

APPENDIX A - ATTACHMENT 4 : EPTDS Rating Calculations

PWID: 1431001 Pequannock Township Water Department

EPTDS Susceptibility Rating Determination

Each public drinking water source received a susceptibility rating of high (H), medium (M), or low (L). The rating reflects the potential for contamination of source water, not the existence of contamination. The susceptibility rating was calculated using susceptibility models developed by the United States Geological Survey.

Most treatment and monitoring takes place at the Entry Point to the Distribution System (EPDTS) level, therefore to assist in monitoring strategies a susceptibility score and rating was developed for each EPTDS. Most public water systems have multiple wells and/or intakes. Some blend groundwater (wells) and surface water (intakes). In cases of groundwater or surface water only systems, the well(s) or intake(s) scores were grouped together to calculate the EPTDS rating. The EPTDS rating was determined by the following method. The source contribution resulted from multiplying each source's susceptibility score by the source's pumping rate. Next, all source contributions were summed and divided by the total capacity (sum of all the pumping rates and/or capacities) for the EPTDS. The EPTDS score was classified as low, medium or high susceptibility according to the same scales developed in the source susceptibility models.

For ground water sources, only permanent, seasonal, and interim wells were used in the EPTDS rating calculation. Other wells such as emergency, reserve, and not-in-use wells were not included in the source to EPTDS "roll-up," but these wells were rated on a source basis.

If a facility has only one well or intake, the EPTDS received the same rating as the well or intake.

This attachment illustrates how DEP calculated the EPTDS ratings for the water system. The following tables, beginning on page 3 of the attachment, identify the EPTDS in the upper left-hand corner using the EPTDS identification number. Under the EPTDS heading, the table contains several columns illustrating the steps DEP followed to calculate the susceptibility rating for each contaminant category.

The first column identifies the contributing sources to the EPTDS using the source identification number. The second column, labeled "Capacity", contains the pumping rate or capacity for each source. This value is the pumping rate used to determine the source's source water assessment area and susceptibility rating.

The remaining columns are specific for each contaminant category identified. The "SS" represents the Source Susceptibility Score, which is the numerical susceptibility rating the source received for each contaminant category. Depending on the contaminant category, the numerical score represents a high, medium, or low susceptibility rating.

The "SC" in these columns represents the Source Contribution, which is the source's susceptibility score multiplied by the source's capacity. The Source Contributions are then summed to calculate the Total Contribution for each contaminant category.

Next, the Total Contribution for a contaminant category was divided by the Total Capacity for the EPTDS to calculate the numerical susceptibility score for each contaminant category for the EPTDS. The numerical score was then converted into a high, medium, or low susceptibility rating for the EPTDS, using the susceptibility rating scale for each contaminant category. The scales, shown on page 2, are the same scales developed by USGS for source susceptibility ratings. The numerical score and susceptibility rating are both found in this attachment.

Capacity

For unconfined wells, the pumping rate, or capacity, was determined as per the “Guidelines for Delineation of Well Head Protection Areas in New Jersey” (NJ Geological Survey, Open File Report OFR 03-1). This value was generated for the flow-model to determine the Source Water Assessment delineation areas.

Confined wells were deemed to be not susceptible to contaminants originating at the land surface, and instead a 50 foot radius was drawn around the each confined well. Since an individual delineation was not done for confined wells, a value for pumping capacity was not necessary and not generated during the delineation phase. In order to generate a capacity value for confined wells, the following steps, adapted from the “Guidelines for Delineation of Well Head Protection Areas in New Jersey” (NJ Geological Survey, Open File Report OFR 03-1), were taken:

1. The first step in electing the capacity values was to determine if the well had been in operation for a least two years, and if the withdrawal data for the well was available in the Site Specific Water Use Data System maintained by the NJ Geological Survey. If the data were available, the pumping rate was based on the preferred selection method which required an evaluation of the existing data for the well’s period of operation, up to and including the previous 12 years. The 12-year time frame was selected based on the 12-year Time of Travel for Tier 3 and the availability of accurate historical pumping data. The following steps were taken:

- a. For each year of data, the total withdrawal was determined.
- b. An average annual pumping rate was determined for each year’s data.
- c. The average annual pumping rate from the year with the highest average annual pumping rate was selected as the maximum average annual pumping rate.
- d. The maximum average annual pumping rate was increased by a safety factor equal to 25% of the maximum average annual pumping rate.
- e. If the maximum average annual pumping rate plus the safety factor resulted in a value that was greater than the well’s pump capacity, then the well’s pump capacity was used.

2. If data on annual pumping rate was not available in the Site Specific Water Use Data System maintained by the NJ Geological Survey, the value of installed pump capacity for the well was used. This value is maintained by the NJ Geological Survey in their NJGSwells and Outpath databases.

3. If data on installed pump capacity was not available in the Outpath database maintained by the NJ Geological Survey, the value of pump rate for the well was used. This value is also maintained by the NJ Geological Survey in their NJGSwells and Outpath databases.

Susceptibility Model Rating Scales

Groundwater										Surface Water			
Metals Highest rating of:	Arsenic	Low		Medium		High		Metals Highest rating of:	Arsenic	Low	Medium	High	
	Barium	0-5		6-8		9-11			Fluoride	0-4	5-11	12-14	
	Beryllium	0-6		7-9		None			Lead	0-6	7-13	14-17	
	Fluoride	0-7		8-10		11-17							
	Lead	0-16		17-19		None							
	Mercury	0-5.5		6-9.5		10-14							
Nutrients		Low		Medium		High		Nutrients		Low	Medium	High	
	Confined	0 (All wells)								0-2	3-6	7-12	
	Unconfined	5-12		13-15		16-25							
Pesticides		Low		Medium		High		Pesticides		Low	Medium	High	
	Confined	0 (All wells)								0-6.5	7-9.5	10-12	
	Unconfined	5-19		20-35		None							
VOCs		Low		Medium		High		VOCs		Low	Medium	High	
		0-17		None		18-25				0-4	5-6	7-8	
DBPs	Note: For a EPTDS rating for Groundwater DBPs the confined and unconfined scales were merged to create one scale as follows below												
		Low	Medium				High		DBPs		Low	Medium	High
	Confined Source Scale	0-3	4	5	6	7	8	9,10			0	None	1-4
	Confined EPTDS Scale	0	2	4	6	8	9	10					
		Low	Medium				High						
	Unconfined Source Scale	None	0,1	2,3	4,5	6,7	8,9	10, 11, 12, 13		14	15,16		
Unconfined EPTDS Scale	None	1	2	3	4	6	7	8		9	10		
Pathogens		Low		Medium		High		Pathogens		Low	Medium	High	
		0-6.5		7-8.5		9-14							
Radionuclides Highest rating of:		Low		Medium		High		Radionuclides Highest rating of:		Low	Medium	High	
	Alpha	0-3.5		4-7.5		8-17.5							
	Radium	1-2		3-6		7-14							
	Uranium	0-6		7-8		9							
Radon		Low		Medium		High		Radon		Low	Medium	High	
		1-2.5		3-6.5		7-11							

EPTDS ID: 01

EPTDS Name: TREATMENT PLANT WELL 1

SFID Capacity	Pathogens		Nutrients		Pesticides		VOCs		Arsenic		Barium		Beryllium		Flouride		Lead		Mercury		Alpha		Radium		Uranium		Radon		DBPs	
	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC
002 1.05696	2	2.1139	17	17.968	18	19.025	23	24.310	7	7.3987	6	6.3418	5	5.2848	10	10.57	5.5	5.8133			8	8.4557	6	6.3418	5	5.2848	7	7.3987	7	8.4557

Totals (Sum of above columns)

Capacity	Pathogens	Nutrients	Pesticides	VOCs	Arsenic	Barium	Beryllium	Flouride	Lead	Mercury	Alpha	Radium	Uranium	Radon	DBPs
1.0569614	2.1139228	17.968344	19.025305	24.310112	7.3987298	6.3417684	5.284807	10.569614	5.8132877		8.4556912	6.3417684	5.284807	7.3987298	8.4556912

EPTDS Susceptibility Score _Susceptibility Rating (Total Contribution/Total Capacity)

Pathogens		Nutrients		Pesticides		VOCs		Arsenic		Barium		Beryllium		Flouride		Lead		Mercury		Alpha		Radium		Uranium		Radon		DBPs	
Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating
2	L	17	H	18	L	23	H	7	M	6	L	5	L	10	L	6	M			8	H	6	M	5	L	7	H	8	M
Inorganics										Radionuclides																			
Rating										Rating																			
M										H																			

Notes:

1. Inorganics - (Groundwater highest rating of Arsenic, Barium, Beryllium, Flouride, and Lead)
(Surface Water-highest rating of Arsenic, Flouride, and Lead)
2. Radionuclides - (Groundwater-highest rating of Alpha, Radium, and Uranium)
(Surface Water-all sources and EPTDS are rated Low)
3. Pathogens - (Surface Water all sources and EPTDS are rated High)

EPTDS ID: 02

EPTDS Name: TREATMENT PLANT WELL 2

SFID Capacity	Pathogens		Nutrients		Pesticides		VOCs		Arsenic		Barium		Beryllium		Flouride		Lead		Mercury		Alpha		Radium		Uranium		Radon		DBPs	
	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC
004 0.89424	2	1.7885	17	15.202	19	16.991	20	17.885	7	6.2597	7	6.2597	4	3.577	7	6.2597	3.5	3.1298			11	9.3895	5	4.4712	5	4.4712	6	5.3654	6	6.2597

Totals (Sum of above columns)

Capacity	Pathogens		Nutrients		Pesticides		VOCs		Arsenic		Barium		Beryllium		Flouride		Lead		Mercury		Alpha		Radium		Uranium		Radon		DBPs	
0.8942415	1.788483		15.202105		16.990588		17.88483		6.2596904		6.2596904		3.5769659		6.2596904		3.1298452				9.3895355		4.4712074		4.4712074		5.3654489		6.2596904	

EPTDS Susceptibility Score _Susceptibility Rating (Total Contribution/Total Capacity)

Pathogens		Nutrients		Pesticides		VOCs		Arsenic		Barium		Beryllium		Flouride		Lead		Mercury		Alpha		Radium		Uranium		Radon		DBPs	
Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating
2	L	17	H	19	L	20	H	7	M	7	M	4	L	7	L	4	L			10	H	5	M	5	L	6	M	7	M

Inorganics																Radionuclides							
Rating																Rating							
M																H							

Notes:

- Inorganics - (Groundwater highest rating of Arsenic, Barium, Beryllium, Flouride, and Lead)
(Surface Water-highest rating of Arsenic, Flouride, and Lead)
- Radionuclides - (Groundwater-highest rating of Alpha, Radium, and Uranium)
(Surface Water-all sources and EPTDS are rated Low)
- Pathogens - (Surface Water all sources and EPTDS are rated High)

EPTDS ID: 07

EPTDS Name: WELL NO. 3 TREATMENT FACILITY/

SFID Capacity	Pathogens		Nutrients		Pesticides		VOCs		Arsenic		Barium		Beryllium		Flouride		Lead		Mercury		Alpha		Radium		Uranium		Radon		DBPs	
	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC	SS	SC
015 0.3571	6	2.1426	21	7.499	23	8.2132	15	5.3564	7	2.4997	7	2.4997	6	2.1426	12	4.2851	5.5	1.9640			9	3.2139	4	1.4284	5	1.7855	9	3.2139	6	2.4997

Totals (Sum of above columns)

Capacity	Pathogens	Nutrients	Pesticides	VOCs	Arsenic	Barium	Beryllium	Flouride	Lead	Mercury	Alpha	Radium	Uranium	Radon	DBPs
0.3570952	2.1425712	7.4989992	8.2131896	5.356428	2.4996664	2.4996664	2.1425712	4.2851424	1.9640236		3.2138568	1.4283808	1.785476	3.2138568	2.4996664

EPTDS Susceptibility Score _Susceptibility Rating (Total Contribution/Total Capacity)

Pathogens		Nutrients		Pesticides		VOCs		Arsenic		Barium		Beryllium		Flouride		Lead		Mercury		Alpha		Radium		Uranium		Radon		DBPs	
Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating
6	L	21	H	23	M	15	L	7	M	7	M	6	L	12	L	6	M			9	H	4	M	5	L	9	H	7	M

Inorganics										Radionuclides					
Rating										Rating					
M										H					

Notes:

- Inorganics - (Groundwater highest rating of Arsenic, Barium, Beryllium, Flouride, and Lead)
(Surface Water-highest rating of Arsenic, Flouride, and Lead)
- Radionuclides - (Groundwater-highest rating of Alpha, Radium, and Uranium)
(Surface Water-all sources and EPTDS are rated Low)
- Pathogens - (Surface Water all sources and EPTDS are rated High)