

Attachment A

Process for Developing Time Durations for Special Wellhead Protection Areas



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December 2025

Introduction

This attachment describes the process that was used by members of the Spokane Aquifer Joint Board (SAJB) in Spokane County, Washington, to select the time duration to use for delineating Special Wellhead Protection Areas (SWPAs) during 2025 at each drinking water supply well owned by SAJB members. The process described in this attachment is the same process that was used when SWPAs were first defined for SAJB member wells during development of SAJB's original Wellhead Protection (WHP) program. The process for defining SWPAs was documented by CH2M HILL (1996) and incorporated into the technical report for SAJB's WHP program (CH2M HILL, 2000). Following are discussions of:

- The goals for selecting the SWPA time duration at any given well.
- The methodology for selecting the SWPA time duration at any given well.
- A tabulation of the selected time durations.
- A list of references cited in this attachment.

Goals for Selecting the SWPA Time Duration

For a given water supply well, the goal of delineating a SWPA is to obtain an optimally sized management area that has the following two characteristics:

- The SWPA is large enough to give the water purveyor sufficient time to replace the water source (if replacement is needed).
- The SWPA is not so large that it becomes infeasible to implement management plans or contingency plans.

The response time is the period of time that would be needed to replace the groundwater supply that is lost if a contamination event were to make the well unusable. Options for replacing the groundwater supply can vary from well to well and from purveyor to purveyor according to such factors as:

- How important a given well is for providing year-round or seasonal water supply.
- The ability of an SAJB member's other wells and the water distribution system to accommodate increases in production (pumping) from wells not affected by the contamination event.
- The SAJB member's ability to obtain water supply from another SAJB member.

Methodology for Selecting the SWPA Time Duration

As discussed by CH2M HILL (1996), during a July 25, 1996, meeting the SAJB membership agreed that a 1-year (12-month) time duration should serve as the base period for delineating SWPAs for all wells, but should be adjusted at any given well to be longer or shorter than 1 year to account for the response time to a contamination event affecting that well. CH2M HILL (1996) described the adjusted time duration as the “importance factor” reflecting the response time that the well owner anticipates is needed at a given well to respond to a contamination event. The importance factor is mathematically related to the 1-year groundwater travel time to a well and to the response time at that well as follows:

$$\text{Importance Factor} = \text{Response Time} / 1 \text{ Year}$$

As described by CH2M HILL (1996), an important factor of less than 1.0 indicates that the response time is less than 1 year, while a value greater than 1.0 indicates the response time is longer than 1 year. When using the groundwater flow model to delineate the SWPA for a given well, the model delineates the SWPA capture zone for a time duration that is equal to the response time. For example, if the importance factor for a well is 0.5, then the model will delineate a 6-month (1/2-year) capture zone. In this example, the resulting SWPA for this well can be thought of as a 6-month capture zone reflective of a 6-month response time to a contamination event.

In order for the size and extent of the SWPAs to be defensible to the public, a specific set of methods is used to select the response times and importance factors at each well. For a given well, the process relies on selecting the SWPA time duration based on 15 scenarios that relate to (1) the use of the well, (2) the water transmission capabilities of the water distribution system, and (3) the availability of water supply from other SAJB members. Table 1 summarizes the scenarios, which are distinguished by the following considerations:

- **The Use of the Well.** The following three types of uses are considered:
 - **Primary Supply.** Describes wells that are used each month of the year (or nearly so).
 - **Secondary Supply.** Describes wells that are used at least 6 months of the year. These wells supplement the primary wells and serve a broader demand period than peak-season demands.
 - **Peaking Supply.** Describes wells that operate for less than 6 months each year. Their primary purpose is to meet peak-day and peak-month demands during the hottest months of the year.
- **The Capabilities of the Distribution System.** Consideration is given to the degree to which the distribution system is capable of handling an increase in pumping from other wells that are not affected by the contamination event that causes the given well of interest to go offline.
- **The Availability of Water Supply from Other SAJB Members.** Consideration is given to the degree to which the distribution system is capable of handling an increase in pumping from other wells that are not affected by the contamination event that causes the given well of interest to go offline.

Table 1 lists the response times and the importance factors for each of the 15 scenarios. As indicated in the table, the time element does not necessarily need to describe the response time to a contamination event (which measures the ability to replace an impacted water supply source). Instead, the time element could be the duration of time that the SAJB member wishes to have available to conduct planning work in response to a contamination event. For primary wells, which are used year-round, the desired planning time might be much longer than the actual time that the SAJB member is capable of bringing an alternative water source online under emergency circumstances. For peaking wells, which are used only on a seasonal basis, the response time and the planning time may be similar.

The rationale behind the derivation of the response times and importance factors contains the following elements:

- The highest importance factors are for the primary wells. Progressively lower factors are used for secondary and peaking wells, respectively.
- Primary wells have importance factors no lower than 1.0. This means that the SWPA represents the area contributing water to the well during a 1-year (or longer) time period.
- Secondary and peaking wells are allowed to have importance factors less than 1.0.
- The minimum importance factor for any scenario is 0.1. This corresponds (approximately) to a 30-day (1-month) time period for SWPA delineation.
- Importance factors are increased if other wells owned by the given SAJB member (or by other SAJB members) cannot supply the needed makeup water supply. The importance factors are further increased if agreements and facilities are not currently in place to replace the volume of water that is needed.
- Importance factors are increased if the distribution system is limited in its ability to convey increased pumping from other wells (whether those other wells are owned by the SAJB member whose well has been impacted by contamination or by another SAJB member).
- The maximum importance factor is 5.0, which corresponds to a 5-year time period for SWPA delineation. Delineations for longer time periods would result in areas that are too large to be feasibly managed.

Assumptions incorporated into the methodology are:

- The flow volume provided by the lost well needs to be replaced in full. This assumption is incorporated into all 15 scenarios listed in Table 1. If this assumption is unrealistic for a given well or SAJB member, then the importance factor can be adjusted downward (but not below 0.1).
- If the necessary volume of water can presently be obtained from other SAJB members, then the distribution system is assumed to be capable of delivering this flow. This assumption is incorporated into Scenarios 5, 10, and 15.
- If no existing alternative groundwater supply source is available, then the distribution system is assumed to require additional capital expenditures. This assumption is incorporated into Scenarios 4, 9, and 14.

Tabulation of Selected SWPA Time Durations

For each SAJB member well, Table 2 lists the final selected time duration (i.e., the importance factor values) and the associated scenario for the time duration (importance factor) that was selected.

References

- CH2M HILL. 1996. *Assessment Importance Factors for Water Supply Wells (Wellhead Protection Area Delineation)*. Technical memorandum prepared for Spokane Aquifer Joint Board Members. Prepared by John Porcello and Brad Phelps. July 26, 1996.
- CH2M HILL. 2000. *Spokane Aquifer Joint Board Wellhead Protection Plan– Volume 1*. Prepared for the Spokane Aquifer Joint Board.

Table 1. Scenarios for Response Times and Importance Factors

Scenario No.	Well Use ¹	Is the Necessary Production Obtainable from Other Wells? ²	Can the Necessary Production be Obtained from Other Purveyors? ³	Distribution System Capabilities ⁴	Response Time or Planning Time (months)	Importance Factor ⁵
1	Primary	Yes	—	Capable	≤ 12	1.0
2	Primary	Yes	—	Limited	12 to 36	1.0 to 3.0
3	Primary	Yes	—	Incapable	24 to 60	2.0 to 5.0
4	Primary	No	No	Limited or Incapable	24 to 60	2.0 to 5.0
5	Primary	No	Yes	Capable	12 to 24	1.0 to 2.0
6	Secondary	Yes	—	Capable	9 to 12	0.75 to 1.0
7	Secondary	Yes	—	Limited	12 to 36	1.0 to 3.0
8	Secondary	Yes	—	Incapable	24 to 60	2.0 to 5.0
9	Secondary	No	No	Limited or Incapable	18 to 60	1.5 to 5.0
10	Secondary	No	Yes	Capable	6 to 12	0.5 to 1.0
11	Peaking	Yes	—	Capable	3 to 6	0.25 to 0.5
12	Peaking	Yes	—	Limited	6 to 36	0.5 to 3.0
13	Peaking	Yes	—	Incapable	12 to 36	1.0 to 3.0
14	Peaking	No	No	Limited or Incapable	6 to 36	0.5 to 3.0
15	Peaking	No	Yes	Capable	1 to 12	0.1 to 1.0

Notes

¹ Well uses are defined as follows:

Primary: used on a year-round (or nearly year-round) basis.

Secondary: Helps with summer peak demands, but also used at other times.

Peaking: Used exclusively for peak-demand periods.

² It is assumed that the lost pumping volumes needs to be replaced.

³ An em-dash (—) indicates that this question is not relevant (i.e., capacity is available at other wells). A “Yes” entry assumes agreements and facilities are in place and supply is available.

⁴ Distribution system capabilities are defined as follows:

Capable: Pumping loss at this well can be replaced by pumping from another well without exceeding the capacity of the distribution system at other wells.

Limited: Pumping increases may not be possible at other wells without exceeding the capacity of the distribution system. This may depend on the season during which pumping needs to be increased at other wells.

Incapable: The system would require capital improvements before increasing pumping at other wells.

⁵ Equals the response time divided by 1 year.

Table 2. Selected Time Durations (Importance Factors)

SAJB Member	Name of Active Well	Time Duration (years) (Importance Factor Value)	Importance Factor Scenario
Carnhope Irrigation District No. 7	Carnhope	5.0	4
Consolidated Irrigation District No. 19	CID-1 Wellfield	2.0	9
	CID-2 Wellfield	2.0	4
	CID-3 Wellfield	2.0	4
	CID-4 Wellfield	2.0	9
	CID-5 Wellfield	2.0	9
	CID-6 Wellfield	2.0	9
	CID-7 Wellfield	2.0	4
	CID-8 Wellfield	2.0	9
	CID-9 Wellfield	2.0	9
	CID-10 Wellfield	2.0	9
	CID-11 Wellfield	2.0	9
East Spokane Water District No. 1	Wells 1 and 2	1.0	Not Defined
	Wells 3 and 4	1.0	Not Defined
	Well 5	0.5	Not Defined
	Well 6	0.5	Not Defined
	Well 7	0.5	Not Defined
	Wells 8 and 9	3.0	Not Defined
Honeywell Electronic Materials	Well 1	1.5	Not Defined
	Well 2	1.0	Not Defined
Hutchinson Irrigation District No. 16	Well 1	5.0	4
	Well 2	5.0	4
Irvin Water District No. 6	Well 1	1.0	10
	Well 3	1.0	15
	Well 4	5.0	4
	Well 5	5.0	4
Kaiser Aluminum Trentwood Works	North Prod. Well	5.0	4
Liberty Lake Sewer and Water District No. 1	Kenney 1 and 2	1.0	1
	Mission	1.0	1
	Schultz	1.0	1
	Sprague	1.0	1
	Valleyway	1.0	1
Millwood, City of	Butler	1.0	10
	New Park	3.0	4
	Old Park	2.0	11
Moab Irrigation District No. 20	Wells 1, 2, 3, and 4	2.0	4 and 5
Model Irrigation District No. 18	Well 1	1.0	1
	Well 3	2.0	6
	Well 4	1.0	2
	Well 5	2.0	6
	Well 6	0.5	11
	Well 7	3.0	12
Modern Electric Water Company	Well 2	1.0	1
	Well 3	1.0	1
	Well 4	1.0	1
	Well 6	1.0	1
	Well 7	1.0	1
	Well 8	1.0	1
	Well 9	1.0	1
	Well 11	1.0	1
North Spokane Irrigation District No. 8	Wells 1 and 3	5.0	4
	Wells 2 and 4	5.0	4
Orchard Irrigation District No. 6	Park Well 1	2.0	Not Defined
	Office Well 2	1.0	Not Defined
Pasadena Park Irrigation District No. 17	Well 2	2.5	6
	Well 3	3.0	3
	Well 4	4.0	4
	Well 5	4.0	4
	Well 6	2.5	6
	Well 7	2.5	6
Spokane Business & Industrial Park	Wells 1, 2, 3, and 4	2.0	Not Defined

Table 2. Selected Time Durations (Importance Factors) (cont'd)

SAJB Member	Name of Active Well	Time Duration (years) (Importance Factor Value)	Importance Factor Scenario
Spokane, City of	Central	0.167	Not Defined
	Hoffman	0.083	Not Defined
	Grace	0.167	Not Defined
	Nevada	0.167	Not Defined
	Well Electric	1.0	Not Defined
	Parkwater	1.0	Not Defined
	Ray Street	0.167	Not Defined
	Havana Street	0.167	Not Defined
Spokane County Water District No. 3 (System 1; East Wellfield)	20 th and Balfour	5.0	4
	Freeway and Vista	1.0	10
	Koren	2.0	5
	Vercler Well 1	5.0	4
	Vercler Well 2	2.0	2
Spokane County Water District No. 3 (Systems 3 and 4; North Wellfield)	Cherry	3.0	4
	Helena Well	3.0	9
	Helena Well 2	2.0	2
	Lyons and Normandie	3.0	9
	Mead Well 6	2.0	3
	Pineriver Park	5.0	4
	Steer Inn	5.0	4
Trentwood Irrigation District No. 3	Well 3	2.0	4
	Well 4	1.0	14
	Well 5	2.0	4
	Well 6	2.0	2
Vera Water & Power	Well 1	1.0	Not Defined
	Wells 3 and 33	1.0	Not Defined
	Well 4	3.0	Not Defined
	Well 5	3.0	Not Defined
	Well 6	2.0	Not Defined
	Wells 8 and 9	1.0	Not Defined
Wells 21 and 22	1.0	Not Defined	
Whitworth Water District No. 2	Well 1	1.0	Not Defined
	Well 1A	1.0	Not Defined
	Well 2A	1.0	Not Defined
	Well 2B	1.5	Not Defined
	Well 2C	1.5	Not Defined
	Well 3	0.5	Not Defined
	Well 3B	1.0	Not Defined
	Well 3C	1.5	Not Defined
	Well 3D	1.5	Not Defined
	Well 3E	1.5	Not Defined
	Well 8	0.5	Not Defined
	Well 8A1	1.0	Not Defined
	Well 8A2	1.5	Not Defined
	Well 8B	1.5	Not Defined
	Well 8C	1.5	Not Defined

Notes
 All wells listed in this table pump groundwater from the Spokane Valley-Rathdrum Prairie Aquifer except for 5 wells owned by Whitworth Water District #2 (wells 8, 8A1, 8A2, 8B, and 8C, which are located just north of the aquifer boundary in the Little Spokane River watershed).
 No. = Number
 SAJB = Spokane Aquifer Joint Board