DEPARTMENT CIRCULAR PWS 6

SOURCE WATER PROTECTION DELINEATION

1999 EDITION

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SECTION 1.0 - PURPOSE

Delineation and assessment of source water protection (SWP) areas is defined in the 1996 Federal Safe Drinking Water Act Amendments. Delineation is a process whereby areas that contribute water to aquifers or surface waters used for drinking water, called source water protection areas, are identified on a map. Geologic and hydrologic conditions are evaluated in order to delineate source water protection areas. Assessment involves identifying businesses, activities, or land uses in source water protection areas where chemicals or other regulated contaminants are generated, used, or transported, and determining the potential for contamination from these sources.

The purpose of this circular is to insure that the results of delineations and assessments are reported consistently and that minimum technical requirements are met. Keep in mind when preparing a report that delineation and assessment are the foundation of source water protection plans, the mechanism public water supply (PWS) systems use to protect their drinking water sources. Although voluntary for existing systems, source water protection plans are the ultimate focus of source water delineation and assessment. Therefore, delineation and assessment reports should facilitate public water systems and communities in completing source water protection plans.

The base map, showing the boundary of the source water protection area, is an important component of the delineation and assessment report. Within this boundary, land uses and locations of potential contaminant sources shall be identified. A narrative shall be included that describes characteristics of the community and public water supply that influence delineation and assessment. Also included in the narrative shall be descriptions of the methods and sources of information used to delineate the source water protection area, to identify potential contaminant sources, and to assess susceptibility. The report should be written for the public water system and community decision makers.

SECTION 1.1 - REPORT CRITERIA

a. Acknowledgments

An acknowledgment section should include the following:

- name of the system or development and county it is located in
- name and address of the system owner
- public water system identification number
- report author's, phone number, and date of report, and
- contact person and phone number.

b. Introduction

Describe the purpose and potential benefits of delineation and assessment and encourage development of a source water protection plan. The entire report, but this section in particular, should be written with the average water customer in mind. The DEQ can provide a generic example that can be used as a template.

c. Background Information

The purpose of this section is to describe the characteristics of the public water system, including its location, that influence delineation and assessment. The average layman should be able to understand this information and how it affects the delineation and assessment.

1. The Community

Describe the population, basis of the economy, any industrial activities, and major transportation routes. Include a description of all unusually large or major water users and/or waste generators. The purpose of this subsection is to give the unfamiliar reader a feeling for the community and activities in the area.

2. Geographic Setting

Describe the general geographic setting, including reference to a vicinity map as an appendix. This summary should include general descriptions of the climate, physiographic features, major roads and railways, streams and lakes, and any unique geographic characteristics. For surface water sources, include the names of the eight and eleven digit United States Geological Survey (USGS) Hydrologic Units and the Montana Watershed Management Region. You may be able to use an existing description associated with the local soil survey available through the Natural Resource Conservation Service office in the county seat. Other sources for geographic information include local or regional history publications, agricultural publications, the National Oceanic and Atmospheric Administration climate database, and regional geology books.

The vicinity map should show the location of the public water system relative to a major town or city. The vicinity map should, at a minimum, be a copy of a portion of a state or regional map that shows highways, rivers, cities and towns, and the location of the public water system. Maps used for the vicinity map may include the Official Montana Highway Map or any other map of similar scale.

3. Public Water Supply

List the number of residents and service connections on the system and describe the well or intake, treatment, and distribution system. Include reference to a layout map as an appendix, which shows mains, valves, wells, storage tanks, and treatment works. The layout map may be a copy of an existing distribution system map or you may create your own. It does not need to be a professionally created drawing but should be clear and readable and show the items noted above. Some of this information may be readily available in the public water system files at DEQ.

For wells, describe the depth, construction details, and general location and attach log(s) as an appendix. Also, describe the pump(s), pump cycles, pumping rates, and specific capacity upon which the delineation is based. Well logs may be available through the Ground Water Information Center at the Montana Bureau of Mines and Geology (MBMG) in Butte, (406) 496-4336. For streams or reservoirs describe the location, depth (low and high water), pumping rates, and protective structures.

4. Water Quality

Describe the ambient water quality and natural conditions that may influence water quality at the public water system to the extent such information is available. Also, describe known ground water or surface water contamination as recommended in the Methods and Criteria Table on page 6 of this document. For surface water sources, include the use-classification and identify any impaired or threatened streams within the watershed and describe the prioritization and status of Total Maximum Daily Load (TMDL) development.

SECTION 2.0 - DELINEATION OF GROUND WATER SOURCES

For ground water sources, delineation is the process of identifying areas that contribute water to aquifers used for drinking water. The first step is to develop a conceptual model of ground water flow based on hydrogeologic conditions. The conceptual model should consist of a set of simplifying assumptions about aquifer boundaries, aquifer hydraulic characteristics, the existence of a confining layer and its properties, and the way water flows in the aquifer. The delineation approach under Montana's Source Water Assessment Program relies on simple analytical models and hydrogeologic mapping. As a result, the conceptual model will have to be simple in order to use these simple tools. Therefore, assumptions and factors that limit the application of the delineation must be stated clearly. The next steps are to describe how you delineated the source water protection regions and to list the values used for parameters and variables in the analytical equations. Finally, discuss the limiting factors that influence the delineation and its application.

a. Hydrogeologic Conditions

Describe the aquifer, its properties, and boundaries sufficiently to support your delineation approach. Different methods and criteria are used to delineate subregions of the source water protection area depending on whether an aquifer is unconfined, confined, or hydraulically connected to surface water. Therefore, you need to demonstrate the nature of the aquifer and whether it is hydraulically connected to surface water. Include a description of geologic conditions such as lithologies, vertical succession of geologic units, lateral extent and thickness of the aquifer, lateral extent of confining units, structural trends, and local topography. The aquifer sensitivity should be described in terms needed to assess compliance with the federal ground water rule. Aquifers in fractured bedrock, karst formations, or unconsolidated deposits are sensitive unless protected by a confining layer.

Attach a geologic map and a cross-section that demonstrates your hydrogeologic conceptual model. Summarize all other geologic or hydrogeologic work that has occurred in the area in a table and attach critical supporting documentation as an appendix. Include reference to geologic maps, hydrogeologic maps, or other works listed in the table. Sources of geologic information may include MBMG or USGS publications available through an interlibrary loan from the Montana State Library in Helena or purchased from the MBMG publications office in Butte. Lithological and well information may be available through the ground water information center at the MBMG.

b. Conceptual Model and Assumptions

Describe your conceptual model based on the hydrogeologic conditions and list all simplifying assumptions. Be sure to include assumptions made about aquifer boundaries. For example, were aquifer boundaries represented in your model? Discuss the extent to which aquifer properties can be considered homogeneous and isotropic and whether ground water flow is uniform and two-dimensional. Also, discuss if the area recharge or surface water interaction is dealt with in the conceptual model. Be sure to include other assumptions that may limit the accuracy of the delineation.

c. Methods and Criteria

Describe how you delineated the source water protection area and appropriate subregions. Source water protection areas are divided into control, inventory, and recharge regions that encompass progressively larger areas. The Montana Source Water Protection Program requires that, at a minimum, the delineation be completed using analytical ground water flow equations and hydrogeologic mapping. The U.S. EPA, WHPA and WHAEM computer models are available through EPA or DEQ's Source Water Protection Assessment Program and can be used to solve analytical ground water flow equations. Alternatively, another approach is to calculate the dimensions of the ground water capture zone using the uniform flow equations. You are encouraged to conduct a more in-depth analysis using a numerical model or other means if the complexity of the aquifer warrants a more in-depth analysis (refer to the table on the following page for delineation criteria).

Special circumstances to be aware of.

- In the absence of credible evidence to the contrary an aquifer must be assumed to be unconfined for the purpose of delineating the source water protection area.
- Recharge areas at outcrops of confined aquifers should be identified within the recharge region.
- Surface water bodies are considered to be hydraulically connected to ground water if they flow over an inventory region in an unconfined alluvial aquifer, unless there is credible evidence to the contrary.
- Hydraulically connected surface water bodies within the recharge region need to be included in the inventory region to the extent of their recent alluvium.
- Non-community public water supplies can be delineated using fixed distance criteria. However, a more in-depth approach is encouraged if the source aquifer is highly susceptible to contamination.

Uncertainty of hydrogeologic conditions and the presence of preferential flow paths need to be considered when delineating inventory regions based on Time of Travel (TOT). Geologic settings where preferential flow paths commonly occur include fractured and karstic bedrock and alluvial sediments. TOT calculated for the fastest probable flow path should be used in your delineation.

d. Model Input

Present the values of variables, such as hydraulic conductivity, used to delineate the inventory region and describe the basis for using the selected values. Provide a table that shows the selected values and ranges of values obtained from previous reports or general texts. Include completed analytical equations or model input/output information. The table on the following page can be used to summarize model inputs.

Methods and criteria for delineating source water protection regions for PWSs.

If your public Water System Classification Is:	And Your Aquifer Type Is:	Then your Source Water Protection Regions are:	You Can Use This Delineation Method For Each Region:	And Your delineation Must Meet these Criteria and Minimum Values:
Community	Unconfined or semi-confined	Control Inventory Recharge	Fixed radius Analytical method Hydrogeologic mapping	Distance - 100 feet Distance - larger of 1,000 feet up-gradient or 3 -year TOT Flow boundaries - physical and hydrologic + surface waters that cross the Inventory Region
Community	Confined or artesian	Control Inventory Recharge	Fixed radius Analytical Method Hydrogeologic mapping	Distance - 100 feet Distance B 1000 feet for flowing wells and one-half mile for non-flowing wells, must include any aquifer formation outcrop that occurs within a 3-year TOT Flow boundaries-physical and hydrologic + surface waters that cross inventory regions
Community	Surface water	Spill Response Watershed	Fixed radius Hydrologic Mapping	One-half mile buffer extending upstream a distance corresponding to a 4-hour TOT but not to exceed ten miles or the nearest intake. Buffer will not exceed the extent of the watershed. Limits of one of four watershed regions.
Non-community	Ground water Surface water	Control Inventory Spill Response	Fixed radius Fixed radius Fixed radius	Distance - 100 feet Distance - 1 mile One-half mile buffer extending upstream a distance corresponding to a 4-hour TOT but not to exceed ten miles or the nearest intake. Buffer will not exceed the extent of the watershed.

e. Limiting Factors

Describe how uncertainty in your estimates of hydraulic conductivity, aquifer thickness, porosity, hydraulic gradient, hydraulic boundaries, and pumping rate influence the delineation. Also, state whether the assumptions made in your conceptual model are consistent with hydrogeologic conditions. Discuss the nature of errors resulting from the limiting factors and estimate upper and lower bounds for your delineation solution. If there is significant uncertainty in your input values or conceptual model, you may need to conduct a sensitivity analysis to see how systematic changes in critical input values affect the final delineation results.

SECTION 2.1 - DELINEATION OF SURFACE WATER SOURCES

a. Hydrologic Conditions

Describe the source water in sufficient detail to support your delineation. For streams include the mean annual daily high flow and velocity, ten-year seven-day low flow, and gauge station number. If records are not available, estimate flows using data from a gauge station on a stream that has similar flow, drainage area, gradient, and geographic location. For lakes or reservoirs estimate the low and high levels and volumes. For all surface waters describe any factors that affect runoff including precipitation, width and type of channel, steepness and permeability of stream banks, presence and kind of vegetation, extent of shoreline wetlands, and significant shoreline development. Describe watershed conditions such as drainage pattern, average land slope, area, overland flow length, geology, vegetation, soil erodability, and geomorphology. Discuss the importance of ground water discharge especially during low flow conditions. Discuss any unique characteristics of the source water that affect management decisions.

b. Assumptions

Discuss assumptions made in your analysis.

c. Methods and Criteria

Describe how you delineated the source water protection area and appropriate subregions. Discuss your reasoning if you use criteria other than fixed distance to delineate a buffer region. Include your calculation of the mean annual high flow velocity for determining the length of buffers.

d. Limiting Factors

Describe conditions in the watershed that limit the accuracy of your delineation.

MODEL INPUT SUMMARY TABLE

Source Name/ID#	**Value used**	**Units**	**How Derived**	**Remarks**
Elevation at well				
SWL				
PWL				
Drawdown				
Pumping rate				
Specific Capacity				
Intake elevation				
Transmissivity				
Hydraulic conduct				
Hydraulic gradient				
Effective porosity				

SECTION 3.0 - INVENTORY

Inventory Method

Describe the method used to inventory subregions of the source water protection area and list the names of the participants. Inventory methods may include business directory research, agency database research, door-to-door surveys, windshield surveys, etc.

An inventory sheet should be completed for each property within the control zone of public water supply wells. In the inventory region, complete inventory sheets only for specific activities or sites of concern that have potential to contaminate your source water (see Section 4.1, A-C). All land uses within the entire source water protection area, should be identified on your base map. Generally, land uses can be described as: sewered-residential(SR), sewered-commercial(SC), sewered-mixed(SM), unsewered residential(UR), unsewered- commercial(UC), unsewered-mixed(UM), industrial(I), railroad right-of-way, highway right-of-way(ROW), agriculture-dry-land crop(DC), agriculture-irrigated crop(IC), agriculture-irrigated pasture(IP), agriculture-dry-land pasture(DP) and forest(F). Land use data can be obtained from the USGS Geographic Information Retrieval and Analysis System.

For surface water supplies, sources of contaminants with acute health risks, and highway, railroad, or pipeline crossings should be identified in the spill response region. Potential sources of acute health risks that shall be identified include animal feeding operations, wastewater treatment facilities, MPDES discharges, storm-water discharges, and urban land uses. Large EPA regulated facilities listed in the Resource Conservation and Recovery Information System (RCRIS), the Toxic Release Inventory (TRI), the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS), or the Montana State VOC Registrant List must be inventoried throughout the source water protection area. Conditionally exempt facilities need not be inventoried in source water protection regions of surface water supplies because of the relatively small spill hazard posed by these facilities. General land uses and large EPA regulated facilities may be identified in the DEQ watershed management region where the public water supply is located. Again, USGS land use data and EPA databases should be used.

Contaminant source inventories for non-community, transient public water supplies, may be limited to acute health risks in the inventory or spill response regions, for ground water or surface water systems, respectively. A site identification number may be entered on both the inventory sheet and the base map. When complete, you will have a base map showing general land uses in your SWP area and specific sites noted by a map locator number that corresponds to the inventory sheet ID number. Reference the completed inventory forms (Section 4.1, A-D).

SECTION 4.0 - SUSCEPTIBILITY

a. Susceptibility Determination for Specific Contaminants

Susceptibility of the PWS to specific contaminant sources, or classes of contaminant sources identified in the contaminant source inventory, is determined by the hazard associated with potential contaminant sources and the existence of natural or engineered barriers. For point sources, hazard is determined by proximity to the water intake. Density is the measure used for assessing hazards associated with contaminant sources such as septic systems that have been grouped into classes. The results should be presented to the DEQ as a table, listing sources, source classes and their associated susceptibility rating along with a narrative describing the analysis. Contact DEQ for worksheets intended to assist in the completion of this section.

Relative susceptibility of a PWS to specific contaminant sources as determined by hazard (see SECTION 4.1(d-g), Hazard Determination and SECTION 4.0 (d-e), Barriers).

Presence of Barriers	Hazard		
	High	**Moderate**	**Low**
No Barriers	**Very High**	**High**	**Moderate**
One Barrier	**High**	**Moderate**	**Low**
Multiple Barriers	**Moderate**	**Low**	**Very Low**

b. Hazard Determination for Ground Water Systems

Hazards for ground water systems are determined by proximity of a well to point contaminant sources and by density for classes of contaminant sources and non-point sources in the inventory region. Follow SECTION 4.1 (a-e) in determining the hazard for each source, source class, or land use.

c. Hazard Determination for Surface Water Systems

Hazards for surface water systems are determined by the following two criteria: a presence in the spill response region; or relative land use located outside a spill response region, in the case of urban runoff. A hazard to a point source is not

differentiated by distance, or time of travel, because rapid transport occurs everywhere in the spill response region. Follow SECTION 4.1 (a, b, c, f, g) in determining the hazard for each source, source class, or land use.

d. Engineered Barriers

Engineered barriers for wells are considered to be any man-made structure or human activity between a contaminant source and a well that reduces the likelihood of the well being contaminated. Leak detection and spill containment systems are common types of engineered barriers. Use of Best Management Practices (BMPs) is also considered an engineered barrier for the purpose of susceptibility analysis. Further, a water intake that meets current DEQ construction standards is considered an engineered barrier to the extent that a secure intake prevents contamination within the control zone or through interaquifer leakage. Evidence of the presence of an engineered barrier will be required before it can be considered as part of a susceptibility analysis.

Man-made structures or management practices that reduce the probability of contaminants reaching a surface water intake are considered engineered barriers for surface water sources. Examples are spill catchment structures or infiltration basins for industrial facilities. Surface water intakes will usually be considered inherently vulnerable, however, intake location may be considered protective under certain circumstances. Concerted efforts to reduce storm water runoff from nearby urban areas are also considered an engineered barrier. No engineered barriers will be considered effective for preventing contaminant spills at highway, railroad, or pipeline crossings when determining susceptibility.

e. Natural Barriers

Thick clayey soils, a thick unsaturated zone, or a thick confining layer can afford natural barriers for wells. Chemical reactions between a contaminant and soil or rock may also impede contaminant movement. Factors that should be considered when evaluating natural barriers include soil permeability, soil organic content, aquifer transmissivity, well intake depth, depth to water table, presence of a thick continuous confining layer, presence of fractures or solution openings, net recharge rate, and vertical hydraulic gradient. Evidence from previous investigations at or nearby a PWS well indicating the existence of a natural barrier are required before considering it in a susceptibility determination. An upward hydraulic gradient from the source aquifer or the results of tritium analysis may be used to confirm the existence of a natural barrier. A level of protection equal to multiple barriers can be claimed if a PWS well is a flowing artesian well or if tritium levels indicate that water recharged the source aquifer prior to atmospheric atomic bomb testing in the 1950's and 1960's.

Natural barriers for surface water sources are any natural conditions at a potential contaminant source that reduce the probability of direct runoff. Intrinsic properties considered when determining susceptibility of surface water sources include steepness of stream banks, soil thickness and permeability, presence and kind of vegetation, and land use. Dilution through mixing also may be considered a natural barrier.

f. Assumptions and Limiting Factors

The susceptibility analysis implemented in the Montana Source Water Assessment Program is not based on a rigorous analysis of contaminant transport, but relies on indicators of hazards and simple assessments of the effectiveness of barriers. Discuss the assumptions made in this analysis and the probable errors in relation to potential sources and contaminants in the source water protection area. Important assumptions that need to be addressed for wells include:

1. contaminants flow at the same speed as water,

2. contaminants do not degrade once in the ground,

3. population density correlates with septic tank density, and

4. agricultural and urban non-point sources can be approximated by relative land use. Assumptions made to assess susceptibility of surface water sources include: 1) contaminants are thoroughly mixed within the surface water body, and 2) non-point pollution from urban runoff can be approximated by relative land use. Errors and approximations inherent in the databases used to locate sources and land uses should be discussed. Also, the scoring systems for ranking hazards are relative and not based on direct relationship to health effects.

SECTION 4.1 - METHODS AND CRITERIA FOR HAZARD DETERMINATION

Methods and criteria used in evaluation of source water protection for PWSs are presented on the following pages.

Contaminant Inventory and Inventory Form

Source categories and information to be included in contaminant inventory narratives.

Source Category	Information
Septic Systems	Estimated Density by Quarter Section
Animal Feeding Operations	Type, Location, Size and History of Releases
EPA Regulated Facilities	Industry Classification, Location, and History of Releases
Class V Injection Wells	Industry Classification, Location, and History of Releases
Wastewater Treatment Spray Irrigation / Lagoons	Location and Permit Requirements
MPDES Wastewater Discharges	Location, Permitted Discharge or TMDL
Storm Water Discharges	Permitted Discharge
Highways, Roads, Railroads & Pipelines	Location
Land Use	Location and Percent of Agricultural and Urban Land Uses

SWP INVENTORY FORM

PWSID Name & ID#_____ Site ID Or Other Number_____

SWP Region_____ Inventory Person_____

Site Name_____ Owner Name_____

Site Address_____

City_____ Zip Code _____ County_____

Phone _____ T/R/S_____ Lat/Long_____

Property owner (if different from above)_____

Address_____ Phone_____

City_____ Zip Code_____

NATURE OF PROPERTY

____Service Business ____Industrial/Mfg. ____Retail Business ____Agricultural

____Residential ____Government ____Other (describe on back)

LAND USES or POTENTIAL CONTAMINANT SOURCES

Place a check by the letter or number of each land use activity or potential source found at this site. Also place the number or letter and the map locator number (from upper right corner, SWP Inventory Form - Site ID or other Number) on the base map to indicate the location of each land use activity or potential contaminant source. List the chemicals used or stored and approximate volume on back of the form. Also include any other important or useful site information.

____(A) Ag chemical use site
____(B) Brine pit
____(C) Chemical storage
____(D) Chemigation well
____(E) Chemical mixing/loading site
____(F) Drain ditch/canal
____(G) Feedlot
____(H) Grain storage
____(I) Greenhouse/nursery/orchard
____(J) Highway/county road
____(K) Injection well
____(L) Irrigated land
____(M) Irrigation canal
____(N) Land application of waste site
____(O) Landfill/dump
____(P) Mine/quarry/gravel pit
____(Q) Oil/gas well or exploration borehole
____(R) Pipeline
____(S) Railroad right-of-way
____(T) Salvage yard
____(U) Septic tank
____(V) Service Station dry well/sump
____(W) Stormwater drain/sump
____(X) Stream/river/lake/pond
____(Y) Underground storage tank
____(Z) Utility substation/transformer storage
____(1) Wastewater lagoon
____(2) Water well in use
____(3) Other, Specify on Back

Site History Chemicals Used or Stored at This Site

Map Locator # and Source ID	Land Use	Associated Chemicals & CAS #s

Additional site information

Sketch of Site (optional)

d. Hazard Determination for Wells

Hazard is defined in this section by the proximity of individual contaminant sources to a well or by the density of classes of potential contaminant sources within the inventory region. Follow the table when developing thresholds for hazard designations.

Hazard of potential contaminant sources associated with proximity to a PWS well or density within a PWS inventory region.

Source Type	Hazard		
	High	**Moderate**	**Low**
Septic Systems (# / sq. mi.)	>300	50-300	<50
Cropped Agricultural Land (%)	>50	20-50	<20
Urban Land Use (persons/sq. mi.	>100	20-100	<20
EPA Regulated Facilities (1 within __ TOT in years)	<1	1-3	>3
Conditionally Exempt Facilities (5 within __ TOT in years)	<1	1-3	>3
Other Significant Point Sources USTs, landfills, clustered industrial (1 within __ TOT in years)	<1	1-3	>3
Class V Injection Well (5 within __ TOT in years	<1	1-3	>3
Highways or Railroads (1 within __ TOT in years)	<1	1-3	>3
Animal Feeding Operations (1 within __ TOT in years)	<1	1-3	>3
Wastewater Treatment/Spray Irrigation/Lagoons (1 within __ TOT in years)	<1	1-3	>3

e. Criteria for a Hazard Determination for Wells

1. Septic Systems - Septic system density thresholds used by DEQ to regulate subdivision development serve as a starting point in setting thresholds for septic system hazards. Thresholds for the classification of septic system density in subdivisions are 1 septic system per 1, 5, and 20 acres (640, 128, and 32 per square mile). There is evidence, however, that nitrate levels in ground water are elevated in areas with septic densities below those allowed in subdivision permitting (Drake, 1995). Also, these thresholds do not apply to spatial averages but to specific subdivision developments. This is important because septic system densities averaged over larger areas will decrease as undeveloped land is included. Consequently, the thresholds for septic systems presented in SECTION 4.1 (d) are roughly twice as restrictive as those specified in subdivision regulations. Further, septic system densities are estimated at the quarter section level to lessen the effect of averaging over larger areas. If septic system density exceeds a threshold in any quarter section within an inventory region, septic system hazard will be assigned according to that value. Note that in SECTION 4.1 (d), septic system density is estimated from population within census blocks and based on the state average of 2.4 persons per rural household. This approach is used because data on septic system densities is generally not available.

2. Cropped Agricultural Land - Cropped agriculture includes any land cultivated and harvested on a regular basis. This includes dry land as well as irrigated crops but does not include natural hay where there is no cultivation or chemical application. Herbicides, pesticides, and fertilizer are the primary hazards associated with cropped agriculture. Percent cropped agriculture is determined from data obtained from the USGS Geographic Information Retrieval and Analysis System. USGS digitized the data from 1:250,000 scale maps, which it created through field surveys and aerial photo interpretation. The minimum sizes of regions classified were 10 acres in urban areas, 40 acres in rural areas, linear man-made features at least 660 feet wide, and linear natural features at least 1,320 feet wide.

3. Urban Land Use - Urban land use is designated to cover potential contaminant sources associated with concentrated human activities of various kinds. Stormwater runoff, residential chemical use, concentrated transportation of chemicals, and unpermitted underground injection wells are examples of potential sources in urban areas. Thresholds for urban land use are based on average population density in the inventory region. The data was derived from U.S. Census Bureau TIGER files and population counts were used to identify urban land uses.

4. EPA Regulated Facilities - The hazards associated with generators, transporters, treaters, storers, or disposers of hazardous materials are assessed individually according to the TOT distance from a PWS well. Facilities included in this category are those that are regulated by EPA and that data is readily available through the Montana State VOC Registrant List or the following EPA databases: Resource Conservation and Recovery Information System (RCRIS), Toxic Release Inventory (TRI), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). Facilities that are conditionally exempt under RCRA are excluded from this category. MPDES permit holders are included where conjunctive delineation of surface water and ground water is necessary (see Determination of Susceptibility for Surface Water Sources section for TOT criteria). Locations of MPDES permitted facilities can be obtained from EPA's Permit Compliance System (PCS) database.

5. Conditionally Exempt Facilities - Facilities in this category generate no more than 220 lbs or about 25 gallons of hazardous waste, or no more than 2.2 lbs of acute hazardous waste, in any calendar month. Sources in this category are assigned a composite hazard assessment according to the number within TOT distance thresholds. Sources of data for this source category are EPA databases, searches of Internet yellow pages by Standard Industry Classification (SIC) codes, and DEQ information.

6. Class-V Underground Injection Wells - Class-V wells are non-domestic wastewater open-bottomed wells, disposal drains or septic systems (sumps, french drains, or seepage pits). Sources in this category are assigned a composite hazard assessment according to the number within TOT distance thresholds, as with conditionally exempt facilities. Information from DEQ personnel and searches of Internet yellow pages, by SIC, codes will provide the data needed in this category.

7. Landfills - Active and retired landfills in Montana that are listed in the DEQ - Solid Waste Management Program archives are included in this category. Hazard is assessed individually according to the TOT distance from a PWS well.

8. Highways or Railroads - The hazard of transporting hazardous materials on highways and active railroads through an inventory region is assessed according to TOT distance from a PWS well. The location of highways shall be obtained from maps or from 1:100,000 scale TIGER census data. Determinations of whether transport frequency is significant will be based on DEQ personnel and citizen input.

9. Animal Feeding Operations - The hazards of animal feeding activities are assessed according to TOT distance from a PWS well. The location of operations under this category will come from the DEQ permit database and input from DEQ personnel.

10. Wastewater Treatment/Spray Irrigation/Lagoons - The hazards of waste treatment activities are assessed according to TOT distance from a PWS well. The location of facilities under this category will come from the DEQ permit database and input from DEQ personnel.

f. Hazard Determination for Surface Water Intakes

Hazard is defined in this section by source type (or population density in the case of urban land use) (f-1). Developing thresholds for hazard designation and the criteria for identifying barriers is described in the remainder of this section.

Table f-1. Hazard of potential contaminant sources according to source type or population density within a PWS spill response region

	Hazard		
Source Type	**High**	**Moderate**	**Low**
Urban Land Use Within (persons / sq. mi.)	**>100**	**20-100**	**<20**
EPA Regulated Facilities		**All**	
MPDES Wastewater Discharges	**All**		
Storm Water Discharges		**All**	
Highway or Railroad Crossings	**All**		
Pipeline Crossings	**All**		
Animal Feeding Operations	**All**		
Wastewater Treatment/ Spray Irrigation/Lagoons	**All**		

g. Criteria for Hazard Determination for Surface Water Intakes

1. Urban Land Use - Urban land use is designated to cover potential sources located outside the spill response region but which may contaminate a surface water source through stormwater runoff. Thresholds for urban land use are based on average population density within one-half mile of a surface water source for a four-hour time-of-travel distance upstream from an intake. Data derived from U.S. Census Bureau TIGER files and population counts are used to identify urban land uses.

2. EPA Regulated Facilities - The hazards associated with generators, transporters, treaters, storers, or disposers of hazardous materials are assessed as moderate for all facilities within the buffer region. Facilities included in this category are those that are regulated by the EPA. Facilities regulated by the EPA can be identified through the Montana State VOC Registrant List or the following EPA databases: Resource Conservation and Recovery Information System (RCRIS), Toxic Release Inventory (TRI), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS). Facilities that are conditionally exempt under RCRA are excluded from this category.

3. MPDES Regulated Facilities - Hazards from MPDES permitted facilities are high for all discharges. Locations of MPDES permit holders may be obtained from the EPA's Permit Compliance System (PCS) database.

4. Storm Water Discharges - Storm water discharge points are hazards separate from the sources of the storm water runoff covered under the urban land use category. Discharges in this category generally will not be listed in the PCS database. Hazard is considered to be moderate for all discharges.

5. Highway or Railroad Crossings - The hazard of transporting hazardous materials on highways and active railroads across a surface water source is considered to be high. Locations of highways may be obtained from maps or from 1:100,000 scale TIGER census data.

6. Pipeline Crossings - The hazard of transporting chemicals through pipelines across a surface water source is considered to be high. Locations of pipelines may be obtained from DEQ databases.

7. Animal Feeding Operations - Hazards of animal feeding activities are considered to be high. Locations of operations under this category may be obtained from the DEQ permit database and input from PWS personnel.

8. Wastewater Treatment/Spray Irrigation/Lagoons - Waste treatment activities are assigned high hazard ratings. Locations of facilities under this category may be obtained from the DEQ permit database and input from DEQ personnel.

SECTION 5.0 - Report Review and Certification

Department staff will complete the delineation and assessment report review process, for existing sources. Delineation and assessment for new sources must be submitted along with the application provided to the Department for each new PWS source. The applicant must submit a draft delineation map and assessment supporting documentation with plans and specifications for the source to be developed. The Department shall review the delineation and assessment, and comment within 60 days of receipt of an application.