EPA underground injection control

Inventory Information Request for Owners and Operators

Aquifer Recharge and/or Aquifer Storage and Recovery Systems

The Underground Injection Control (UIC) Program, created under the authority of the Safe Drinking Water Act (SDWA), is a preventative program aimed at protecting existing and future underground sources of drinking water (USDWs). Class V wells, which are typically shallow wells or disposal systems that discharge fluids into the subsurface, can be authorized to inject by rule or permit. Aquifer Recharge and Aquifer Storage and Recovery are two types of Class V wells which may be used to store drinking water sources.

Artificial aquifer recharge (AR) is the enhancement of natural ground water supplies using man-made conveyances such as infiltration basins or injection wells and is subject to Class V regulation.

Aquifer storage and recovery (ASR) is a specific type of AR for augmenting ground water resources and recovering the water in the future for various uses. While an AR well is used only to replenish the water in an aquifer, ASR wells are used to achieve two objectives: (1) storing water in the ground; and (2) recovering the stored water either using the same well or by pairing injection wells with recovery wells located in the same wellfield.

Class V wells that have the potential for ground water contamination or degradation are usually permitted. Those that do not have a potential to contribute to contamination or degradation of ground water are usually rule authorized, once the following inventory information has been submitted according to the requirements of 40 CFR 144.26. Rule Authorized wells do not require public notice or ongoing monitoring of injection activities.

REQUIRED INJECTION WELL INVENTORY INFORMATION

Please provide the following project information:

- Facility name and location;
- Name and address of legal contact;
- Ownership of facility;
- Nature and type of injection wells;

- Location of each well or project given by Township, Range, Section and Quarter-Section, or by latitude and longitude to the nearest second, according to the conventional practice in the State:
- Date of completion of each well;
- Identification and depth of the formation(s) into which each well is injecting;
- Total depth of each well;
- Casing and cementing record tubing size, and depth of packer;
- Nature of the injected fluids;
- Average and maximum injection pressure at the wellhead;
- Average and maximum injection rate; and
- Date of the last mechanical integrity test, if any.

In addition to the inventory requirements, EPA may, under the authority of 40 CFR 144.27, require the owner or operator of any well authorized by rule to submit additional information to determine if injection activity could endanger a USDW.

Applicants are asked to provide the additional information included in the attached document, ATTACHMENT A, to help expedite EPA's determination as to whether a particular project should be authorized by rule or permit. Specifically, EPA will use all information provided by an applicant to evaluate: 1) the impact a Class V injection well used for AR or ASR would have on the local hydrogeologic system; and 2) potential for USDW contamination.

ATTACHMENT A

ADDITIONAL INFORMATION REQUESTED (40 CFR 144.27)

Note: You may skip those items below that have already provided to meet the injection well inventory information requirements noted above.

Contact Information

Identify the following:

- Property owner of the facility. Include an email, physical and mailing address, phone, and fax numbers.
- Operator of facility including an email, physical and mailing address, phone, and fax numbers.
- Responsible party(s) for the operation, maintenance, and closure of the injection system including an email, physical and mailing address, phone and fax numbers.
- The name of the operator of the recovering facility including Public Water System (PWS) Identification number, an email, physical and mailing address, and phone numbers.
- Contact persons representing any other state or local agencies that have an interest in the site; include an email, physical and mailing address and phone number.

Project Description

- Describe the well(s) and/or project area location.
- Discuss the project plan. Identify the source of injectate, describe the injection procedures, volume, and other operating conditions.
- Include a completion diagram showing the construction plans for the proposed injection well(s) and other well(s) located within the Area of Review.
- Provide a brief description of contingency plans for treating the well(s) to prevent or remediate bacteriological or mineral buildup in the well, which could affect the injection operation.
- Describe the proposed ongoing monitoring program, including tracking of injectate volume, proposed for the operation.
- Any planned workover activities (acidization, fracturing, etc.) to be done on the well prior to injection should a final permit be issued.

Injectate Specific Data

- Identify the injection source (raw water) prior to treatment. For example, sources collected downstream of wastewater and/or reclaimed water discharged to surface water.
- Describe the beneficial use(s) of the water and who/what are the intended recipients of the water.
- Provide laboratory data results for the treated injectate water source analyzed using ATTACHMENT B – Aquifer Recharge and Aquifer Storage and Recovery Baseline Parameter List, presented as tabular data (also submit an electronic copy in a useable electronic format such as an Excel spreadsheet or CSV). Specify the sampling location.
- Provide a detailed description of the planned treatment train (identify each step) <u>prior to injection</u> for the injectate proposed, such as filtering to remove particulates which might

plug the receiving formation. Disclose the chemicals that may be used in each stage of the treatment process.

Receiving Formation & Recovered Water Specific Data

- Provide laboratory data results for the receiving aquifer water sample(s) analyzed using ATTACHMENT B – Aquifer Recharge and Aquifer Storage and Recovery Baseline Parameter List, presented as tabular data (also submit an electronic copy in a useable electronic format such as an Excel spreadsheet or CSV). Specify the sampling location.
- Provide the receiving aquifer characteristics including groundwater flow rates and gradient, if available.
- Describe the proposed treatment to be used by any PWS recovering water from this aquifer to meet the National Primary Drinking Water Regulations.
- Provide the location and a description of any PWS drinking water wells or springs which will be recovering water from this aquifer (may be marked on a topographic map indicating proposed injection wells, nearby surface water bodies, and locations of recovery wells at the recovering PWS, as well as identify PWS identification number and name of the next two closest PWSs).
- Identify whether the recovered water will be regulated and treated as groundwater under the direct influence of surface water.
- Confirm that recovered water is expected to meet current drinking water standards. Otherwise, identify expected exceedances.

NDMA Data Request

- If available, provide any UCMR data or other N-Nitrosodimethylamine (NDMA) testing data collected during treatment or at the completion of treatment. Include data from finished water for NDMA precursors/indicators: ammonia; total nitrogen; natural organic matter, purgeable Total Organic Carbon (TOC) analyzable by Ion Chromatography; ranitidine (RNTD); Trimethylamine; Minocycline (MNCL); and SMTR (Sumatription); nitrate and nitrite.
- If injectate is treated water, confirm if it contains chlorinated compounds and if chloramines are used in the treatment process.

Hydrogeology & Area of Review

- Provide a description of the intended receiving formation(s).
- Describe the hydrogeology of the area. Discuss the hydrogeology, location, depth, and current use (if any) of the receiving formation(s).
- Describe the overlying and underlying aquifers that could be impacted.
- Discuss transmissivity, storage coefficient, hydraulic conductivity, saturated thickness.
- Provide information from drawdown tests and specific capacity information.
- Describe any known surface water-subsurface water interactions, which may be affected by injection activities.

- Identify confinement zones above and below the proposed injection zone(s). Provide depths and thickness.
- Identify the public and private wells within a one quarter and one mile radius of the project area.
- Identify which formation(s) all wells in the area are completed into. Only provide this information for all wells completed into the receiving formation and for all wells which may be impacted by injection activities (i.e., wells completed into any overlying or underlying formation which is hydraulically connected to the proposed injection zone).
- Determine the aerial extent of the aquifer(s) (i.e. fill-up volume) that would be impacted by the proposed injection based on the proposed injection volumes and rates.
- Identify all outcrops of the formation to receive injectate and any potential to create artificial springs.
- Identify mechanisms which will increase the volume of ground water infiltration into nearby surface water bodies, in relations to the proposed AR/ASR activities.
- Identify all erosional intersections between the proposed injection formation and potentially affected surface water drainage systems.
- Provide map of the site location (1:24,000 topographic map or similar).
- If injection is into an alluvial aquifer, provide locations of surface water bodies, such as rivers, streams, and lakes, within one mile of the injection site (may substitute topographic map).
- Identify the presence of any ground water contamination plumes near the project area that could affect or be affected by injection activity.
- Describe how the injection rate was determined and provide data results, if available.

Impacts Analysis

- Describe the impacts of injection activities on the aquifers (both injection zone and surrounding aquifers).
- Discuss the effect of injection activities on surrounding wells.
- Demonstrate the compatibility of injected water on the receiving formation(s), plot the major anions and cations from the above analyses of the injectate, the receiving formation fluids, and mixed fluids on a trilinear diagram or Piper diagram. Provide a brief assessment of the results.
- Identify any potential mineralogical constituents in the receiving formation that might be mobilized as a result of injection activities. Provide chemical analysis of core, sampling, if available.
- Describe the effect of injectate on the water-bearing formation and the groundwater: reaction products or by-products that are anticipated.
- Provide any previous bench scale testing results performed to evaluate potential impacts from injection activities, if available.
- Evaluate the results of samples from the receiving formation and results from column leachate tests simulating the chemical conditions of injection activities, if available.

Send information to:

Linda Bowling (303) 312-6254 work (303) 312-7517 fax **bowling.linda@epa.gov** *Mailing Address* U.S. Environmental Protection Agency, Region 8 1595 Wynkoop Street Mailcode: 8WD-SDU Denver, Colorado 80202-1129	Craig Boomgaard (303) 312-6794 work (303) 312-7517 fax **boomgaard.craig@epa.gov** *Mailing Address* U.S. Environmental Protection Agency, Region 8 1595 Wynkoop Street Mailcode: 8WD-SDU Denver, Colorado 80202-1129

ATTACHMENT B
AQUIFER RECHARGE AND AQUIFER STORAGE AND RECOVERY
BASELINE PARAMETER LIST

General

PARAMETER NAME	REGULATORY LIMIT (MG/L) OR SPECIFIED UNIT	STANDARD TYPE	ANALYTICAL METHODS
pH	6.5 – 8.5	secondary	150.1
Electricity Conductivity			SM 2510B, 120.1
Total Dissolved Solids	500	secondary	
Total Organic Carbon			
Alkalinity, Total	mg/L as $CaCO_3$	0.006	

Metals

Parameter Name	Regulatory Limit (mg/L) or Specified Unit	Standard Type	Analytical Methods
Aluminum	200 ug/l		
Antimony	0.006	MCL	EPA 200.8, 200.9
Arsenic	0.01	MCL	EPA 200.7, 200.8, 200.9
Barium	2	MCL	EPA 200.7, 200.8
Beryllium	0.004	MCL	EPA 200.7, 200.8, 200.9
Boron	6	HA-Lifetime	EPA 200.7, 212.3
Cadmium	0.005	MCL	EPA 200.7, 200.8, 200.9
Calcium			
Chromium (total)	0.1	MCL	EPA 200.7, 200.8, 200.9
Copper	1.3	MCL-TT	EPA 200.7, 200.8, 200.9
Iron	5	Region 8 Permit Limit	EPA 200.7, 200.9
Lead	0.015	MCL-TT	EPA 200.8, 200.9
Manganese	0.3	HA-Lifetime	EPA 200.7, 200.8, 200.9
Magnesium			
Mercury (inorganic)	0.002	MCL	EPA 245.1, 245.2, 200.8
Molybdenum	0.04	HA-Lifetime	EPA 200.7, 246.1, 246.2
Nickel	0.1	HA-Lifetime	EPA 200.7, 200.8, 200.9
Potassium			

Parameter Name	Regulatory Limit (mg/L) or Specified Unit	Standard Type	Analytical Methods
Selenium	0.05	MCL	EPA 200.8, 200.9
Silver	0.1	HA-Lifetime	EPA 200.7, 200.8, 200.9
Sodium			
Strontium	4	HA-Lifetime	EPA 272.1, 272.2, 200.7
Thallium	0.002	MCL	EPA 200.8, 200.9
Zinc	2	HA-Lifetime	EPA 200.7, 200.8

Inorganics

Parameter Name	Regulatory Limit (mg/L) or specified unit	Standard Type	Analytical Methods
Ammonia	30 mg/L	HA-Lifetime	EPA 350.1, 350.2, 350.3
Asbestos (fibers/l>10µm in length)	7 million fibers/L	MCL	EPA 100.1,100.2
Bicarbonate			SM 2330B
Carbonate			SM 2330B
Chloride	250	secondary	
*Cyanide	0. 2 mg/L	MCL	EPA 335.4
Fluoride	4 mg/L	MCL	EPA 300.0
Nitrate (as N)	10 mg/L	MCL	EPA 300.0
Nitrate-Nitrite (both as N)	10 mg/L	MCL	EPA 300.0
Nitrite (as N)	1 mg/L	MCL	EPA 300.0
Sulfate	250	secondary	

Radionuclides

Parameter Name	Regulatory Limit (mg/L) or specified unit	Standard Type	Analytical Methods
Radium 226 & 228 combined	5 pCi/L	MCL	Standard Method 304
Gross alpha particle activity (excluding Ra-226, radon, and uranium)	15 pCi/L	MCL	EPA 900.0
Uranium	0.03	MCL	EPA 908.0, 908.1

Volatile Organics using EPA Method 524.2 or 8260

Parameter Name	CAS No	Regulatory Limit (mg/L)	Standard Type
1,1,1,2-Tetrachloroethane	630-20-6	0.07	HA-Lifetime
1,1,1-Trichloroethane	71-55-6	0.2	MCL
1,1,2,2-Tetrachloroethane	79-34-5	0.04	Region 8 Permit Limit 10^{-4} Cancer Risk
1,1,2-Trichloroethane	79-00-5	0.005	MCL
1,1-Dichloroethylene	75-35-4	0.007	MCL
1,2-(cis)Dichloroethylene	156-59-2	0.07	MCL
1,2-(trans)Dichloroethylene	156-60-5	0.1	MCL
1,2,3-Trichloropropane	96-18-4	0.02	Region 8 Permit Limit
1,2,4-Trichlorobenzene	120-82-1	0.07	MCL
1,2-Dibromomethane (Ethylene Dibromide EDB)	106-93-4	0.00005	MCL
1,2-Dichlorobenzene o-	95-50-1	0.6	MCL
1,2-Dichloroethane	107-06-2	0.005	MCL
1,2-Dichloropropane	78-87-5	0.005	MCL
1,3-Dichlorobenzene m-	541-73-1	0.6	HA-Lifetime
1,4-Dichlorobenzene p-	106-46-7	0.075	MCL
2-Chlorotoluene (o-)	95-49-8	0.1	HA-Lifetime
4-Chlorotoluene (p-)	106-43-4	0.1	HA-Lifetime
Acetone	67-64-1	6	Region 8 Permit Limit
Acrylonitrile	107-13-1	0.006	Region 8 Permit Limit 10^{-4} Cancer Risk
Benzene	71-43-2	0.005	MCL
Bromobenzene	108-86-1	0.06	HA-Lifetime
Bromochloromethane	74-97-5	0.09	HA-Lifetime
Bromodichloromethane (THM)	75-27-4	0.02	Region 8 Permit Limit
Bromoform (THM)	75-25-2	0.2	Region 8 Permit Limit
Bromomethane	74-83-9	0.01	HA-Lifetime
Carbon tetrachloride	56-23-5	0.005	MCL
Chlorobenzene (Monochlorobenzene)	108-90-7	0.1	MCL

Parameter Name	CAS No	Regulatory Limit (mg/L)	Standard Type
Chlorodibromomethane (Dibromochloromethane) (THM)	124-48-1	0.06	HA-Lifetime
Chloroform (THM)	67-66-3	0.07	HA-Lifetime
Chloromethane	74-87-3	0.4	10-day HA for a 10 kg child
*Cyanogen Chloride (testing not needed if cyanide is present in source water and alkaline chlorination is used, pH 8.5)	506-77-4	0.4	Region 8 Permit Limit
Dichlorodifluoromethane	75-71-8	1	HA-Lifetime
Dichloromethane (Methylene chloride)	75-09-2	0.005	MCL
Ethylbenzene	100-41-4	0.7	MCL
Hexachlorobutadiene	87-68-3	0.002	Region 8 Permit Limit
Hexachloroethane	67-72-1	0.001	HA-Lifetime
Isopropylbenzene (cumene)	98-82-8	0.8	Region 8 Permit Limit
Methyl Ethyl Ketone	78-93-3	4	HA-Lifetime
Naphthalene	91-20-3	0.1	HA-Lifetime
Perchloroethylene (PCE) (Tetrachloroethylene)	127-18-4	0.005	MCL
Styrene	100-42-5	0.1	MCL
Toluene	108-88-3	1	MCL
Total Trihalomethanes		0.08	MCL
Trichloroethylene (TCE)	79-01-6	0.005	MCL
Trichlorofluoromethane	75-69-4	2	HA-Lifetime
Vinyl chloride	75-01-4	0.002	MCL
Total Xylenes	1330-20-7	10	MCL

Semi-volatile Organics using EPA Method 525.2 or 8270

Parameter Name	CAS No	Regulatory Limit (mg/l) or specified unit	Standard Type
1,2,4-Trichlorobenzene	120-82-1	0.07	MCL
1,2-Dichlorobenzene	95-50-1	0.6	MCL
1,3-Dichlorobenzene	541-73-1	0.6	HAL

Parameter Name	CAS No	Regulatory Limit (mg/l) or specified unit	Standard Type
1,4-Dichlorobenzene	106-46-7	0.075	MCL
2,4,6-Trichlorophenol	88-06-2	0.002	Region 8 Permit Limit
2,4-Dichlorophenol	120-83-2	0.02	HA-Lifetime
2,4-Dinitrotoluene	121-14-2	0.005	Region 8 Permit Limit 10^{-4} Cancer Risk
2,6-Dinitrotoluene	606-20-2	0.005	Region 8 Permit Limit 10^{-4} Cancer Risk
2-Chlorophenol	95-57-8	0.04	HA-Lifetime
4-Nitrophenol	100-02-7	0.06	HA-Lifetime
Acenaphthene	83-32-9	0.4	Region 8 Permit Limit
Aldrin	309-00-2	0.0002	Region 8 Permit Limit 10^{-4} Cancer Risk
Anthracene	120-12-7	2	Region 8 Permit Limit
Benzo(a)pyrene	50-32-8	0.0002	MCL
bis(2-Ethylhexyl) phthalate	117-81-7	0.006	MCL
Butyl benzyl phthalate	85-68-7	1	Region 8 Permit Limit
Chlordane	57-74-9	0.002	MCL
Dieldrin	60-57-1	0.0002	Region 8 Permit Limit 10^{-4} Cancer Risk
Diethyl phthalate	84-66-2	6	Region 8 Permit Limit
Di-n-butyl phthalate	84-74-2	0.8	Region 8 Permit Limit
Endrin	72-20-8	0.002	MCL
Fluorene	86-73-7	0.2	Region 8 Permit Limit
Heptachlor	76-44-8	0.0004	MCL
Heptachlor epoxide	1024-57-3	0.0002	MCL
Hexachlorobenzene	118-74-1	0.001	MCL
Hexachlorobutadiene	87-68-3	0.002	Region 8 Permit Limit
Hexachlorocyclopentadiene	77-47-4	0.05	MCL
Hexachloroethane	67-72-1	0.001	HA-Lifetime
Isophorone	78-59-1	0.1	HA-Lifetime
Lindane	58-89-9	0.0002	MCL
Naphthalene	91-20-3	0.1	HA-Lifetime
Pentachlorophenol	87-86-5	0.001	MCL
Phenol	108-95-2	2	HA-Lifetime
Pyrene	129-00-0	0.2	Region 8 Permit Limit
Toxaphene	8001-35-2	0.003	MCL

Pesticides and Herbicides

Parameter Name	CAS No	Regulatory Limit (mg/L) or specified unit	Standard Type	Analytical Methods
Alachlor	15972-60-8	0.002	MCL	EPA 505, 507, 525
Aldicarb	116-06-03	0.003	MCL	EPA 531.1
Aldicarb sulfone	1646-87-4	0.002	MCL	EPA 531.1
Aldicarb sulfoxide	1646-87-3	0.004	MCL	EPA 531.1
Aldrin	309-00-2	0.0002	Region 8 Permit Limit 10^{-4} Cancer Risk	EPA 505, 508
Ametryn	834-12-8	0.06	HA-Lifetime	EPA 507
Atrazine	1912-24-9	0.003	MCL	EPA 505, 507
Bromacil	314-40-9	0.07	HA-Lifetime	EPA 507
Butylate	2008-41-5	0.4	HA-Lifetime	EPA 507
Carbaryl	63-25-2	0.08	Region 8 Permit Limit	EPA 531.1
Carbofuran	1563-66-2	0.04	MCL	EPA 531.1
Carboxin	5234-68-4	0.7	HA-Lifetime	EPA 507
Chlordane	57-74-9	0.002	MCL	EPA 505, 508, 525
Chlorothalonil	1897-45-6	0.1	Region 8 Permit Limit	EPA 508
DCPA (Dactyl)	1861-32-1	0.07	HA-Lifetime	EPA 508
Diazinon	333-41-5	0.001	HA-Lifetime	EPA 507
Dieldrin	60-57-1	0.0002	Region 8 Permit Limit 10^{-4} Cancer Risk	EPA 505, 508
Diphenamid	957-51-7	0.2	HA-Lifetime	EPA 507
Disulfoton	298-04-4	0.0007	HA-Lifetime	EPA 507
Endrin	72-20-8	0.002	MCL	EPA 505, 508, 525.1
Fenamiphos	22224-92-6	0.0007	HA-Lifetime	EPA 507
Heptachlor	76-44-8	0.0004	MCL	EPA 505, 508
Heptachlor epoxide	1024-57-3	0.0002	MCL	EPA 505, 508

Parameter Name	CAS No	Regulatory Limit (mg/L) or specified unit	Standard Type	Analytical Methods
Hexachlorobenzene	118-74-1	0.001	MCL	EPA 505, 508, 525.1
Hexachlorocyclopentadiene	77-47-4	0.05	MCL	EPA 505, 525.1
Hexazinone	51235-04-2	0.4	HA-Lifetime	EPA 507
Lindane	58-89-9	0.0002	MCL	EPA 505, 508
Methomyl	16752-77-5	0.2	HA-Lifetime	EPA 531.1
Methoxychlor	72-43-5	0.04	MCL	EPA 505, 508, 525
Metolachlor	51218-45-2	0.7	HA-Lifetime	EPA 507
Metribuzin	21087-64-9	0.07	HA-Lifetime	EPA 507
Oxamyl (Vydate)	23135-22-0	0.007	MCL	EPA 531.1
Prometon	1610-18-0	0.4	HA-Lifetime	EPA 507
Pronamide	23950-58-5	0.1	Region 8 Permit Limit 10^{-4} Cancer Risk	EPA 507
Propachlor	1918-16-7	0.1	Region 8 Permit Limit 10^{-4} Cancer Risk	EPA 508
Propazine	139-40-2	0.01	HA-Lifetime	EPA 507
Simazine	122-34-9	0.004	MCL	EPA 505, 507, 525.1
Tebuthiuron	34014-18-1	0.5	HA-Lifetime	EPA 507
Terbacil	5902-51-2	0.09	HA-Lifetime	EPA 507
Terbufos	13071-79-9	0.0004	HA-Lifetime	EPA 507
Trifluralin	1582-09-8	0.01	HA-Lifetime	EPA 508

Disinfectants and Disinfection Byproducts

Parameter Name	Regulatory Limit (mg/L) or specified unit	Standard Type	Analytical Method
Bromate	0.01	MCL	EPA 317.0, Revision 2 321.8, 326.0
Chloramine (as free chlorine)	4	MCL	
Chlorine (free chlorine, combined)	4	MCL	Standard Methods 20th edition: 4500-Cl D 4500-Cl F 4500-Cl G

Parameter Name	Regulatory Limit (mg/L) or specified unit	Standard Type	Analytical Method
			4500-Cl H
Chlorine dioxide	0.8	MCL	EPA 327, Revision 1 Standard Method 20th edition: 4500-ClO_2 D 4500-CLO_2 E
Chlorite	1.0	MCL	EPA 300.0, 300.1
Total Haloacetic Acids (HAA5s) Bromoacetic acid Dibromoacetic acid Dichloroacetic acid Monochloroacetic acid Trichloroacetic acid	0.06	MCL	EPA 552.3
Total Trihalomethanes (TTHMs) Chloroform Bromodichloromethane Dibromoclormethane Bromoform	0.08	MCL	EPA 502.2, 524.2
N-nitroso-dimethylamine (NDMA)	NA		EPA 521
N-nitroso-diethylamine (NDEA)	NA		EPA 521
N-nitroso-di-n-butylamine (NDBA)	NA		EPA 521
N-nitroso-di-n-propylamine (NDPA)	NA		EPA 521
N-nitroso-methylethylamine (NMEA)	NA		EPA 521
N-nitroso-pyrrolidine (NPYR)	NA		EPA 521

*** Cyanide and Cyanogen Chloride Analysis:** Testing for cyanogen chloride is tiered/triggered in this permit. If cyanide is detected in the source water and is alkalized to a pH of 8.5 or greater, then there is no need to test for cyanogen chloride in the injectate following chloramination. If cyanide is detected in the source water and not alkalized, either find a laboratory that can test for cyanogen chloride or remove cyanide from the source water prior to chloramination.

MCL: Maximum Contaminant Level. The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLG as feasible using the best available analytical and treatment technologies and taking cost into consideration. MCLs are enforceable standards.

MCLG: Maximum Contaminant Level Goal. A non-enforceable health goal which is set at a level at which no known or anticipated adverse effect on the health of persons occurs and which allows an adequate margin of safety.

TT: Treatment Technique. A required process intended to reduce the level of a contaminant in drinking water.

HA: Health Advisory. An estimate of acceptable drinking water levels for a chemical substance based on health effects information; a Health Advisory is not a legally enforceable Federal standard, but serves as technical guidance to assist federal, state and local officials.

HA-Lifetime: The concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects for a lifetime of exposure. The Lifetime HA is based on exposure of a 70-kg adult consuming 2 liters of water per day. The Lifetime HA for Group C carcinogens includes an adjustment for possible carcinogenicity.

Region 8 Permit Limit: Permit limit calculated by Region 8 Drinking Water Toxicologist based on human health criteria.

10^{-4} Cancer Risk: The concentration of a chemical in drinking water corresponding to an excess estimated lifetime cancer risk of 1 in 10,000

HA-Ten Day: The concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects for up to ten days of exposure for a 10 kg child consuming 1 liter per day.