United States Environmental Protection Agency
Office of Water 4607
EPA 816-R-99-006
DRAFT- April 1999

A Review of Contaminant Occurrence in Public Water Systems Related to Class V Injection Wells

Table of Contents

List of Tables

Acknowledgements

The drinking-water contaminant occurrence data presented in this report were compiled and analyzed as part of EPA Office of Ground Water and Drinking Water's (OGWDW) ongoing review of chemical monitoring programs. This effort was directed by Mr. Edwin Thomas of OGWDW. The Cadmus Group, Inc. served as the prime contractor for this project, supporting the data collection and analysis.

Disclaimer

This is a draft for review purposes only and does not constitute U.S. Environmental Protection Agency Policy. Do not cite or quote. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

This document is designed to provide technical background information for revisions to the Class V Injection Well program. The document does not, however, substitute for the SDWA or EPA's regulations nor is this document a regulation itself. Thus, it cannot impose legally-binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based on the circumstances.

A Review of Contaminant Occurrence in Public Water Systems Related to Class V Injection Wells

I. Introduction

The purpose of this report is to provide an assessment of the occurrence of contaminants associated with Class V industrial and automotive waste disposal wells in public water systems. This evaluation is in support of on-going efforts to revise regulations on certain types of Class V wells (*Class V Injection Wells Underground Injection Control Regulations, Revisions; Proposed Rule*, 63 FR 40586-40614, July 29, 1998). The limited information available does not enable examination of local geographic or temporal patterns, nor can contaminant occurrence be linked directly to Class V Well locations or discharges. Site incidence reports provide the best source of this information. This overview of occurrence data demonstrates that contaminants known to be associated with Class V wells occur nationally in Public Water Systems (PWSs).

II. Methods and Data

The data used for this study were compiled as part of EPA's Office of Ground Water and Drinking Water's (OGWDW) Chemical Monitoring Reform (CMR) program's analysis of contaminant occurrence in PWSs. The data sets are composed of a collection of SDWA PhaseII/V contaminant monitoring results volunteered by several States for the CMR effort. Other data were included in most State data sets, allowing for analysis of various non-PhaseII/V compounds (e.g., lead, silver, and methyl ethyl ketone). The format of the SDWA occurrence data does not always lend itself readily to the current analysis.[1] Despite some limitations, the data are adequate for a general review of occurrence of most of the selected Class V contaminants. Particular data quality issues will be noted in the report as needed.

In total, 14 different databases were used for this analysis, including State databases with over 10 million analytical results from over 25,000 PWSs (see Appendix A). In particular, data from eight States were used to develop a national cross-section of contaminant occurrence. Table 1 lists and ranks the cross-section States and the pollution potential indicators used in this summary report. The eight States were selected to provide a balanced national cross-section, based on geographic coverage, relative rankings for pollution potential (the number of manufacturing facilities per

[1] For instance, the State data are for finished drinking water (post-treatment) rather than raw (untreated) water samples. Chloroform was originally considered for study in the analysis since it is a potential Class V contaminant. However, chloroform is also a by-product of chlorine-based water system disinfectants. Because all of the data analyzed are from finished water samples, it would not be possible to distinguish between detections of Class V chloroform and chloroform contamination as a disinfection by-product. Thus, chloroform does not appear in the current analysis.

square mile), and data quality and completeness.[2] These States provide geographic representation from across the U.S., and some representation from all quartiles of the two major pollution potential indicators. The data from these eight States were used to compute aggregate occurrence values (i.e., the percentage of water systems that had a detection of contaminant X) as an approximation of a national sample. While the data from these cross-section States cannot be stated to be "statistically representative" their distribution should provide an indication of central tendency. The national cross-section data have been compared with other large national or multi-State data sets. The comparisons show that the aggregated national cross-section provides a conservative, but reasonable, approximation of national occurrence values. The comparisons with other data suggest that the cross-section summary values are likely slightly high.

To ensure sufficient data for analysis, only contaminants which were tested in a significant number of systems (e.g., several hundred or more) by at least one State included in the CMR analysis, were selected for inclusion in this study. There may be other contaminants associated with Class V wells (such as methanol, 1,4-dichlorobenzene, and formaldehyde) which were excluded for lack of data. Exclusion from this study does not imply that a contaminant does not, in fact, occur in public water systems -- it merely reflects that systems are not testing for this compound, or that the results are not included in the State's general data set. The compounds selected for analysis do not include every compound which might conceivably be disposed of through a Class V well. They are considered to be among the more common Class V related contaminants from the prior work conducted to review Class V well issues.

[2]There is a close correlation between the number of manufacturing establishments per square mile and the population density in each State, as well as a clear association with the total TRI pounds released/square mile, number of manufacturing employees, and total value added. Hence, the number of manufacturing establishments per square mile was used as the best indicator of representativeness. The other key reason for choosing this factor was that it is a simple measure of how many establishments are actually engaged in manufacturing and thus are potentially polluting sources of drinking water.

Table 1. States with water quality data included in the national cross-section of drinking water occurrence. States are listed by their national rank order (1=highest, 50=lowest) for the number of manufacturing establishments per square mile.

Quartiles for rank-order of all States	National Cross-Section States	National Rank: Number of Manufacturing Facilities per square mile
1	New Jersey	2
	Illinois	10
	California	11
2	Michigan	13
	Alabama	25
3		
	Oregon	34
4	New Mexico	44
	Montana	48

Additional occurrence data (from Indiana, Iowa, Massachusetts, and the American Water Works Service Company (AWWSC)) were used to show the range of occurrence in the summaries of results to provide an estimate of the upper and lower bounds of contaminant occurrence nationally. However, the ranges for only a few of the contaminants were extended by the additional data.

Data from EPA's Unregulated Contaminant Monitoring Information System (URCIS) database were also used as an independent source of data and for a cross-comparison with the State cross-section analysis. URCIS contains about 3.5 million analytical records from about 40 States and Territories from the first round of unregulated contaminant monitoring (1989-1993); the database also includes samples taken prior to 1989 which were grandfathered into the database. (The URCIS values shown in this report may be different than URCIS values cited in other EPA reviews because of the screening conducted for this study to ensure consistency in analysis.) The contaminants in common include all of the volatile organic compounds (VOCs) considered except for methyl ethyl ketone. URCIS contains no data on inorganic compounds (IOCs).

III. Industries and Contaminants Associated with Class V Wells

This analysis considers contaminants known or suspected to be associated with effluent from Class V industrial and automotive waste disposal wells. Conceivably, any retail shop, small business, or industry which has a septic tank, a floor drain, or some kind of underground drainage system is a potential Class V well user. Given the variety of potential users, almost any type of contaminant might be disposed of in a Class V well. Although it is difficult to be certain of the full list of potential Class V well users and contaminants, studies of State inventories and other data provide a general overview of some typical Class V well users and the contaminants most likely to be disposed of through such wells.

Tables 2.a and 2.b present the contaminants known or suspected to be associated with Class V wells analyzed in this study, broken down into IOC and VOC categories. Also provided in the tables are the maximum concentration level (MCL) or health advisory level (HAL) of each contaminant, some common sources and uses for each compound, a general well-type classification associated with each contaminant, and the potential health effects of contaminant exposure. The general well-type classification is given as either “A” for automotive waste disposal users or “I” for industrial waste disposal users. These are meant as very general associations and it is likely that a contaminant listed only as industrial could on occasion appear in an automotive waste disposal well. In addition, not every industrial waste disposal well user would necessarily use all of the contaminants in the industrial category nor would every automotive waste disposal well user use all of the automotive related contaminants. For a list of industries which are considered potential Class V well users, see Appendix B or refer to EPA’s OGWDW’s *Economic Analysis for the Proposed Revisions to the Class V UIC Regulations,* 1998.

Twenty-three contaminants known or believed to be associated with Class V injection wells were selected for analysis: arsenic, barium, cadmium, chromium, cyanide, lead, mercury, selenium, silver, 1,1,1-trichloroethane, 1,1-dichloroethane, 1,2-dichloroethane, benzene, carbon tetrachloride, chlorobenzene, ethyl benzene, methyl ethyl ketone, methylene chloride, tetrachloroethylene (PCE), toluene, trichloroethylene (TCE), vinyl chloride, and xylenes (total). Many of these contaminants are cited in the 1987 *Report to Congress on Class V Injection Wells*, the Class V proposed rule (63 FR 40600, July 29, 1998), EPA’s Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database, or in EPA Records of Decision (RODs) reports on contamination sites.

Of these 23 contaminants, 1,2-dichloroethane, benzene, chlorobenzene, ethyl benzene, methylene chloride, PCE, TCE, toluene, xylenes, arsenic, barium, cadmium, chromium, and lead have been associated with Class V motor vehicle waste disposal wells by EPA in (63 FR 40600, July 29, 1998) or with the automobile service industry, in general. These establishments (and their corresponding Standard Industrial Classification Code) include general automotive repair shops (SIC 7538), gasoline service stations (SIC 5541), and motor vehicle dealers (SIC 5511 and 5521).

Methylene chloride and trichloroethylene may also be associated with carwashes which wash the undercarriage of vehicles (SIC 7542).

Many industrial waste disposal wells share the same effluent constituents of the automotive waste disposal wells. In addition to those VOC contaminants listed above, 1,1-dichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, methyl ethyl ketone, and vinyl chloride are also associated with industrial waste disposal wells. Such industries include plastics products (SIC 3089), commercial printing (SIC 2752 and 2759), petroleum and petroleum product wholesalers (SIC 5172), chemicals and allied products wholesalers (SIC 5169), dry cleaners (SIC 7216), and retail nursery and garden stores (SIC 5261), among others.

Arsenic, barium, cadmium, chromium, cyanide, lead, mercury, selenium, and silver are inorganic compounds associated with a variety of industrial processes which may involve discharges into an industrial waste disposal well. Electric services (SIC 4911), welding repair (SIC 7692), commercial lithographic printing (SIC 2752), and general contractors (SIC 1521) are some of the potential sources of one or more of these contaminants in Class V Wells.

Funeral homes (SIC 7261) are associated with formaldehyde, methanol, and phenol in the proposed regulation. However, there is insufficient data on these compounds to include them in this report.

Table 2.a. Contaminants known or suspected to be associated with Class V injection wells: inorganic compounds.

Contaminant	MCL/ *HAL** (mg/L)	Common Sources and Uses	Potential Industry (A = automotive, I = industrial)	Potential Health Effects
Inorganic Chemicals				
Arsenic	0.050	Natural deposits, smelters, glass, electronic wastes, old orchards	A, I	Skin, nervous system toxicity
Barium	2.0	Natural deposits, pigments, epoxy sealants, spent coal	A, I	Circulatory system effects
Cadmium	0.0050	Galvanized pipe corrosion, natural deposits, batteries, paints, electroplating	A, I	Kidney effects
Chromium	0.10	Natural deposits, mining, electroplating, pigments	A, I	Liver, kidney, circulatory disorders
Cyanide	0.20	Electroplating, steel, plastics, mining, fertilizer	I	Thyroid, nervous system damage
Lead	0.0150	Pipes, solder, paint, batteries	A, I	Brain damage, kidney damage, central nervous system effects
Mercury	0.0020	Natural deposits, batteries, electrical switches	I	Kidney, nervous system disorders
Selenium	0.050	Natural deposits, mining, smelting, coal/oil combustion, paint manufacture	I	Liver damage
Silver	*0.10*	Photographic procedures, jewelry making, solders, electroplating	I	Argyreia (permanent skin discoloration), kidney effects
* Health advisory level in italics.				

Table 2.b. Contaminants known or suspected to be associated with Class V injection wells: volatile organic compounds.

Contaminant	MCL/ *HAL** (mg/L)	Common Sources and Uses	Potential Industry (A = automotive, I = industrial)	Potential Health Effects
Volatile Organic Chemicals				
Benzene	0.0050	Gas, drugs, paint, plastics, solvent, printing and lithography	A, I	Cancer
Carbon tetrachloride	0.0050	Solvents and their degradation products	I	Cancer
Chlorobenzene	0.10	Waste solvent from metal degreasing processes	A, I	Nervous system and liver damage
1,2-Dichloroethane	0.0050	Leaded gas, fumigants, paints, solvent, gasoline additive	A, I	Cancer
1,1-Dichloroethene (1,1-Dichloroethylene)	0.0070	Plastics, dyes, perfumes, paints	I	Cancer, liver & kidney effects
Ethyl benzene	0.70	Gasoline, insecticides, chemical manufacturing wastes, solvent	A, I	Liver, kidney, nervous system effects
Methylene chloride (Dichloromethane)	0.0050	Paint stripper, metal degreaser, propellant	A, I	Cancer
Methyl ethyl ketone	---	solvent, manufacturing, cements & adhesives	I	Decreased fetal birth weight
Tetrachloroethylene (PCE)	0.0050	Dry cleaning, solvent	A, I	Cancer
Toluene	1.0	Gasoline additive, manufacturing operations, solvent	A, I	Liver, kidney, nervous, circulatory effects
1,1,1-Trichloroethane	0.20	Adhesives, aerosols, textiles, paints, inks, metal degreasers, drain cleaner, solvent	I	Liver, nervous system effects
Trichloroethene (TCE)	0.0050	Textiles, adhesives and metal degreasers	A, I	Cancer
Vinyl chloride	0.0020	Plastics industry, may leach from PVC pipe, solvent breakdown	I	Cancer
Xylenes (Total)	10.0	By-product of gasoline refining, paints, inks, detergents, solvent	A, I	Liver, kidney, nervous system effects
* Health advisory level in italics.				

The industries and compounds cited above are by no means an exhaustive list of potential Class V disposal well users or contaminants. Rather, the list is intended to illustrate the variety of potential sources and types of effluent associated with Class V wells.

IV. Contaminant Occurrence

The results of the occurrence analysis will be summarized by two major contaminant groups: IOCs (e.g., arsenic, cyanide, mercury); and VOCs (e.g., 1,1,1-trichloroethane, benzene, methylene chloride, vinyl chloride). Industrial waste disposal wells and automotive waste disposal wells share many of the same effluent constituents (for example, both types of well users often use degreasers or solvents). Therefore, no attempt will be made to differentiate contaminants by well-type in this analysis.

Tables 3.a and 3.b present summaries of contaminant analytical results for the national cross-section occurrence data for ground water and surface water systems, respectively. As noted, the cross-section cannot be stated to be a statistically representative sample, but it does provide an indication of central tendency and an approximation of a national sample. The values presented in the tables are the percentage of systems from the national cross-section with contaminant detections at concentrations greater than the MRL (minimum reporting level), the percentage of systems with detections greater than half the MCL or HAL, and the percentage of systems with detections greater than the MCL or HAL. (The MCL or HAL is shown for each contaminant in Tables 2.a and 2.b.) For perspective, the national cross-section IOC data is typically derived from 7,000 PWSs and 35,000 to 40,000 analyses; most VOC results include data from 12,000 to 13,000 PWSs and approximately 150,000 analyses.

Values for the range of percent detections include the supplementary data from all States. Contaminant occurrence varies from State to State. While the cross-section provides one national estimate the ranges provide perspective on the variation among States. For example, Table 3.a shows that, for TCE, 3.1% of ground water systems in the national cross-section have detections (>MRL). The range (from 0.6 to 12.8%) shows that one State had only 0.6% ground water systems with detections while the State with the greatest problems had 12.8% of systems with detections. The ranges provide other perspectives as well. The cross-section provides an estimate that 2% of ground water systems have detections of cyanide. Among the States, one State had 0.8% systems with detections exceeding the MCL (>MCL) while at least one other State had no systems with detections (0.0% >MRL). (The range for percentage systems with detections is much greater for IOCs than VOCs. This is because there is a wider range of methods and reporting limits that may be used for IOCs than VOCs.) Appendix C shows the number of systems and samples collected for each contaminant from both the national cross-section States and the combined data sets used to characterize the range of occurrence.

While ground water contamination is the primary concern for UIC Class V wells, data from PWSs using surface waters are also included. Many injection wells discharge into shallow ground water. Shallow ground water can recharge wells, but it may also move laterally to provide the baseflow for streams and lakes. Hence, contaminants originally discharged into ground water may also appear in surface waters. Also, the observations from the surface water PWSs include systems that may use both surface and ground water sources, as well as ground water under the direct influence of surface water. Hence, these data provide additional insight on the occurrence of the Class V contaminants in these most vulnerable settings.

Every contaminant selected for analysis with an MCL or an HAL has been detected in ground water and surface water systems at concentrations greater than the MRL. In ground water systems, every contaminant with an MCL was detected at concentrations greater than the MCL; in surface water systems every contaminant, except cyanide, selenium, total xylenes, and methyl ethyl ketone was detected at levels greater than the MCL. (Note: methyl ethyl ketone does not have an MCL or HAL.)

Data from testing for the contaminant methyl ethyl ketone was only included in two data sets. Thus, the values given for methyl ethyl ketone are supplementary and can not be taken as representative of the state of occurrence nation-wide. However, methyl ethyl ketone was detected in ground water supplied PWSs. Refer to Appendix C for information on methyl ethyl ketone occurrence.

Ground water systems

All nine of the IOCs were detected in ground water systems in the cross-section of States at concentrations greater than the MRL. Cyanide was detected in the lowest percentage of systems (2.0%) and barium was detected in the highest percentage of systems (47.3%). All of the IOCs were detected at concentrations greater than the MCL. Silver has the lowest percentage of systems with detections greater than the MCL (0.1%) and lead has the highest percentage of systems with detections greater than the MCL (3.1%). (Among the individual States, the range for the percentage of systems with detections greater than the MCL varied from 0.0% to 0.3% for silver and from 0.0% to 26.7% for lead.) These findings are not surprising. Barium typically occurs in greater concentrations naturally and lead is often associated with piping and solder in older water systems. (From these data the occurrence of lead related to sources within a water system cannot be separated from contamination that may be related to Class V wells, or other external sources.)

All of the VOCs were detected in ground water systems in the cross-section of States at concentrations greater than the MRL. Vinyl chloride was detected in the lowest percentage of systems (0.5%) and methylene chloride was detected in the highest percentage of systems (11.1%). All of the VOCs were detected in ground water systems in the cross-section of States at concentrations greater than their MCL (except for methyl ethyl ketone which has no MCL or HAL). Ethyl benzene and total xylenes were detected at concentrations greater than the MCL in the lowest percentage of systems (0.1%) and methylene chloride was detected greater than the MCL in the highest percent percentage of systems (2.3%). (Among the individual States, the range for the percentage of systems with detections greater than the MCL varied from 0.0% to 0.6% for vinyl chloride and from 0.0 to 11.9% for methylene chloride.) It should be noted however, that the detection of methylene chloride can be confounded with other organic compounds, and it is suspected that the occurrence values reported may be too great.

Surface water systems

All nine of the IOCs were detected in surface water systems in the cross-section of States at concentrations greater than the MRL. Cadmium, cyanide, and silver were detected in the lowest percentage of systems (5.1%) and barium was detected in the highest percentage of systems (49.1%). All of the IOCs were detected in surface water systems in the cross-section of States at concentrations greater than the MCL with the exceptions of cyanide and selenium. Cadmium, chromium, and silver have the lowest positive percent detections greater than the MCL (0.2%) and lead was detected in the highest percentage of systems at concentrations greater than the MCL (1.1%). (Among the individual States, the range for the percentage of systems with detections greater than the MCL varied from 0.0% to 0.5% for chromium and silver and from 0.0% to 11.8% for lead.) Again, it should be noted that some of the lead detections may be associated with piping and solder within a water system rather than an outside source of contamination.

Thirteen of the VOCs were detected in surface water systems in the cross-section of States at concentrations greater than the MRL. The contaminant 1,1-dichloroethane was detected in the lowest percentage of systems (2.9%) and methylene chloride was detected in the highest percentage of systems (25.6%). All of the VOCs were detected in surface water systems in the cross-section of States at concentrations greater than half the MCL and all of the VOCs except total xylenes were detected in surface water systems in the cross-section of States at concentrations greater than the MCL. Chlorobenzene has the lowest percent detections greater than the MCL (0.2%) and methylene chloride was detected in the highest percentage of systems greater than the MCL (4.7%). (Among the individual States, the range for the percentage of systems with detections greater than the MCL varied from 0.0% to 3.0% for chlorobenzene and from 0.0 to 24.2% for methylene chloride.) It should be noted however, that the detection of methylene chloride can be confounded with other organic compounds, and it is suspected that the occurrence values reported may be too great.

Table 3.a. Summary of occurrence of contaminants associated with Class V Disposal Wells from a national cross-section of public water systems using ground water; ranges from all States studied.

Ground Water Systems	% > MRL	Range > MRL	% > 0.5 MCL*	Range > 0.5 MCL*	% > MCL*	Range > MCL*
Inorganic Compounds						
Arsenic	19.3%	2.5% - 95.9%	1.6%	0.0% - 4.6%	0.9%	0.0% - 2.5%
Barium	47.3%	31.5% - 98.6%	0.8%	0.0% - 6.9%	0.2%	0.0% - 3.1%
Cadmium	4.9%	0.4% - 93.9%	1.2%	0.0% - 21.7%	0.6%	0.0% - 1.5%
Chromium	13.2%	1.3% - 95.7%	0.5%	0.0% - 2.4%	0.2%	0.0% - 0.6%
Cyanide	2.0%	0.0% - 91.1%	0.5%	0.0% - 1.7%	0.2%	0.0% - 0.8%
Lead (action level; not MCL)	15.4%	0.0% - 73.3%	4.8%	0.0% - 40.0%	3.1%	0.0% - 26.7%
Mercury	4.5%	0.4% - 93.3%	0.7%	0.0% - 3.2%	0.4%	0.0% - 2.0%
Selenium	8.6%	0.5% - 93.3%	0.3%	0.0% - 0.8%	0.2%	0.0% - 0.5%
Silver	3.5%	0.3% - 16.7%	0.3%	0.0% - 0.6%	0.1%	0.0% - 0.3%
Volatile Organic Compounds						
1,1,1 - Trichloroethane	3.3%	1.1% - 19.4%	1.3%	0.0% - 8.8%	1.3%	0.0% - 8.4%
1,1 - Dichloroethene	1.5%	0.0% - 5.0%	1.0%	0.0% - 5.0%	0.9%	0.0% - 5.0%
1,2 - Dichloroethane	1.4%	0.0% - 4.3%	0.6%	0.0% - 2.3%	0.4%	0.0% - 2.3%
Benzene	1.2%	0.0% - 4.2%	0.5%	0.0% - 1.8%	0.4%	0.0% - 1.8%
Carbon tetrachloride	1.7%	0.0% - 8.2%	0.6%	0.0% - 1.8%	0.4%	0.0% - 1.8%
Chlorobenzene	1.0%	0.0% - 3.0%	0.3%	0.0% - 1.0%	0.3%	0.0% - 1.0%
Ethyl benzene	2.2%	0.5% - 11.2%	0.3%	0.0% - 1.6%	0.1%	0.0% - 0.8%
Methylene chloride (Dichloromethane)	11.1%	0.0% - 57.8%	3.3%	0.0% - 11.9%	2.3%	0.0% - 11.9%
Tetrachloroethylene (PCE)	4.3%	0.6% - 14.2%	2.3%	0.1% - 7.6%	1.8%	0.0% - 5.7%
Toluene	3.8%	0.0% - 14.4%	0.7%	0.0% - 3.8%	0.4%	0.0% - 2.3%
Trichloroethene (TCE)	3.1%	0.6% - 12.8%	1.8%	0.0% - 6.2%	1.5%	0.0% - 5.5%
Vinyl chloride	0.5%	0.0% - 3.0%	0.2%	0.0% - 0.6%	0.2%	0.0% - 0.6%
Xylenes (Total)	3.9%	0.4% - 15.3%	0.2%	0.0% - 1.0%	0.1%	0.0% - 0.8%

* % > MCL indicates the proportion of systems with any analytical results exceeding the concentration value of the MCL; it does not necessarily indicate an MCL violation. An MCL violation occurs when the MCL is exceeded by the average results from four quarterly samples or confirmation samples as required by the primacy State.

Table 3.b. Summary of occurrence of contaminants associated with Class V Disposal Wells from a national cross-section of public water systems using surface water; ranges from all States studied.

Surface Water Systems	% > MRL	Range > MRL	% > 0.5 MCL*	Range > 0.5 MCL*	% > MCL*	Range > MCL*
Inorganic Compounds						
Arsenic	13.0%	0.5% - 100.0%	0.6%	0.0% - 3.0%	0.5%	0.0% - 3.0%
Barium	49.1%	22.1% - 100.0%	0.6%	0.0% - 6.1%	0.5%	0.0% - 3.0%
Cadmium	5.1%	0.0% - 100.0%	1.3%	0.0% - 9.1%	0.2%	0.0% - 1.9%
Chromium	10.5%	0.9% - 100.0%	0.3%	0.0% - 0.9%	0.2%	0.0% - 0.5%
Cyanide	5.1%	0.0% - 95.7%	0.4%	0.0% - 3.8%	0.0%	0.0% - 0.0%
Lead (action level; not MCL)	18.3%	0.0% - 100.0%	4.6%	0.0% - 100.0%	1.1%	0.0% - 11.8%
Mercury	9.0%	0.0% - 100.0%	1.3%	0.0% - 6.1%	0.5%	0.0% - 1.9%
Selenium	11.2%	0.0% - 100.0%	0.2%	0.0% - 3.0%	0.0%	0.0% - 0.0%
Silver	5.1%	0.0% - 27.3%	0.2%	0.0% - 0.5%	0.2%	0.0% - 0.5%
Volatile Organic Compounds						
1,1,1 - Trichloroethane	7.3%	0.0% - 20.5%	0.9%	0.0% - 18.2%	0.9%	0.0% - 18.2%
1,1 - Dichloroethene	2.9%	0.0% - 12.8%	0.3%	0.0% - 6.1%	0.3%	0.0% - 6.1%
1,2 - Dichloroethane	3.1%	0.0% - 13.7%	0.3%	0.0% - 3.7%	0.3%	0.0% - 1.9%
Benzene	3.9%	0.0% - 17.1%	0.5%	0.0% - 3.0%	0.3%	0.0% - 3.0%
Carbon tetrachloride	9.0%	0.0% - 37.6%	1.6%	0.0% - 18.2%	1.1%	0.0% - 18.2%
Chlorobenzene	8.1%	0.0% - 31.6%	0.2%	0.0% - 3.0%	0.2%	0.0% - 3.0%
Ethyl benzene	7.3%	0.0% - 17.1%	0.3%	0.0% - 3.0%	0.3%	0.0% - 3.0%
Methylene chloride (Dichloromethane)	25.6%	0.0% - 73.5%	10.4%	0.0% - 28.2%	4.7%	0.0% - 24.2%
Tetrachloroethylene (PCE)	7.1%	0.0% - 16.2%	2.5%	0.0% - 15.2%	1.7%	0.0% - 15.2%
Toluene	11.9%	0.0% - 30.0%	1.0%	0.0% - 7.5%	0.5%	0.0% - 5.7%
Trichloroethene (TCE)	5.6%	0.0% - 21.2%	1.9%	0.0% - 21.2%	1.2%	0.0% - 21.2%
Vinyl chloride	3.1%	0.0% - 13.7%	0.3%	0.0% - 3.0%	0.3%	0.0% - 3.0%
Xylenes (Total)	12.3%	1.9% - 29.1%	0.2%	0.0% - 1.9%	0.0%	0.0% - 0.0%

* % > MCL indicates the proportion of systems with any analytical results exceeding the concentration value of the MCL; it does not necessarily indicate an MCL violation. An MCL violation occurs when the MCL is exceeded by the average results from four quarterly samples or confirmation samples as required by the primacy State.

Unregulated Contaminant Monitoring Information System

The URCIS database contains information on the following selected contaminants related to Class V well use: 1,1,1-trichloroethane, 1,1-dichloroethene, 1,2-dichloroethane, benzene, carbon tetrachloride, chlorobenzene, ethyl benzene, methylene chloride, PCE, toluene, TCE, vinyl chloride, and total xylenes. Table 4 summarizes the results of the analysis of the URCIS occurrence data for ground water and surface water systems.

Every contaminant selected for analysis in the URCIS database has been detected in ground water systems and surface water systems at concentrations greater than the MRL. Every contaminant was detected at concentrations greater than half the MCL in both ground water systems and surface water systems with the exception of chlorobenzene, ethyl benzene, toluene, and total xylenes. In ground water and surface water systems, every contaminant, with the exception of 1,1,1-trichloroethane, chlorobenzene, ethyl benzene, toluene, and total xylenes, was detected at levels greater than the value of the MCL.

Table 4. Summary of occurrence of contaminants associated with Class V Disposal Wells from the URCIS data set for public water systems using ground water and surface water.

	Ground Water Systems			Surface Water Systems		
	% > MRL	% > 0.5 MCL*	% > MCL*	% > MRL	% > 0.5 MCL*	% > MCL*
1,1,1-Trichloroethane	4.5%	0.1%	0.0%	5.6%	0.1%	0.0%
1,1-Dichloroethene	1.4%	0.5%	0.3%	2.3%	0.6%	0.3%
1,2-Dichloroethane	1.6%	0.4%	0.3%	1.8%	0.5%	0.5%
Benzene	1.9%	0.7%	0.4%	2.5%	0.9%	0.3%
Carbon tetrachloride	1.6%	0.5%	0.3%	5.1%	0.8%	0.4%
Chlorobenzene	0.3%	0.0%	0.0%	3.4%	0.0%	0.0%
Ethyl benzene	1.9%	0.0%	0.0%	4.3%	0.0%	0.0%
Methylene chloride (Dichloromethane)	3.8%	1.2%	0.7%	11.9%	5.9%	3.3%
Tetrachloroethylene (PCE)	4.2%	1.9%	1.2%	3.1%	1.2%	0.9%
Toluene	3.8%	0.0%	0.0%	8.2%	0.0%	0.0%
Trichloroethene (TCE)	4.2%	1.8%	1.3%	6.7%	2.2%	1.3%
Vinyl chloride	0.5%	0.3%	0.2%	1.2%	0.8%	0.6%
Xylenes (Total)	3.1%	0.0%	0.0%	11.9%	0.0%	0.0%

* % > MCL indicates the proportion of systems with any analytical results exceeding the concentration value of the MCL; it does not necessarily indicate an MCL violation. An MCL violation occurs when the MCL is exceeded by the average results from four quarterly samples or confirmation samples as required by the primacy State.

Comparison of national cross-section of States and Unregulated Contaminant Monitoring Information System data

For contaminant occurrence in ground water, the URCIS data and the national cross-section State data are quite comparable. The similarity between the two different data sets provides some verification of data quality regarding types and general levels of contaminants. The percentage of ground water systems with detections greater than the MRL values from the URCIS data are within one percent of the corresponding national cross-section value with the exception of methylene chloride (3.8% for URCIS, 11.1% for the cross-section) and TCE (4.2% for URCIS, 3.1% for the cross-section). Also, every percentage of systems greater than the MRL value from URCIS falls within the range of values from the State data. All of the percentage of systems greater than the MCL values from URCIS fall within the range of values from the State data.

For contaminant occurrence in surface water, the URCIS data are also generally consistent with the cross-section data results, although there is greater variation between the two data sets than is the case with ground water systems. The percentage of surface water systems with detections greater than the MRL values from the URCIS data are within two percentage points of the corresponding national cross-section data for only five of the 11 contaminants (1,1-dichloroethene, 1,2-dichloroethane, benzene, TCE, vinyl chloride, and total xylenes). However, only methylene chloride has a difference of greater than five percentage points (11.9% URCIS, 25.6% cross-section) and every percent greater than the MRL value from URCIS falls within the range of values from the State data. For the percentage of systems with detections at concentrations greater than the MCL, every value from the URCIS data falls within the range of values from the State data.

Table 5 illustrates the comparison of percentage of systems with detections greater than the MRL for URCIS data and the national cross-section State data for ground water and surface water systems.

Table 5. Comparison of occurrence of contaminants associated with Class V Disposal Wells from the URCIS data and the national cross-section State data for public water systems using ground water and surface water.

	Ground Water Systems		Surface Water Systems	
	URCIS	**Cross-Section**	**URCIS**	**Cross-Section**
	% > MRL	% > MRL	% > MRL	% > MRL
1,1,1-Trichloroethane	4.5%	3.3%	5.6%	7.3%
1,1-Dichloroethene	1.4%	1.5%	2.3%	2.9%
1,2-Dichloroethane	1.6%	1.4%	1.8%	3.1%
Benzene	1.9%	1.2%	2.5%	3.9%
Carbon tetrachloride	1.6%	1.7%	5.1%	9.0%
Chlorobenzene	0.3%	1.0%	3.4%	8.1%
Ethyl benzene	1.9%	2.2%	4.3%	7.3%
Methylene chloride (Dichloromethane)	3.8%	11.1%	11.9%	25.6%
Tetrachloroethylene (PCE)	4.2%	4.3%	3.1%	7.1%
Toluene	3.8%	3.8%	8.2%	11.9%
Trichloroethene (TCE)	4.2%	3.1%	6.7%	5.6%
Vinyl chloride	0.5%	0.5%	1.2%	3.1%
Xylenes (Total)	3.1%	3.9%	11.9%	12.3%

V. Discussion and Conclusions

The results of the analysis show that contaminants associated with Class V wells occur in public drinking water systems across the nation, many at concentrations greater than their MCL/HAL. A direct causal link between Class V well effluent and contaminant occurrence in public drinking water systems can not be established with these data.

APPENDIX A. DATA MANAGEMENT

Table 6. Principal State and supplemental databases used for analysis in this report.

State	Contaminant Groups Represented (IOCs, SOCs, VOCs)	Number of Analytical Results	Number of PWSs with Results	Time Period
Alabama	IOC, SOC, VOC	708,569	731	1985-1998
California	IOC, SOC, VOC	3,897,362	6,414	1984-1998
Illinois	IOC, SOC, VOC	2,967,946	1,392	1987-1997
Indiana	IOC, SOC, VOC	257,428	1,488	1982-1997
Iowa	IOC, SOC, VOC, O (published report)	458,320	2,090	1988-1995
Massachusetts	VOCs only	76,737	322	1993-1997
Michigan (CWS)	SOC, VOC	346,181	1,146	1993-1997
Michigan (NTNC)	SOC, VOC	339,540	2,106	1993-1997
Montana	IOC, SOC, VOC	276,675	1,786	1993-1998
New Jersey	IOC, SOC, VOC	980,915	4,503	1993-1998
New Mexico	IOC, SOC, VOC	266,262	1,299	1992-1996
Oregon	IOC, SOC, VOC	169,521	2,345	1990-1998
STATE TOTALS		**10,745,456**	**25,622**	
URCIS (40 States & Territories)	some SOC, VOC	3,492,480	24,357	1983-1992
AWWSC (19 States)	IOC, SOC, VOC	55,526	137	1995-1996
TOTALS		**14,293,462**		

Table 6 summarizes the State data utilized and two other major sources of data. Altogether, the data reviewed for this report include more than 14 million analytical results, not all of which pertain to Class V related contaminants. (The number of systems from the States and these supplemental sources is not totaled because there is overlap among these special databases and some States, and hence many systems would be double-counted.) The supplemental databases include:

- EPA's Unregulated Contaminant Monitoring Information System (URCIS) with data from about 40 States and Territories from the first round of unregulated contaminant monitoring (1989-1993); the data also includes samples taken prior to 1989 which were grandfathered into the database. (The values shown here for URCIS may be different than for other EPA reviews because of the screening conducted for this study to ensure consistency in analysis.)

- Drinking water data from systems operated by the American Water Works Service Company, which operates systems in many states.

There are numerous data handling and management issues, as well as data quality issues, that had to be addressed to enable the analysis presented in this report. The primary objective was to develop a consistent and repeatable approach that would allow data to be compared between and among the various data sets and allow the data to be jointly evaluated to provide some overview of occurrence patterns at the national level. A brief review of some of these issues is necessary as a preface to understanding the results.

In general, States/sources were not asked to reorganize or reformat data, but simply to transmit the data in whatever manner was easiest. For example, while the Phase II/V compliance data from 1993-1995 were of the greatest interest, in many cases, it was easier for the State simply to transmit their entire data set, generally containing information on all chemical contaminants, from a greater span of years (as noted in Table 5). In addition to the regulated contaminants, every database included additional data on other contaminants and these varied among each database.

The data were transferred using three main media: FTP, e-mail, and diskettes (including zip-disks or CD-ROM). Evident from the number of analytical results presented on Table 5, these are very large databases, often several megabytes in size, and transmission was often complicated. Many of the data sets received were "as is" and had not been formatted by the State in any way. The data were received in a number of file types including spreadsheet files, DBF files, and THM files. Each data set was unique in format, layout, custom codes, and data element usage.

After receiving the data, an initial review of the information was conducted. In most cases, the data were not accompanied by a protocol outlining each variable. In many cases, the variable headings could be determined by examination. In every instance, follow-up with the state/data source was necessary for deciphering variable headings or contaminant codes. When all variables were understood, a formatting plan for the data was developed. Nearly all of the data sets required some type of formatting to allow analysis. Data formatting problems varied from one data set to another.

All statistical analyses were conducted in SAS® statistical software. Data formatting problems were corrected in Microsoft® Excel with the aid of specialized programs written in Visual Basic® or were corrected directly in SAS before the analysis began[3]. Data formatting was the most time consuming and labor intensive part of the data analysis, often taking many days for each data set. Each data set presented unique challenges. While analysis of the data was consistent from one data set to another, each data set required some unique editing and filtering because of differences in basic data elements.

[3] SAS is a registered trademark of the SAS Institute, Inc.
Excel and Visual Basic are trademarks of the Microsoft Corporation.

APPENDIX B. INDUSTRIES THAT POTENTIALLY USE CLASS V WELLS

Table 7. Characteristic industries which potentially use Class V wells

SIC Code	Description
Industrial Waste Disposal Wells	
0742	Veterinary services for animal specialties
1521	General contractors - single family houses
1541	Industrial buildings & warehouses
1611	Highway and street construction (not elevated)
1711	Plumbing, heating and air conditioning
1794	Excavation work
2752	Commercial printing, lithographic
2759	Commercial printing, NEC
3089	Plastics products, NEC
3599	Industrial and commercial machinery & equipment, NEC
4911	Electric services
4953	Refuse systems
5012	Automobiles and other motor vehicles
5013	Motor vehicle supplies and new parts
5063	Electrical apparatus and equipment, wiring supplies & construction materials
5082	Construction and mining (except petroleum) machinery and equipment
5083	Farm & garden machinery and equipment
5084	Industrial machinery and equipment
5085	Industrial supplies
5087	Service establishment equipment
5169	Chemicals and allied products, NEC
5172	Petroleum and petroleum products wholesalers excluding bulk stations and terminals
5261	Retail nurseries and garden stores
5411	Grocery stores
5551	Boat dealers
5941	Sporting goods and bicycle shops
5983	Fuel oil dealers
5999	Miscellaneous retail stores, NEC
7261	Funeral service and crematories
7389	Business services, NEC
7542	Carwashes
7692	Welding repair
7694	Armature rewinding shops
7699	Repair shops and related services, NEC

SIC Code	Description
Industrial Waste Disposal Wells	
7999	Amusement and recreation, NEC
8062	General medical and surgical hospitals
8211	Elementary and secondary schools
8734	Testing laboratories
9224	Fire protection
Motor Vehicle Waste Disposal Wells	
4142	Bus charter service, except local
4212	Local trucking, without storage
4213	Trucking, except local
4581	Airports, flying fields, and airport terminal services
5015	Motor vehicle parts, used
5511	Motor vehicle dealers (new and used)
5521	Motor vehicle dealers (used only)
5531	Auto and home supply stores
5541	Gasoline service stations
7514	Passenger car rental
7515	Passenger car leasing
7532	Top, body and upholstery repair shops and paint shops
7533	Auto exhaust system repair shops
7537	Automotive transmission repair shops
7538	General automotive repair shops
7539	Automotive repair shops, NEC
7549	Automotive services, except repair and carwashes
9111	Executive offices

The industries presented in Table 7 are considered illustrative of the variety of sources of potential Class V well users, and are by no means all-inclusive. For example, dry cleaners (SIC 7216) may also be included, as noted in the report. These 57 industries are cited in 63 FR 60610, July 29, 1998.

For further details, refer to EPA's *Economic Analysis for the Proposed Revisions to the Class V UIC Regulations*, 1998.

APPENDIX C. NATIONAL CROSS-SECTION AND SUPPLEMENTARY DATA TABLES

Tables 8.a and 8.b present the national cross-section occurrence data and ranges from Tables 3.a and 3.b in Section IV of this report. For perspective, the number of analyses and number of systems testing is included with the percentage of systems with detections. Occurrence values for methyl ethyl ketone are included at the bottom of both tables. Data from testing for the contaminant methyl ethyl ketone was only included in two data sets. Even though there are several thousand analyses, these values given for methyl ethyl ketone are supplementary and can not be taken as representative of the state of occurrence nation-wide.

Appendix C

Table 8.a. Summary of Occurrence of Contaminants Associated with Class V Injection Wells in Public Water Systems Using Ground Water from a National Cross Section of States. Ranges from all States Studied.

Ground Water Systems										
Chemical Name	All States # of Analyses	All States # of Systems	X Section # of Analyses	X Section # of Systems	% > MRL	Range > MRL	% > 0.5 MCL*	Range > 0.5 MCL*	% > MCL*	Range > MCL*
Inorganic Compounds										
Arsenic	39,629	8,015	36,424	6,588	19.3%	2.5% - 95.9%	1.6%	0.0% - 4.6%	0.9%	0.0% - 2.5%
Barium	37,856	8,037	34,651	6,609	47.3%	31.5% - 98.6%	0.8%	0.0% - 6.9%	0.2%	0.0% - 3.1%
Cadmium	37,905	8,042	34,702	6,615	4.9%	0.4% - 93.9%	1.2%	0.0% - 21.7%	0.6%	0.0% - 1.5%
Chromium	37,898	8,042	34,696	6,615	13.2%	1.3% - 95.7%	0.5%	0.0% - 2.4%	0.2%	0.0% - 0.6%
Cyanide	14,978	5,324	12,504	3,984	2.0%	0.0% - 91.1%	0.5%	0.0% - 1.7%	0.2%	0.0% - 0.8%
Lead (action level; not MCL)	27,578	3,690	27,364	3,661	15.4%	0.0% - 73.3%	4.8%	0.0% - 40.0%	3.1%	0.0% - 26.7%
Mercury	37,929	8,031	34,594	6,582	4.5%	0.4% - 93.3%	0.7%	0.0% - 3.2%	0.4%	0.0% - 2.0%
Selenium	38,065	8,008	34,867	6,581	8.6%	0.5% - 93.3%	0.3%	0.0% - 0.8%	0.2%	0.0% - 0.5%
Silver	28,080	4,135	27,866	4,106	3.5%	0.3% - 16.7%	0.3%	0.0% - 0.6%	0.1%	0.0% - 0.3%
Volatile Organic Compounds										
1,1,1-Trichloroethane	149,314	15,960	140,400	12,382	3.3%	1.1% - 19.4%	1.3%	0.0% - 8.8%	1.3%	0.0% - 8.4%
1,1-Dichloroethene	150,962	15,950	142,146	12,380	1.5%	0.0% - 5.0%	1.0%	0.0% - 5.0%	0.9%	0.0% - 5.0%
1,2-Dichloroethane	149,050	15,959	140,218	12,388	1.4%	0.0% - 4.3%	0.6%	0.0% - 2.3%	0.4%	0.0% - 2.3%
Benzene	147,414	15,922	138,814	12,360	1.2%	0.0% - 4.2%	0.5%	0.0% - 1.8%	0.4%	0.0% - 1.8%
Carbon tetrachloride	152,076	15,948	143,260	12,379	1.7%	0.0% - 8.2%	0.6%	0.0% - 1.8%	0.4%	0.0% - 1.8%
Chlorobenzene	90,558	9,999	81,749	6,431	1.0%	0.0% - 3.0%	0.3%	0.0% - 1.0%	0.3%	0.0% - 1.0%
Ethyl benzene	144,574	15,234	135,975	11,675	2.2%	0.5% - 11.2%	0.3%	0.0% - 1.6%	0.1%	0.0% - 0.8%
Methylene chloride (Dichloromethane)	141,887	14,522	132,871	10,939	11.1%	0.0% - 57.8%	3.3%	0.0% - 11.9%	2.3%	0.0% - 11.9%
Tetrachloroethylene (PCE)	160,224	15,298	151,307	11,728	4.3%	0.6% - 14.2%	2.3%	0.1% - 7.6%	1.8%	0.0% - 5.7%
Toluene	144,547	15,252	135,861	11,679	3.8%	0.0% - 14.4%	0.7%	0.0% - 3.8%	0.4%	0.0% - 2.3%
Trichloroethene (TCE)	164,806	15,951	155,842	12,380	3.1%	0.6% - 12.8%	1.8%	0.0% - 6.2%	1.5%	0.0% - 5.5%
Vinyl chloride	146,580	15,938	137,766	12,369	0.5%	0.0% - 3.0%	0.2%	0.0% - 0.6%	0.2%	0.0% - 0.6%
Xylenes (Total)	142,642	15,165	134,041	11,605	3.9%	0.4% - 15.3%	0.2%	0.0% - 1.0%	0.1%	0.0% - 0.8%
Methyl Ethyl Ketone	6,149	3,051	2,987	1,058	0.5%	0.0% - 0.5%	N/A**			

* % > MCL indicates the proportion of systems with any analytical results exceeding the concentration value of the MCL; it does not necessarily indicate an MCL violation. An MCL violation occurs when the MCL is exceeded by the average results from four quarterly samples or confirmation samples as required by the primacy State.

**N/A: methyl ethyl ketone does not have an MCL or HAL.

Appendix C

Table 8.b. Summary of Occurrence of Contaminants Associated with Class V Injection Wells in Public Water Systems Using Surface Water from a National Cross Section of States. Ranges from all States Studied.

Surface Water Systems

Chemical Name	All States # of Analyses	All States # of Systems	X Section # of Analyses	X Section # of Systems	% > MRL	Range > MRL	% > 0.5 MCL*	Range > 0.5 MCL*	% > MCL*	Range > MCL*
Inorganic Compounds										
Arsenic	4,981	736	4,420	629	13.0%	0.5% - 100.0%	0.6%	0.0% - 3.0%	0.5%	0.0% - 3.0%
Barium	4,796	732	4,235	625	49.1%	22.1% - 100.0%	0.6%	0.0% - 6.1%	0.5%	0.0% - 3.0%
Cadmium	4,788	734	4,226	627	5.1%	0.0% - 100.0%	1.3%	0.0% - 9.1%	0.2%	0.0% - 1.9%
Chromium	4,775	733	4,214	626	10.5%	0.9% - 100.0%	0.3%	0.0% - 0.9%	0.2%	0.0% - 0.5%
Cyanide	2,143	566	1,915	452	5.1%	0.0% - 95.7%	0.4%	0.0% - 3.8%	0.0%	0.0% - 0.0%
Lead (action level; not MCL)	3,207	489	3,019	436	18.3%	0.0% - 100.0%	4.6%	0.0% - 100.0%	1.1%	0.0% - 11.8%
Mercury	4,847	745	4,203	625	9.0%	0.0% - 100.0%	1.3%	0.0% - 6.1%	0.5%	0.0% - 1.9%
Selenium	4,775	734	4,214	627	11.2%	0.0% - 100.0%	0.2%	0.0% - 3.0%	0.0%	0.0% - 0.0%
Silver	2,833	464	2,645	411	5.1%	0.0% - 27.3%	0.2%	0.0% - 0.5%	0.2%	0.0% - 0.5%
Volatile Organic Compounds										
1,1,1-Trichloroethane	12,371	799	11,516	645	7.3%	0.0% - 20.5%	0.9%	0.0% - 18.2%	0.9%	0.0% - 18.2%
1,1-Dichloroethene	12,613	801	11,756	646	2.9%	0.0% - 12.8%	0.3%	0.0% - 6.1%	0.3%	0.0% - 6.1%
1,2-Dichloroethane	12,613	803	11,753	647	3.1%	0.0% - 13.7%	0.3%	0.0% - 3.7%	0.3%	0.0% - 1.9%
Benzene	12,410	797	11,568	644	3.9%	0.0% - 17.1%	0.5%	0.0% - 3.0%	0.3%	0.0% - 3.0%
Carbon tetrachloride	12,432	800	11,577	645	9.0%	0.0% - 37.6%	1.6%	0.0% - 18.2%	1.1%	0.0% - 18.2%
Chlorobenzene	10,814	648	9,960	493	8.1%	0.0% - 31.6%	0.2%	0.0% - 3.0%	0.2%	0.0% - 3.0%
Ethyl benzene	11,765	784	10,921	630	7.3%	0.0% - 17.1%	0.3%	0.0% - 3.0%	0.3%	0.0% - 3.0%
Methylene chloride (Dichloromethane)	11,560	732	10,686	577	25.6%	0.0% - 73.5%	10.4%	0.0% - 28.2%	4.7%	0.0% - 24.2%
Tetrachloroethylene (PCE)	12,405	788	11,550	632	7.1%	0.0% - 16.2%	2.5%	0.0% - 15.2%	1.7%	0.0% - 15.2%
Toluene	11,752	785	10,908	631	11.9%	0.0% - 30.0%	1.0%	0.0% - 7.5%	0.5%	0.0% - 5.7%
Trichloroethene (TCE)	12,925	801	12,070	646	5.6%	0.0% - 21.2%	1.9%	0.0% - 21.2%	1.2%	0.0% - 21.2%
Vinyl chloride	12,332	800	11,478	645	3.1%	0.0% - 13.7%	0.3%	0.0% - 3.0%	0.3%	0.0% - 3.0%
Xylenes (Total)	11,184	778	10,340	625	12.3%	1.9% - 29.1%	0.2%	0.0% - 1.9%	0.0%	0.0% - 0.0%
Methyl Ethyl Ketone	504	67	485	59	0.0%	0.0% - 0.0%	N/A**			

* % > MCL indicates the proportion of systems with any analytical results exceeding the concentration value of the MCL; it does not necessarily indicate an MCL violation. An MCL violation occurs when the MCL is exceeded by the average results from four quarterly samples or confirmation samples as required by the primacy State.

**N/A: methyl ethyl ketone does not have an MCL or HAL.