



Exhibit 3.4 – Water System Flushing Procedures after Loss in System Pressure due to Flooding or Earthquake

STATE OF COLORADO

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S. Laboratory Services Division
Denver, Colorado 80246-1530 8100 Lowry Blvd.
Phone (303) 692-2000 Denver, Colorado 80230-6928
Located in Glendale, Colorado (303) 692-3090
www.colorado.gov/cdphe



Colorado Department
of Public Health
and Environment

General Draft Guidance for Public Water Systems Affected by September 2013 Flood Emergencies

Water systems that have had a power outage or disruption in service

Any water system that has lost power and/or had a disruption in water supply during the flood emergency should assume that there has been a loss of pressure in their water system and should notify CDPHE Drinking Water Compliance Assurance. Upon consultation with CDPHE, Public Notice to all consumers of a boil, bottled, or other water advisory may be required. Before water is served, the water system must follow standard flushing procedures (attached), and must collect five bacteriological samples from representative sites in the distribution system. The water cannot be declared potable until all samples are tested and confirmed to be absent for total coliform, the flushing has occurred, and CDPHE lifts the water advisory in writing.

Surface water systems that are encountering very high turbidity raw water

Surface water systems that have shut off intakes and have been using storage or alternate sources during the flood emergency should ensure through sampling and testing that the turbidity level of the raw water can be managed within the treatment plant. The finished water turbidity must not exceed the regulatory limit for the type of filtration used. Because of the increased likelihood of pathogens present in surface water, any exceedance of the finished water turbidity limits must immediately be reported to CDPHE, and CDPHE will advise on the course of action. Additional sampling should be considered by water systems including: herbicides and pesticides from agricultural sources, synthetic volatile organic compounds from industrial activities, and asbestos from building debris. CDPHE is actively working to identify specific areas where contamination may be more likely.

Groundwater systems that have been inundated

Groundwater systems where a source water area or wellhead has been inundated should advise CDPHE immediately. CDPHE is actively working to assess the potential pollutants in the flood affected area. There may be contamination from oil and gas activities, industrial waste,

domestic waste, and livestock operations. CDPHE advises at a minimum that the water system collect a raw source water bacteriological sample and a raw source water ammonia/nitrate/nitrite sample as soon as possible to ensure the groundwater source is not inundated with domestic or livestock waste. Additional sampling should be considered by water systems including: herbicides and pesticides from agricultural sources, synthetic volatile organic compounds from industrial activities, and asbestos from building debris. CDPHE is actively working to identify specific areas where contamination may be more likely.

Suspected contamination

Any water system that has observed a sheen or chemical odor in their raw or finished water or suspects unusual chemical contamination should contact CDPHE for further instructions and assistance.

Emergency water hauling

CDPHE tracks regulated water haulers. CDPHE is requesting that emergency water haulers who are not already Public Water Systems contact us so that we can assist public water systems in obtaining emergency water supplies. CDPHE is advising emergency haulers to obtain all water from a regulated public water system. Also, CDPHE highly recommends that all haulers collect a chlorine residual sample from each hauled load. In addition, a log book should be kept identifying the hauler name, the truck or bladder used, the Public Water System Identification Number (PWSID) of the wholesale system providing the water, and the PWSID of the system receiving the water. To protect public health, all trucks or bladders used for potable water hauling must be sanitized in accordance with AWWA C652 prior to first use. A general rule of thumb is to:

- a. Either, spray down the tank with a chlorine solution of 200 mg/L. A 200 mg/L chlorine solution can be made by adding 1 ½ cups of chlorox bleach (8.25%) to 50 gallons of water.
- b. Alternatively, the tank can be filled with a high strength chlorine solution and allowed to disinfect for 6 hours. The high strength chlorine solution can be made by mixing ¾ cup of 8.25% chlorox bleach for each 100 gallons of water used.

Water systems that are interested in water hauling should contact COWARN, or the local assistance number.

For more information contact CDPHE for:

Compliance Assurance, sampling requirements:	303-692-3556
Field Services, suspected contamination:	303-692-3603
Engineering, design criteria:	303-692-3278
Acute Team, boil/bottle water advisories:	303-692-3258
Local Assistance, COWARN:	303-692-3619

Drinking Water System

Generic Flushing and Sanitization Procedure

The flushing and sanitizing of a drinking water system begins at the treatment plant and proceeds systematically outward to all ends of the distribution system. Proper flushing, sanitation, and bacteriological testing are required prior to lifting a boil-water advisory.

1. The first step is to increase the disinfectant (chlorine) level leaving the properly operating treatment plant, and entering the distribution system, to between 3 and 4 mg/l (free chlorine).
2. The next step is to systematically begin flushing from the entry point of the distribution system outwards to all ends of the distribution system. Adequate flushing can be easily verified by measuring for the increased disinfectant residual at each flushing point.
3. After flushing, the disinfectant (chlorine) residual level is returned to the normal operating range and the system is once again flushed until the disinfectant (chlorine) level at the system's furthest tap is within the normal operating range, generally greater than 0.2 mg/l but less than 2.0 mg/l free chlorine.
4. Once the quality of finished water has stabilized throughout the distribution system, microbiological samples (Standard Coliform Test) must be collected at representative locations, (minimum of 5 to 10 sample points), in the distribution system, including all ends of the system. Disinfectant (chlorine) levels in the sampled water must also be measured at the same time the microbiological samples are collected.
5. If the above microbiological monitoring results indicate unsafe conditions (total coliform – positive, on any single sample) the above procedure must be re-implemented until the microbiological monitoring results indicate safe conditions, (total coliform – negative, on all sample locations).
6. Submit results in a written document summarizing all activities undertaken to fix the treatment problem, flush and sanitize the distribution system, and results of all laboratory and field-testing.