NATIONAL OUTBREAK REPORTING SYSTEM (NORS) FOR WATERBORNE DISEASE AND OUTBREAKS

CDC 52.12 Form Instructions

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1 INTRODUCTION

This document is a reference manual for public health professionals who use the CDC 52.12 form to report data to the National Outbreak Reporting System (NORS). NORS is a web-based system that has been designed to improve the quality of the data and its usability by local, state and national partners. NORS integrates outbreak reporting for foodborne illnesses, waterborne illnesses and enteric person-to-person illnesses (e.g. norovirus infection). Reports for these outbreaks contain a shared section that asks common questions (e.g. date(s) and location(s) of the outbreak). NORS users will be able to download and analyze data entered into NORS. Further, waterborne disease outbreaks in NORS will be reviewed for inclusion in the Waterborne Disease and Outbreak Surveillance System (WBDOSS). A collaboration between the Council of State and Territorial Epidemiologists (CSTE), the Centers for Disease Control and Prevention (CDC), and the Environmental Protection Agency (EPA), the WBDOSS tracks, analyzes and describes waterborne disease outbreaks on a national level.

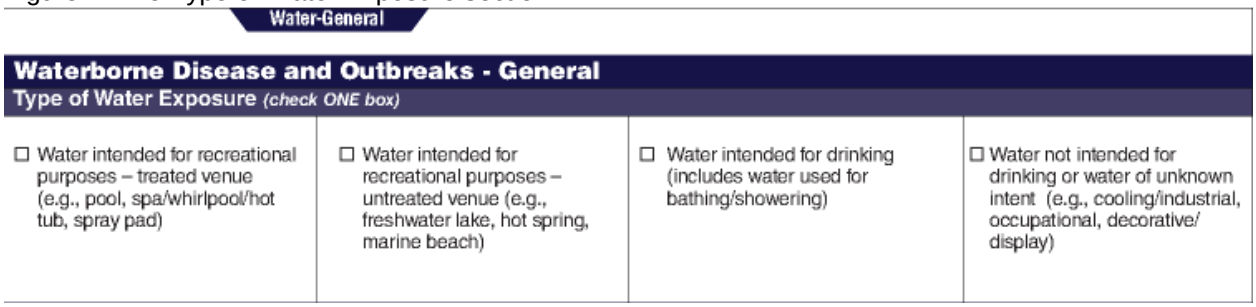
The CDC 52.12 has been revised and formatted to facilitate timely entry of detailed waterborne disease outbreak investigation data into the electronic system. Past users of the CDC 52.12 form expressed uncertainty about how to report information for different types of water exposure (e.g. drinking water vs. recreational water); therefore, NORS was organized so that the types of water exposure would be divided into separate parts. Similarly, the revised paper form is organized into parts. The guidance in this document has been organized to correspond to the tabs on the paper form; tabs have been placed at the top of each page to indicate a water-specific Water-General part, and parts for the four types of water exposure: treated recreational water, untreated recreational water, drinking water and water not intended for drinking--excluding recreational water--or water of unknown intent (WNID/WUI). Only one of the four water exposure tabs is completed for one outbreak report. A completed report should contain the General tab (see data entry guidance for CDC 52.13 form), the Water- General tab, and one of four tabs for the type of water exposure implicated in the outbreak.

Data reporting in NORS will take a more systematic and detailed approach, substantially improving the ability to evaluate and incorporate environmental elements and contributing factors into waterborne disease outbreak prevention efforts. To improve the standardization of data, the majority of fields in the electronic version of NORS contain dropdown menus with comprehensive pick lists. The pick lists are included in the appendices to this guidance document to assist CDC 52.12 form users. New values may be added to many of the pick lists, as indicated in the guidance for individual fields. Please complete as many of the fields as possible to improve data quality and enhance data analysis capabilities for your reporting site; however, please note that only **Reporting State** and **Date first case became ill** are required data entry fields in the electronic system. Other fields may be left blank if the questions are not relevant to a particular outbreak or if no answer is available for the question.

2 WATER- GENERAL

2.1 Type of Water Exposure

Figure 1. The Type of Water Exposure section.



Check the box next to the type of water exposure that is believed to have led to the waterborne disease outbreak or illness. Note that recreational water is separated into treated and untreated water exposures. If an outbreak involved both treated and untreated recreational venues, select the type of water exposure that reflects the venue that had the most compelling epidemiological and environmental evidence linking it to the waterborne disease outbreak or illness. If it is unclear which type of recreational water exposure to select, choose the type that reflects the first exposure experienced by the first reported case. Additional information about the outbreak may be attached to the outbreak report and/or included in the remarks section on page 2 or in the remarks section at the end of the tab that is completed for type of water exposure.

1. **Water intended for recreational purposes**- **treated venue-** Select this type of exposure if recreational water illnesses (RWIs) were associated with treated water. Examples include: cryptosporidiosis from a swimming pool; legionellosis from a whirlpool or hot tub; and giardiasis from a spray pad. Recreational water exposures in home environments, such as fill-and-drain kiddie pools, also fall into this category, as do illnesses stemming from chemical exposures (e.g. chloramines at an indoor pool, pH imbalances, releases of chlorine gas in the water).

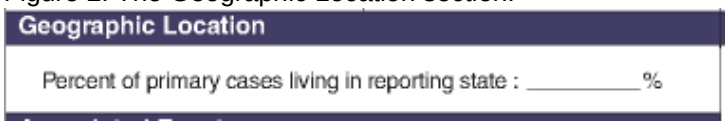
2. **Water intended for recreational purposes- untreated venue**- Select this type of exposure if RWIs were associated with untreated water in a natural setting. Examples include: cercarial dermatitis from a freshwater pond**;** cryptosporidiosis from a lake; or norovirus infection from a swimming beach. A chemical exposure, such as contact with an algaecide on a freshwater pond, would also be included in this category.

3. **Water intended for drinking.** Select this type of exposure if the illness was associated with drinking water in a distribution system or bottled water. This includes showering and bathing exposures where the water source is part of a drinking water distribution system. For example, some non-recreational legionellosis outbreaks fall into this category. This type of exposure does not include water that was not intended for ingestion (e.g. water from a stream by a hiking trail) regardless of whether or not the water was treated by an individual prior to being consumed.

4. **Water not intended for drinking or water of unknown intent-** Select this type of exposure if the illness was associated with water that was not intended for drinking (excluding recreational water) or if the type of water exposure cannot be categorized as drinking or recreational water. This type of water includes—but is not limited to—water used in cooling towers, industrial processes, agricultural processes, occupational settings, and decorative or display settings (e.g. decorative fountains).

2.2 Geographic Location

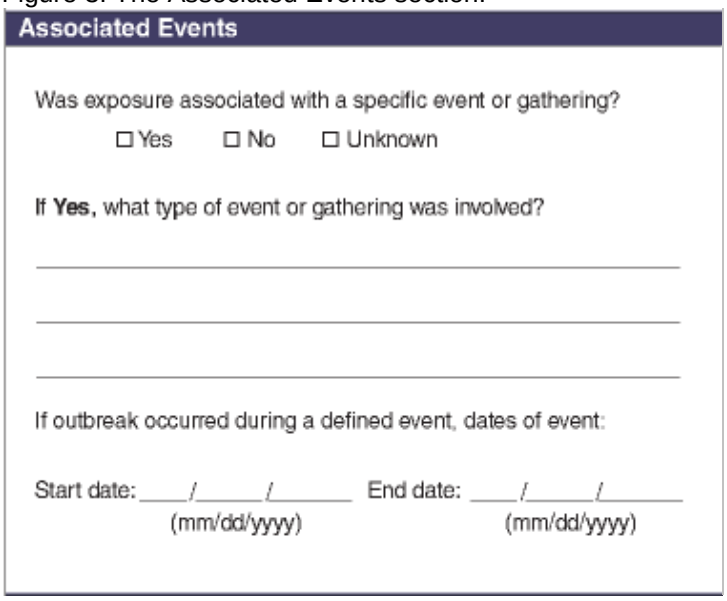
Figure 2. The Geographic Location section.



Percent of primary cases living in reporting state- Complete this field to give more information about the number of outbreak-related cases among residents of the reporting state. This field is most relevant when reporting an outbreak with an exposure in a single state that involved cases from multiple states (e.g. water park) or an outbreak with an exposure that occurred in multiple states and involved cases from multiple states (e.g. commercially-bottled water).

2.3 Associated Events

Figure 3. The Associated Events section.



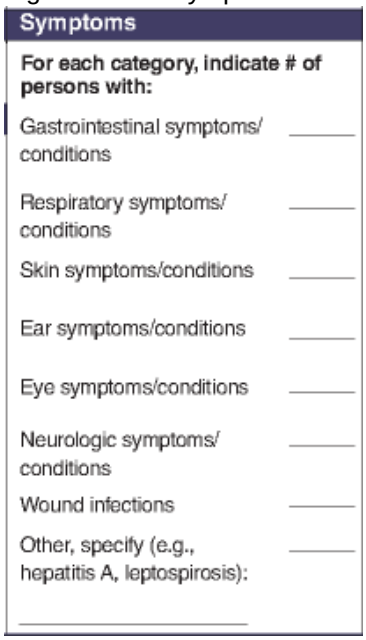
Was exposure associated with a specific event or gathering?- Check 'yes' for this question if the majority of primary cases were exposed as a result of a specific event that they attended. An event has a defined start and end date or time (e.g. wedding reception, corporate retreat, picnic, pool party). Travel-related hotel/motel/lodge/inn stays are not counted as events; however specific events or gatherings (e.g. wedding reception, awards ceremony) in hotel/motel/lodge/inn settings are counted as events.

- **If Yes, what type of event or gathering was involved?-** If the answer to the previous question was 'yes,' write in the type of event or gathering in the space provided. Refer to **Appendix C** for a list of commonly reported events. If the event or gathering is not listed, please write it in the space provided so that it may be added to the list in NORS.

- **If outbreak occurred during a defined event, dates of event**
  - **Start date**-This date reflects the first scheduled day of the event. If more than one event was involved, enter the first scheduled day of the earliest-occurring event.
  - **End date**- This date reflects the last scheduled day of the event.

2.4 Symptoms

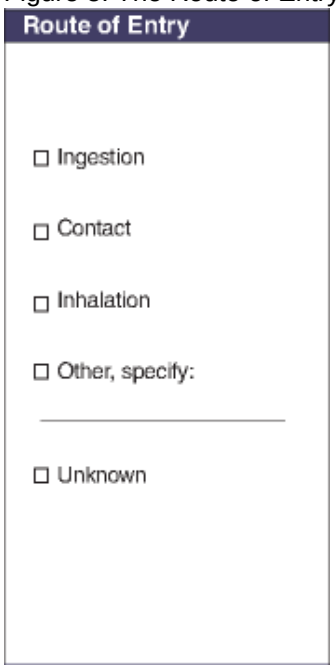
Figure 4. The Symptoms section.



This section complements the symptoms list in the General section by combining symptoms into categories that can be used to describe the outbreak according to illness type. For example, nausea and vomiting would be categorized as gastrointestinal symptoms/conditions. Please enter the number of people with each symptom/condition. Use the 'Other' category and write in the symptom/condition if the common or predominant symptoms for the illness are poorly described using the existing categories.

2.5 Route of Entry

Figure 5. The Route of Entry section.



Select the route(s) of entry associated with this outbreak. Route of entry refers to the water exposure that resulted in illness. Responses should reflect known routes of entry, rather than suspected routes of entry.

Ingestion- Intentional and/or accidental ingestion of water.
Contact- Physical contact with water that does not involve ingestion or inhalation.
Inhalation- This may include inhalation of mist, steam, or larger water droplets.
Other- Add a known route of entry if it is not already listed.
Unknown- Use this category if the route of entry is only suspected or cannot be determined. If an unlisted route of entry is only suspected, please select 'Unknown' and include a comment about the suspected route of entry in the Remarks section at the end of the outbreak report.

2.6 Epidemiologic Data

Figure 6. The Epidemiologic Data section.

Epidemiologic Data

1. Estimated total number of persons with primary exposure: _____

2. Were data collected from comparison groups to estimate risk? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

   If ***No*** or ***Unknown***, was water the only common source shared by persons who were ill? ☐ Yes ☐ No ☐ Unknown

Exposure (Vehicle/Setting) *(e.g., pool—waterpark; hot spring; well water)*	**Total # Exposed (A)**	**# Ill Exposed (B)**	**Total # Not Exposed**	**# Ill Not Exposed**	**Attack Rate (%) (B/A)**	**Odds Ratio**	**Relative Risk**	**p-Value** *(provide exact value, if known)*	**95% Confidence Interval**

Attack rate for residents of reporting state: _____ % **Attack rate for non-residents of reporting state:** _____ %

Estimated total number of persons with primary exposure- Enter the estimated number of people with the primary exposure, regardless of whether they became ill or not. Note: The actual total number of persons with primary exposure is preferred if the information is available.

Were data collected from comparison groups to estimate risk?- Check 'yes' if an epidemiologic study (e.g. case-control, cohort) was conducted to calculate an odds ratio or relative risk for one or more exposures.

- **If No or Unknown, was water the only common source shared by persons who were ill? -** Check 'yes' if an investigation indicated that there were no other common exposures (e.g. food) that could account for the illnesses. If it is suspected that water is the only common source but there is no supporting evidence, check unknown.

Epidemiologic Data Table

Enter findings from epidemiological investigations into this table. Each of the following bullets represents a column in which you can enter data. **Attack Rate** will be automatically calculated in NORS using the numbers entered for 'Total # Exposed' and '# Ill Exposed.' Additional findings (e.g. a local or state outbreak investigation report) may also be attached to the CDC 52.12 form.

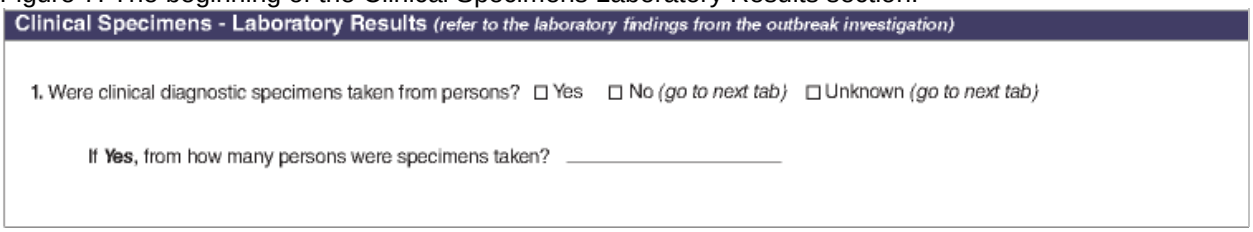
- **Exposure (Vehicle/Setting)**- This field is used to describe the type of exposure, vehicle or variable that was evaluated by the epidemiological study. Examples include: Cooling Tower, Drinking Water Dispenser, and specific pool environments, such as 'Pool- Water Slide.' Refer to **Appendix D** for a list of common exposures. If the appropriate exposure, vehicle or variable is not on the list, please write it in the Exposure field.
- **Total # Exposed (A)**- This is the total number of people in the study who were exposed.
- **# Ill Exposed (B)**- This is the number of people who were exposed and became ill, according to the case definition for the study.
- **Total # Not Exposed**- This is the total number of people in the study who were not exposed.
- **# Ill Not Exposed**- This is the total number of people in the study who were not exposed but became ill, according to the case definition for the study.
- **Attack Rate (%) (B/A)**- The attack rate is the proportion of exposed persons who became ill out of the total number of people exposed. If numbers are entered into 'Total # Exposed' and '# Ill Exposed,' the attack rate will be calculated automatically by the electronic system when the data are entered into NORS.
- **Odds Ratio-** The odds ratio (OR) is commonly reported for a case-control study. This value describes the odds of exposure in cases relative to the odds of exposure in controls.
- **Relative Risk**- The relative risk (RR) is a measure that is more commonly reported for cohort studies. This measure describes the risk of disease in exposed persons relative to the risk of disease in unexposed persons.
- **p-Value-** Please enter the exact p-Value that was calculated (entries such as '<0.001' cannot be entered into the electronic system). The p-Value can be used to evaluate the statistical significance of ORs and RRs.
    - The p-Value is the probability of observing a result as extreme or more extreme than the one observed, under the assumption that the null hypothesis (determined by the investigator) is true.
    - In a more general sense, the p-Value is the probability that the observed differences in a particular comparison, such as exposure to a suspected spa among ill people versus exposure to the same spa among healthy people, could have happened by chance alone, assuming that the group of people that became ill and the group of people that remained healthy were the same in all other ways.
    - CDC uses a p-Value of 0.05 to evaluate the statistical significance of waterborne disease outbreak analyses. For example, CDC would consider the epidemiological evidence for waterborne illness to be strong if the odds of developing *Pseudomonas*-related folliculitis were higher in people who used a spa at a recreational facility compared to the odds in people who attended the same facility but did not use the spa, and the p-Value was less than 0.05 (e.g. OR=1.8, p=0.008).
- **Confidence Interval**- A confidence interval (CI) can be used to provide a range for the true value of an OR or an RR and a level of confidence that the true value will be within that range. For example, when the upper and lower limits of a 95% CI are calculated for an OR, it is then possible for the investigator to state that he/she is 95% confident that the true OR will fall between those two numbers. A CI may also be used to evaluate the statistical significance in place of a p-Value—for example, if a 95% CI for an OR or an RR does not contain the number one, the ratio measure is considered significant at p=0.05.

Attack rate for residents of reporting state- The attack rate is the proportion of exposed residents of the reporting state who became ill out of the total number of state residents exposed. Enter the attack rate that reflects the exposure most strongly associated with the outbreak.

Attack rate for non-residents – The attack rate is the proportion of exposed non-residents from other states who became ill out of the total number of non-residents exposed. If information is available about non-residents, enter the attack rate that reflects the exposure most strongly associated with the outbreak. The exposure used for the resident and non-resident attack rate fields should be the same.

2.7 Clinical Specimens- Laboratory Results

Figure 7. The beginning of the Clinical Specimens Laboratory Results section.

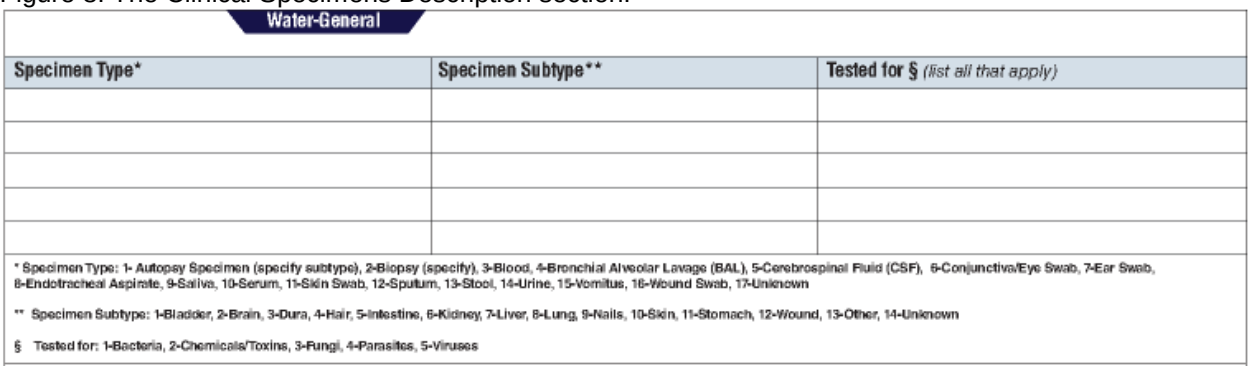


Data in this section help to describe the etiology of the outbreak. If clinical diagnostic specimens (e.g. stool samples, blood samples, urine samples) were collected during the outbreak, please answer yes to question one and enter the number of persons who provided samples. (note--the number of specimens collected for testing may be greater than the number of persons who submitted samples).

Some outbreaks might have multiple etiologies. CDC considers a pathogen to be responsible for an outbreak if ≥ 5% of all the positive clinical specimens test positive for the pathogen.

Specimen Description Table

Figure 8. The Clinical Specimens Description section.



Enter information about the specimens that were collected and tested. If a specimen type was tested for multiple categories of disease agents (e.g. parasites and bacteria), enter a row for each category of disease agent.

- **Specimen Type**- The specimen type (e.g. blood, stool) will typically be identified on the laboratory report. There is an option for 'unknown' if no information is available about the specimen type. Specimen types are listed on the form below the Specimen Description Table.
- **Specimen Subtype**- If an autopsy specimen or a biopsy specimen was tested, enter a subtype for the specimen. Specimen subtypes are listed on the form below the Specimen Description Table. There is an option for 'unknown' if you have no information about the specimen subtype.
- **Tested for**- This field describes, in a general sense, what the specimens were being tested for. These pathogens and agent categories are listed on the form below the Specimen Description Table.

Etiology Table

Figure 9. The Clinical Specimens Etiology section.

Enter positive findings in the table below. If tests for a specific pathogen/agent were negative, please also list that pathogen/agent and fill in the Specimen Type, Specimen Subtype, Test Type, Total # of People Tested and Total # of People Positive.

Clinical Specimen Row Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype
1				
2				
3				
4				
5				

Clinical Specimen Row Number	Confirmed as Etiology ?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Specimen Type *	Specimen Subtype **
1	☐ yes				
2	☐ yes				
3	☐ yes				
4	☐ yes				
5	☐ yes				

Clinical Specimen Row Number	Test Type §	Total # People Tested	Total # People Positive
1			
2			
3			
4			
5			

* Specimen Type: 1-Autopsy Specimen (specify subtype), 2-Biopsy (specify), 3-Blood, 4-Bronchial Alveolar Lavage (BAL), 5-Cerebrospinal Fluid (CSF), 6-Conjunctiva/Eye Swab, 7-Ear Swab, 8-Endotracheal Aspirate, 9-Saliva, 10-Serum, 11-Skin Swab, 12-Sputum, 13-Stool, 14-Urine, 15-Vomitus, 16-Wound Swab, 17-Unknown

** Specimen Subtype: 1-Bladder, 2-Brain, 3-Dura, 4-Hair, 5-Intestine, 6-Kidney, 7-Liver, 8-Lung, 9-Nails, 10-Skin, 11-Stomach, 12-Wound, 13-Other, 14-Unknown

§ Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Refer to the laboratory report and final outbreak report for information about the etiology of the outbreak. Please report positive findings and negative findings (if a test for a specific pathogen returned null findings). Some of the information may be absent from the report, depending on the testing that was performed (e.g., although a species may have been identified, it may not have been genotyped). If tests were performed on a subset of specimens to determine the species or subtype of a particular microorganism, please report the results for the total set of specimens, as well as the subset (e.g., If 20/25 people tested for positive for *Cryptosporidium,* of whom 11 were *C. hominis*-positive and 9 were *C. parvum*-positive, enter one row of data for the 20/25 people who were *Cryptosporidium*-positive and separate rows for the 11/20 and 9/20 people who tested positive for *C. hominis* and *C. parvum,* respectively). This will provide important information about the number of people who were tested and the strength of the evidence at each level of testing.

- **Genus/Chemical/Toxin-** This field provides the broadest description of the pathogen or agent for which the clinical specimen tested negative or positive. Enter this information based on the laboratory report data. Refer to **Appendix E** for the reference list of microorganisms, chemicals and toxins.
- **Species**- This field is for known species of each genus of bacteria, parasite or virus. Refer to **Appendix E** for the reference list of microorganisms, chemicals and toxins. Note that there are 6 species categorizations for *Escherichia coli*: enteroaggregative, enterohemorrhagic, enterotoxigenic, enteropathogenic, enteroinvasive, and other. These categories provide information about the type and severity of the outbreak. The table below summarizes the main categories (adapted from http://www.cdc.gov/foodborneoutbreaks/guide_fd.htm).
    - Not all laboratories are able to perform the analyses necessary to categorize *E. coli*. Most commonly, state laboratories will only provide information about enterohemorrhagic *E. coli* (e.g. *E. coli* O157:H7) versus all other types of *E. coli*. Please note that CDC may be able to provide these states with additional laboratory diagnostic testing of *E. coli*.

Table 1. Descriptions of the species categorizations for *Escherichia coli*.

***Escherichia coli* category**	**Incubation Period**	**Clinical Syndrome**	**Laboratory Confirmation**
Enteroaggregative (EAEC)*	Variable	Diarrhea, mild abdominal pain and fever. Blood and fecal leukocytes not common.	Isolation of organism of same enteroaggregative serotype from stool of two or more ill persons. EAEC is defined by its pattern of adherence to HEp-2 cells in culture.
Enterohemorrhagic/Shiga-toxin-producing (*E. coli* O157:H7 and others)	1-10 days; usually 3-4 days	Diarrhea (often bloody), abdominal cramps (often severe), little or no fever	Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from clinical specimen from two or more ill persons
Enterotoxigenic (ETEC)	6-48 hrs	Diarrhea, abdominal cramps, nausea; vomiting and fever less common	Isolation of organism of same serotype, demonstrated to produce heat-stable (ST) and/or heat-labile (LT) enterotoxin, from stool of two or more ill persons
Enteropathogenic (EPEC)	Variable	Diarrhea, fever, abdominal cramps	Isolation of organism of same enteropathogenic serotype from stool of two or more ill persons
Enteroinvasive (EIEC)	Variable	Diarrhea (might be bloody), fever, abdominal cramps	Isolation of same enteroinvasive serotype from stool of two or more ill persons
Other	Other – may vary	Other – may vary	Other – may vary

* Source: 9th Edition of the Manual of Clinical Microbiology, 2007, American Society for Microbiology, Washington, DC/editor in chief, PR Murray; editors EJ Baron, JH Jorgensen, ML Landry, and MA Pfaller.

- **Serotype/Serogroup/Serovar-** A serotype, serogroup or serovar refers to a subtype that is determined by conducting molecular testing on surface antigens of the microorganism (e.g. *Legionella pneumophila* s1). This approach to subtyping is more common for bacteria, fungi and viruses than parasites. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Refer to **Appendix E** for the reference list of microorganisms, chemicals and toxins.
- **Genotype/Subtype-** The genotype/subtype refers to a subtype that is determined by conducting molecular testing to describe the genetic composition of the microorganism. These methods are primarily used for subtyping parasites such as *Cryptosporidium* spp. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance.
- **Confirmed as etiology?-** A checkmark in this field indicates that the clinical specimens tested positive for the pathogen or chemical/toxin and that this is the etiology of the outbreak.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 28 oocysts/L of *Cryptosporidium hominis* were measured, the concentration would be 28. There may not b a concentration if the results from multiple specimens are being reported together, however, for a single specimen or a case with a chemical exposure, a concentration should be available.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L; mg/L, parts per million [ppm], colony forming units [CFU], most probable number [MPN]). As with concentration, there may not be a unit if the results from multiple specimens are being reported together, however, for a single specimen or a case with a chemical exposure, a unit of measure should be available.
- **Specimen Type**- This will correspond to data in the **Specimen Type** column of the Specimen Description Table if data have been entered in that table.
- **Specimen Subtype** - This will correspond to data in the **Specimen Subtype** column of the Specimen Description Table if data have been entered in that table.
- **Test Type-** This field describes the method of testing used to identify the microorganism. If multiple methods were used, select the method that provided the most detailed information (e.g., if a microorganism was found using microscopy and then genotyped using polymerase chain reaction (PCR), select 'DNA or RNA Amplification/Detection (e.g. PCR, RT-PCR)').
- **Total # People Tested**- This field is used to indicate how many people were tested for the pathogen or agent. This information provides a denominator to determine the proportion of people who tested positive for each pathogen or agent.
- **Total # People Positive-** This field indicates the number of people who tested positive for a given pathogen or agent. This information may be used to calculate the proportion of people who tested positive overall and is used to calculate the proportion of positive people, by pathogen or agent, when multiple pathogens or agents have been implicated.

2.8 Isolates

Figure 10. The Isolates section.

Isolates		
State Lab Isolate ID	Specimen Profile 1 *(e.g., PFGE, MLVA, or genotype)*	Specimen Profile 2 *(e.g., PFGE, MLVA, or genotype)*

This table captures additional information about the molecular patterns of pathogens found in biological specimens. If laboratory data or the final outbreak report provides data about a DNA pattern (aka a 'fingerprint') for a pathogen that was determined using pulse-field gel electrophoresis (PFGE) or a similar molecular testing method (e.g., MLVA), the lab isolate ID number and the pattern can be entered into this table. To learn more about current uses of PFGE patterns in outbreak investigations, refer to the web site for PulseNet (http://www.cdc.gov/pulsenet). PulseNet is a foodborne disease surveillance program that includes a searchable database of PFGE patterns. The development of similar processes for parasites will improve waterborne disease surveillance by supporting efforts to identify parasitic outbreaks that are not clustered in one geographic area (e.g. matching patterns would provide evidence of a waterborne disease outbreak that might otherwise be missed if several cases of cryptosporidiosis lived in different states but visited the same water park)

- **State Lab Isolate ID-** This is the isolate identification number assigned by the state laboratory. This is a unique identifier for the isolate.
- **Specimen Profile 1**- This field is for the entry of a molecular subtyping result, such as a combination of letters and numbers that represents a unique subtype (e.g. PFGE pattern)
- **Specimen Profile 2-** This field is for the entry of the molecular subtyping method used (e.g. PFGE, MLVA).

3 REC WATER-TREATED

3.1 Recreational Water Vehicle Description

Figure 11. The Recreational Water Vehicle Description section for treated water venues.

Rec Water-Treated

Recreational Water – Treated Venue

Recreational Water Vehicle Description

Water Vehicle Number *(e.g., 1, 2, 3)*	Water Type *(e.g., spa/whirlpool/hot tub; pool- swimming pool; pool- waterpark)*	Water Subtype *(select indoor, outdoor, or unknown)*	Setting of Exposure *(e.g., club, requiring membership; hotel/motel/lodge/inn; waterpark)*

Water Vehicle Number *(e.g., 1, 2, 3)*	USUAL Water Treatment Provided at Venue *(e.g., no treatment; coagulation; disinfection; flocculation; filtration (pool); unknown)*	Venue Treatment Subtype *(disinfection or pool filtration: e.g., UV; chlorine dioxide; bag filter; cartridge filter; unknown)*	Chlorination Subtype *(chlorine disinfection only- e.g., gaseous; sodium hypochlorite; cyanurates /stabilized chlorine)*

Water Vehicle Number *(e.g., 1, 2, 3)*	Fill Water Type *(e.g., public water supply; sea water; untreated ground or surface water; unknown)*	IF PUBLIC WATER WAS USED TO FILL, USUAL Water Treatment Provided for Fill Water Before Coming to the Venue *(e.g., no treatment; disinfection; filtration (treatment plant); unknown)*	IF PUBLIC WATER WAS USED TO FILL, Fill Water Treatment Subtype *(disinfection or pool filtration: e.g., UV; chlorine dioxide; bag filter; cartridge filter; unknown)*

Recreational Water Vehicle Tables

These three related tables allow you to describe one or more treated water venues that were associated with the outbreak. Refer to **Appendix G** for standard lists of values for the following fields.

Table 1

- **Water Vehicle Number**- This field is provided in each table so that rows can be related to each other more easily. Multiple rows in tables two and three can be linked to a single row in table one by writing in the Water Vehicle Number for the appropriate row in table one.
- **Water Type-** Water Type refers to types of treated recreational water venues, such as a spa or pool. Note that some settings are combined, such as spa/whirlpool/hot tub. Also note that some water types have been divided into multiple categories with standardized names (e.g., pool--swimming pool, pool--waterpark). The water type is further detailed in the water subtype and setting of exposure columns.
- **Water Subtype**- this field will allow you to indicate if the water environment was indoors, outdoors or unknown.
- **Setting of Exposure-** This field allows you to report descriptors that explain where the exposure to water occurred. For example, this field allows you to differentiate between a swimming pool at a camp and a swimming pool at a hotel. Note that some settings are combined, such as hotel/motel/lodge/inn.

Table 2

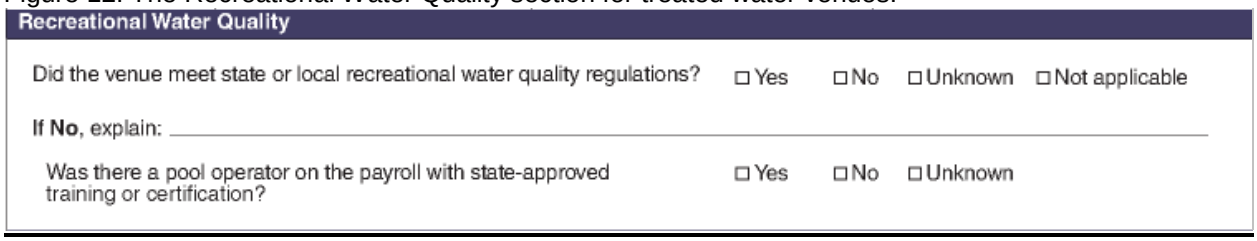
- **Water Vehicle Number**- Refer to Table 1.
- **USUAL Water Treatment Provided at Venue**-This field allows you to enter information about the usual water treatments provided at the venue, regardless of whether or not these treatments were operating correctly at or just prior to the time of the outbreak.
- **Venue Treatment Subtype**- This field provides subtypes for disinfection and filtration treatments frequently used in treated recreational water venues.
- **Chlorination Subtype**- This field provides subtypes specifically for chlorination disinfection methods.

Table 3

- **Water Vehicle Number**- Refer to Table 1.
- **Fill Water Type-** This field includes types of fill water frequently used in treated recreational water venues (e.g., the type of water used to fill up a swimming pool).
- **IF PUBLIC WATER WAS USED TO FILL, USUAL Water Treatment Provided for Fill Water Before Coming to the Venue**- If public water was selected as the fill water type, complete this field to give more information about water treatment provided before the water reached the venue (e.g. treatment prior to the water meter or property line). Enter information about the usual water treatments, regardless of whether or not these treatments were operating correctly at or just prior to the time of the outbreak.
- **IF PUBLIC WATER WAS USED TO FILL, Fill Water Treatment Subtype**- If public water was selected as the fill water type and either disinfection or filtration was selected as the usual water treatment type, complete this field to give more information about the disinfection or filtration method used to treat the water before it arrived at the venue (e.g. subtype for disinfection or filtration treatment prior to the water meter or property line).

3.2 Recreational Water Quality

Figure 12. The Recreational Water Quality section for treated water venues.



Did the venue meet state or local recreational water quality regulations?- Respond using to the water quality regulations for the state or local jurisdiction (e.g., county) where the water exposure that was associated with the outbreak occurred. If the outbreak involved residents of multiple states, the state with the implicated venue(s) should answer 'yes', 'no', 'unknown' or 'not applicable', and the other states should answer 'not applicable'.

- Answer 'yes' if the outbreak involved one or more venues (e.g. a commercial water park and a community swimming pool) in one or more jurisdictions and the response would be 'yes' for all of the venues according to the regulations for the state where the exposure occurred.
- Answer 'no' if the outbreak involved one or more venues (e.g. a commercial water park and a community swimming pool) in one or more jurisdictions and the response would be 'no' for even one of the venues according to the regulations for the state where the exposure occurred. Provide an explanation in the text box if 'no' is selected.
- Answer 'unknown' if the response would be 'unknown' for one or more venues where the exposure occurred.
- Answer 'not applicable' if none of the exposures occurred at venues in the reporting state or if state or local recreational water quality regulations were not applicable to the venue.

Was there a pool operator on the pay roll with state-approved training or certification?- If the outbreak involved residents of multiple states, the state with the implicated venue(s) should answer 'yes', 'no', or 'unknown', and the other states should answer 'unknown'.

- Answer 'yes' if the outbreak involved one or more venues (e.g. a commercial water park and a community swimming pool) in one or more jurisdictions and the response would be 'yes' for all of the venues with reference to the training or certification standards for the state where the exposure occurred.
- Answer 'no' if the outbreak involved one or more venues (e.g. a commercial water park and a community swimming pool) in one or more jurisdictions and the response would be 'no' for even one of the venues with reference to the training or certification standards for the state where the exposure occurred.
- Answer 'unknown' if you are responding about one or more venues in another state or if the outbreak involved one or more venues in one or more jurisdictions and the response would be 'unknown' for even one of the venues.

3.3 Laboratory Section - Recreational Water Samples from Treated Venues

Figure 13. The beginning of the Recreational Water Laboratory section and the Water Quality Results table.

Laboratory Section - Recreational Water Samples from Treated Venues

Was water from treated recreational water venues tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Results						
Sample		1	2	3	4	5
Source of Sample *(e.g., swimming pool, hot tub)*						
Additional Description of Source of Sample *(e.g., specific location, time of day, backwash sample, etc.)*						
Date *(mm/dd/yyyy)*						
Volume Tested	**Number**					
	Unit					
Temperature	**Number**					
	Unit					
Residual/Free Disinfectant Level *(if total and combined disinfectant levels given, total - combined = free)*	**Number**					
	Unit					
Combined Disinfectant Level *(if total and free disinfectant levels given, total - free = combined)*	**Number**					
	Unit					
pH						

This section collects information about water samples that were collected from the recreational venue. These data provide evidence regarding water quality, as well as the presence of specific pathogens in the water associated with the outbreak.

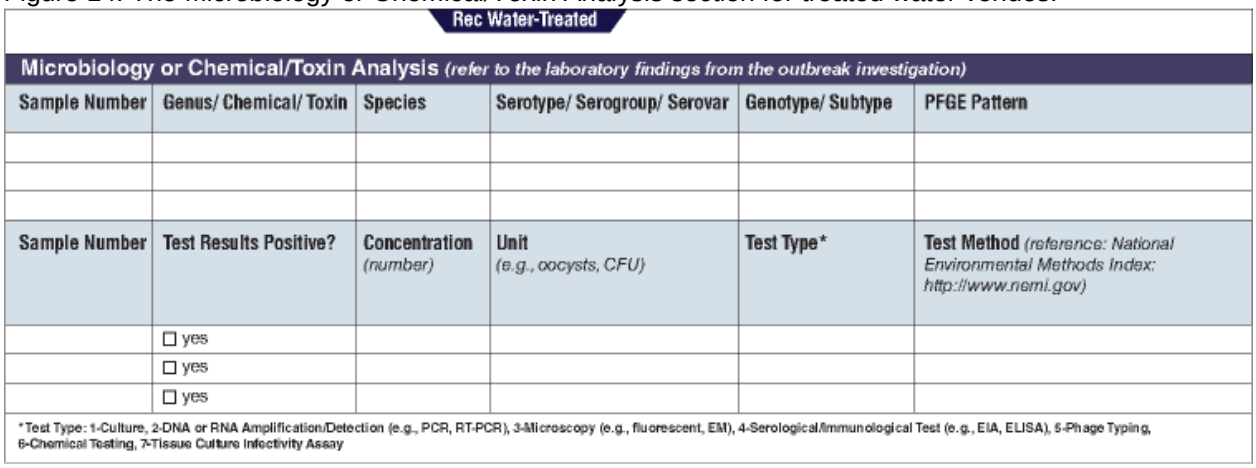
Was water from treated recreational water venues tested? - Respond to this question to indicate whether or not water was tested.

Water Quality Results Table

- **Sample** - This number allows you to associate your water sample with results in the following Microbiology table.
- **Source of Sample**- Enter the source of the water sample.
- **Additional Description of Source of Sample**- Provide additional information that will help to explain the source of the sample. For example, one sample might be “pool- deep end” while another might be “pool- backwash”
- **Date**- This is the date that the sample was collected.
- **Volume Tested (Number, Unit)**- Complete this section if a specific amount of water was collected for testing.
- **Temperature (Number, Unit)-** Complete this section if a temperature was recorded for the water sample.
- **Residual/Free Disinfectant Level (Number, Unit)-** Complete this section if a residual or free disinfectant level was recorded for the water sample. This field refers to the level of disinfectant that has not reacted with other compounds in the water and is still available to effectively inactivate microorganisms in the water. If only the total disinfectant level and the combined disinfectant level are known: (Residual or Free)=Total-Combined.
- **Combined Disinfectant Level (Number, Unit)-** Complete this section if a combined disinfectant level was recorded for the water sample. This field refers to the level of disinfectant that has combined with organic compounds in the water and is no longer available to work as an effective disinfectant (e.g. chloramines). If only the total disinfectant level and the residual/free disinfectant level are known: Combined=Total-(Residual or Free).
- **pH-** Complete this field if a pH level was recorded for the water sample.

3.4 Microbiology or Chemical/Toxin Analysis

Figure 14. The Microbiology or Chemical/Toxin Analysis section for treated water venues.



Rec Water-Treated

Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*

Sample Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype	PFGE Pattern

Sample Number	Test Results Positive?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Test Type*	Test Method *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				

*Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Microbiology or Chemical/Toxin Analysis Results Table

Refer to the laboratory report and final outbreak report for information. Please report positive findings and negative findings (if a test for a specific pathogen returned null findings). Some of the information may be absent from the report, depending on the testing that was performed (e.g., although a species may have been identified, it may not have been genotyped). If tests were performed to determine the species and/or subtype a particular microorganism from a water sample, please report the results for the total set of specimens, as well as the subset (e.g., If a sample tested positive for *Cryptosporidium* oocysts, enter the results, along with the concentration, if available. Then enter a separate row of data to report the species, if known.)

- **Sample Number-** Enter the sample number that corresponds to the appropriate sample from the Water Quality Results Table.
- **Genus/Chemical/Toxin-** This field provides the broadest description of the pathogen or agent for which the clinical specimen tested negative or positive. Enter this information based on the laboratory report data. Refer to the first column in **Appendix E**. If the appropriate genus, chemical or toxin is not on the list, please write it in the Genus/Chemical/Toxin field.
- **Species**- This field is for known species of each genus of bacteria, parasite or virus. Enter a new value if the species was identified but is missing from the pick list. Find the appropriate genus in **Appendix E** and refer to the second column for a list of known species. If the species is not on the list, please write it in the Species field. Note that there are 6 species categorizations for *Escherichia coli*: enteroaggregative, enterohemorrhagic, enterotoxigenic, enteropathogenic, enteroinvasive, and other. These categories provide information about the type and severity of the outbreak. The table below summarizes the main categories (adapted from http://www.cdc.gov/foodborneoutbreaks/guide_fd.htm).
    - Not all laboratories are able to perform the analyses necessary to categorize *E. coli*. Most commonly, state laboratories will only provide information about enterohemorrhagic *E. coli* (e.g. *E. coli* O157:H7) versus all other types of *E. coli*. Please note that CDC may be able to provide these states with additional laboratory diagnostic testing of *E. coli*.

Table 2. Descriptions of the species categorizations for *Escherichia coli*.

***Escherichia coli* category**	**Laboratory Confirmation**
Enteroaggregative (EAEC)*	Isolation of organism of enteroaggregative serotype from a water sample. EAEC is defined by its pattern of adherence to HEp-2 cells in culture.
Enterohemorrhagic/Shiga-toxin-producing (*E. coli* O157:H7 and others)	Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from a water sample.
Enterotoxigenic (ETEC)	Isolation of organism of serotype, demonstrated to produce heat-stable (ST) and/or heat-labile (LT) enterotoxin, from a water sample.
Enteropathogenic (EPEC)	Isolation of organism of enteropathogenic serotype from a water sample
Enteroinvasive (EIEC)	Isolation of enteroinvasive serotype from a water sample.
Other	Other – may vary

- **Serotype/Serogroup/Serovar-** A serotype, serogroup or serovar refers to a subtype that is determined by conducting molecular testing on surface antigens of the microorganism (e.g. *Legionella pneumophila* s1). This approach to subtyping is more common for bacteria, fungi and viruses than parasites. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching serotypes/serogroups/serovars from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water. Refer to **Appendix E** for the reference list of microorganisms, chemicals and toxins.

* Source: 9th Edition of the Manual of Clinical Microbiology, 2007, American Society for Microbiology, Washington, DC/editor in chief, PR Murray; editors EJ Baron, JH Jorgensen, ML Landry, and MA Pfaller.

- **Genotype/Subtype-** The genotype/subtype refers to a subtype that is determined by conducting molecular testing to describe the genetic composition of the microorganism. These methods are primarily used for subtyping parasites such as *Cryptosporidium* spp. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching genotypes/subtypes from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **PFGE Pattern-** The PFGE pattern, or fingerprint, can be used to differentiate genetically similar pathogens. Matching PFGE patterns from water and biological samples are strong environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **Test Results Positive?-** A checkmark in this field indicates that the water sample tested positive for the pathogen or chemical/toxin.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 5 oocysts/L of *Cryptosporidium hominis* were measured, the concentration would be 5. There will typically be a concentration for initial test that have positive results, however, there may not always be a concentration for more complex tests that provide species or subtyping results.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L, mg/L, parts per million [ppm], colony forming units [CFU], most probable number [MPN]). As with concentration, there may not always be a unit to enter into this field.
- **Test Type-** This field describes the method of testing used to identify the microorganism. If multiple methods were used, select the method that provided the most detailed information (e.g., if a microorganism was found using microscopy and then genotyped using polymerase chain reaction (PCR), select 'DNA or RNA Amplification/Detection (e.g. PCR, RT-PCR)').
- **Test Method-** This field provides information about the water testing methods that were used on the sample. Many of the method numbers refer to standard testing procedures or approved EPA methods. Refer to the National Environmental Methods Index (NEMI) at http://www.nemi.gov to compare and contrast methods for either microbiological testing or chemical testing. Common method numbers for this field are listed in **Appendix F** and contain the following information: method source, official method number, and method summary description.

3.5 Factors Contributing to Recreational Water Contamination and/or Increased Exposure in Treated Venues

Figure 15. The Contributing Factors section for treated water venues.

Factors Contributing to Recreational Water Contamination and/or Increased Exposure in Treated Venues			
	Factors *(check all that apply)***	Documented/ Observed***	Suspected***
	Out of compliance with bather load/density requirements	☐	☐
PEOPLE	Primary intended use of water is by diaper/toddler-aged children (e.g., kiddie pool)	☐	☐
PEOPLE	Heavy use by child care center groups	☐	☐
PEOPLE	Fecal/vomitus accident	☐	☐
PEOPLE	Patrons continued to swim when ill or within 2 weeks of being ill	☐	☐
	Operator error	☐	☐
	Intentional contamination (explain in remarks)	☐	☐
FACILITY DESIGN	Combined pool filtration systems led to cross-contamination	☐	☐
FACILITY DESIGN	Hygiene facilities inadequate or distant (e.g., no toilets, no diaper changing facilities)	☐	☐
FACILITY DESIGN	Spray feature water demand higher than treatment system capacity so water returns to features and bypasses filtration/treatment system	☐	☐
FACILITY DESIGN	No supplemental disinfection installed that would have inactivated pathogen (e.g., *Cryptosporidium*)	☐	☐
	Water temperature ≥30°C (≥86°F)	☐	☐
	Cross-connection with wastewater or non-potable water	☐	☐
	Disinfectant control system malfunctioning, inadequate, or lacking (e.g., hand feed)	☐	☐
	Incorrect settings on disinfectant control system	☐	☐
	pH control system malfunctioning, inadequate, or lacking (e.g., hand feed)	☐	☐
	Incorrect settings on pH control system	☐	☐
	Filtration system malfunctioning or inadequate (e.g., low flow rate)	☐	☐
MAINTENANCE	Supplemental disinfection system malfunctioning (e.g., ultraviolet light, ozone)	☐	☐
MAINTENANCE	Insufficient system checks so breakdown detection delayed	☐	☐
MAINTENANCE	No preventive maintenance programs to reduce breakdowns	☐	☐
MAINTENANCE	Remote monitoring system in use	☐	☐
MAINTENANCE	Ventilation insufficient for indoor aquatic facilities	☐	☐
MAINTENANCE	Chemical handling error (e.g., chemical hookup, improper mixing or application)	☐	☐
	Maintenance chemicals not flushed from system before opening to swimmers	☐	☐
	Low or zero water flow combined with continuous feed of chemicals resulted in excess chemicals in water	☐	☐
	Extensive slime/biofilm formation	☐	☐
	Recent construction	☐	☐
	Cyanurate level excessive	☐	☐
	Lack of draining/cleaning	☐	☐
	Stagnant water in spa piping was aerosolized	☐	☐
	No aquatics operators on payroll who have received state/local certified training	☐	☐
POLICY AND MANAGEMENT	Untrained/inadequately trained staff on duty	☐	☐
POLICY AND MANAGEMENT	Unclear communication chain for reporting problems	☐	☐
POLICY AND MANAGEMENT	Inadequate water quality monitoring (e.g., inadequate test kit, inadequate testing frequency)	☐	☐
POLICY AND MANAGEMENT	Employee illness policies absent or not enforced	☐	☐
POLICY AND MANAGEMENT	Missing or poor chemical handling policies, practices, and training	☐	☐
POLICY AND MANAGEMENT	No operator on duty at the time of incident	☐	☐
POLICY AND MANAGEMENT	Facility falls outside aquatic health code	☐	☐
POLICY AND MANAGEMENT	No shock/hyperchlorination policy	☐	☐
	Other, specify:	☐	☐
	Unknown	☐	☐

** Only check off what was found during investigation
*** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.

Please select factors that were found during the investigation. Each contributing factor that is selected has two check boxes so that the user can indicate whether the factor was 'Documented/Observed' or 'Suspected.' 'Documented/Observed' refers to information gathered during document reviews, direct observations and/or interviews. 'Suspected' refers to factors that probably occurred but for which no documentation or observable evidence is available. Additional guidance for some of the factors is included below.

In a multi-venue outbreak (e.g. multiple community pools), please select factors if they were documented/observed or suspected for at least one venue. Clarification can be provided in the Remarks section.

1) People
- Out of compliance with bather load/density requirements
- Primary intended use of water is by diaper/toddler-aged children (e.g. kiddie pool)
- Heavy use by child care center groups
- Fecal/vomitus accidents
- Patrons continued to swim when ill or within 2 weeks of being ill
- Operator error
- Intentional contamination (explain in remarks)- *Please add a comment in the Remarks section to explain the cause of the contamination.*

2) Facility Design
- Combined pool filtration systems led to cross contamination
- Hygiene facilities inadequate or distant (e.g no toilets, no diaper changing facilities)
- Spray feature water demand higher than treatment system capacity so water returns to features and bypasses filtration/treatment system
- No supplemental disinfection installed that would have inactivated pathogen (e.g. *Cryptosporidium*)- *For example, this would apply in a cryptosporidiosis outbreak if the pool had chlorination but no UV disinfection.*
- Water temperatures ≥ 30^0C (≥ 86°F)
- Cross connection with wastewater or non-potable water

3) Maintenance: Equipment and Operation
- Disinfectant control system malfunctioning, inadequate, or lacking (e.g. hand feed)
- Incorrect settings on disinfectant control system
- pH control system malfunctioning inadequate, or lacking (e.g. hand feed)
- Incorrect settings on pH control system
- Filtration system malfunctioning or inadequate (e.g. low flow rate)
- Supplemental disinfection system malfunctioning (e.g. ultraviolet light, ozone)
- Insufficient system checks so breakdown detection delayed- *For example, a breakdown in the system was not detected promptly because the system was not checked often enough or thoroughly enough.*
- No preventive maintenance programs to reduce breakdowns- *For example, there was a lack of scheduled maintenance to keep the components of the system in good working order.*
- Remote monitoring system in use
- Ventilation insufficient for indoor aquatic facilities
- Chemical handling error (e.g. chemical hookup, improper mixing or application)- *For example, a chemical feed line was not clamped before disconnecting, resulting in a spill or chemical mixing (e.g., chlorine and acid) OR chemicals were mixed together or applied incorrectly (e.g. by staff members).*
- Maintenance chemicals not flushed from system before opening to swimmers- *For example, the pool was not closed to swimmers during maintenance or was reopened before maintenance steps were completed.*
- Low or zero water flow combined with continuous feed of chemicals resulted in excess chemicals in water
- Extensive slime/biofilm formation
- Recent construction
- Cyanurate level excessive
- Lack of draining/cleaning
- Stagnant water in spa piping was aerosolized

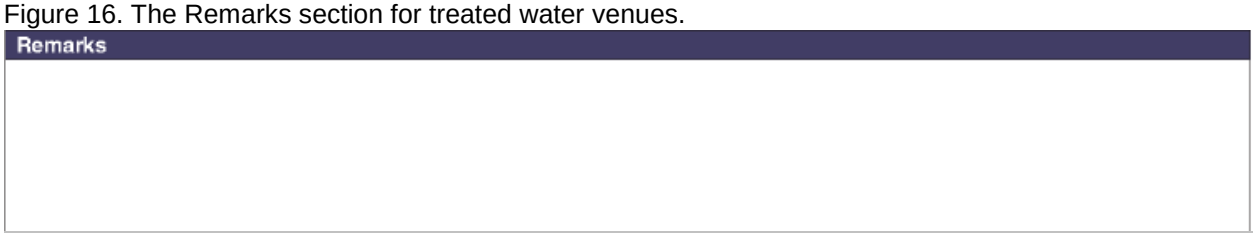
4) Policy and Management

- No aquatics operators on payroll who have received state/local certified training
- Untrained/inadequately trained staff on duty
- Unclear communication chain for reporting problems
- Inadequate water quality monitoring (e.g. inadequate test kit, inadequate testing frequency)
- Employee illness policies absent or not enforced
- Missing or poor chemical handling policies, practices, and training
- No operator on duty at the time of incident
- Facility falls outside aquatic health code
- No shock or hyperchlorination policy

5) Unknown or insufficient information to assign deficiencies

3.6 Remarks

Figure 16. The Remarks section for treated water venues.



Please comment on important elements or results of the outbreak investigation that were not captured by the questions in the electronic form.

4 REC WATER-UNTREATED

4.1 Recreational Water Vehicle Description

Figure 17. The Recreational Water Vehicle Description section for untreated water venues.

Rec Water-Untreated

Recreational Water – Untreated Venue

Recreational Water Vehicle Description

Water Type *(e.g., canal; lake; river/stream; ocean)*	IF SPRING OR HOT SPRING, Water Subtype *(select indoor, outdoor or unknown)*	Setting of Exposure *(e.g., beach- public; camp/cabin/recreational area)*

Recreational Water Vehicle Table

This table allows you to describe one or more untreated water venues that were associated with the outbreak. Refer to **Appendix H** for standard lists of values for the following fields.

- **Water Type**- Water Type refers to the most commonly reported types of untreated recreational water venues, such as a stream or lake. Note that some settings are combined, such as lake/reservoir/impoundment. Also note that some water types have been divided into multiple categories with standardized names. The water type is further detailed in the water subtype and setting of exposure columns.
- **IF SPRING OR HOT SPRING, Water Subtype**- This field will allow you to indicate whether the location of a spring or hot spring was indoors, outdoors or unknown.
- **Setting of Exposure**- This field allows you to select descriptors that explain where the exposure to water occurred (e.g. beach, park). Note first that some settings are combined, such as camp/cabin/recreational area.

4.2 Recreational Water Quality

Figure 18. The Recreational Water Quality section for untreated water venues.

Recreational Water Quality

Did the venue meet state or local recreational water quality regulations? ☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **No**, explain: _____

Did the venue meet Environmental Protection Agency (EPA) recreational water quality standards?

☐ Yes ☐ No ☐ Unknown ☐ Not applicable

If **No**, explain: _____

Did the venue meet state or local water quality regulations?- Respond using to the water quality regulations for the state or local jurisdiction where the water exposure that was associated with the outbreak occurred. If the outbreak involved residents of multiple states, the state with the implicated venue(s) should answer 'yes', 'no', 'unknown' or 'not applicable', and the other states should answer 'not applicable'.

- Answer 'yes' if the outbreak involved one or more venues (e.g.more than one lake) in one or more jurisdictions and the response would be 'yes' for all of the venues according to the regulations for the state where the exposure occurred.
- Answer 'no' if the outbreak involved one or more venues (e.g. more than one lake) in one or more jurisdictions and the response would be 'no' for even one of the venues according to the regulations for the state where the exposure occurred. Provide an explanation in the text box if 'no' is selected.
- Answer 'unknown' if the response would be 'unknown' for one or more venues where the exposure occurred.
- Answer 'not applicable' if none of the exposures occurred at venues in the reporting state or if state or local recreational water quality regulations were not applicable to the venue(s).

Did the venue meet the Environmental Protection Agency (EPA) recreational water quality standards?- Respond for the state or local jurisdiction where the water exposure that was associated with the outbreak occurred. If the outbreak involved residents of multiple states, the state with the implicated venue(s) should answer 'yes', 'no', 'unknown' or 'not applicable', and the other states should answer 'not applicable'.

- Answer 'yes' if the outbreak involved one or more venues (e.g. more than one lake) in one or more jurisidictions and the response would be 'yes' for all of the venues.
- Answer 'no' if the outbreak involved one or more venues (e.g. more than one lake) in one or more jurisdictions and the response would be 'no' for even one of the venues. Provide an explanation in the text box if 'no' is selected.
- Answer 'unknown' if the response would be 'unknown' for one or more venues where the exposure occurred.
- Answer 'not applicable' if none of the exposures occurred at venues in the reporting state or if EPA regulations were not applicable to the venue(s).

4.3 Laboratory Section - Recreational Water Samples from Untreated Venues

Figure 19. The beginning of the Recreational Water Laboratory section and the Water Quality Results table

Laboratory Section - Recreational Water Samples from Untreated Venues						
Was water from untreated recreational water venues tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown						
Results						
Sample		1	2	3	4	5
Source of Sample *(e.g., lake or stream)*						
Additional Description of Source of Sample *(e.g., specific location, time of day, etc)*						
Date *(mm/dd/yyyy)*						
Volume Tested	**Number**					
	Unit					
Temperature	**Number**					
	Unit					

This section collects information about water samples that were collected from the recreational venue. These data provide evidence regarding water quality, as well as the presence of specific pathogens in the water associated with the outbreak.

Was water from untreated recreational water venues tested?- Respond to this section to indicate whether or not water was tested.

Water Quality Results Table

- **Sample** - This number allows you to associate your water sample with results in the following Microbiology table.
- **Source of Sample**- Enter the source of the water sample.
- **Additional Description of Source of Sample**- Provide additional information that will help to explain the source of the sample. For example, one sample might be “lake- swim area” while another might be “lake- wading area”
- **Date**- This is the date that the sample was collected.
- **Volume Tested (Number, Unit)**- Complete this section if a specific amount of water was collected for testing.
- **Temperature (Number, Unit)-** Complete this section if a temperature was recorded for the water sample.

4.4 Water Quality Indicator

Figure 20. The Water Quality Indicator section for untreated water venues.

Water Quality Indicator			
Sample Number	**Type** *(e.g., fecal coliforms)*	**Concentration** *(number)*	**Unit** *(e.g., CFU)*

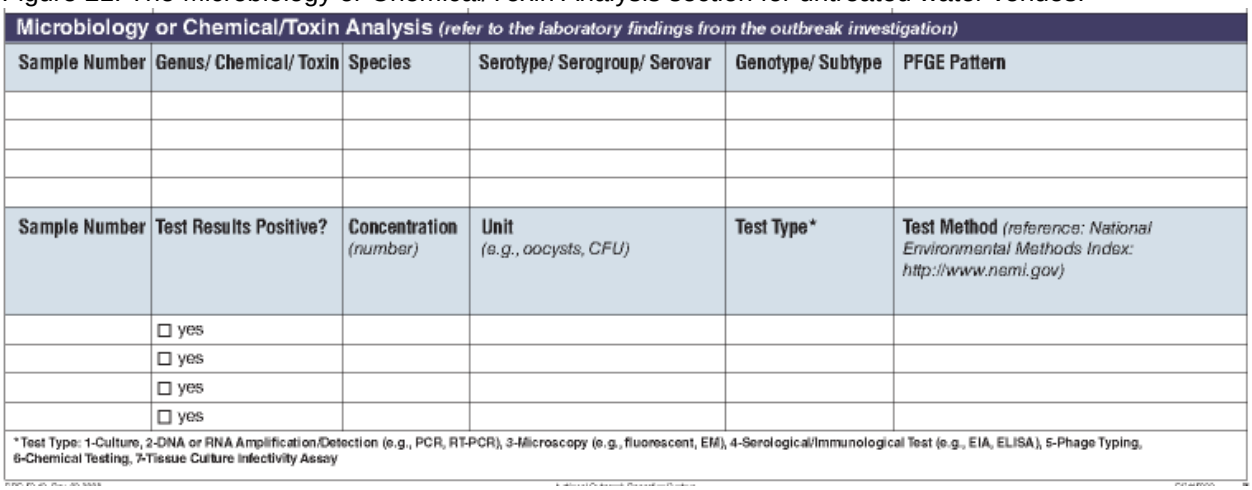
Water Quality Indicator Table

Water quality data may be helpful when an investigator is trying to determine the source of an outbreak. For example, if a laboratory did not find *Giardia* spp. in a water sample from an implicated lake, fecal coliform levels above EPA standards would provide environmental evidence to support the argument that the lake was the source of the outbreak.

- **Sample Number-** This field allows you to pick the sample number that corresponds with the appropriate sample from the Water Quality Results Table.
- **Type-** Select the type of water quality indicator for which the water was tested. If more than one water quality indicator was tested, enter a separate row for each line of data. Total coliforms and fecal coliforms are both examples of water quality indicators.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 250 colony forming units (CFU) of fecal coliforms were measured, the concentration would be 250.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L; mg/L, parts per million [ppm], CFU, most probable number [MPN]).

4.5 Microbiology or Chemical/Toxin Analysis

Figure 21. The Microbiology or Chemical/Toxin Analysis section for untreated water venues.



Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*

Sample Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype	PFGE Pattern

Sample Number	Test Results Positive?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Test Type*	Test Method *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				
	☐ yes				

*Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Microbiology or Chemical/Toxin Analysis Results Table

Refer to the laboratory report and final outbreak report for information. Please report positive findings and negative findings (if a test for a specific pathogen returned null findings). Some of the information may be absent from the report, depending on the testing that was performed (e.g., although a species may have been identified, it may not have been genotyped). If tests were performed to determine the species and/or subtype a particular microorganism from a water sample, please report the results for the total set of specimens, as well as the subset (e.g., If a sample tested positive for Cryptosporidium oocysts, enter the results, along with the concentration, if available. Then enter a separate row of data to report the species, if known.)

- **Sample Number-** Enter the sample number that corresponds with the appropriate sample from the Water Quality Results Table.
- **Genus/Chemical/Toxin-** This field provides the broadest description of the pathogen or agent for which the clinical specimen tested negative or positive. Enter this information based on the laboratory report data. Refer to the first column in **Appendix E**. If the appropriate genus, chemical or toxin is not on the list, please write it in the Genus/Chemical/Toxin field.
- **Species**- This field is for known species of each genus of bacteria, parasite or virus. Enter a new value if the species was identified but is missing from the pick list. Find the appropriate genus in **Appendix E** and refer to the second column for a list of known species. If the species is not on the list, please write it in the Species field. Note that there are 6 species categorizations for *Escherichia coli*: enteroaggregative, enterohemorrhagic, enterotoxigenic, enteropathogenic, enteroinvasive, and other. These categories provide information about the type and severity of the outbreak. The table on the next page summarizes the main categories (adapted from http://www.cdc.gov/foodborneoutbreaks/guide_fd.htm).
    - Not all laboratories are able to perform the analyses necessary to categorize *E. coli*. Most commonly, state laboratories will only provide information about enterohemorrhagic *E. coli* (e.g. *E. coli* O157:H7) versus all other types of *E. coli*. Please note that CDC may be able to provide these states with additional laboratory diagnostic testing of *E. coli*.

Table 3. Descriptions of the species categorizations for *Escherichia coli*.

***Escherichia coli* category**	**Laboratory Confirmation**
Enteroaggregative (EAEC)*	Isolation of organism of enteroaggregative serotype from a water sample. EAEC is defined by its pattern of adherence to HEp-2 cells in culture.
Enterohemorrhagic/Shiga-toxin-producing (*E. coli* O157:H7 and others)	Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from a water sample.
Enterotoxigenic (ETEC)	Isolation of organism of serotype, demonstrated to produce heat-stable (ST) and/or heat-labile (LT) enterotoxin, from a water sample.
Enteropathogenic (EPEC)	Isolation of organism of enteropathogenic serotype from a water sample
Enteroinvasive (EIEC)	Isolation of enteroinvasive serotype from a water sample.
Other	Other – may vary

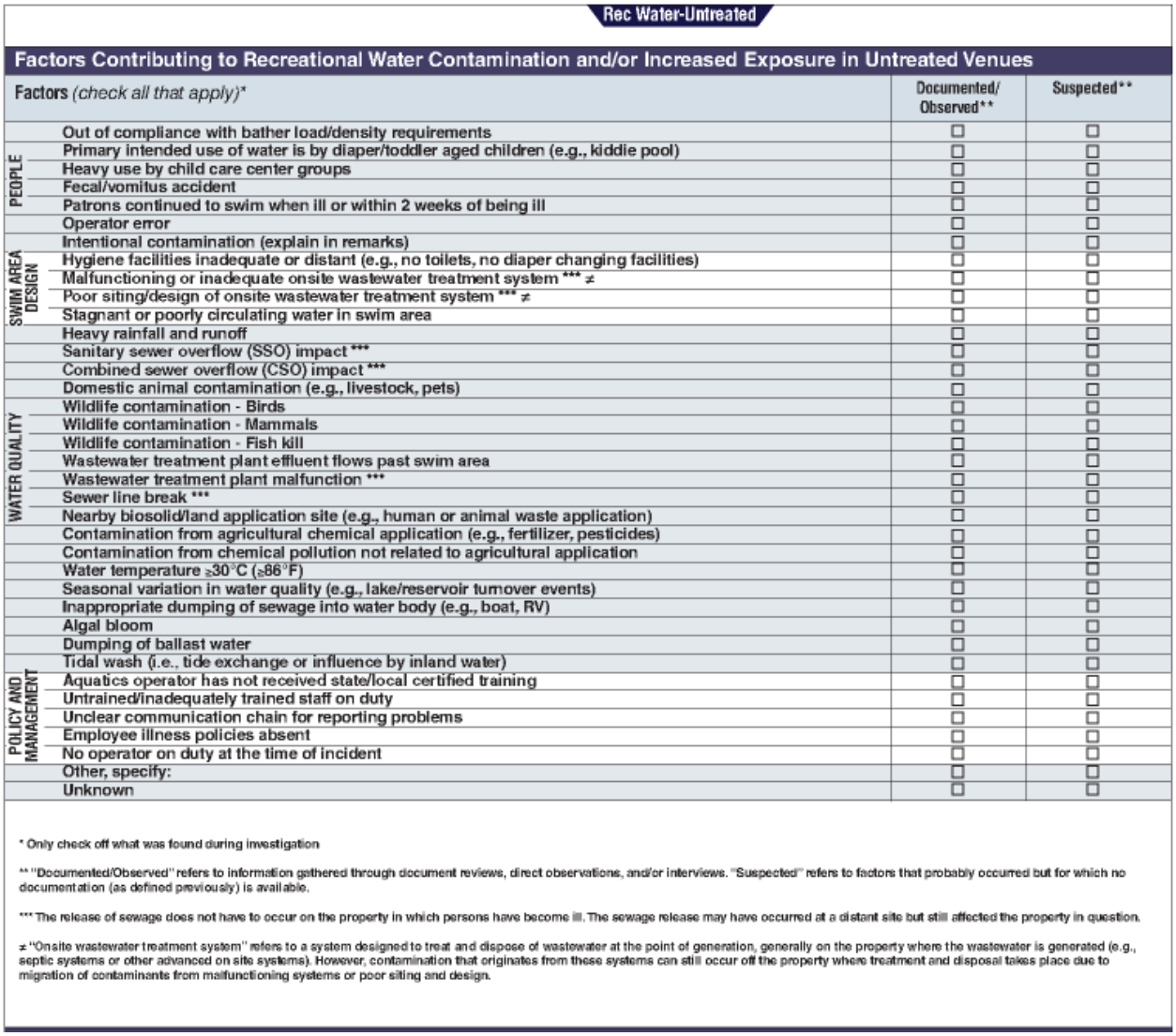
- **Serotype/Serogroup/Serovar-** A serotype, serogroup or serovar refers to a subtype that is determined by conducting molecular testing on surface antigens of the microorganism (e.g. *Legionella pneumophila* s1). This approach to subtyping is more common for bacteria, fungi and viruses than parasites. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching serotypes/serogroups/serovars from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water. Refer to **Appendix E** for the reference list of microorganisms, chemicals and toxins.
- **Genotype/Subtype-** The genotype/subtype refers to a subtype that is determined by conducting molecular testing to describe the genetic composition of the microorganism. These methods are primarily used for subtyping parasites such as *Cryptosporidium* spp. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching genotypes/subtypes from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **PFGE Pattern-** The PFGE pattern, or fingerprint, can be used to differentiate genetically similar pathogens. Matching PFGE patterns from water and biological samples are strong environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **Test Results Positive?-** A checkmark in this field indicates that the water sample tested positive for the pathogen or chemical/toxin.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 25 oocysts/L of *Cryptosporidium hominis* were measured, the concentration would be 25. There will typically be a concentration for initial tests that have positive results, however, there may not always be a concentration for more complex tests that provide species or subtyping results.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L, mg/L, parts per million [ppm], colony forming units [CFU], most probable number [MPN]). As with concentration, there may not always be a unit to enter into this field.

* Source: 9th Edition of the Manual of Clinical Microbiology, 2007, American Society for Microbiology, Washington, DC/editor in chief, PR Murray; editors EJ Baron, JH Jorgensen, ML Landry, and MA Pfaller.

- **Test Type-** This field describes the method of testing used to identify the microorganism. If multiple methods were used, select the method that provided the most detailed information (e.g., if a microorganism was found using microscopy and then genotyped using polymerase chain reaction (PCR), select 'DNA or RNA Amplification/Detection (e.g. PCR, RT-PCR)').
- **Test Method-** This field provides information about the water testing methods that were used on the sample. Many of the method numbers refer to standard testing procedures or approved EPA methods. Refer to the National Environmental Methods Index (NEMI) at http://www.nemi.gov to compare and contrast methods for either microbiological testing or chemical testing. Common method numbers for this field are listed in **Appendix F** and contain the following information: method source, official method number, and method summary description.

4.6 Factors Contributing to Recreational Water Contamination and/or Increased Exposure in Untreated Venues

Figure 22. The Contributing Factors section for untreated water venues.



Rec Water-Untreated

Factors Contributing to Recreational Water Contamination and/or Increased Exposure in Untreated Venues

	Factors *(check all that apply)**	Documented/ Observed**	Suspected**
PEOPLE	Out of compliance with bather load/density requirements	☐	☐
PEOPLE	Primary intended use of water is by diaper/toddler aged children (e.g., kiddie pool)	☐	☐
PEOPLE	Heavy use by child care center groups	☐	☐
PEOPLE	Fecal/vomitus accident	☐	☐
PEOPLE	Patrons continued to swim when ill or within 2 weeks of being ill	☐	☐
	Operator error	☐	☐
	Intentional contamination (explain in remarks)	☐	☐
SWIM AREA DESIGN	Hygiene facilities inadequate or distant (e.g., no toilets, no diaper changing facilities)	☐	☐
SWIM AREA DESIGN	Malfunctioning or inadequate onsite wastewater treatment system *** ≠	☐	☐
SWIM AREA DESIGN	Poor siting/design of onsite wastewater treatment system *** ≠	☐	☐
SWIM AREA DESIGN	Stagnant or poorly circulating water in swim area	☐	☐
	Heavy rainfall and runoff	☐	☐
	Sanitary sewer overflow (SSO) impact ***	☐	☐
	Combined sewer overflow (CSO) impact ***	☐	☐
	Domestic animal contamination (e.g., livestock, pets)	☐	☐
WATER QUALITY	Wildlife contamination - Birds	☐	☐
WATER QUALITY	Wildlife contamination - Mammals	☐	☐
WATER QUALITY	Wildlife contamination - Fish kill	☐	☐
WATER QUALITY	Wastewater treatment plant effluent flows past swim area	☐	☐
WATER QUALITY	Wastewater treatment plant malfunction ***	☐	☐
WATER QUALITY	Sewer line break ***	☐	☐
	Nearby biosolid/land application site (e.g., human or animal waste application)	☐	☐
	Contamination from agricultural chemical application (e.g., fertilizer, pesticides)	☐	☐
	Contamination from chemical pollution not related to agricultural application	☐	☐
	Water temperature ≥30°C (≥86°F)	☐	☐
	Seasonal variation in water quality (e.g., lake/reservoir turnover events)	☐	☐
	Inappropriate dumping of sewage into water body (e.g., boat, RV)	☐	☐
	Algal bloom	☐	☐
	Dumping of ballast water	☐	☐
	Tidal wash (i.e., tide exchange or influence by inland water)	☐	☐
POLICY AND MANAGEMENT	Aquatics operator has not received state/local certified training	☐	☐
POLICY AND MANAGEMENT	Untrained/inadequately trained staff on duty	☐	☐
POLICY AND MANAGEMENT	Unclear communication chain for reporting problems	☐	☐
POLICY AND MANAGEMENT	Employee illness policies absent	☐	☐
	No operator on duty at the time of incident	☐	☐
	Other, specify:	☐	☐
	Unknown	☐	☐

* Only check off what was found during investigation

** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.

*** The release of sewage does not have to occur on the property in which persons have become ill. The sewage release may have occurred at a distant site but still affected the property in question.

≠ "Onsite wastewater treatment system" refers to a system designed to treat and dispose of wastewater at the point of generation, generally on the property where the wastewater is generated (e.g., septic systems or other advanced on site systems). However, contamination that originates from these systems can still occur off the property where treatment and disposal takes place due to migration of contaminants from malfunctioning systems or poor siting and design.

Please select factors that were found during the investigation. Each contributing factor that is selected has two check boxes so that the user can indicate whether the factor was 'Documented/Observed' or 'Suspected.' 'Documented/Observed' refers to information gathered during document reviews, direct observations and/or interviews. 'Suspected' refers to factors that probably occurred but for which no documentation or observable evidence is available. Additional guidance for some of the factors is included below.

In a multi-venue outbreak (e.g. multiple swimming beaches), please select factors if they were documented/observed or suspected for at least one venue. Clarification can be provided in the remarks section.

1) People

- Out of compliance with bather load/density requirements
- Primary intended use of water is by diaper/toddler aged children (e.g., kiddie pool area)
- Heavy use by child care center groups
- Fecal/vomitus accident
- Patrons continued to swim when ill or within 2 weeks of being ill
- Operator error
- Intentional contamination (explain in remarks)- *Please add a comment in the Remarks section to explain the cause of the contamination*

2) Swim Area Design

- Hygiene facilities inadequate or distant (e.g. no toilets, no diaper changing facilities)
- Malfunctioning or inadequate onsite wastewater treatment***≠
- Poor siting/design of onsite wastewater treatment system***≠
- Stagnant or poorly circulating water in swim area

***The release of sewage does not have to occur on the property in which persons have been ill. The sewage release may have occurred at a distant site but still affected the property in question.

≠"Onsite wastewater treatment system" refers to a system designed to treat and dispose of wastewater at the point of generation, generally on the property where the wastewater is generated (e.g. septic systems or other advanced onsite systems). However, contamination that originates from these systems can still occur off the property where treatment and disposal takes place due to migration of contaminants from malfunctioning systems or poor siting and design.

3) Water Quality

- Heavy rainfall and runoff
- Sanitary sewer overflow (SSO) impact***- *An SSO is an unintentional discharge of raw sewage from a municipal sanitary sewer. Refer to the following EPA site for more information: http://cfpub.epa.gov/npdes/home.cfm?program_id=4)*
- Combined sewer overflow (CSO) impact***-*A combined sewer system collects several types of waste water in the same pipe. A CSO occurs when the volume of water exceeds the system or treatment facility's capacity and sewer water is discharged into natural water systems. Refer to the following EPA site for more information: (http://cfpub.epa.gov/npdes/home.cfm?program_id=5)*
- Domestic animal contamination (e.g., livestock, pets)
- Wildlife contamination - Birds
- Wildlife contamination - Mammals
- Wildlife contamination - Fish kill
- Wasterwater treatment plant effluent flows past swim area
- Wastewater treatment facility malfunction***
- Sewer line break***
- Nearby biosolid/land application site (e.g., human or animal waste application)
- Contamination from agricultural chemical application (e.g., fertilizer, pesticides)
- Contamination from chemical pollution not related to agricultural application
- Water temperatures ≥ 30^0C (≥ 86°F)

- Seasonal variation in water quality (e.g. lake/reservoir turnover events)
- Inappropriate dumping of sewage into water body (e.g. boat, RV)
- Algal bloom
- Dumping of ballast water
- Tidal wash (i.e., tide exchange or influence by inland water)

***The release of sewage does not have to occur on the property in which persons have been ill. The sewage release may have occurred at a distant site but still affected the property in question.

4) Policy and Management

- Aquatics operator has not received state/local certified training
- Untrained/inadequately trained staff on duty
- Unclear communication chain for reporting problems
- Employee illness policies absent or not enforced
- No operator on duty at the time of incident

5) Unknown or insufficient information to assign deficiencies

4.7 Remarks

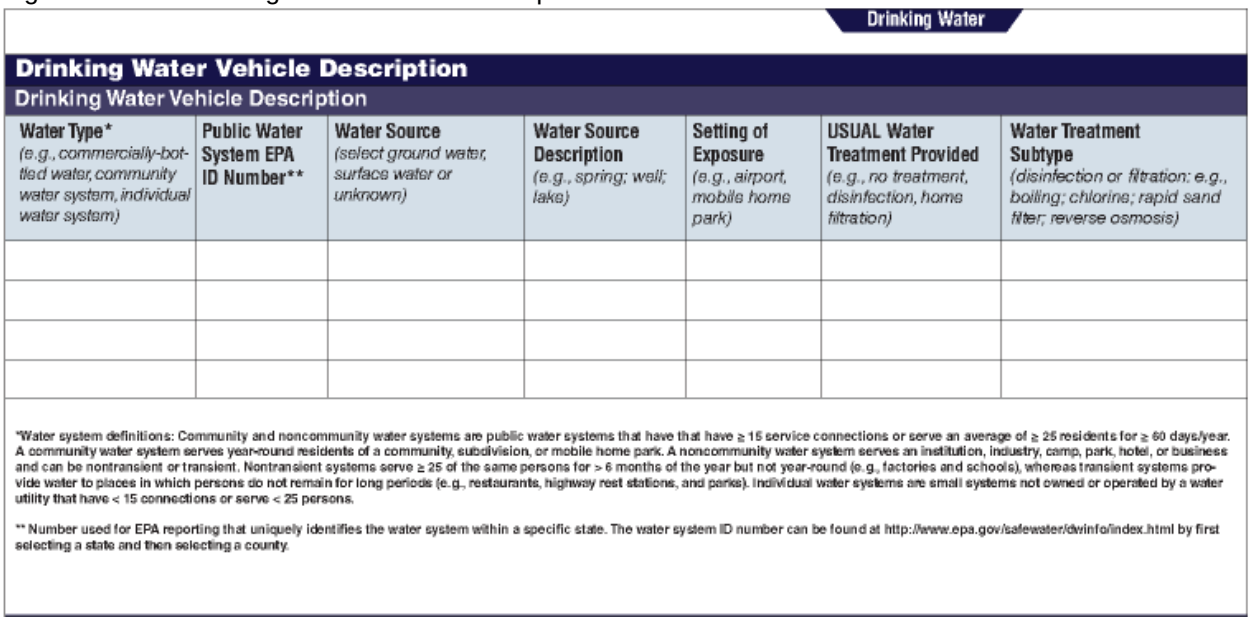
Figure 23. The Remarks section for untreated water venues.

Please comment on important elements or results of the outbreak investigation that were not captured by the questions in the electronic form.

5 DRINKING WATER

5.1 Drinking Water Vehicle Description

Figure 24. The Drinking Water Vehicle Description section.



Drinking Water

Drinking Water Vehicle Description

Drinking Water Vehicle Description

Water Type* *(e.g., commercially-bottled water, community water system, individual water system)*	Public Water System EPA ID Number**	Water Source *(select ground water, surface water or unknown)*	Water Source Description *(e.g., spring; well; lake)*	Setting of Exposure *(e.g., airport, mobile home park)*	USUAL Water Treatment Provided *(e.g., no treatment, disinfection, home filtration)*	Water Treatment Subtype *(disinfection or filtration; e.g., boiling; chlorine; rapid sand filter; reverse osmosis)*

*Water system definitions: Community and noncommunity water systems are public water systems that have that have ≥ 15 service connections or serve an average of ≥ 25 residents for ≥ 60 days/year. A community water system serves year-round residents of a community, subdivision, or mobile home park. A noncommunity water system serves an institution, industry, camp, park, hotel, or business and can be nontransient or transient. Nontransient systems serve ≥ 25 of the same persons for > 6 months of the year but not year-round (e.g., factories and schools), whereas transient systems provide water to places in which persons do not remain for long periods (e.g., restaurants, highway rest stations, and parks). Individual water systems are small systems not owned or operated by a water utility that have < 15 connections or serve < 25 persons.

** Number used for EPA reporting that uniquely identifies the water system within a specific state. The water system ID number can be found at http://www.epa.gov/safewater/dwinfo/index.html by first selecting a state and then selecting a county.

Drinking Water Vehicle Table

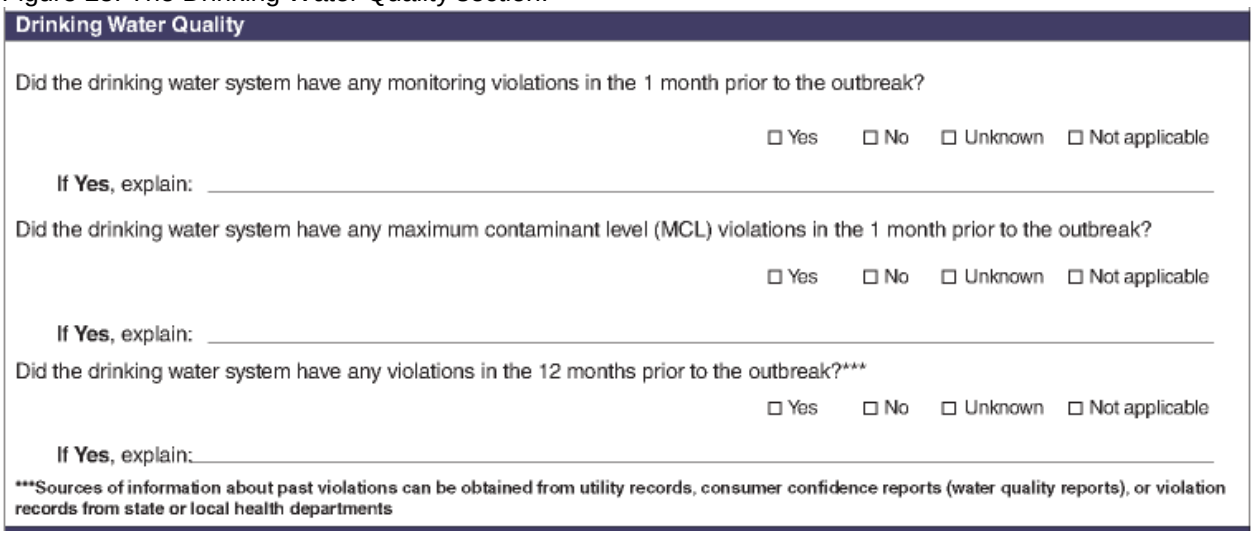
This table allows you to describe one or more drinking water systems that were associated with the outbreak. Refer to **Appendix I** for standard lists of values for the following fields.

- **Water Type**- The water type is further detailed in the remaining columns of the table. The following definitions may be used to differentiate among community, noncommunity and individual systems:
    - Community water system**:** A public water system that has ≥ 15 service connections used by year-round residents or regularly serves ≥ 25 year-round residents. A community water system might be owned by a private or public entity providing water to a community, subdivision, or mobile home park.
    - Nontransient Noncommunity Water System**:** A public water system that is not a community system. A nontransient noncommunity water system has ≥ 15 service connections or serves ≥ 25 of the same persons for >6 months/year (e.g. a factory or school) but does not serve year-round residents.
    - Transient Noncommunity Water System**:** A public water system that is not a community system. A transient noncommunity water system has ≥ 15 service connections or serves an average of ≥ 25 people for ≥ 60 days/year where persons do not remain for long periods of time (e.g. restaurants, highway rest stations, and parks).
    - Individual/Private Water System (also known as Non-Public Water System)**:** A water system that does not meet the Environmental Protection Agency's (EPA) definition for a public water system. An individual/private water system is not owned or operated by a water utility. It has < 15 service connections or serves < 25 people.

- **Public Water System EPA ID Number**- This is the number used for EPA reporting that uniquely identifies the water system within a specific state. The water system ID number can be found at http://www.epa.gov/safewater/dwinfo/index.html by first selecting a state and then selecting a county.
- **Water Source**- Enter whether or not the water was groundwater (well or spring water), surface water, or unknown.
- **Water Source Description**- Enter the correct type of water source description. Note that some water source descriptions are combined, such as Lake/Reservoir/Impoundment.
- **Setting of Exposure**- Enter descriptors that explain where the exposure to water occurred (e.g. Hospital/Health Care Facility, Indoor Place of Work/Office) Note that some settings are combined, such as Hotel/Motel/Lodge/Inn.
- **USUAL Water Treatment Provided-** Complete this section to provide more information about the type of water treatment usually provided before water use or water consumption. Treatment can occur at any point in the distribution system. If filtration usually occurred, specify whether it was done at the treatment plant or at home/point-of-use. Enter information about the usual water treatments, regardless of whether or not these treatments were operating correctly at or just prior to the time of the outbreak.
- **Water Treatment Subtype-** Complete this section to provide more information about the disinfection or filtration method used to treat the water.

5.2 Drinking Water Quality

Figure 25. The Drinking Water Quality section.



Sources of information about past violations can be obtained from utility records, consumer confidence reports (water quality reports), or violation records from state or local health departments.

- If one or more drinking water systems was involved in the outbreak (e.g. a community water system and an individual/private water system), respond 'yes' if at least one drinking water system had a past violation of the type and time period specified in the question. Provide an explanation in the text box if 'yes' is selected.
- If there were no known violations but information is not available for one (or more) drinking water system(s), respond 'unknown.'

5.3 Laboratory Section - Drinking Water

Figure 26. The beginning of the Laboratory section and the Water Quality Results table.

Laboratory Section - Drinking Water						
Was drinking water tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown						
Results						
Sample		1	2	3	4	5
Source of Sample						
Additional Description of Source of Sample *(e.g., kitchen faucet, well, reservoir)*						
Date *(mm/dd/yyyy)*						
Volume Tested	**Number**					
	Unit					
Temperature	**Number**					
	Unit					
Residual/Free Disinfectant Level *(if total and combined disinfectant levels given, total - combined = free)*	**Number**					
	Unit					
pH						
Turbidity (NTU)						

This section collects information about drinking water samples. These data provide evidence regarding water quality, as well as the presence of specific pathogens in the water associated with the outbreak.

Was drinking water tested?- Respond to this section to indicate whether or not water was tested.

Water Quality Results Table

- **Sample**- This number allows you to associate your water sample with results in the following Microbiology table.
- **Source of Sample**- Enter the source of the water sample.
- **Additional Description of Source of Sample**- Provide additional information that will help to explain the source of the sample. For example, one sample might be “tap” while another might be “reservoir”
- **Date**- This is the date that the sample was collected.
- **Volume Tested (Number, Unit)**- Complete this section if a specific amount of water was collected for testing.
- **Temperature (Number, Unit)-** Complete this section if a temperature was recorded for the water sample.
- **Residual/Free Disinfectant Level (Number, Unit)-** Complete this section if a residual or free disinfectant level was recorded for the water sample. This field refers to the level of disinfectant that has not reacted with other compounds in the water and is still available to effectively inactivate microorganisms in the water. If only the total disinfectant level and the combined disinfectant level are known: (Residual or Free)=Total-Combined.
- **pH-** Complete this field if a pH level was recorded for the water sample.
- **Turbidity (NTU)-** Complete this field if turbidity was measured for the water sample. Turbidity describes the amount of suspended matter in the sample.

5.4 Water Quality Indicator

Figure 27. The Water Quality Indicator section for drinking water.

Drinking Water

Water Quality Indicator			
Sample Number	**Type** *(e.g., fecal coliforms)*	**Concentration** *(number)*	**Unit** *(e.g., CFU)*

Water Quality Indicator Table

Water quality data may be helpful when an investigator is trying to determine the source of an outbreak. For example, if *Campylobacter jejuni* was present in clinical specimens from an outbreak that was epidemiologically linked to a particular well but no *Campylobacter* spp. were found in well water samples, positive findings for fecal coliforms would provide environmental evidence to support the argument that the well was the source of the outbreak.

- **Sample Number-** Enter the sample number that corresponds to the appropriate sample from the Water Quality Results Table.
- **Type-** Enter the type of water quality indicator for which the water was tested. If more than one water quality indicator was tested, enter a separate row for each line of data. Total coliforms and fecal coliforms are both examples of water quality indicators.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 250 colony forming units (CFU) of fecal coliforms were measured, the concentration would be 250.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L; mg/L, parts per million [ppm], CFU, most probable number [MPN]).

5.5 Microbiology or Chemical/Toxin Analysis

Figure 28. The Microbiology or Chemical/Toxin Analysis section for drinking water.

Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*					
Sample Number	**Genus/ Chemical/ Toxin**	**Species**	**Serotype/ Serogroup/ Serovar**	**Genotype/ Subtype**	**PFGE Pattern**
Sample Number	**Test Results Positive?**	**Concentration** *(number)*	**Unit** *(e.g., oocysts, CFU)*	**Test Type***	**Test Method** *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				

* Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Microbiology or Chemical/Toxin Analysis Results Table

Refer to the laboratory report and final outbreak report for information. Please report positive findings and negative findings (if a test for a specific pathogen returned null findings). Some of the information may be absent from the report, depending on the testing that was performed (e.g., although a species may have been identified, it may not have been genotyped). If tests were performed to determine the species and/or subtype a particular microorganism from a water sample, please report the results for the total set of specimens, as well as the subset (e.g., If a sample tested positive for *Cryptosporidium* oocysts, enter the results, along with the concentration, if available. Then enter a separate row of data to report the species, if known.)

- **Sample Number-** This field allows you to pick the sample number that corresponds with the appropriate sample from the Water Quality Results Table.
- **Genus/Chemical/Toxin-** This field provides the broadest description of the pathogen or agent for which the clinical specimen tested negative or positive. Enter this information based on the laboratory report data. Refer to the first column in **Appendix E**. If the appropriate genus, chemical or toxin is not on the list, please write it in the Genus/Chemical/Toxin field.
- **Species**- This field is for known species of each genus of bacteria, parasite or virus. Enter a new value if the species was identified but is missing from the pick list. Find the appropriate genus in **Appendix E** and refer to the second column for a list of known species. If the species is not on the list, please write it in the Species field. Note that there are 6 species categorizations for *Escherichia coli*: enteroaggregative, enterohemorrhagic, enterotoxigenic, enteropathogenic, enteroinvasive, and other. These categories provide information about the type and severity of the outbreak. The table below summarizes the main categories (adapted from http://www.cdc.gov/foodborneoutbreaks/guide_fd.htm).
    - Not all laboratories are able to perform the analyses necessary to categorize E. coli. Most commonly, state laboratories will only provide information about enterohemorrhagic E. coli (e.g. *E. coli* O157:H7) versus all other types of *E. coli*. Please note that CDC may be able to provide these states with additional laboratory diagnostic testing of *E. coli*.

Table 4. Descriptions of the species categorizations for *Escherichia coli*.

***Escherichia coli* category**	**Laboratory Confirmation**
Enteroaggregative (EAEC)*	Isolation of organism of enteroaggregative serotype from a water sample. EAEC is defined by its pattern of adherence to HEp-2 cells in culture.
Enterohemorrhagic/Shiga-toxin-producing (*E. coli* O157:H7 and others)	Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from a water sample.
Enterotoxigenic (ETEC)	Isolation of organism of serotype, demonstrated to produce heat-stable (ST) and/or heat-labile (LT) enterotoxin, from a water sample.
Enteropathogenic (EPEC)	Isolation of organism of enteropathogenic serotype from a water sample
Enteroinvasive (EIEC)	Isolation of enteroinvasive serotype from a water sample.
Other	Other – may vary

* Source: 9th Edition of the Manual of Clinical Microbiology, 2007, American Society for Microbiology, Washington, DC/editor in chief, PR Murray; editors EJ Baron, JH Jorgensen, ML Landry, and MA Pfaller.

- **Serotype/Serogroup/Serovar-** A serotype, serogroup or serovar refers to a subtype that is determined by conducting molecular testing on surface antigens of the microorganism (e.g. *Legionella pneumophila* s1). This approach to subtyping is more common for bacteria, fungi and viruses than parasites. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching serotypes/serogroups/serovars from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water. Refer to **Appendix E** for the reference list of microorganisms, chemicals and toxins.
- **Genotype/Subtype-** The genotype/subtype refers to a subtype that is determined by conducting molecular testing to describe the genetic composition of the microorganism. These methods are primarily used for subtyping parasites such as *Cryptosporidium* spp. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching genotypes/subtypes from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **PFGE Pattern-** The PFGE pattern, or fingerprint, can be used to differentiate genetically similar pathogens. Matching PFGE patterns from water and biological samples are strong environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **Test Results Positive?-** A checkmark in this field indicates that the water sample tested positive for the pathogen or chemical/toxin.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 1 oocyst/L of *Cryptosporidium hominis* were measured, the concentration would be 1. There will typically be a concentration for initial tests that have positive results, however, there may not always be a concentration for more complex tests that provide species or subtyping results.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L, mg/L, parts per million [ppm], colony forming units [CFU], most probable number [MPN]). As with concentration, there may not always be a unit to enter into this field.
- **Test Type-** This field describes the method of testing used to identify the microorganism. If multiple methods were used, select the method that provided the most detailed information (e.g., if a microorganism was found using microscopy and then genotyped using polymerase chain reaction (PCR), select 'DNA or RNA Amplification/Detection (e.g. PCR, RT-PCR)').
- **Test Method-** This field provides information about the water testing methods that were used on the sample. Many of the method numbers refer to standard testing procedures or approved EPA methods. Refer to the National Environmental Methods Index (NEMI) at http://www.nemi.gov to compare and contrast methods for either microbiological testing or chemical testing. Common method numbers for this field are listed in **Appendix F** and contain the following information: method source, official method number, and method summary description.

5.6 Factors Contributing to Drinking Water Contamination and/or Increased Exposure to Contaminated Drinking Water

Please select factors that were found during the investigation. Each contributing factor that is selected has two check boxes so that the user can indicate whether the factor was 'Documented/Observed' or 'Suspected.' 'Documented/Observed' refers to information gathered during document reviews, direct observations and/or interviews. 'Suspected' refers to factors that probably occurred but for which no documentation or observable evidence is available. Please check only one box for each contributing factor. Additional guidance for some of the factors is included below.

In a multi-system outbreak (e.g. both a nontransient noncommunity and an individual system were involved), please select a factor if it was documented/observed or suspected for at least one venue. Clarification can be provided in the remarks section.

1. ***Did a problem with the source water (i.e. ground or surface water) contribute to the disease or outbreak?*** Answer yes if a factor was either 'Documented/Observed' or 'Suspected.' Select the appropriate factor(s) or add the factor to the list.

Figure 29. The Contributing Factors section regarding source water for drinking water.

Factors Contributing to Drinking Water Contamination and/or Increased Exposure to Contaminated Drinking Water

Did a problem with the source water (i.e., ground water or surface water) contribute to the disease or outbreak?
☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Source Water Factors *(check all that apply)***	Documented/ Observed***	Suspected***
Sanitary sewer overflow (SSO) ****	☐	☐
Combined sewer overflow (CSO) ****	☐	☐
Malfunctioning on-site wastewater treatment system **** ≠	☐	☐
Sewage treatment plant malfunction ***	☐	☐
Sewer line break ***	☐	☐
Poor siting/design of on site wastewater treatment system **** ≠	☐	☐
Nearby biosolid/land application site (e.g., human or animal waste application)	☐	☐
Contamination from agricultural chemical application (e.g., fertilizer, pesticides)	☐	☐
Contamination from chemical pollution not related to agricultural application	☐	☐
Contamination by a chemical that the current treatment methods were not designed to remove	☐	☐
Domestic animal contamination (e.g., livestock, concentrated feeding operations, pets)	☐	☐
Wildlife contamination - Birds	☐	☐
Wildlife contamination - Mammals	☐	☐
Wildlife contamination - Fish kill	☐	☐
Flooding/heavy rains	☐	☐
Algal bloom	☐	☐
Seasonal variation in water quality (e.g., lake/reservoir turnover events, resort community with seasonal loading)	☐	☐
Low water table (e.g., drought, over-pumping)	☐	☐
Ground water under direct influence of surface water (e.g., shallow well)≠ ≠	☐	☐
Contamination through limestone or fissured rock (e.g., karst)	☐	☐
Contaminated recharge water	☐	☐
Use of an alternate source of water by a water utility	☐	☐
Mixing of raw water from different sources	☐	☐
Improper construction or location of a well or spring	☐	☐
Water system intake failure (e.g., cracked well casing, cracked intake pipe)	☐	☐
Intentional contamination (explain in remarks)	☐	☐
Other, specify:	☐	☐
Unknown		

** Only check off what was found during investigation

*** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.

**** The release of sewage does not have to occur on the property in which persons have become ill. The sewage release may have occurred at a distant site but still affected the property in question.

≠ "On site wastewater treatment system" refers to a system designed to treat and dispose of wastewater at the point of generation, generally on the property where the wastewater is generated (e.g., septic systems or other advanced on site systems). However, contamination that originates from these systems can still occur off the property where treatment and disposal takes place du to migration of contaminants from malfunctioning systems or poor siting and design.

≠ ≠ Any water beneath the surface of the ground with substantial occurrence of insects or other macroorganisms, algae, or large-diameter pathogens (e.g., *Giardia intestinalis* or *Cryptosporidium*), or substantial and relatively rapid shifts in water characteristics (e.g., turbidity, temperature, conductivity, or pH) that closely correlate with climatologic or surface water conditions. Direct influence must be determined for individual sources in accordance with criteria established by the state.

- Sanitary sewer overflow (SSO)***- *An SSO is an unintentional discharge of raw sewage from a municipal sanitary sewer. Refer to the following EPA site for more information: http://cfpub.epa.gov/npdes/home.cfm?program_id=4)*
- Combined sewer overflow (CSO)***-*A combined sewer system collects several types of waste water in the same pipe. A CSO occurs when the volume of water exceeds the system or treatment facility's capacity and sewer water is discharged into natural water systems. Refer to the following EPA site for more information: (http://cfpub.epa.gov/npdes/home.cfm?program_id=5)*
- Malfunctioning onsite wastewater treatment system *** ≠
- Sewage treatment plant malfunction ***
- Sewer line break ***
- Poor siting/design of wastewater treatment system *** ≠
- Nearby biosolid/land application site (e.g. human or animal waster application)
- Contamination from agricultural chemical application (e.g., fertilizer, pesticides)
- Contamination from chemical pollution not related to agricultural application

- Contamination by a chemical that the current treatment methods were not designed to remove
- Domestic animal contamination (e.g., livestock, concentrated feeding operations, pets)
- Wildlife contamination – Birds
- Wildlife contamination – Mammals
- Wildlife contamination – Fish Kill
- Flooding/heavy rains
- Algal bloom
- Seasonal variation in water quality (e.g., lake/reservoir turnover events, resort community with seasonal loading)
- Low water table (e.g., drought, over-pumping)
- Ground water under direct influence of surface water (e.g. shallow well)≠≠
- Contamination through limestone or fissured rock (e.g., karst)
- Contaminated recharge water *(e.g. a groundwater supply replenished with contaminated surface water, which includes rain, that reached it by traveling through the soil. http://www.epa.gov/OCEPAterms/rterms.html)*
- Use of an alternate source of water by a water utility
- Mixing of raw water from different sources- *raw water is water that has not undergone treatment for microorganisms and metal/chemical contaminants.*
- Improper construction or location of a well or spring
- Water system intake failure (e.g., cracked well casing, cracked intake pipe)
- Intentional Contamination (explain in remarks)- *Please add a comment in the Remarks section to explain the cause of the contamination*
- Unknown

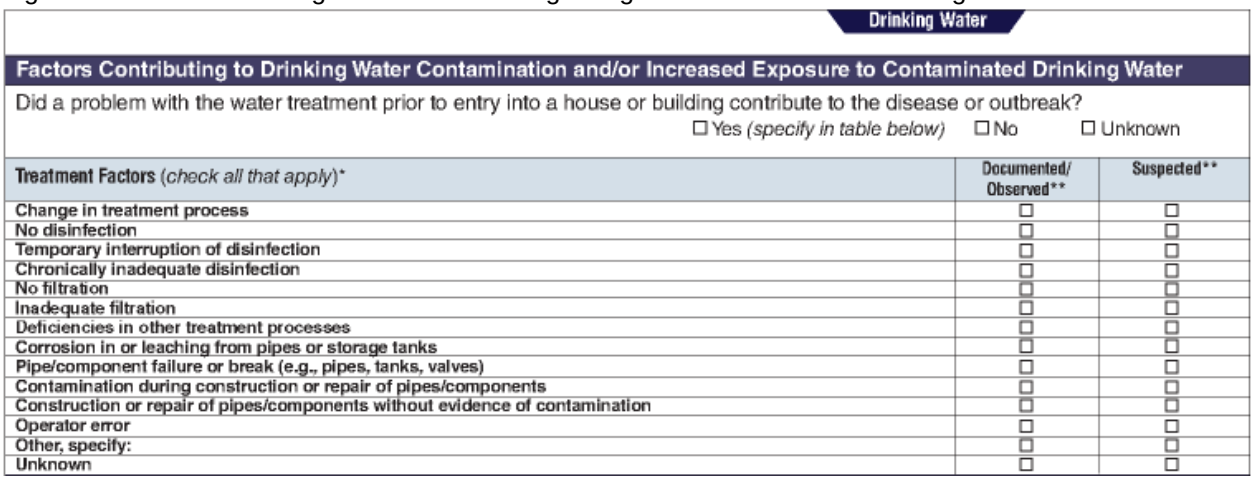
***The release of sewage does not have to occur on the property in which persons have been ill. The sewage release may have occurred at a distant site but still affected the property in question.

≠"Onsite wastewater treatment system" refers to a system designed to treat and dispose of wastewater at the point of generation, generally on the property where the wastewater is generated (e.g. septic systems or other advanced onsite systems). However, contamination that originates from these systems can still occur off the property where treatment and disposal takes place due to migration of contaminants from malfunctioning systems or poor siting and design.

≠≠ Any water beneath the surface of the ground with substantial occurrence of insects or other macroorganisms, algae, or large-diameter pathogens (e.g. *Giardia intestinalis* or *Cryptosporidium*), or substantial and relatively rapid shifts in water characteristics (e.g. turbidity, temperature, conductivity, or pH) that closely correlate with climatologic or surface water conditions. Direct influence must be determined for individual sources in accordance with criteria established by the state.

2. ***Did a problem with the water treatment prior to entry into a house or building contribute to the disease or outbreak?*** Answer yes if a factor was either 'Documented/Observed' or 'Suspected.' Select the appropriate factor(s) below or add the factor to the list.

Figure 30. The Contributing Factors section regarding water treatment for drinking water.



Drinking Water

Factors Contributing to Drinking Water Contamination and/or Increased Exposure to Contaminated Drinking Water

Did a problem with the water treatment prior to entry into a house or building contribute to the disease or outbreak?
☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Treatment Factors *(check all that apply)**	Documented/ Observed**	Suspected**
Change in treatment process	☐	☐
No disinfection	☐	☐
Temporary interruption of disinfection	☐	☐
Chronically inadequate disinfection	☐	☐
No filtration	☐	☐
Inadequate filtration	☐	☐
Deficiencies in other treatment processes	☐	☐
Corrosion in or leaching from pipes or storage tanks	☐	☐
Pipe/component failure or break (e.g., pipes, tanks, valves)	☐	☐
Contamination during construction or repair of pipes/components	☐	☐
Construction or repair of pipes/components without evidence of contamination	☐	☐
Operator error	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

- Change in treatment process
- No disinfection
- Temporary interruption of disinfection
- Chronically inadequate disinfection
- No filtration
- Inadequate filtration
- Deficiencies in other treatment processes
- Corrosion in or leaching from pipes or storage tanks
- Pipe/component failure or break (e.g., pipes, tanks, valves)
- Contamination during construction or repair of pipes/components
- Construction or repair of pipes/components without evidence of contamination
- Operator error
- Unknown

3. *Did a problem with the distribution system contribute to the disease or outbreak?* Answer yes if a factor was either 'Documented/Observed' or 'Suspected.' Select the appropriate factor(s) below or add the factor to the list.

For a **community** system, the distribution system refers to the pipes and storage intrastructure under the jurisdiction of the water utility prior to the water meter (or property line if the system is not metered). For **noncommunity and nonpublic water systems**, the distribution system refers to the pipes and storage infrastructure prior to entry into a building or house.

Figure 31. The Contributing Factors section regarding the distribution system for drinking water.

Did a problem with the distribution system contribute to the disease or outbreak? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

(NOTE: For a community water system, the distribution system refers to the pipes and storage infrastructure under the jurisdiction of the water utility prior to the water meter (or property line if the system is not metered). For noncommunity and nonpublic water systems, the distribution system refers to the pipes and storage infrastructure prior to entry into a building or house)

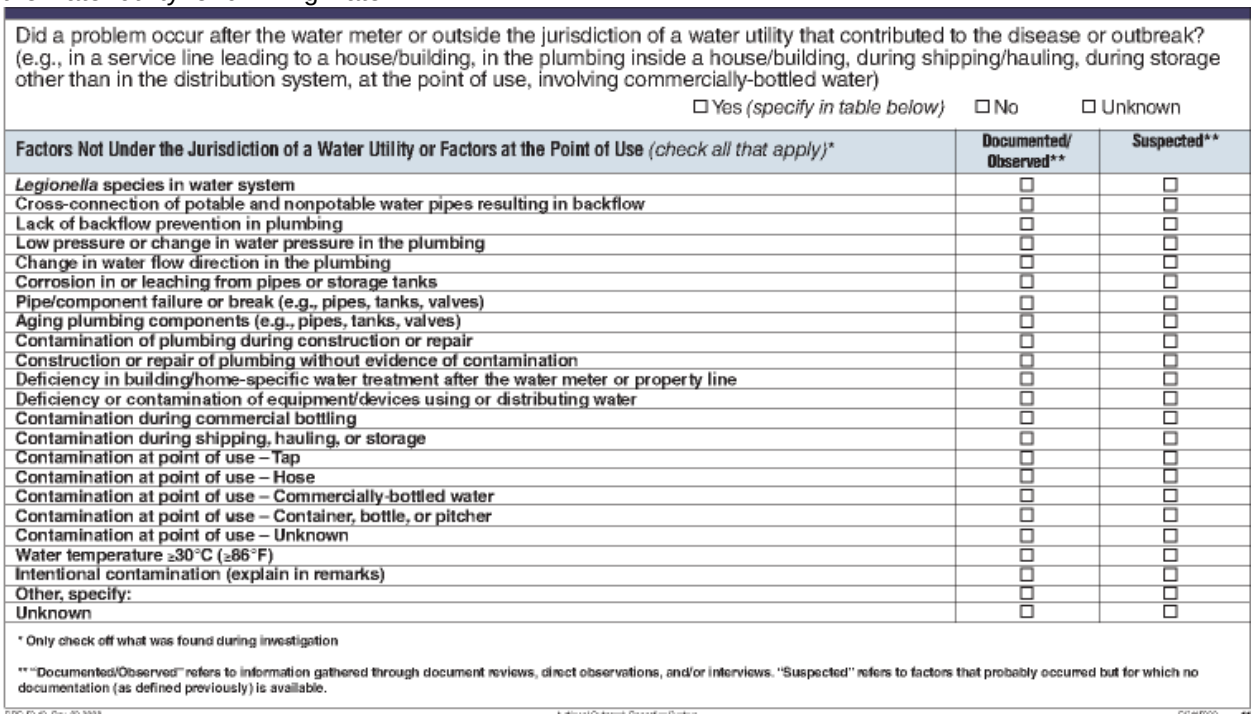
Distribution and Storage Factors *(check all that apply)**	**Documented/ Observed****	**Suspected****
Cross-connection of potable and nonpotable water pipes resulting in backflow	☐	☐
Low pressure or change in water pressure in the distribution system	☐	☐
Change in water flow direction in the distribution system	☐	☐
Mixing of treated water from different sources	☐	☐
Pipe/component failure or break (e.g., pipes, tanks, valves)	☐	☐
Corrosion in or leaching from pipes or storage tanks	☐	☐
Contamination of mains during construction or repair	☐	☐
Construction or repair of mains without evidence of contamination	☐	☐
Scheduled flushing of the distribution system	☐	☐
Contamination of storage facility	☐	☐
Aging water distribution components (e.g., pipes, tanks, valves)	☐	☐
Water temperature ≥30°C (≥86°F)	☐	☐
Intentional contamination (explain in remarks)	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

- Cross-connection of potable and nonpotable water pipes resulting in backflow *(e.g., non-potable water enters the potable water supply at the point of cross-connection)*
- Low pressure or change in water pressure in the distribution system
- Change in water flow direction in the distribution system
- Mixing of treated water from different sources
- Pipe/Component failure or break (e.g., pipes,tanks,valves)
- Corrosion in or leaching from pipes or storage tanks
- Contamination of mains during construction or repair *(e.g., a water main)*
- Construction or repair of mains without evidence of contamination *(e.g., a water main)*
- Scheduled flushing of the distribution system
- Contamination of storage facility
- Aging water distribution components (e.g., pipes, tanks, valves)
- Water Temperature ≥ 30°C (≥ 86°F)
- Intentional contamination (explain in remarks)- *Please add a comment in the Remarks section to explain the cause of the contamination.*
- Unknown

4. *Did a problem occur after the water meter or outside the jurisdiction of a water utility that contributed to the disease or outbreak?* Answer yes if a factor was either 'Documented/Observed' or 'Suspected.' Select the appropriate factor(s) below or add the factor to the list.

The following are examples that would fall into this category: a problem in a service line leading to a house/building; a problem in the plumbing inside a house/building; a problem during shipping/hauling; a problem during storage other than in the distribution system; a problem at the point of use; a problem involving commercially bottled water.

Figure 32. The Contributing Factors section regarding water after the water meter or outside the jurisdiction of the water utility for drinking water.



Did a problem occur after the water meter or outside the jurisdiction of a water utility that contributed to the disease or outbreak? (e.g., in a service line leading to a house/building, in the plumbing inside a house/building, during shipping/hauling, during storage other than in the distribution system, at the point of use, involving commercially-bottled water)

☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Factors Not Under the Jurisdiction of a Water Utility or Factors at the Point of Use *(check all that apply)**	Documented/ Observed**	Suspected**
Legionella species in water system	☐	☐
Cross-connection of potable and nonpotable water pipes resulting in backflow	☐	☐
Lack of backflow prevention in plumbing	☐	☐
Low pressure or change in water pressure in the plumbing	☐	☐
Change in water flow direction in the plumbing	☐	☐
Corrosion in or leaching from pipes or storage tanks	☐	☐
Pipe/component failure or break (e.g., pipes, tanks, valves)	☐	☐
Aging plumbing components (e.g., pipes, tanks, valves)	☐	☐
Contamination of plumbing during construction or repair	☐	☐
Construction or repair of plumbing without evidence of contamination	☐	☐
Deficiency in building/home-specific water treatment after the water meter or property line	☐	☐
Deficiency or contamination of equipment/devices using or distributing water	☐	☐
Contamination during commercial bottling	☐	☐
Contamination during shipping, hauling, or storage	☐	☐
Contamination at point of use – Tap	☐	☐
Contamination at point of use – Hose	☐	☐
Contamination at point of use – Commercially-bottled water	☐	☐
Contamination at point of use – Container, bottle, or pitcher	☐	☐
Contamination at point of use – Unknown	☐	☐
Water temperature ≥30°C (≥86°F)	☐	☐
Intentional contamination (explain in remarks)	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

* Only check off what was found during investigation

** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.

- *Legionella* species in water system
- Cross-connection of potable and nonpotable water pipes resulting in backflow *(eg., non-potable water enters the potable water supply at the point of cross-connection)*
- Lack of backflow prevention in plumbing *(e.g., lack of a backflow prevention device)*
- Low pressure or change in water pressure in the plumbing
- Change in water flow direction in the plumbing
- Corrosion in or leaching from pipes or storage tanks
- Pipe/component failure or break (e.g., pipes, tanks, valves)
- Aging plumbing components (e.g., pipes, tanks, valves)
- Contamination of plumbing during construction or repair
- Construction or repair of plumbing without evidence of contamination
- Deficiency in building/home-specific water treatment after the water meter or property line
- Deficiency or contamination of equipment/devices using or distributing water *(e.g., drink machine, kidney dialysis machine)*
- Contamination during commercial bottling or making beverage or ice
- Contamination during shipping, hauling, or storage

- Contamination at point of use - Tap
- Contamination at point of use - Hose
- Contamination at point of use – Commercially-bottled water
- Contamination at point of use – Container, bottle, or pitcher
- Contamination at point of use – Unknown
- Water Temperature ≥ 30°C (≥ 86°F)
- Intentional Contamination (explain in remarks) *Please add a comment in the Remarks section to explain the cause of the contamination.*
- Unknown

5.7 Remarks

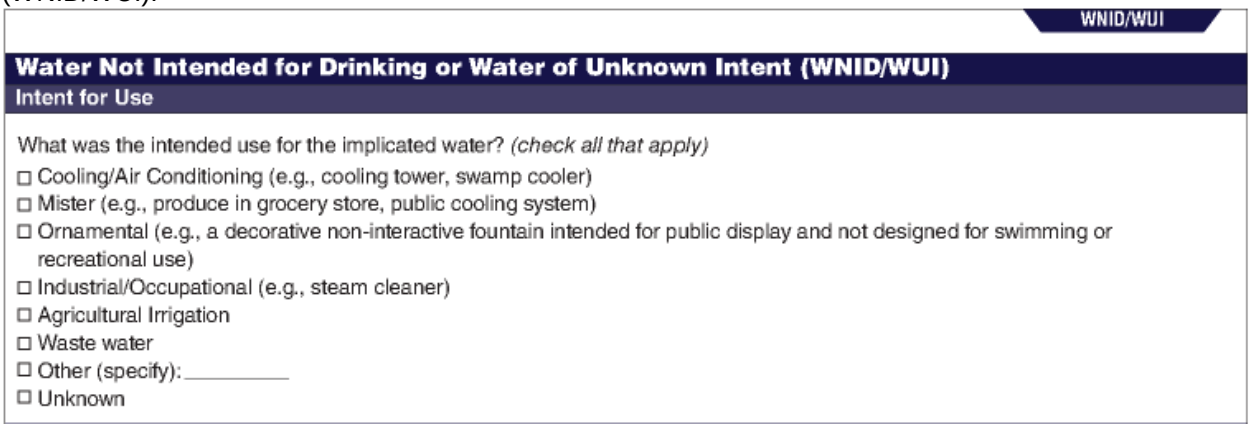
Figure 33. The Remarks section for drinking water.

Please comment on important elements or results of the outbreak investigation that were not captured by the questions in the electronic form.

6 WNID/WUI

6.1 Intent for Use

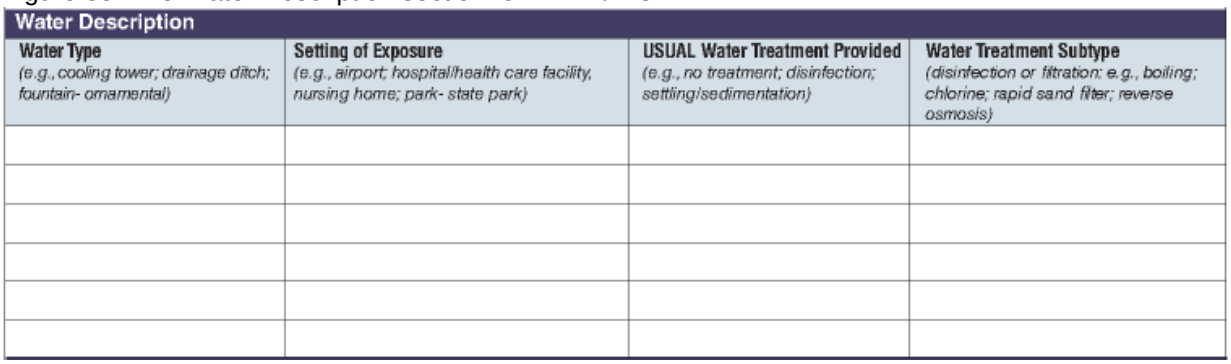
Figure 34. The Intent for Use section for water not intended for drinking or water of unknown intent (WNID/WUI).



What was the intended use for the implicated water?- Select an option from the list to describe the intended use of the water that led to the waterborne outbreak or illness, if known. Water that is not intended for drinking or recreational purposes often involves cooling processes/air conditioning, industrial processes, agricultural processes, waste water, occupational settings, and decorative or display settings.

6.2 Water Description

Figure 35. The Water Description section for WNID/WUI.



Water Description Table

This table allows the user to describe one or more water vehicles that were associated with the outbreak. Refer to **Appendix J** for standard lists of values for the following fields.

- **Water Type**- The water type is further detailed in the water subtype and setting of exposure columns.
- **Setting of Exposure**- Enter descriptors that explain where the exposure to water occurred. Note that some settings are combined, such as hotel/motel/lodge/inn,

- **USUAL Water Treatment Provided**- Enter information about the usual water treatments provided, regardless of whether or not these treatments were operating correctly at or just prior to the time of the outbreak.
- **Water Treatment Subtype**- Complete this section to provide more information about the disinfection or filtration method used to treat the water.
- **Water Treatment Subtype**- This section provides subtypes for disinfection and filtration treatments.

6.3 Laboratory Section

Figure 36. The beginning of the Laboratory section and the Water Quality Results table.

Laboratory Section

Was the implicated water tested? ☐ Yes *(specify in table below)* ☐ No ☐ Unknown

Results						
Sample		1	2	3	4	5
Source of Sample						
Additional Description of Source of Sample *(e.g., stream not intended for drinking, main A/C unit)*						
Date *(mm/dd/yyyy)*						
Volume Tested	Number					
	Unit					
Temperature	Number					
	Unit					
Residual/Free Disinfectant Level *(if total and combined disinfectant levels given, total - combined = free)*	Number					
	Unit					
Turbidity (NTU)						
pH						

This section collects information about water samples. These data provide evidence regarding water quality, as well as the presence of specific pathogens in the water associated with the outbreak.

Was the implicated water tested?- Respond to this section to indicate whether or not water was tested.

Water Quality Results Table

- **Sample** - This number allows you to associate your water sample with results in the following Microbiology table.
- **Source of Sample**- Enter the source of the water sample.
- **Additional Description of Source of Sample**- Provide additional information that will help to explain the source of the sample. For example, one sample might be “stream by hiking trail” while another might be “main A/C unit.”
- **Date**- This is the date that the sample was collected.
- **Volume Tested (Number, Unit)**- Complete this section if a specific amount of water was collected for testing.
- **Temperature (Number, Unit)-** Complete this section if a temperature was recorded for the water sample.
- **Residual/Free Disinfectant Level (Number, Unit)-** Complete this section if a residual or free disinfectant level was recorded for the water sample. This field refers to the level of disinfectant that has not reacted with other compounds in the water and is still available to effectively inactivate microorganisms in the water. If only the total disinfectant level and the combined disinfectant level are known: (Residual or Free)=Total-Combined.
- **Turbidity (NTU)-** Complete this field if turbidity was recorded for the water sample. Turbidity describes the amount of suspended matter in the sample.
- **pH-** Complete this field if a pH level was recorded for the water sample.

6.4 Water Quality Indicator

Figure 37. The Water Quality Indicator section for WNID/WUI.

Water Quality Indicator			
Sample Number	**Type** *(e.g., fecal coliforms)*	**Concentration** *(number)*	**Unit** *(e.g., CFU)*

Water Quality Indicator Results Table

Water quality data may be helpful when an investigator is trying to determine the source of an outbreak. For example, if a laboratory did not find *Giardia* spp. in a water sample from a stream by a hiking trail (e.g., water not intended for drinking), fecal coliform levels above EPA standards would provide environmental evidence to support the argument that the stream was the source of the outbreak.

- **Sample Number-** Enter the sample number that corresponds to the appropriate sample from the Water Quality Results Table.
- **Type-** Enter the type of water quality indicator for which the water was tested. If more than one water quality indicator was tested, enter a separate row for each line of data. Total coliforms and fecal coliforms are both examples of water quality indicators.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 250 colony forming units (CFU) of fecal coliforms were measured, the concentration would be 250.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L; mg/L, parts per million [ppm], CFU, most probable number [MPN]).

6.5 Microbiology or Chemical/Toxin Analysis

Figure 38. The Microbiology or Chemical/Toxin Analysis section for WNID/WUI.

WNID/WUI

Microbiology or Chemical/Toxin Analysis *(refer to the laboratory findings from the outbreak investigation)*

Sample Number	Genus/ Chemical/ Toxin	Species	Serotype/ Serogroup/ Serovar	Genotype/ Subtype	PFGE Pattern

Sample Number	Test Results Positive?	Concentration *(number)*	Unit *(e.g., oocysts, CFU)*	Test Type*	Test Method *(reference: National Environmental Methods Index: http://www.nemi.gov)*
	☐ yes				
	☐ yes				
	☐ yes				
	☐ yes				

* Test Type: 1-Culture, 2-DNA or RNA Amplification/Detection (e.g., PCR, RT-PCR), 3-Microscopy (e.g., fluorescent, EM), 4-Serological/Immunological Test (e.g., EIA, ELISA), 5-Phage Typing, 6-Chemical Testing, 7-Tissue Culture Infectivity Assay

Microbiology or Chemical/Toxin Analysis Results Table

Refer to the laboratory report and final outbreak report for information. Please report positive findings and negative findings (if a test for a specific pathogen returned null findings). Some of the information may be absent from the report, depending on the testing that was performed (e.g., although a species may have been identified, it may not have been genotyped). If tests were performed to determine the species and/or subtype a particular microorganism from a water sample, please report the results for the total set of specimens, as well as the subset (e.g., If a sample tested positive for *Cryptosporidium* oocysts, enter the results, along with the concentration, if available. Then enter a separate row of data to report the species, if known.)

- **Sample Number-** Enter the sample number that corresponds to the appropriate sample from the Water Quality Results Table.
- **Genus/Chemical/Toxin-** This field provides the broadest description of the pathogen or agent for which the clinical specimen tested negative or positive. Enter this information based on the laboratory report data. Refer to the first column in **Appendix E**. If the appropriate genus, chemical or toxin is not on the list, please write it in the Genus/Chemical/Toxin field.
- **Species**- This field is for known species of each genus of bacteria, parasite or virus. Enter a new value if the species was identified but is missing from the pick list. Find the appropriate genus in **Appendix E** and refer to the second column for a list of known species. If the species is not on the list, please write it in the Species field.Note that there are 6 species categorizations for *Escherichia coli*: enteroaggregative, enterohemorrhagic, enterotoxigenic, enteropathogenic, enteroinvasive, and other. These categories provide information about the type and severity of the outbreak. The table on the next page summarizes the main categories (adapted from http://www.cdc.gov/foodborneoutbreaks/guide_fd.htm).
    - Not all laboratories are able to perform the analyses necessary to categorize *E. coli*. Most commonly, state laboratories will only provide information about enterohemorrhagic *E. coli* (e.g. *E. coli* O157:H7) versus all other types of *E. coli*. Please note that CDC may be able to provide these states with additional laboratory diagnostic testing of *E. coli*.

Table 5. Descriptions of the species categorizations for *Escherichia coli*.

***Escherichia coli* category**	**Laboratory Confirmation**
Enteroaggregative (EAEC)*	Isolation of organism of enteroaggregative serotype from a water sample. EAEC is defined by its pattern of adherence to HEp-2 cells in culture.
Enterohemorrhagic/Shiga-toxin-producing (*E. coli* O157:H7 and others)	Isolation of *E. coli* O157:H7 or other Shiga-like toxin-producing *E. coli* from a water sample.
Enterotoxigenic (ETEC)	Isolation of organism of serotype, demonstrated to produce heat-stable (ST) and/or heat-labile (LT) enterotoxin, from a water sample.
Enteropathogenic (EPEC)	Isolation of organism of enteropathogenic serotype from a water sample
Enteroinvasive (EIEC)	Isolation of enteroinvasive serotype from a water sample.
Other	Other – may vary

- **Serotype/Serogroup/Serovar-** A serotype, serogroup or serovar refers to a subtype that is determined by conducting molecular testing on surface antigens of the microorganism (e.g. *Legionella pneumophila* s1). This approach to subtyping is more common for bacteria, fungi and viruses than parasites. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching serotypes/serogroups/serovars from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water. Refer to **Appendix E** for the reference list of microorganisms, chemicals and toxins.
- **Genotype/Subtype-** The genotype/subtype refers to a subtype that is determined by conducting molecular testing to describe the genetic composition of the microorganism. These methods are primarily used for subtyping parasites such as *Cryptosporidium* spp. This information may be available on the laboratory report. If testing is not available at the state laboratory, CDC may be able to provide laboratory testing assistance. Matching genotypes/subtypes from water and biological samples provide stronger environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **PFGE Pattern-** The PFGE pattern, or fingerprint, can be used to differentiate genetically similar pathogens. Matching PFGE patterns from water and biological samples are strong environmental evidence that the pathogens or agents responsible for the outbreak were transmitted through exposure to contaminated water.
- **Test Results Positive?-** A checkmark in this field indicates that the water sample tested positive for the pathogen or chemical/toxin.
- **Concentration-** The concentration is a count of microorganisms or chemical particles. The units for the concentration are entered in the next field. For example, if 5 oocysts/L of *Cryptosporidium hominis* were measured, the concentration would be 5. There will typically be a concentration for initial tests that have positive results, however, there may not always be a concentration for more complex tests that provide species or subtyping results.
- **Unit-** The unit refers to the amount of the microorganism or chemical that was measured by the laboratory (e.g. oocysts/L; mg/L, parts per million [ppm], colony forming units [CFU], most probable number [MPN]). As with concentration, there may not always be a unit to enter into this field.

*Source: 9th Edition of the Manual of Clinical Microbiology, 2007, American Society for Microbiology, Washington, DC/editor in chief, PR Murray; editors EJ Baron, JH Jorgensen, ML Landry, and MA Pfaller.

- **Test Type-** This field describes the method of testing used to identify the microorganism. If multiple methods were used, select the method that provided the most detailed information (e.g., if a microorganism was found using microscopy and then genotyped using polymerase chain reaction (PCR), select 'DNA or RNA Amplification/Detection (e.g. PCR, RT-PCR)').
- **Test Method-** This field provides information about the water testing methods that were used on the sample. Many of the method numbers refer to standard testing procedures or approved EPA methods. Refer to the National Environmental Methods Index (NEMI) at http://www.nemi.gov to compare and contrast methods for either microbiological testing or chemical testing. Common method numbers for this field are listed in **Appendix F** and contain the following information: method source, official method number, and method summary description.

6.6 Factors Contributing to Contamination and/or Increased Exposure to Contaminated Water

Figure 39. The Contributing Factors section for WNID/WUI.

Factors Contributing to Contamination and/or Increased Exposure to Contaminated Water

Factors *(check all that apply)**	Documented/ Observed**	Suspected**
Cooling tower/evaporative condenser – shutdown for >3 days without draining to waste	☐	☐
Cooling tower/evaporative condenser – lack of a maintenance program	☐	☐
Cooling tower/evaporative condenser – lack of a qualified water quality specialist	☐	☐
Cooling tower/evaporative condenser – presence of scale or corrosion	☐	☐
Cooling tower/evaporative condenser – presence of dirt, organic matter, or other debris in the cold water basin	☐	☐
Cooling tower/evaporative condenser – absence of drift eliminators	☐	☐
Cooling tower/evaporative condenser – presence of damaged drift eliminators	☐	☐
Cooling tower/evaporative condenser – history of recent repairs to the device	☐	☐
Cooling tower/evaporative condenser – siting of device near building air intakes	☐	☐
Cooling tower/evaporative condenser – siting of device near windows that can be opened	☐	☐
Cooling tower/evaporative condenser – siting of device in immediate area of kitchen exhaust fans, live plants, truck bays, or other sources of organic matter	☐	☐
Cooling tower/evaporative condenser – construction on the premises of the device within 6 months before the index case	☐	☐
Cooling tower/evaporative condenser – construction within 100 meters of the premises of the device within 6 months before the index case	☐	☐
Ornamental fountain – presence of submerged lighting	☐	☐
Ornamental fountain – lack of a written cleaning and maintenance program	☐	☐
Ornamental fountain – presence of dirt, organic matter, or other debris in the water basin	☐	☐
Broken/damaged sewer pipe	☐	☐
Recycling of water	☐	☐
Water temperature ≥30°C (≥66°F)	☐	☐
Other, specify:	☐	☐
Unknown	☐	☐

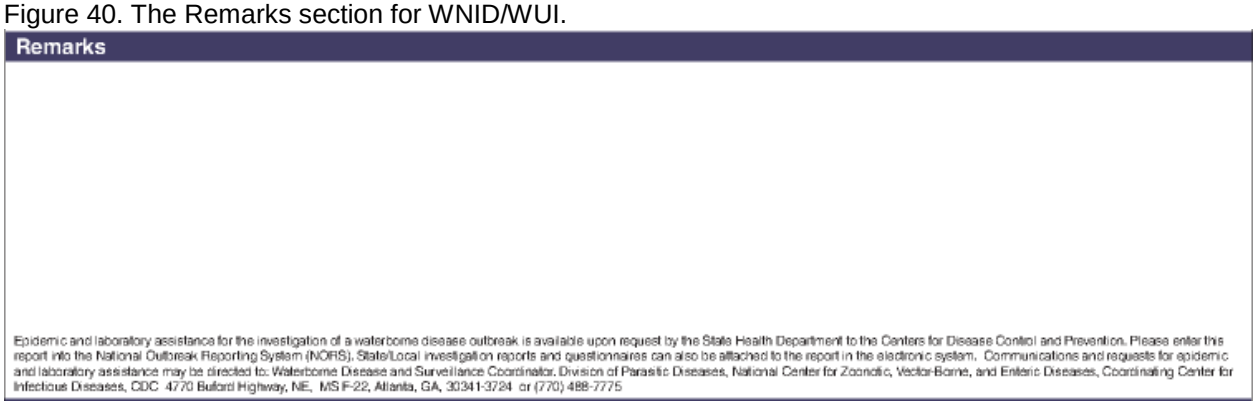
* Only check off what was found during investigation

** "Documented/Observed" refers to information gathered through document reviews, direct observations, and/or interviews. "Suspected" refers to factors that probably occurred but for which no documentation (as defined previously) is available.

Please select factors that were found during the investigation. Each contributing factor that is selected has two check boxes so that the user can indicate whether the factor was 'Documented/Observed' or 'Suspected.' 'Documented/Observed' refers to information gathered during document reviews, direct observations and/or interviews. 'Suspected' refers to factors that probably occurred but for which no documentation or observable evidence is available.

6.7 Remarks

Figure 40. The Remarks section for WNID/WUI.



Please comment on important elements or results of the outbreak investigation that were not captured by the questions in the electronic form.

7 APPENDICES

7.1 Appendix A- Associated Events

Note: Additional events may be added to this list.

- Banquet
- Bar Mitzvah/Bat Mitzvah
- Class/Training
- Concert
- Convention
- Demonstration/Protest/Rally
- Fair/Festival
- Field trip
- Funeral
- Mass evacuation/Disaster
- Meeting
- Party
- Picnic
- Religious ceremony or service
- Reunion
- Rodeo
- Sporting Event/Game/Tournament
- Tour
- Wedding
- Workshop

7.2 Appendix B- Exposure (Vehicle/Setting)

Note: Additional exposures, vehicles or settings may be added to this list.

- Bulk Water Purchase
- Canal
- Commercially-Bottled Water
- Cooling Tower
- Dialysis Machine
- Drain
- Drainage Ditch
- Drink Mix/Soda Machine (dispensing or mixing fountain)
- Drinking Water Dispenser (e.g., container, bottle, pitcher, cooler)
- Evaporative Condenser/Air Conditioning Unit
- Faucet/Tap
- Filter
- Fountain - Interactive (A fountain intended for or accessible to recreational use)
- Fountain - Ornamental (A decorative non-interactive fountain intended for public display and not designed for swimming or recreational use)
- Fountain – Unknown Intent
- Hot Spring
- Lake/Reservoir/Impoundment
- Manicure Bath
- Mist/Steam - Mister
- Mist/Steam - Device Producing Mist or Steam as a Side-Effect of Use (e.g., steam cleaner) Ocean
- Pedicure Bath
- Plumbing – Home/Building
- Pond
- Pool – Waterpark
- Pool – Kiddie/Wading (private – e.g., backyard)
- Pool – Kiddie/Wading (public)
- Pool – Swimming Pool
- Pool – Water Slide
- Pool – Wave Pool
- Puddle
- River/stream
- Sediment
- Shower
- Sink
- Spa/Whirlpool/Hot Tub
- Spray Pad/Splash Pad/Wet Deck
- Spring
- Storage Tank
- Swamp
- Water Distribution System Under the Jurisdiction of a Water Utility
- Well

7.3 Appendix C Etiology List *(Clinical Specimens, Water Sample sections)*

Table 6. Etiology picklists for clinical specimen results and water sample results. Additional values may be added to each column of this table.

Genus/Chemical/Toxin	Species	Serotype/Serogroup/Serovar
Bacterium - unspecified	.	.
Chemical - unspecified	.	.
Parasite - unspecified	.	.
Virus - unspecified	.	.
2,4-Dichlorophenoxyacetic Acid	.	.
1,1-Dichloroethylene	.	.
Acanthamoeba	culbertsoni	.
Acanthamoeba	divionensis	.
Acanthamoeba	healyi	.
Acanthamoeba	palestinensis	.
Acanthamoeba	polyphaga	.
Acanthamoeba	castellanii	.
Acanthamoeba	astronyxis	.
Acanthamoeba	hatchetti	.
Acanthamoeba	rhysodes	.
Acanthamoeba	unknown	.
Acrylamide	.	.
Adenovirus	.	.
Aeromonas	hydrophilia	.
Aeromonas	caviae	.
Aeromonas	veronii	biovar sobria
Aeromonas	unknown	.
Aeromonas	other	.
Alachlor	.	.
Amnesic Shellfish Poison	.	.
Anasakidae	spp	.
Angiostrongylus	cantonensis	.
Angiostrongylus	costaricensis	.
Anisakiasis	.	.
Anisakis	simplex	.
Arcobacter	butzleri	.
Arsenic	.	.
Astrovirus	.	.
Atrazine	.	.
Bacillus	cereus	.
Bacillus	other	.
Bacillus	subtilus	.
Bacillus	unknown	.

Balamuthia	**mandrillaris**	**.**
Benzene	**.**	**.**
Blastocystis	**hominis**	**.**
Bromate	**.**	**.**
Bromine	**.**	**.**
Brucella	**spp**	**.**
Cadmium	**.**	**.**
Calicivirus	**norovirus**	**Genogroup I (GI), non typeable by GI probes**
Calicivirus	**norovirus**	**GI / Norwalk cluster**
Calicivirus	**sapovirus**	**London cluster**
Calicivirus	**norovirus**	**Genogroup II (GI), non typeable by GII probes**
Calicivirus	**norovirus**	**GI / P1A**
Calicivirus	**norovirus**	**GI / undefined cluster by sequence**
Calicivirus	**norovirus**	**GIV**
Calicivirus	**norovirus**	**Unspecified**
Campylobacter	**unknown**	**.**
Campylobacter	**coli**	**.**
Campylobacter	**fetus**	**.**
Campylobacter	**lari**	**.**
Campylobacter	**jejuni**	**.**
Campylobacter	**other**	**.**
Chloramines	**.**	**.**
Chlordane	**.**	**.**
Chlorine	**.**	**.**
Chlorine Dioxide	**.**	**.**
Chlorine Gas	**.**	**.**
Chlorite	**.**	**.**
Chromium	**.**	**.**
Ciguatoxin	**.**	**.**
Cleaning Agents	**.**	**.**
Clostridium	**botulinum**	**.**
Clostridium	**other**	**.**
Clostridium	**perfringens**	**.**
Clostridium	**unknown**	**.**
Copper	**.**	**.**
Cryptosporidium	**hominis**	**.**
Cryptosporidium	**parvum**	**.**
Cryptosporidium	**spp**	**.**
Cyclospora	**cayatenensis**	**.**
Dientamoeba	**fragilis**	**.**
Diphyllobothrium	**latum**	**.**
Endolimax	**nana**	**.**
Entamoeba	**coli**	**.**
Entamoeba	**dispar**	**.**
Entamoeba	**gingivalis**	**.**
Entamoeba	**histolytica**	**.**

Enterobacter	**other**	**.**
Enterobacter	**cloacae**	**.**
Enterobacter	**unknown**	**.**
Enterococcus	**faecium**	**.**
Enterococcus	**faecalis**	**.**
Enterococcus	**other**	**.**
Enterococcus	**unknown**	**.**
Enterovirus	**spp.**	**.**
Enterovirus	**Coxsackievirus A**	**serotypes 1-24**
Enterovirus	**Coxsackievirus B**	**serotypes 1-6**
Enterovirus	**Echovirus**	**serotypes 1-34**
Enterovirus	**Enterovirus**	**serotypes 68-72**
Enterovirus	**unknown**	**.**
Enterovirus	**other**	**.**
Escherichia	**coli., Enteroaggregative**	**O127**
Escherichia	**coli., Enteroaggregative**	**O7**
Escherichia	**coli., Enteroaggregative**	**Unspecified**
Escherichia	**coli., Enterohemorrhagic**	**O172**
Escherichia	**coli., Enterohemorrhagic**	**O2**
Escherichia	**coli., Enterohemorrhagic**	**Unspecified**
Escherichia	**coli., Enteroinvasive**	**O167**
Escherichia	**coli., Enteroinvasive**	**O28**
Escherichia	**coli., Enteroinvasive**	**Unspecified**
Escherichia	**coli., Enteropathogenic**	**O158**
Escherichia	**coli., Enteropathogenic**	**O18**
Escherichia	**coli., Enteropathogenic**	**Unspecified**
Escherichia	**coli., Enterotoxigenic**	**O173**
Escherichia	**coli., Enterotoxigenic**	**O6**
Escherichia	**coli., Enterotoxigenic**	**Unspecified**
Escherichia	**coli., Other**	**.**
Ethylene Glycol	**.**	**.**
Fluoride	**.**	**.**
Gasoline and Gasoline Byproducts	**.**	**.**
Giardia	**intestinalis**	**.**
Haloacetic Acids	**.**	**.**
Heavy metals	**.**	**.**
Helicobacter	**canadensis**	**.**
Helicobacter	**pylori**	**.**
Hepatitis	**A**	**.**
Hepatitis	**E**	**.**
Heptachlor	**.**	**.**
Histamine	**.**	**.**
Hydrochloric (Muriatic) Acid	**.**	**.**
Iodamoeba	**butschlii**	**.**
Isospora	**belli**	**.**
Lead	**.**	**.**
Legionella	**anisa**	**.**
Legionella	**benidorm**	**.**
Legionella	**birminghamensis**	**.**

Legionella	**bozemanii**	**serogroup 1**
Legionella	**bozemanii**	**serogroup 2**
Legionella	**bozemanii**	**Unspecified**
Legionella	**cincinnatiensis**	**.**
Legionella	**denver**	**.**
Legionella	**dumoffii**	**.**
Legionella	**erythra**	**.**
Legionella	**feeleii**	**serogroup 1**
Legionella	**feeleii**	**serogroup 2**
Legionella	**feeleii**	**Unspecified**
Legionella	**gormanii**	**.**
Legionella	**hackeliae**	**serogroup 1**
Legionella	**hackeliae**	**serogroup 2**
Legionella	**hackeliae**	**Unspecified**
Legionella	**jordanis**	**.**
Legionella	**lansingensis**	**.**
Legionella	**longbeachae**	**serogroup 1**
Legionella	**longbeachae**	**serogroup 2**
Legionella	**longbeachae**	**Unspecified**
Legionella	**maceachernii**	**.**
Legionella	**micdadei**	**.**
Legionella	**oakridgensis**	**.**
Legionella	**parisiensis**	**.**
Legionella	**pneumophila**	**serogroups 1**
Legionella	**pneumophila**	**serogroup 2**
Legionella	**pneumophila**	**serogroup 3**
Legionella	**pneumophila**	**serogroup 4**
Legionella	**pneumophila**	**serogroup 5**
Legionella	**pneumophila**	**serogroup 6**
Legionella	**pneumophila**	**serogroup 7**
Legionella	**pneumophila**	**serogroup 8**
Legionella	**pneumophila**	**serogroup 9**
Legionella	**pneumophila**	**serogroup 10**
Legionella	**pneumophila**	**serogroup 11**
Legionella	**pneumophila**	**serogroup 12**
Legionella	**pneumophila**	**serogroup 13**
Legionella	**pneumophila**	**serogroup 14**
Legionella	**pneumophila**	**serogroup 15**
Legionella	**pneumophila**	**Unspecified**
Legionella	**sainthelensi**	**serogroup 1**
Legionella	**sainthelensi**	**serogroup 2**
Legionella	**sainthelensi**	**Unspecified**
Legionella	**tucsonensis**	**.**
Legionella	**wadsworthii**	**.**
Legionella	**unknown**	**.**
Legionella	**other**	**.**
Leptospira	**interrogans**	**.**
Leptospira	**borgpeterseni**	**.**
Leptospira	**inadai**	**.**
Leptospira	**noguchii**	**.**
Leptospira	**santarosai**	**.**
Leptospira	**weillii**	**.**
Leptospira	**kirschneri**	**.**

Listeria	**monocytogenes**	**.**
Listeria	**unknown**	**.**
Listeria	**other**	**.**
Mercury	**.**	**.**
Microcoleus	**lyngbyei (chthonoplastes)**	**.**
Microcystin toxin (blue-green algae)	**.**	**.**
Microsporidium	**spp.**	**.**
Microsporidium	**africanum**	**.**
Microsporidium	**ceylonensis**	**.**
Enterocytozoon	**bieneusi**	**.**
Encephalitozoon	**intestinalis**	**.**
Encephalitozoon	**cuniculi**	**.**
Encephalitozoon	**hellem**	**.**
Brachiola	**algerae**	**.**
Brachiola	**connori**	**.**
Brachiola	**vesicularum**	**.**
Nosema	**ocularum**	**.**
Nosema-like microsporidian	**.**	**.**
Pleistophora	**ronneafiei**	**.**
Trachipleistophora	**anthropophthera**	**.**
Trachipleistophora	**hominis**	**.**
Vittaforma	**corneae**	**.**
Vittaforma-like microsporidian	**.**	**.**
Monosodium glutamate (MSG)	**.**	**.**
Mushroom toxins	**.**	**.**
Mycobacterium	**avium complex**	**.**
Mycobacterium	**avium**	**.**
Mycobacterium	**intracellulare**	**.**
Mycobacterium	**paratuberculosis**	**.**
Mycobacterium	**abscessus**	**.**
Mycobacterium	**mucogenicum**	**.**
Mycobacterium	**fortuitum**	**.**
Mycobacterium	**spp.**	**.**
Mycobacterium	**unknown**	**.**
Mycotoxins	**.**	**.**
Naegleria	**australiensis**	**.**
Naegleria	**fowleri**	**.**
Naegleria	**gruberi**	**.**
Naegleria	**italica**	**.**
Brevetoxin (Neurotoxic Shellfish Poison)	**.**	**.**
Nitrate	**.**	**.**
Nitrite	**.**	**.**
Other	**.**	**.**
Other bacterial	**.**	**.**
Other byproducts of disinfection	**.**	**.**
Other chemical	**.**	**.**
Other etiology	**.**	**.**
Other natural toxins	**.**	**.**
Other parasitic	**.**	**.**
Other viral	**.**	**.**
Saxitoxin (Paralytic Shellfish Poison)	**.**	**.**
Pesticides	**.**	**.**
Pharmaceuticals	**.**	**.**

Plant toxins (Herbal toxins)	**.**	**.**
Plesiomonas	**shigelloides**	**.**
Polychlorinated Biphenyls	**.**	**.**
Proteus	**mirabilis**	**.**
Proteus	**other**	**.**
Proteus	**unknown**	**.**
Pseudomonas	**aeruginosa**	**.**
Pseudoterranova	**decipens**	**.**
Puffer fish tetrodotoxin	**.**	**.**
Reovirus	**.**	**.**
Rotavirus	**.**	**.**
Salmonella	**unknown**	**.**
Salmonella	**enterica**	**Aarhus**
Salmonella	**enterica**	**Unspecified**
Salmonella	**enterica**	**Zwickau**
Salmonella	**other**	**.**
Scombroid toxin	**.**	**.**
Selenium	**.**	**.**
Shigella	**boydii**	**serotype 1**
Shigella	**dysenteriae**	**serotype 16**
Shigella	**flexneri**	**serotype 1 unspecified**
Shigella	**unknown**	**.**
Shigella	**boydii**	**serotype 19**
Shigella	**dysenteriae**	**serotype 1**
Shigella	**dysenteriae**	**Unspecified**
Shigella	**flexneri**	**serotype Variant X**
Shigella	**flexneri**	**serotype Variant Y**
Shigella	**flexneri**	**Unspecified**
Shigella	**other**	**.**
Shigella	**sonnei**	**.**
Sodium Hydroxide	**.**	**.**
Staphylococcus	**aureus**	**MRSA**
Staphylococcus	**aureus**	**Other (instead of .)**
Staphylococcus	**other**	**.**
Staphylococcus	**unknown**	**.**
Streptococcus	**Group A**	**.**
Streptococcus	**Group B, C or G**	**.**
Streptococcus	**other**	**.**
Streptococcus	**unknown**	**.**
Toxaphene	**.**	**.**
Toxoplasma	**gondii**	**.**
Trichinella	**spiralis**	**.**
Trichinella	**spp**	**.**
Trichloroethylene	**.**	**.**
Trihalomethanes	**.**	**.**
Vibrio	**vulnificus**	**.**
Vibrio	**cholerae**	**O1**
Vibrio	**cholerae**	**Other**
Vibrio	**other**	**.**
Vibrio	**parahaemolyticus**	**Other**
Vibrio	**unknown**	**.**
Vinyl Chloride	**.**	**.**
Uranium	**.**	**.**

Yersinia	**enterocolitica**	**.**
Yersinia	**other**	**.**
Yersinia	**pseudotuberculosis**	**.**
Yersinia	**unknown**	**.**

7.4 Appendix D- Test Method

Note: Additional values may be added by contacting NORSadmin@cdc.gov

- ASTM D1067-Alkalinity or acidity in water
- ASTM D1125-Electrical conductivity and resistivity (field, routine lab- static samples)
- ASTM D1179-Fluoride (ion selective electrode)
- ASTM D1292-Odor in water
- ASTM D1293-pH (routine/continuous measurement)
- ASTM D1688-Copper (atomic absorption, direct)
- ASTM D1688-Copper (atomic absorption, graphite furnace)
- ASTM D2036-Cyanides
- ASTM D2972-Arsenic (atomic absorption, graphite furnace)
- ASTM D2972-Arsenic (atomic absorption, hydride generation)
- ASTM D3223-Mercury, total (analytical procedure)
- ASTM D3559-Lead (atomic absorption, graphite furnace)
- ASTM D3645-Beryllium (atomic absorption, graphite furnace)
- ASTM D3697-Antimony (AAS)
- ASTM D3859-Selenium (gaseous hydride AAS)
- ASTM D3859-Selenium (graphite furnace AAS)
- ASTM D3867-Nitrite, Nitrate (automated cadmium reduction)
- ASTM D3867-Nitrite, Nitrate (manual cadmium reduction)
- ASTM D4327-Anions (ion chromatography)
- ASTM D511-Calcium, magnesium (AAS)
- ASTM D511-Calcium, magnesium (complexometric titration)
- ASTM D516-Sulfate (turbidimitry)
- ASTM D5317-Chlor. organic acids (GC, electron capture device)
- ASTM D859-Silica (colorimetric)
- EPA 100.1-Asbestos (TEM)
- EPA 100.2-Asbestos (TEM)
- EPA 110.1-Color (spectrophotometry)
- EPA 110.2-Color (spectrophotometry)
- EPA 110.3-Color (spectrophotometry)
- EPA 1103.1(modified)-E. coli (membrane filtration plating, modified mTEC agar)
- EPA 150.1-pH (electrometric method)
- EPA 150.2-pH
- EPA 1600-Enterococci (membrane filtration, mEI agar)
- EPA 1604-Total coliforms, E. coli, drinking water (membrane filtration)
- EPA 1605-Aeromonas, finished water (membrane filtration)
- EPA 1613-Dioxins, furans (HRGC/HRMS)
- EPA 1622 Geno-Test method 1622 + genotyping
- EPA 1622-Cryptosporidium (fitration/IMS/FA microscopy)
- EPA 1623 Geno-Test method 1623+genotyping
- EPA 1623-Cryptosporidium, Giardia (filtration/IMS/FA microscopy)
- EPA 200.7-Metals (ICP-AES)
- EPA 200.8-Metals (ICP/MS)
- EPA 200.9-Trace elements (GFAA)

- EPA 245.1-Mercury (CVAA)
- EPA 245.2-Mercury (CVAA, automated)
- EPA 300.0-Inorganic anions (ion chromatography)
- EPA 300.1-Anions (IC)
- EPA 335.4-Cyanide, total (colorimetry)
- EPA 350.1-Ammonia (colorimetry, automated)
- EPA 353.2-Nitrate-Nitrite Nitrogen (colorimetry)
- EPA 365.1-Phosphorus, all forms (semi-automated colorimetry)
- EPA 375.2-Sulfate (colorimetry)
- EPA 413.1-Oil, Grease (extraction and gravimetery)
- EPA 418.1-Petroleum hydrocarbons, total recoverable (extraction, adsorption, I-R)
- EPA 502.2-VOCs (GC/PID/ELCD)
- EPA 504.1-EDB, DCBP, 123TCP (GCECD)
- EPA 505-Pesticides, PCBs (GC-ECD)
- EPA 506-Phthalate, adipate esters (GCPID)
- EPA 507-Pesticides (GCNPD)
- EPA 508.1-Chlor. pesticides, herbicides, organohalides (GCECD)
- EPA 508A-PCBs (GCECD)
- EPA 508-Chlor. pesticides (GCECD)
- EPA 515.1-Chlor. acids (GC/ECD)
- EPA 515.2-Chlor. acids (GCECD)
- EPA 515.3-Chlor. acids (GC/ECD)
- EPA 524.3-VOCs (GCMS)
- EPA 525.2-Organics (GCMS)
- EPA 531.1-Carbamates (HPLC, post-column deriv.)
- EPA 547-Glyphosphate (HPLC, post-column deriv.)
- EPA 548.1-Endothall by FID (GCMS)
- EPA 548.1-Endothall by MS (GCMS)
- EPA 549.2-Diquat, Paraquat (HPLC/UV)
- EPA 550.1-PAHs (HPLC/UV/FL)
- EPA 550-PAHs (HPLC/UV/FL)
- EPA 551.1-Chlor. compounds (GC-ECD)
- EPA 552.1-Haloacetic acid, dalapon (GCECD)
- EPA 552.2-Haloacetic acid, dalapon (GCECD)
- EPA 555-Chlor. acids (HPLC/UV)
- EPA 600/4-84-013-USEPA Manual of Methods for Virology
- EPA 601-Gas chromatography (electrolytic conductivity detection)
- Hach 10029-E. coli (m-ColiBlue24 broth, membrane filtration)
- SM 2120-Color (visual comparison)
- SM 2150-Odor (threshold odor test)
- SM 2320-Alkalinity (titration)
- SM 2510-Conductivity (lab method)
- SM 2540-Solids (total dissolved solids, 180° C)
- SM 2550-Temperature (laboratory and field)
- SM 3111-Metals (FLAA)
- SM 3112-Metals (cold-vapor AAS)
- SM 3113-Metals (GFAA)
- SM 3114-Arsenic, selenium (hydride generation/AAS)
- SM 3120-Metals (ICP)
- SM 3500-Ca-Calcium (EDTA, titrimetric)
- SM 3500-Mg-Magnesium (calculation)
- SM 4110-Anions (ion chromatography)
- SM 4110-Fluoride (SM 4110 with modifications)

- SM 4500-Cl^--Chloride (potentiometric)
- SM 4500-ClO_2-Chlorine dioxide (amperometric, method I)
- SM 4500-CN-Cyanide (amenable to chlor.)
- SM 4500-CN-Cyanide (ion selective electrode)
- SM 4500-CN-Cyanide in distillate (colorimetric)
- SM 4500-CN-Cyanide, total (after distillation)
- SM 4500-F^--Fluoride (complexone)
- SM 4500-F^--Fluoride (ion-selective electrode)
- SM 4500-F^--Fluoride (prelim. distillation)
- SM 4500-F^--Fluoride (SPADNS)
- SM 4500-H+B-pH (potentiometry)
- SM 4500-NO_2-Nitrite (colorimetry)
- SM 4500-NO_3-Nitrate (after cadmium reduction)
- SM 4500-NO_3-Nitrate (automated cadmium reduction)
- SM 4500-NO_3-Nitrate (nitrate electrode)
- SM 4500-P-Phosphorus (ascorbic acid)
- SM 4500-P-Phosphorus (automated ascorbic acid reduction)
- SM 4500-SiO_2-Silica (automated method for molybdate-reactive silica)
- SM 4500-SiO_2-Silica (heteropoly blue)
- SM 4500-SiO_2-Silica (molybdosilicate)
- SM 4500-SO_4^{2-}-Sulfate (automated methylthymol blue)
- SM 4500-SO_4^{2-}-Sulfate (gravimetric, drying of residue)
- SM 4500-SO_4^{2-}-Sulfate (gravimetric, ignition of residue)
- SM 4500-SO_4^{2-}-Sulfate (turbidimetric)
- SM 5540-Surfactants (anionic surfactants as MBAS)
- SM 6610-Carbamate pesticides (HPLC)
- SM 6651-Glyphosphate herbicide (liquid chrom. post-column fluor.)
- SM 9222-Coliforms, total (membrane filtration)
- SM 9222-E. coli (membrane filtration, MUG-fluorescent detection)
- SM 9222-Fecal coliforms (membrane filtration)
- SM 9260-Pathogenic bacteria, *Aeromonas*
- SM 9260-Pathogenic bacteria, *Campylobacter jejuni*
- SM 9260-Pathogenic bacteria, *E. coli* O157:H7
- SM 9260-Pathogenic bacteria, *Legionella*
- SM 9260-Pathogenic bacteria, *Leptospira*
- SM 9260-Pathogenic bacteria, *Mycobacterium*
- SM 9260-Pathogenic bacteria, *Salmonella* (general qualitative isolation, identification)
- SM 9260-Pathogenic bacteria, *Salmonella* (immunofluorescence identification)
- SM 9260-Pathogenic bacteria, *Salmonella* (quantitative procedures)
- SM 9260-Pathogenic bacteria, *Shigella*
- SM 9260-Pathogenic bacteria, *Vibrio cholerae*
- SM 9260-Pathogenic bacteria, *Yersinia enterocolitica*
- USGS I-1250-85-Color (visual comparison)
- USGS-NWQL I-1030-85-Alkalinity (electrometric titration)
- USGS-NWQL I-1700-85-Silica, dissolved (colorimetric, molybdate blue)
- USGS-NWQL I-2601-90-Phosphorus, orthophosphate (colorimetry)
- USGS-NWQL I-2700-85- Silica (colorimetric, dissolved)
- USGS-NWQL I-3300-85-Cyanide, total (colormetric, pyridine-pyrazolone)
- USGS-NWQL I-3720-85-Silver (AAS, chelation-extraction)

7.5 Appendix E- Treated Recreational Water: Vehicle Description Table

Note: If additional values may be added to a list, this information is indicated at the top of the list.

Water Type- Additional water types may be added to this list.

- Fountain - Interactive (A fountain intended for or accessible to recreational use). Also known as a Spray Pad/Splash Pad/Wet Deck
- Pool – Waterpark
- Pool – Kiddie/Wading (private – e.g., backyard)
- Pool – Kiddie/Wading (public)
- Pool – Swimming Pool
- Pool – Water Slide
- Pool – Wave Pool
- Spa/Whirlpool/Hot Tub
- Unknown

Water Subtype

- Indoor
- Outdoor
- Unknown

Setting of Exposure- Additional settings may be added to this list.

- Airport
- Apartment/Condominium
- Beach – Private
- Beach – Public
- Beach - Nonspecific
- Camp/Cabin/Recreational Area
- Child Care/Daycare Center
- Church
- Club (Requiring Membership)
- Community/Municipality
- Factory/Industrial Facility
- Farm/Rural/Agricultural Setting
- Hall/Meeting Facility
- Hospital/Health Care Facility/Nursing Home
- Hotel/Motel/Lodge/Inn
- Manicure Bath
- Military Facility
- Native American Reservation
- Office
- Park – Amusement
- Park - Community/Municipal
- Park – Forestry Service
- Park - State Park
- Park - National Park
- Park – Waterpark
- Park – Nonspecific
- Pedicure Bath
- Prison/Jail/Incarceration Facility (Juvenile/Adult)
- Private Residence
- Public Outdoor Area
- Resort
- Restaurant/Cafeteria
- School/College/University
- Ship/Boat – Cruise
- Ship/Boat – Other - Unspecified
- Store
- Subdivision/Neighborhood
- Temporary Event - Festival/Fair
- Temporary Event - Other – Unspecified
- Trailer Park
- Zoo
- Unknown

USUAL Water Treatment Provided at Venue- Additional water treatments may be added to this list.

- No Treatment
- Coagulation
- Flocculation
- Disinfection
- Filtration at Pool
- Unknown

Venue Treatment Subtype- Additional water treatment subtypes may be added to these lists.

Disinfection:

- Chlorine
- Chlorine Dioxide
- Biguanide
- Bromine
- Copper-Silver Ionization Unit
- Hydrogen Peroxide
- Ozone
- Povidine
- Ultraviolet (U.V.)
- Unknown

Filtration at Pool:

- Bag Filter
- Cartridge Filter
- Sand Filter
- Diatomaceous Earth
- Unknown

Chlorination Subtype- Additional chlorination subtypes may be added to this list.

- Gaseous
- Sodium hypochlorite
- Calcium hypochlorite
- Stabilized chlorine/cyanurates
- Onsite chlorine generator (e.g., sodium chloride, MIOX)
- Unknown

Fill Water Type- Additional fill water types may be added to this list.

- Mineral/Hot Spring Water
- Public Water Supply
- Sea Water
- Untreated Ground Water (e.g., well, spring)
- Untreated Surface Water (e.g., lake water, river water)
- Unknown

IF PUBLIC WATER WAS USED TO FILL, USUAL Water Treatment Provided for Fill Water Before Coming to the Venue- Additional water treatments may be added to this list.

- No Treatment
- Coagulation
- Flocculation
- Disinfection
- Distillation
- Filtration at Treatment Plant (do not include home filters)
- Settling (Sedimentation)
- Softening
- Other Chemical Addition (e.g., fluoride, oxidation, metals removal, corrosion control)
- Unknown

IF PUBLIC WATER WAS USED TO FILL, Fill Water Treatment Subtype- Additional water treatment subtypes may be added to these lists.

Disinfection:

- Boiling/Heating/Pasteurization
- Chlorine
- Chloramine (Chlorine and Ammonia)
- Chlorine Dioxide
- Copper-Silver Ionization Unit
- Cyanurates/Stabilized Chlorine
- Ozone
- Ultraviolet (U.V.)
- Unknown

Filtration:

- Activated Carbon
- Reverse Osmosis
- Bag Filter
- Cartridge Filter
- Rapid Sand
- Slow Sand
- Diatomaceous Earth
- Unknown

7.6 Appendix F- Untreated Recreational Water: Vehicle Description Table

Note: If additional values may be added to a list, this information is indicated at the top of the list.

Water Type- Additional water types may be added to this list.

- Canal
- Hot Spring
- Lake/Reservoir/Impoundment
- Ocean
- Pond
- Puddle
- River/Stream
- Spring
- Swamp
- Unknown

IF SPRING OR HOT SPRING, Water Subtype

- Indoor
- Outdoor
- Unknown

Setting of Exposure- Additional settings may be added to this list.

- Airport
- Apartment/Condominium
- Beach – Private
- Beach – Public
- Beach - Nonspecific
- Camp/Cabin/Recreational Area
- Child Care/Daycare Center
- Church
- Club (Requiring Membership)
- Community/Municipality
- Factory/Industrial Facility
- Farm/Rural/Agricultural Setting
- Hall/Meeting Facility
- Hospital/Health Care Facility/Nursing Home
- Hotel/Motel/Lodge/Inn
- Manicure Bath
- Military Facility
- Native American Reservation
- Office
- Park – Amusement
- Park - Community/Municipal
- Park – Forestry Service
- Park - State Park
- Park - National Park
- Park – Waterpark
- Park – Nonspecific
- Pedicure Bath
- Prison/Jail/Incarceration Facility (Juvenile/Adult)
- Private Residence
- Public Outdoor Area
- Resort
- Restaurant/Cafeteria
- School/College/University
- Ship/Boat – Cruise
- Ship/Boat – Other - Unspecified
- Store
- Subdivision/Neighborhood
- Temporary Event - Festival/Fair
- Temporary Event - Other – Unspecified
- Trailer Park
- Zoo
- Unknown

7.7 Appendix G- Drinking Water: Vehicle Description Table

Note: If additional values may be added to a list, this information is indicated at the top of the list.

Water Type

- Commercially-Bottled Water
- Bulk Water Purchase
- Community Water System
- Nontransient Noncommunity Water System
- Transient Noncommunity Water System
- Individual/Private Water System
- Unknown

Water Source (Source of untreated or raw water used to produce drinking water)

- Ground Water
- Surface Water
- Unknown

Water Source Description

Ground Water

- Spring
- Well (Drilled)
- Well (Dug)
- Well (Bored)
- Well- unknown

Surface Water

- Lake/Reservoir/Impoundment
- Pond
- Puddle/Canal/Swamp
- River/Stream
- Unknown

Setting of Exposure- Additional settings may be added to this list.

- Airport
- Apartment/Condominium
- Beach – Private
- Beach - Public
- Beach – Nonspecific
- Bus Station
- Camp/Cabin/Recreational Area
- Child Care/Daycare Center
- Church/Other Place of Worship
- Club (Requiring Membership)
- Community/Municipality
- Factory/Industrial Facility
- Farm/Rural/Agricultural Setting
- Hall/Meeting Facility
- Hospital/Health Care Facility/Nursing Home
- Hotel/Motel/Lodge/Inn
- Indoor Place of Work/ Office
- Native American Reservation
- Military Facility
- Mobile Home Park
- Outdoor Place of Work
- Park – Amusement
- Park - Community/Municipal
- Park – Forestry Service
- Park - State Park
- Park - National Park
- Park – Waterpark
- Park – Nonspecific
- Prison/Jail/Incarceration Facility (Juvenile/Adult)
- Private Residence
- Public Outdoor Area
- Resort
- Restaurant/Cafeteria
- School/College/University
- Ship/Boat – Cruise
- Ship/Boat - Other - Unspecified
- Store
- Subdivision/Neighborhood
- Street Vendor
- Temporary Event - Festival/Fair
- Temporary Event - Other –unspecified
- Train Station
- Zoo
- Unknown

USUAL Water Treatment Provided

- No Treatment
- Aeration
- Coagulation
- Flocculation
- Disinfection
- Distillation
- Filtration at Treatment Plant (**do not** include home filters)
- Home/Point-of-Use Filtration
- Settling (Sedimentation)
- Softening
- Other Chemical Addition (e.g., fluoride, oxidation, metals removal, corrosion control)
- Unknown

Water Treatment Subtype- Additional water treatment subtypes may be added to these lists.

Disinfection:
- Boiling/Heating/Pasteurization
- Chlorine
- Chlorine Dioxide
- Chloramine (Chlorine and Ammonia)
- Copper-Silver Ionization Unit
- Cyanurates/Stabilized Chlorine
- Ozone
- U.V.
- Unknown

Filtration at Treatment Plant:
- Activated Carbon
- Bag Filter
- Cartridge Filter
- Diatomaceous Earth
- Membrane Microfiltration
- Rapid Sand
- Reverse Osmosis
- Slow Sand
- Ultrafiltration
- Unknown

Home/Point-of-Use Filtration:
- Reverse Osmosis
- Activated Carbon
- $\leq$ 1 micron absolute pore size
- Unknown

7.8 Appendix H- WUI/WNID: Vehicle Description Table

Note: If additional values may be added to a list, this information is indicated at the top of the list.

Water Type

- Bulk Water Purchase
- Cooling Tower
- Drainage Ditch
- Evaporative Condenser/Air Conditioning Unit
- Fountain - Ornamental (A decorative non-interactive fountain intended for public display and not designed for swimming or recreational use)
- Fountain – Unknown Intent
- Hot Spring
- Lake/Reservoir/Impoundment
- Mist/Steam - Mister
- Mist/Steam - Device Producing Mist or Steam as a Side-Effect of Use (e.g., steam cleaner)
- Ocean
- Pond
- Puddle/Canal/Swamp
- Public Drinking Water
- River/Stream
- Spring
- Treated Wastewater Effluent
- Untreated Sewage
- Well
- Unknown

Setting of Exposure- Additional settings may be added to this list.

- Airport
- Apartment/Condominium
- Beach – Private
- Beach - Public
- Beach – Nonspecific
- Bus Station
- Camp/Cabin/Recreational Area
- Child Care/Daycare Center
- Church/Other Place of Worship
- Club (Requiring Membership)
- Community/Municipality
- Factory/Industrial Facility
- Farm/Rural/Agricultural Setting
- Hall/Meeting Facility
- Hospital/Health Care Facility/Nursing Home
- Hotel/Motel/Lodge/Inn
- Indoor Place of Work/ Office
- Native American Reservation
- Military Facility
- Mobile Home Park
- Outdoor Place of Work?
- Park – Amusement
- Park - Community/Municipal
- Park – Forestry Service
- Park - State Park
- Park - National Park
- Park – Waterpark
- Park – Nonspecific
- Prison/Jail/Incarceration Facility (Juvenile/Adult)
- Private Residence
- Public Outdoor Area
- Resort
- Restaurant/Cafeteria
- School/College/University
- Ship/Boat – Cruise
- Ship/Boat - Other - Unspecified
- Store
- Subdivision/Neighborhood
- Street Vendor
- Temporary Event - Festival/Fair
- Temporary Event - Other –unspecified
- Train Station
- Zoo
- Unknown

USUAL Water Treatment Provided- Additional water treatments may be added to this list.

- No Treatment
- Coagulation
- Flocculation
- Disinfection
- Distillation
- Filtration at Treatment Plant (**do not** include home filters)
- Home/Point-of-Use Filtration
- Settling (Sedimentation)
- Softening
- Other Chemical Addition (e.g., fluoride, oxidation, metals removal, corrosion control)
- Unknown

Water Treatment Subtype- Additional water treatment subtypes may be added to these lists.

Disinfection:

- Boiling/Heating/Pasteurization
- Chlorine
- Chlorine Dioxide
- Chloramine (Chlorine and Ammonia)
- Copper-Silver Ionization Unit
- Cyanurates/Stabilized Chlorine
- Ozone
- U.V.
- Unknown

Filtration at Treatment Plant:

- Activated Carbon
- Bag Filter
- Cartridge Filter
- Diatomaceous Earth
- Membrane Microfiltration
- Rapid Sand
- Reverse Osmosis
- Slow Sand
- Ultrafiltration
- Unknown

Home/Point-of-Use Filtration:

- Reverse Osmosis
- Activated Carbon
- $\leq$ 1 micron absolute pore size
- Unknown

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