source Characteristics
  - a. Area of tributary watershed: \_\_\_\_\_ acres or square miles
  - b. Area of water body within watershed: \_\_\_\_\_ acres or square miles
  - c. Volume of water body: \_\_\_\_\_ acre-feet
  - d. Maximum rate of withdrawal through intake: \_\_\_\_\_ gallons per day
  - e. Are the primary tributaries seasonal, perennial or both? \_\_\_\_\_
  
3. What is the approximate travel time to the intake for water at farthest reaches of the water body?
  - a. Source is direct intake, no impounded water body
  - b. Less than 30 days
  - c. More than 30 days and less than 1 year
  - d. More than 1 year
  
4. What is the general topography of the watershed?
  - a. Flat terrain (<10% slopes)
  - b. Hilly (10 to 30% slopes)
  - c. Mountainous (> 30% slopes)
  - d. Not sure



5. What is the general geology of the watershed?
  - a. Materials prone to landslides
  - b. Materials not prone to landslides
  - c. Not sure
  
6. What general soil types are on the watershed?
  - a. Rock
  - b. Loams, sands
  - c. Clay
  - d. Not sure
  
7. What type of vegetation covers most of the watershed?
  - a. Grasses
  - b. Low growing plants and shrubs
  - c. Trees
  - d. Not sure
  
8. What is the mean seasonal precipitation on the watershed?
  - a. More than 40 inches/year
  - b. 10 to 40 inches/year
  - c. Less than 10 inches/year
  - d. Not sure
  
9. Is there significant ground water recharge to the water body?
  - a. Yes
  - b. No
  - c. Not sure

### **Physical Barrier Effectiveness Determination**

Parameters indicating **Low Physical Barrier Effectiveness (LE)**

(A source with any of the parameters listed below would be considered to have less effective physical barrier properties)

- 3a
- 4c or 4d
- 5a or 5c
- 7c or 7d
- 8a or 8d
- 9a

Parameters indicating **High Physical Barrier Effectiveness (HE)**

(A source would need to have all of the parameters listed below to be considered to have highly effective physical barrier properties)

- 3d and
- 4a and
- 5b and
- 7a and
- 8c and
- 9b

All other sources are considered to have **Moderate Physical Barrier Effectiveness**

Determination for this source:

- Low (LE)
- Moderate (ME)
- High (HE)

## Appendix D

### Possible Contaminating Activities (PCA) Inventory Form

#### Surface Water Source

Public water system name: \_\_\_\_\_ ID No. \_\_\_\_\_

Name of drinking water source: \_\_\_\_\_ ID No. \_\_\_\_\_

Inventory date: \_\_\_\_\_ Inventory conducted by: \_\_\_\_\_

Name of Surface Water Body : \_\_\_\_\_

Indicate PCAs pertinent to the drinking water source, its source area (watershed) and protection zones (if established), from the following tables, as applicable:

Commercial/Industrial (Table D-1) \_\_\_\_\_

Residential/Municipal (Table D-2) \_\_\_\_\_

Agricultural/Rural (Table D-3) \_\_\_\_\_

Other (required for all) (Table D-4) \_\_\_\_\_

Are zones established? YES or NO

Attach map of Drinking Water Source with watershed boundaries and zones (if established) indicated.

Proceed to appropriate checklist or checklists. Place a mark in the appropriate boxes.

Example:

		X

Risk Ranking of PCAs (see Tables 7-2, 7-3, 7-4 and 7-5 for separate category lists), where VH = Very High Risk, H = High Risk, M = Moderate Risk, L = Low Risk

**Note: If zones are not established use higher risk ranking. If zones are established, use higher risk ranking in zones, lower risk ranking for remainder of watershed.**

<b>PCA Checklist</b>						
<b>Table D-1, page 1 of 2</b>						
<b>COMMERCIAL/INDUSTRIAL</b>						
<b>IF ZONES ESTABLISHED</b>						
PCA (Risk Ranking)	No PCA in zones	PCA in Zone A?	PCA in Zone B?	PCA in Watershed	Unknown	Comments
Automobile-related activities						
Body shops (H)						
Car washes (M)						
Gas stations (VH)						
Repair shops (H)						
Boat services/repair/ refinishing (H)						
Chemical/petroleum processing/storage (VH)						
Chemical/petroleum pipelines (H)						
Dry cleaners (VH)						
Electrical/electronic manufacturing (H)						
Fleet/truck/bus terminals (H)						
Furniture repair/ manufacturing (H)						
Home manufacturing (H)						
Junk/scrap/salvage yards (H)						
Machine shops (H)						
Metal plating/ finishing/fabricating (VH)						
Photo processing/printing (H)						
Plastics/synthetics producers (VH)						
Research laboratories (H)						

<b>PCA Checklist</b>						
<b>Table D-1, page 2 of 2</b>						
<b>COMMERCIAL/INDUSTRIAL</b>						
PCA (Risk Ranking)	<b>IF ZONES ESTABLISHED</b>			PCA in Watershed	Unknown	Comments
	No PCA in zones	PCA in Zone A?	PCA in Zone B?			
Wood preserving/treating (H)						
Wood/pulp/paper processing and mills (H)						
Lumber processing and manufacturing (H)						
Sewer collection systems (H, if in Zones, otherwise L)						
Parking lots/malls (>50 spaces) (M)						
Cement/concrete plants (M)						
Food processing (M)						
Funeral services/graveyards (M)						
Hardware/lumber/parts stores (M)						
Appliance/Electronic Repair (L)						
Office buildings/complexes (L)						
Rental Yards (L)						
RV/mini storage (L)						
Other (list)						

<b>PCA Checklist</b>						
<b>Table D-2, page 1 of 2</b>						
<b>RESIDENTIAL/MUNICIPAL</b>						
	<b>IF ZONES ESTABLISHED</b>					
PCA (Risk Ranking)	No PCA in zones	PCA in Zone A?	PCA in Zone B?	PCA in Watershed	Unknown	Comments
Airports - Maintenance/fueling areas (VH)						
Landfills/dumps (VH)						
Railroad yards/maintenance/ fueling areas (H)						
Septic systems - high density (>1/acre) (VH if in Zones, otherwise M)						
Sewer collection systems (H, if in Zones, otherwise L)						
Utility stations - maintenance areas (H)						
Wastewater treatment and disposal facilities (VH in Zones, otherwise H)						
Drinking water treatment plants (M)						
Golf courses (M)						
Housing - high density (>1 house/0.5 acres) (M)						
Motor pools (M)						
Parks (M)						
Waste transfer/recycling stations (M)						

PCA Checklist Table D-2, page 2 of 2 RESIDENTIAL/MUNICIPAL						
PCA (Risk Ranking)	IF ZONES ESTABLISHED			PCA in Watershed	Unknown	Comments
	No PCA in zones	PCA in Zone A?	PCA in Zone B?			
Apartments and condominiums (L)						
Campgrounds/ Recreational areas (L)						
Fire stations (L)						
RV Parks (L)						
Schools (L)						
Hotels, Motels (L)						
Other (list)						

PCA Checklist						
Table D-3, page 1 of 3						
AGRICULTURAL/RURAL						
PCA (Risk Ranking)	IF ZONES ESTABLISHED			PCA in Watershed	Unknown	Comments
	No PCA in zones	PCA in Zone A?	PCA in Zone B?			
Grazing (> 5 large animals or equivalent per acre) (H in Zones, otherwise M)						
Concentrated Animal Feeding Operations (CAFOs) as defined in federal regulation <sup>1</sup> (VH in Zones, otherwise H)						
Animal Feeding Operations as defined in federal regulation <sup>2</sup> (VH in Zones, otherwise H)						
Other Animal operations (H in Zones, otherwise M)						
Concentrated Aquatic Animal Production Facilities, as defined in federal regulation (VH in Zones, otherwise H)						
Other Aquatic Animal production operations (H in Zones, otherwise M)						
Managed Forests (VH in Zones, otherwise H) (unless additional detail provided*)						
Farm chemical distributor/ application service (H)						
Farm machinery repair (H)						



<b>PCA Checklist</b>						
<b>Table D-3, page 2 of 3</b>						
<b>AGRICULTURAL/RURAL</b>						
PCA (Risk Ranking)	<b>IF ZONES ESTABLISHED</b>			PCA in Watershed	Unknown	Comments
	No PCA in zones	PCA in Zone A?	PCA in Zone B?			
Septic systems – Low density (<1/acre) (H in Zones, otherwise L)						
Lagoons / liquid wastes (H)						
Machine shops (H)						
Pesticide/fertilizer/petroleum storage & transfer areas (H)						
Agricultural Drainage (H in Zones, otherwise M)						
Wells - Agricultural/Irrigation (H)						
Crops, irrigated (Berries, hops, mint, orchards, sod, greenhouses, vineyards, nurseries, vegetable) (M)						
Sewage sludge/biosolids application (M)						
Fertilizer, Pesticide/Herbicide Application (M)						
Crops, nonirrigated (e.g., Christmas trees, grains, grass seeds, hay, pasture) (L) (includes drip-irrigated crops)						
Other (list)						

<b>PCA Checklist</b>						
<b>Table D-3, page 3 of 3</b>						
<b>AGRICULTURAL/RURAL</b>						
<b>IF ZONES ESTABLISHED</b>						
PCA (Risk Ranking)	No PCA in zones	PCA in Zone A?	PCA in Zone B?	PCA in Watershed	Unknown	Comments
* Additional Detail for Managed Forests						
The following categories can be used in lieu of the default risk ranking for Managed Forests:						
* Managed Forests - Broadcast fertilized areas (M in Zones, otherwise L)						
* Managed Forests - Clearcut harvested <30 years (VH in Zones, otherwise H)						
* Managed Forests - Partial harvested <10 years (H in Zones, otherwise M)						
* Managed Forests - Road density > 2 mi/sq. mi) (H in Zones, otherwise M)						

1. Concentrated Animal Feeding Operation: Animal Feeding Operation (requires NPDES permit) with greater than:

<b>If pollutants discharged (directly or indirectly) to navigable waters</b>	<b>If pollutants not discharged</b>
300 slaughter or feeder cattle	1,000 slaughter or feeder cattle
200 mature dairy cows	700 mature dairy cows
750 swine	2500 swine
150 horses	500 horses
3000 sheep or lambs	10,000 sheep or lambs
16,500 turkeys	55,000 turkeys
9,000 laying hens or broilers (liquid manure system)	30,000 laying hens or broilers (liquid manure system)
1500 ducks	5000 ducks
300 animal units	1000 animal units

2. Animal Feeding Operation: lot or facility where animals (other than aquatic) have been or will be stabled or confined and fed or maintained for total of 45 days or more in any 12 month period.

<b>PCA Checklist</b>						
<b>Table D-4, page 1 of 3</b>						
<b>OTHER ACTIVITIES</b>						
PCA (Risk Ranking)	<b>IF ZONES ESTABLISHED</b>			PCA in Watershed	Unknown	Comments
	No PCA in zones	PCA in Zone A?	PCA in Zone B?			
NPDES/WDR permitted discharges (H)						
Underground Injection of Commercial/Industrial Discharges (VH)						
Historic gas stations (VH)						
Historic waste dumps/landfills (VH)						
Illegal activities/unauthorized dumping (H)						
Injection wells/ dry wells/ sumps (VH)						
Known contaminant plumes (VH)						
Military installations (VH)						
Mining operations - Historic (VH)						
Mining operations – Active (VH)						
Mining - Sand/Gravel (H)						
Wells – Oil, Gas, Geothermal (H)						
Salt Water Intrusion (H)						
Recreational area – surface water source (H)						
Snow Ski Areas (H in Zones, otherwise M)						
Recent (< 10 years) Burn Areas (H in Zones, otherwise M)						

<b>PCA Checklist</b>						
<b>Table D-4, page 2 of 3</b>						
<b>OTHER ACTIVITIES</b>						
<b>IF ZONES ESTABLISHED</b>						
PCA (Risk Ranking)	No PCA in zones	PCA in Zone A?	PCA in Zone B?	PCA in Watershed	Unknown	Comments
Dredging (H in Zones, otherwise M)						
<b>Underground storage tanks</b>						
Confirmed leaking tanks (VH)						
Decommissioned - inactive tanks (L)						
Non-regulated tanks (tanks smaller than regulatory limit) (H)						
Not yet upgraded or registered tanks (H)						
Upgraded and/or registered - active tanks (L)						
Above ground storage tanks (M)						
Wells – Water supply (M)						
Construction/demolition staging areas (M)						
Contractor or government agency equipment storage yards (M)						
<b>Transportation corridors</b>						
Freeways/state highways (M)						
Railroads (M)						
Historic railroad right-of-ways (M)						
Road Right-of-ways (herbicide use areas) (M)						
Roads/ Streets (L)						

<b>PCA Checklist</b>						
<b>Table D-4, page 3 of 3</b>						
<b>OTHER ACTIVITIES</b>						
	<b>IF ZONES ESTABLISHED</b>					
PCA (Risk Ranking)	No PCA in zones	PCA in Zone A?	PCA in Zone B?	PCA in Watershed	Unknown	Comments
Hospitals (M)						
Storm Drain Discharge Points (M)						
Storm Water Detention Facilities (M)						
<b>Artificial Recharge Projects</b>						
Injection wells (potable water) (L)						
Injection wells (non-potable water) (M)						
Spreading Basins (potable water) (L)						
Spreading Basins (non-potable water) (M)						
Medical/dental offices/clinics (L)						
Veterinary offices/clinics (L)						
Surface water - streams/lakes/rivers (L)						
Other (list)						

**Appendix E**

**Possible Contaminating Activities Evaluation – Surface Water Source**

(Note: This form is OPTIONAL. It should be completed if a modification of the risk ranking for a type of PCA is desired)

Public water system: \_\_\_\_\_ ID No.: \_\_\_\_\_

Name of source: \_\_\_\_\_ ID No.: \_\_\_\_\_

Assessment date: \_\_\_\_\_ Assessment conducted by \_\_\_\_\_

**PCA/Potential Contaminant Information**

1. Type of Activity (from contaminant inventory checklist):
  
2. Type of potential contaminant associated with this activity (refer to Table 7-2):
  - a. Microbiological
  - b. Chemical
  - c. Both or Other
  
3. Potential Risk (from PCA contaminant inventory checklist):
  - a. Low
  - b. Medium
  - c. High
  - d. Very High
  
4. Location:
  - a. Within a zone (if defined) or within DHS minimum setback distances
  - b. On the watershed outside of zones (if defined) or outside DHS minimum setback distances
  - c. On the watershed (if no zones defined)
  
5. Spatial Area occupied by activity as percentage of watershed area:
  - a. Small (<5% of area)
  - b. Moderate (5% to 25% of area)
  - c. High (>25% of area)
  - d. Unknown
  
6. Volume of potential contaminant (*not applicable for microbiological contaminants*):  
If the maximum quantity of potential contaminant stored at the facility were discharged into

the quantity of water produced by the drinking water supply in a day would the concentration be:

- a. Small (less than one part per billion)
- b. Moderate (between one part per thousand and one part per billion)
- c. High (more than one part per thousand)
- d. Unknown

7. Magnitude of potential acute or chronic health effects associated with the contaminant:

- a. Low
- b. High
- c. Unknown

8. Likelihood of potential contaminant to migrate to drinking water supply:

- a. Low
- b. High
- c. Unknown

9. Has the potential contaminant been detected in the drinking water supply or near-by monitoring wells?

- a. Yes
- b. No
- c. Unknown

10. Compliance of facility (demonstrated performance to keep potential contaminant from being discharged)

- a. Good
- b. Poor
- c. Unknown

## **Determination of revised risk ranking for PCAs**

### **Microbiological Contamination**

If the PCA is categorized as **2a or 2c**, the risk ranking would be LOW if the PCA meets all of the parameters in the table below for **Low**. The risk ranking would be HIGH if the PCA meets all of the parameters in the table for **High**. Otherwise the risk ranking is MODERATE.

#### **Microbiological Contamination PCA Risk Ranking**

Parameter	Low	High
3	<b>a</b>	<b>c or d</b>
4	<b>b</b>	<b>a or c</b>
5	<b>a</b>	<b>c or d</b>
7	<b>a</b>	<b>b or c</b>
8	<b>a</b>	<b>b or c</b>
9	<b>b</b>	<b>a or c</b>
10	<b>a</b>	<b>b or c</b>

### **Chemical Contamination**

If the PCA is categorized as **2b or 2c**, the risk ranking would be LOW if the PCA meets all of the parameters in the table below for **Low**. The risk ranking would be HIGH if the PCA meets all of the parameters in the table for **High**. Otherwise the risk ranking is MODERATE.

#### **Chemical Contamination PCA Risk Ranking**

Parameter	Low	High
3	<b>a</b>	<b>c or d</b>
4	<b>b</b>	<b>a or c</b>
5	<b>a</b>	<b>c or d</b>
6	<b>a</b>	<b>c or d</b>
7	<b>a</b>	<b>b or c</b>
8	<b>a</b>	<b>b or c</b>
9	<b>b</b>	<b>a or c</b>
10	<b>a</b>	<b>b or c</b>



## Appendix F

### Vulnerability Analysis Procedures – Surface Water Source

The Vulnerability analysis incorporates the types of Possible Contaminating Activities (PCAs) identified in the inventory, their respective Risk Rankings, the Zone and the Physical Barrier Effectiveness determination. These factors are used to develop a prioritized listing of types of PCAs and to determine the types of PCAs to which the drinking water source is most vulnerable.

Public water system: \_\_\_\_\_ ID No.: \_\_\_\_\_

Name of source: \_\_\_\_\_ ID No.: \_\_\_\_\_

Assessment date: \_\_\_\_\_ Assessment conducted by \_\_\_\_\_

Vulnerability analysis steps:

1. For each type of PCA identified as existing in the watershed and/or zones, or unknown, determine the number of PCA risk ranking points for that type of PCA. (If the risk ranking for a type of PCA has been modified, Appendix E should be attached). *(For example, Very High (VH) risk activities are 7 points.)*
2. For each type of PCA determine the zone in which it occurs (if zones are defined, or within the watershed if zones are not defined). Add the points associated with that zone to the PCA risk ranking points. If the type of PCA exists within more than one zone, repeat the process for each zone. *(For example, if a type of PCA exists in Zone A add 5 points. For a VH risk PCA in Zone A, the PCA Risk Ranking points + Zone points = 7 + 5 = 12 points.)*
3. Determine the Physical Barrier Effectiveness (PBE) for the drinking water source (from Appendix C). Add the points associated with that PBE to the PCA risk ranking and zone points. The total is the Vulnerability Score. *(For example, if the PBE is Low add 5 points. For a VH risk PCA in Zone A, the Vulnerability Score = PCA Risk Ranking points + Zone points + PBE points = 7 + 5 + 5 = 17 points.)*
4. Prioritize all types of PCAs by the Vulnerability Score, from the most points to the least. A sample form is shown below.
5. The drinking water source is vulnerable to all types of PCAs with a Vulnerability Score of **11** or greater. Refer to the Vulnerability Matrix below. The source is most vulnerable to the types of PCAs with the highest score.
6. **In addition, the Drinking Water Source is most vulnerable to all types of PCAs associated with a contaminant detected in the water source, regardless of Vulnerability Score.**

### Vulnerability Matrix for SURFACE WATER SOURCES

**INDICATE WHICH APPLIES:**

**WITHIN ZONES** (if defined) OR

**WITHIN ENTIRE WATERSHED** (if zones are not defined)

The cutoff point for surface water vulnerability is **11**. The drinking water source is considered Vulnerable to all types of PCAs with Vulnerability Score greater than or equal to **11** (shaded boxes).

PCA points	Zone points		PCA + Zone points	<u>PBE Points</u>			Vulnerability Score PCA + Zone + PBE points		
	Zones Defined	Zones Not Defined		Low	Mod	High	PBE Low	PBE Mod	PBE High
VH (7)	A (5)	Watershed (5)	12	5	3	1	17	15	13
VH (7)	B (3)		10	5	3	1	15	13	11
VH (7)	Watershed (1)		8	5	3	1	13	11	9
VH (7)	Unknown (0)	Unknown (0)	7	5	3	1	12	10	8
H (5)	A (5)	Watershed (5)	10	5	3	1	15	13	11
H (5)	B (3)		8	5	3	1	13	11	9
H (5)	Watershed (1)		6	5	3	1	11	9	7
H (5)	Unknown (0)	Unknown (0)	5	5	3	1	10	8	6
M (3)	A (5)	Watershed (5)	8	5	3	1	13	11	9
M (3)	B (3)		6	5	3	1	11	9	7
M (3)	Watershed (1)		4	5	3	1	9	7	5
M (3)	Unknown (0)	Unknown (0)	3	5	3	1	8	6	4
L (1)	A (5)	Watershed (5)	6	5	3	1	11	9	7
L (1)	B (3)		4	5	3	1	9	7	5
L (1)	Watershed (1)		2	5	3	1	7	5	1
L (1)	Unknown (0)	Unknown (0)	1	5	3	1	6	4	2

\* Source is considered vulnerable to type of PCAs that are Unknown, if the Vulnerability Score is 11 or higher.



## Appendix G

### Checklist for Drinking Water Source Assessment – Surface Water Source

Public water system: \_\_\_\_\_ ID No.: \_\_\_\_\_

Name of source: \_\_\_\_\_ ID No.: \_\_\_\_\_

Assessment date: \_\_\_\_\_ Assessment conducted by \_\_\_\_\_

The following information should be contained in the drinking water source assessment submittal.

If another report that is the functional equivalent to the drinking water assessment (e.g., Watershed Sanitary Survey) is included in this assessment, the part of that report that fulfills the components of the source water assessment should be clearly indicated.

\_\_\_\_\_ Source name, system name, source and system identification numbers, date of assessment, name of person and/or organization conducting the assessment (Appendix G, this form)

\_\_\_\_\_ Assessment map with source location, source area (watershed), and protection zones (if defined).

\_\_\_\_\_ Drinking water source location coordinates and accuracy of method used (Appendix A or equivalent)

\_\_\_\_\_ Delineation of protection zones, if applicable (Appendix B or equivalent)

\_\_\_\_\_ Drinking water Physical Barrier Effectiveness Checklist (Appendix C)

\_\_\_\_\_ Possible contaminating activities (PCA) inventory form (Appendix D).

\_\_\_\_\_ Possible contaminating activities evaluation (optional) (Appendix E)

\_\_\_\_\_ Vulnerability ranking (Appendix F)

\_\_\_\_\_ Additional maps (optional) (e.g. local maps of zones and PCAs, recharge area maps, or maps indicating direction of ground water flow)

\_\_\_\_\_ Assessment Summary including Vulnerability Summary

\_\_\_\_\_ Means of Public Availability of Report (indicate those that will be used)

\_\_\_\_\_ Notice in the Consumer Confidence Report\* (minimum)

\_\_\_\_\_ Copy in DHS district office (minimum)

\_\_\_\_\_ Copy in public water system office (recommended)

\_\_\_\_\_ Copy in public library/libraries

\_\_\_\_\_ Internet (indicate Internet address: \_\_\_\_\_)

\_\_\_\_\_ Other (describe)

\*The CCR should indicate where customers can review the assessments.

## Appendix H

### Comparison of Source Water Assessments and Watershed Sanitary Surveys

The purpose of this document is to explain the significant differences between a Watershed Sanitary Survey (WSS) required under the California Surface Water Treatment regulations and a minimum Source Water Assessment (SWA) of a surface water source as described in the California Drinking Water Source Assessment and Protection Program. Many water systems and DHS staff, having invested substantial time and resources into watershed sanitary surveys, have asked for this explanation. To summarize the information in this document, a Watershed Sanitary Survey is a much more detailed evaluation of a surface water source than a Source Water Assessment.

DHS, under federal regulations, must complete a SWA for all water supply sources by 2003. In California, a system using a surface water source must complete a Watershed Sanitary Survey as required by Section 64665 of Article 7, Chapter 17 of the California Code of Regulations (CCR). Both documents must be updated to reflect any changes that might occur. The Watershed Sanitary Survey is to be updated every 5 years and the SWA is to be updated when ever necessary.

The minimum components of a SWA for a surface water source are:

- Location of drinking water source. This requires determination of the longitude and latitude of surface water intake structure.
- Delineation of Source Area and Protection Zones. For surface water sources, it is necessary to identify the watershed boundaries as the source area. Zones are not required, but if they are established, recommended distances are listed in the Department's guidance program. For large water bodies, the zones may be limited to the area within an appropriate travel time distance from the intake.
- Physical barrier effectiveness checklist.
- Inventory of Possible Contaminating Activities (PCAs) located within the source area and if known, those within the various zones established.
- Vulnerability ranking. This includes an evaluation of the Possible Contaminating Activities in terms of risk ranking, location, and the physical barrier effectiveness of the source.
- Assessment map that shows the location of the drinking water source, source area, and zones (if defined).
- Completion of assessment and summary. This includes an assessment map, zone delineation calculations (if defined), physical barrier effectiveness checklist, Possible Contaminating Activity inventory forms, vulnerability ranking, and any other relevant information.

- Public notification: Information on the assessment and its availability for public review must be included in the water system's annual consumer report.

The elements of a Watershed Sanitary Survey report are listed below with comments that compare the separate requirements to those of a SWA listed above:

1. Physical and hydrological description of the watershed.

A SWA requires a map of the watershed and the longitude and latitude of the intake. The Watershed Sanitary Survey narrative description of the physical and hydrological features of a watershed is a more comprehensive report and requires more investigation and more time to develop.

2. Summary of water quality monitoring data.

In a SWA it is recommended that the available monitoring data be reviewed to determine if contaminants have been detected. In a Watershed Sanitary Survey it is recommended that monitoring data be reviewed to allow a summarization of the overall water quality as it relates to treatment needs. (See item 6 below)

3. Description of activities and sources of contamination.

A SWA identifies the existence of Possible Contaminating Activities within the watershed or zones (if defined). A WSS includes a narrative description of activities identified on the watershed. Identifying the existence of PCAs is much easier than providing a narrative description of activities. An example of this is provided later in this document.

4. Description of any significant changes that have occurred since the last survey which could affect quality of the source water.

The effort needed to provide a narrative description of changes for a WSS is much more than that required to make changes to the checklist of identified PCAs in a SWA.

5. Description of watershed control and management practices.

The SWA does not address this subject. If the watershed is large there may be many different control and management practices to be documented in a WSS. It is hoped that a SWA will serve as a basis for the initiation of watershed control and management practices that are aimed at protecting the water quality.

6. An evaluation of system's ability to meet surface water treatment requirements and recommendations for corrective actions.

The SWA does not address the treatment needs or corrective actions. This element of a Watershed Sanitary Survey can entail an extensive investigation into the overall plant facilities, operation and operator expertise. This will include an evaluation of the plant's past performance associated with the water supply source. Each evaluation of the system's ability to meet requirements is unique to the treatment facilities that exist, the source and the utility staff.

**In summary**, a Watershed Sanitary Survey is a much more detailed evaluation than a Source Water Assessment. A complete, comprehensive Watershed Sanitary Survey should contain most of the information necessary for a minimum Source Water Assessment. The time and effort needed to complete a comprehensive Watershed Sanitary Survey is much greater than the time and effort needed to conduct a minimum Source Water Assessment.

The purpose of a Watershed Sanitary Survey is to identify what treatment facilities are needed to properly treat the source water (item 6 above). The purpose of a Source Water Assessment is to give a general indication of the types of possible contaminating activities on the watershed.

A Watershed Sanitary Survey (WSS), as required under California surface water treatment regulations, will evaluate all information, including past water quality monitoring data associated with identified activities on the watershed to establish what treatment unit processes are needed to properly treat the source water.

A Source Water Assessment can include establishment of zones upstream of an intake and identifies Possible Contaminating Activities within the identified upstream zones and watershed. These zones are differentiated by distance and time of travel to the intake. This information can be used for the purposes of establishing the frequency and the type of water quality monitoring that should be conducted to detect and track drinking water contaminants which have been associated with the identified contaminating activities above the source water intake.

A Source Water Assessment also evaluates any barriers that exist which may prevent potential contaminants from reaching the source intake. When conducting a SWA of a ground water source this can involve a detailed evaluation, however, for a surface water source, there are few effective barriers that will prevent the movement of a contaminant after it has entered a surface water body. Dilution and half-life decay (chemically and biologically) are protection factors. However the reliance on these factors is not appropriate for other reasons related to the over all quality of the water source.

Examples of how two PCAs are handled differently between a Source Water Assessment and a Watershed Sanitary Survey are given below:

PCA: Wastewater Treatment Plant

**SWA**

An upstream wastewater treatment plant discharge to the source water would be identified as a Potential Contaminating Activity in the watershed. Under a Source Water Assessment, the knowledge that an upstream wastewater discharge exists would be used to establish the frequency of coliform and fecal coliform monitoring, nitrate monitoring, other water quality parameter monitoring, including synthetic and volatile organic chemicals, which might be contained in the effluent of the wastewater treatment plant. Basically, a Source Water Assessment confirms the existence of this plant and its location with respect to the downstream intake.

WSS

When evaluating an upstream wastewater treatment plant as part of a Watershed Sanitary Survey, it would be critical to establish location of discharge, the flow in the river, the contributing flow from the wastewater treatment plant discharge, the biological and chemical contaminated loading on the stream and also evaluate past wastewater treatment plant upsets to establish the degree of treatment needed downstream. This effort involves reviewing past water quality data and flow data from the plant as well as flow data in the surface water.

The reliability features available at the wastewater treatment plant and the operational record are of great importance in establishing downstream treatment needs. If past performance is questionable, the WSS may need to establish a communication network that alerts the downstream users when a plant is having performance problems.

The time and effort needed to obtain and evaluate this kind of an investigation is much greater than the time and effort needed to merely establish that a discharge exists at an identified location and then conclude that downstream monitoring is needed to monitor contaminants discharged to the stream.

**PCA: Recreational Activity on Watershed**

SWA

When upstream recreational activities are allowed on a watershed, the SWA would identify that the activity occurs, and the zone in which it occurs (if zones are defined).

WSS

When a WSS establishes that recreational activities are allowed on a watershed, additional specific information is needed including an evaluation of any water quality monitoring done to assess the impacts of the allowed activity.

If boating is allowed, the WSS would evaluate the types of motors and fuel handling facilities. In areas where body contact recreation is allowed, the allowed density of



individuals, availability of restroom facilities, and a review of all available bathing area coliform monitoring data would be undertaken. Measures taken by the agency to control the amount of recreation need to be evaluated and described.

**Summary Of Differences between A Watershed Sanitary Survey and A Source Water Assessment**

Watershed Sanitary Survey

Source Water Assessment

Purpose of Document

<ul style="list-style-type: none"> <li>• To describe control and management practices.</li> <li>• To describe PCAs</li> <li>• To determine if appropriate treatment is provided.</li> </ul>	<ul style="list-style-type: none"> <li>• To determine existence of PCAs</li> <li>• To determine the appropriate monitoring needed.</li> <li>• To inform public.</li> <li>• To assist in development of watershed protection programs.</li> </ul>
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Who Must Complete

<p>Systems using source must submit the completed Watershed Sanitary Survey Report and updates.</p>	<p>State must complete assessment if system does not choose to complete the work.</p>
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Intended User of Document

<ul style="list-style-type: none"> <li>• Water system managers.</li> <li>• Water treatment plant operators.</li> <li>• Land use planners.</li> </ul>	<ul style="list-style-type: none"> <li>• Water system customers.</li> <li>• Water quality monitoring personnel.</li> <li>• Land use planners.</li> </ul>
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The Department of Health Services, together with the Cal-Nevada Section of AWWA, have developed guidance for conducting a Watershed Sanitary Survey that is available through the Cal-Nevada Section.

The Department of Health Services Drinking Water Source Assessment and Protection (DWSAP) program document, for those interested in completing a Source Water Assessment, can be found on the Department's Internet site at <http://www.dhs.ca.gov/ps/ddwem/index.htm>.