

Commonwealth of Kentucky

Guidelines for the Use of Emergency Water Treatment Systems



Kentucky Public Health

Prevent. Promote. Protect.

August 30, 2017

These guidelines were developed and approved by the Kentucky Department for Public Health, in collaboration with the Kentucky Division of Water. Copies may be distributed to supporting agencies to promote information sharing and facilitate coordinated preparedness, response, and recovery activities. The Kentucky Department for Public Health's Preparedness Branch will update and distribute these guidelines annually or as significant changes occur.



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Introduction

The Kentucky Department for Public Health's (KDPH) Preparedness Branch and the Kentucky Division of Water (KDOW) have developed the *Guidelines for the Use of Emergency Water Treatment Systems (EWTS)* to provide assistance to Kentucky's 13 Regional Healthcare Coalitions (HCC) and collaborating agencies for using an EWTS if an approved public water supply is disrupted for longer than 24 – 36 hours.

These guidelines apply specifically to the First Water Systems and Aqua Sun Systems that are prepositioned in Kentucky's 13 Regional HCCs. Refer to [Appendix A](#) for more information on the various EWTS located throughout Kentucky.

Training Requirements

Each HCC should identify at least three persons from member agencies to receive initial and annual training on the operation, use, demobilization, and maintenance of the specific EWTS located within the HCC. This training must be documented and kept on file by the HCC Coordinator and the agency responsible for using the EWTS. These persons will serve as the EWTS trained operators needed to operate the systems when activated for training, exercises, maintenance, or real-world events. Only trained operators should set up, use, maintain, and demobilize any activated EWTS.

Note: First Water will provide on-site training, for a fee, to train persons on the operation, use, demobilization, and maintenance of the First Water EWTS. In addition, training videos are available on First Water's website at <http://firstwaterinc.com/video-library/>

Activation of Unit

The KDOW recommends only using EWTS as a last resort during significant water disruptions. Initially, communities should provide potable water to their consumers from other approved sources, (e.g., emergency interconnections between public water systems, bottled water, hauled potable water, boiled water, or other approved sources). However, if an alternative potable water supply cannot be obtained, the HCC can elect to use an EWTS as described in these guidelines.

Source Water

The EWTS listed in this guidance can draw from any fresh source water to provide potable water. However, these systems only reduce microbiological contaminants and **cannot** remove chemical contaminants. Ideally, source water should be sediment and turbidity free. Examples of source water, from most preferred to least preferred, are as followed:

- 1) Facility plumbing under boil water advisory
- 2) Swimming or therapy pools
- 3) Shuttled water from fire trucks or tankers
- 4) Irrigation wells
- 5) Rain water collected from roof runoff
- 6) *Surface water from retention ponds, lakes, or streams

***Note:** Although surface water from retention ponds, lakes, or streams is listed by the manufacturer as a safe source of freshwater, the KDOW recommends water from this source should never be pumped through an EWTS. Surface water tends to be of low quality and can be difficult to treat and should only be used for toilet flushing during an emergency.

Approval Process

Currently, there is no state approval process for the activation of an EWTS, but KDPH needs to be notified when an EWTS is activated by sending an email to chfsdphdoc@ky.gov. Once an EWTS is activated, KDPH will notify KDOW. A flowchart of the activation process can be found in [Appendix B](#).

Operation

The activation of an EWTS is at the discretion of the HCCs and their partnering agencies, i.e., local health departments (LHD) and hospitals. Trained operators must follow the manufacturer’s operational guidelines when using an EWTS. Figure 1 displays the operational stages of an EWTS. For more information on each operational stage of an EWTS, refer to [Appendix C](#). In addition, [Appendix A](#) contains supporting links to the operation manuals and training videos.

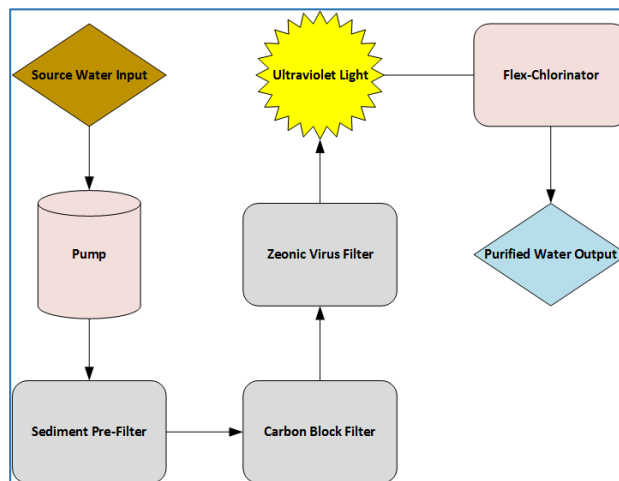


Figure 1: EWTS General Operational Stages

Sampling and Required Testing

The KDOW has a certified laboratory program for all laboratories that test water and wastewater parameters in the state per 401 KAR 5:320. Testing of purified water taken from an EWTS should be completed by one of the certified laboratories listed in [Appendix D](#) based on the required tests in [Appendix E](#).

Only trained operators and LHD environmentalists are authorized to collect water samples for testing. The treated water from each source needs to be tested 30 minutes after the chlorination process and at the end of each filter life per the manufacturer’s guidance listed in [Appendix E](#). Table 1 lists the required tests for each sample. If required testing material is unavailable, LHD Environmentalists should coordinate with their local water utility or county Emergency Management Agency to have these tests conducted.

Note: Bacteriological test results for water samples can take up to 48 hours. However, purified water can still be distributed to consumers in an emergency, pending test results. This should be disclosed to the consumers. If the purified water tests positive for bacterial contaminants, immediately stop water collection and water distribution to the consumer. The EWTS must be dismantled, cleaned with potable water, and reassembled with new filters prior to next use. If the next water sample tests positive for bacterial contaminants, stop producing water, dismantle and clean the EWTS, and identify new source water.

Condition	Test Used
Free Chlorine	HACH Pocket Colorimeter
Turbidity	Nephelometer or Turbidimeter
E. coli and Coliform	TC/Presence-Absence (P-A) Test

Table 1: Potable Water Tests



Water Containers

Operators should ensure that there is no physical contact between containers and the EWTS. The interiors and exteriors of containers used for water collection and distribution need to be clean and in good condition. Nonstandard containers used for storage and transportation of potable water shall comply with requirements of the National Science Foundation (NSF)/American National Standards Institute (ANSI) - 61: Drinking Water System Components. Containers must be nontoxic and made of Federal Drug Administration (FDA) approved food grade material. Consumers are allowed to bring their own containers to retrieve water. The Aqua Bags listed in [Appendix A](#) are made with food-grade plastic and are suitable to store 1.5 gallons of water per bag. The words **POTABLE WATER ONLY** need to be stenciled on both long sides of the exterior of the containers used for storage to ensure that non-water sources are not stored in water containers.

Note: Operators can refuse to give water to consumers if containers appear dirty.

Demobilization and Disinfection

As soon as possible after an event, flush the EWTS by pumping potable water through it for at least 5 minutes. Refer to the operation manual links in [Appendix A](#) for instructions on how to disinfect and disassemble the EWTS.

Key Points:

- 1) Discard all used filters – these cannot be reused.
- 2) If sediment remains in the system, replace empty canisters and flush with clean water.
- 3) Drain the UV chamber by tilting unit slightly and allowing water to flow from the outlet.
- 4) Remove and drain all hoses – hang the hose to drain allowing time to dry completely.
- 5) Leave canisters open and allow the EWTS to air dry for at least 8 hours to ensure that the system is completely dry before storing.

Definitions

- Free Chlorine Residual – all chlorine present in the water
- Gallon Per Hour (GPH) – a unit of volume flow equal to a gallon flow per hour
- Nephelometric Turbidity Units (NTU) – a unit measuring the lack of clarity in water
- Potable Water – water that is safe to drink
- Purified Water – water that has not been tested by a certified laboratory but has been pumped through an EWTS
- Sediment – matter that settles at the bottom of liquid
- Turbidity – the cloudiness or haziness of a fluid caused by a large number of particles

Table 2: Definitions



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APPENDIX A

First Water and Aqua Sun Systems

The following First Water Systems (FW) and Aqua Sun Water System (Outpost), and flex chlorinators, are prepositioned in Kentucky's 13 Regional Healthcare Coalitions (HCC) and should be used as outlined in these guidelines. The Aqua Bags are available in some HCCs and/or can be purchased for use if agreed upon within the HCC. For more information on each system, refer to the links below:

- <http://firstwaterinc.com/support/>
- <http://firstwaterinc.com/video-library/>
- <http://www.aqua-sun-intl.com/index.html>



FW-120-M produces 120 gph



FW-300-M produces 300 gph



FW-1200-M produces 1200 gph



Outpost 12 produces 720 gph



Flex Chlorinator



Aqua Bag

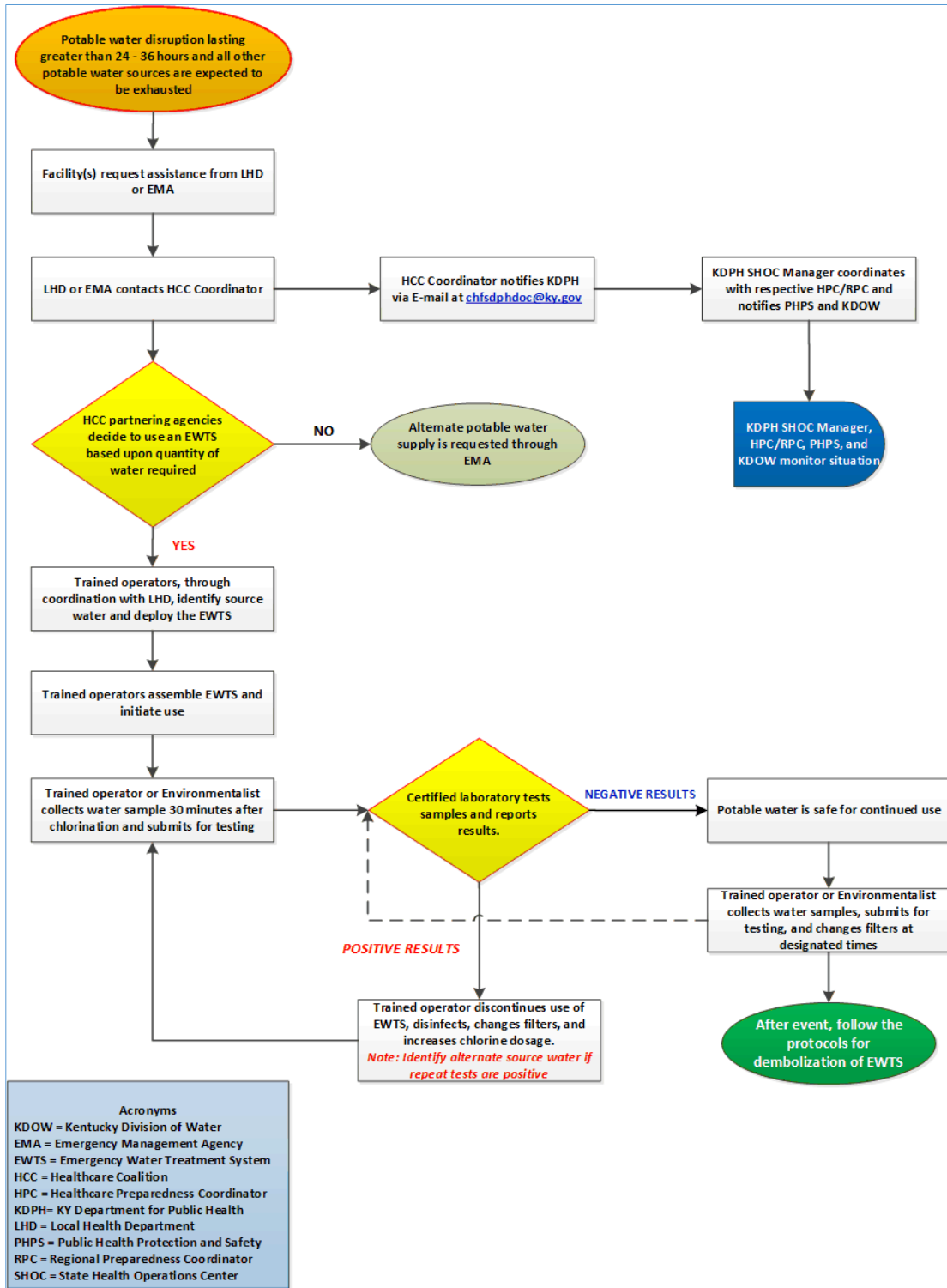


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APPENDIX B

Emergency Water Treatment Systems Activation Flowchart





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APPENDIX C

Operational Stages for First Water and Aqua Sun Systems

Operational Stages for First Water Systems

1. The first step in the First Water filtration process is the use of the polywound sediment pre-filter. This filter removes suspended solids, known as sediment or particulate.
2. Next, the carbon block filter uses activated carbon to remove contaminants and impurities.
3. Then, the zeonic virus filter further reduces microbiological contaminants.
4. After the use of the zeonic virus filter, the UV lamp produces ultraviolet light rays that are up to 99.999% effective at removing viruses and bacteria.
5. The final step in the First Water filtration process is the use of the Flex-Chlorinator.

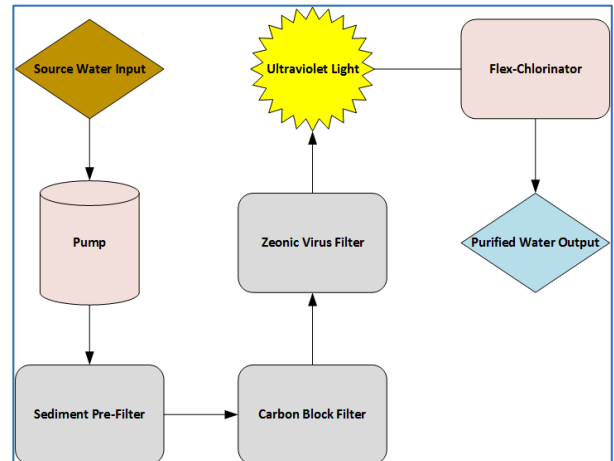


Figure 2: First Water Systems Operational Stages

- a. In order to add residual disinfection to purified water, each EWTS has a designated Flex-Chlorinator that uses common household bleach (sodium hypochlorite) to inject chlorine into the treated water.
- b. Although the Flex-Chlorinator does not have specific National Sanitation Foundation (NSF) approval, all First Water purification systems are independently certified to NSF protocols P231 and P248, which outline standards for microbiological water purifiers.

Operational Stages for Aqua Sun Systems

1. The first step in the Aqua Sun Water System is the use of the washable/reusable sediment pre-filter. This filter removes particles such as twigs, leaves, and sediments. It also protects the sediment pre-filter from premature clogging.
2. Next, the sediment filter is activated. This filter removes additional sediment and protects the carbon block filter from premature clogging.
3. Then, the carbon block polishing filter removes and reduces *giardia lamblia* and *cryptosporidium* cysts, *entamoeba* and *toxoplasma* cysts, turbidity, sediment, color, bad taste, and odors such as hydrogen sulfide by 99.999%.
4. After the use of the carbon block-polishing filter, the UV light rays produced by the ultraviolet lamp are 99.999% effective in killing bacteria and viruses.

5. The final step in the Aqua Sun Systems filtration process is the use of the Outpost Chlorination System. Once the purification process is completed, the outpost chlorination system injects household bleach (sodium hypochlorite) directly into the EWTS.

- a. Proportional mixers are used to mix concentrates with water properly.
- b. The chlorine provides a residual in the water and prevents any cross contamination after the water has been filtered and disinfected.

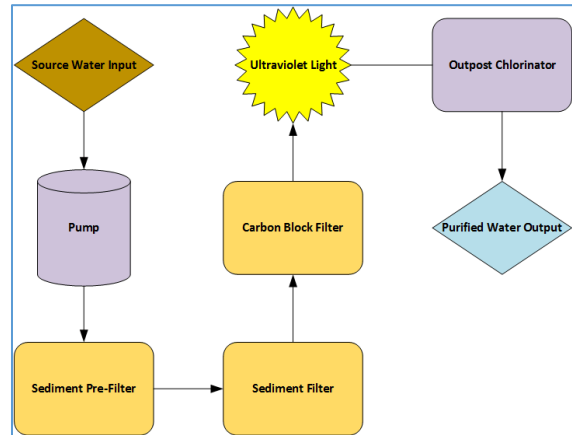


Figure 3: Aqua Sun Systems Operational Stages

Once chlorination is completed, free chlorine residual is tested. More information on free chlorine residual is stated below.

Once household bleach (sodium hypochlorite) is added to purified water, allow water to stand for 30 minutes before distributing to consumers and sampling for testing.

After purified water is pumped from an EWTS, the presence of chlorine residual is tested. Free chlorine residual indicates that:

- 1) A sufficient amount of chlorine was added to inactivate bacteria and some viruses.
- 2) The water is protected from recontamination during storage.

According to the Centers for Disease Control and Prevention (CDC), 30 minutes after the addition of sodium hypochlorite, there should be no more than 2.0 mg/L of free chlorine residual present to ensure that the water does not have an unpleasant scent or odor.

Twenty-four hours after adding of sodium hypochlorite to containers that store water, there should be a minimum of 0.2 mg/L of free chlorine residual present to ensure microbiologically clean water.

Note: Systems that filter must ensure that the turbidity does not go any higher than one NTU. This can be tested by using a nephelometer.



APPENDIX D

List of Certified Laboratories in Kentucky

Region 1

McCoy & McCoy Laboratories Inc.

3038 Lone Oak Road; Suite 4 Paducah KY 42003
Contact: Travis Miller
Phone: (270) 444-6547
Fax: (270) 444-6572
Email: t.miller@mccoylabs.com

Paducah Water

1800 Nth 8th Street Paducah KY 42002
Contact: Mindy Martin
Phone: (270) 444-5572
Fax: (270) 443-8933
Email: mmartin@pwwky.com

Region 2

Hopkinsville Water Environment Authority Moss WTP

1000 Metcalfe Lane Hopkinsville KY 42240
Contact: Chandra Henderson
Phone: (270) 887-4232
Fax: (270) 887-4151
Email: Chenderson@hwea-ky.com

Kentucky American Water

1000 Metcalfe Lane Hopkinsville KY 42240
Contact: David Shehee
Phone: (859) 335-3670
Fax: (859) 335-3388
Email: david.shehee@amwater.com

Logan\Todd Regional Water

248 Tower St. Guthrie KY 42234
Contact: Tameka N. McCullough
Phone: (270) 483-6990
Fax: (270) 483-6691
Email: tmccullough@ltrwc.org

McCoy & McCoy Laboratories Inc.

825 Industrial Road Madisonville KY 42431
Contact: Dr. Todd Cowan
Phone: (270) 821-7375
Fax: (270) 825-9200
Email: t.cowan@mccoylabs.com

Microbac Laboratories, Inc.

5309 Reidland Road Paducah KY 42003
Contact: Ryan VanArsdall
Phone: (270) 898-3637
Fax: (270) 898-3666
Email: Ryan.Vanarsdall@microbac.com

Region 3

Henderson Water Utility

510 N. Water St. Henderson KY 42420
Contact: Ashley Cooper
Phone: (270) 869-6591
Fax: (270) 826-2428
Email: coopera@hkywater.org

Moss McGraw Environmental Laboratory, Inc.

503 S 5th Street Henderson KY 42420
Contact: Wallisa McGraw
Phone: (270) 830-7075
Fax: (270) 830-7348
Email: wallisa@bellsouth.net

Owensboro Municipal Utilities

4067 U.S. Highway 60 East Owensboro KY
42303
Contact: Cathy Vessels
Phone: (270) 926-3200
Fax: (270) 926-7433
Email: vesselsce@omu.org



Region 4

BGMU WTP Lab

16 Chestnut St. Bowling Green KY 42101
Contact: John Gott
Phone: (270) 782-1200
Fax: (270) 782-4307
Email: jgott@bgmu.com

Glasgow Water Company Micro Lab

1321 Narrows Road Glasgow KY 42141
Contact: Tim Smiley
Phone: (270) 646-2042
Fax: (270) 646-2042
Email: tsmiley@glasgowh2o.com

HydroAnalytical

2413 Nashville Road - CR&D Bowling Green KY 42101
Contact: Ethan Given
Phone: (270) 745-5287
Fax (270) 745-3102
Email: ethan.given@wku.edu

IEH - Scottsville

207 E. Locust Street Scottsville KY 42164
Contact: Michelle Quarry
Phone: (207) 239-1367
Email: michelle.corey@iehinc.com

Region 5

Pirtle Spring Bacteriological Laboratory

1500 Shipley Road Cecilia KY 42724
Contact: Amanda Spalding
Phone: (270) 862-4340
Fax: (270) 862-5740
Email: aspalding@hcwd.com

White Mills Laboratory

1300 Cave Road Glendale KY 42740
Contact: Dwayne Barnes
Phone: (270) 862-3213
Fax: (270) 862-3768
Email: whitemillslab@hardincountywater2.org

Western KY Regional Lab

169 2nd Street Hardin KY 42408
Contact: Wendy Rose
Phone: (270) 437-4800
Fax: (270) 437-4805
Email: wendyd.rose@ky.gov

Region 6

Beckmar Environmental Lab

251 Ruckriegel Pkwy. Louisville KY 40222
Contact: Kimberly Fallon
Phone: (502) 266-6533
Fax: (502) 266-6446
Email: kim@beckmarlab.com

Louisville Water Company

3018 Frankfort Avenue Louisville KY 40206
Contact: Monica Ottens-Settles
Phone: 502-569-3600
Fax: 502-569-0813
Email: Mottens@lwcky.com

McCall & Spero Environmental, Inc.

1831 Williamson Court Louisville KY 40223
Contact: S. Dewayne Lear
Phone: (502) 244-7135
Fax: (502) 244-7136
Email: dewayne@mselabs.com

Microbac Laboratories, Inc.

3323 Gilmore Industrial Blvd. Louisville KY 40213
Contact: Ryan VanArsdall
Phone: (502) 962-6400
Fax: (502) 962-6411
Email: Ryan.Vanarsdall@microbac.com

Region 7

Kentucky American Water - Kentucky River Station II (Owenton)

16035 Hwy 127 South Owenton KY 40359
Contact: David Shehee
Phone: (859) 335-3670
Fax: (859) 335-3388
Email: david.shehee@amwater.com



Northern Kentucky Service Center of PACE Analytical

104 North Street Wilder KY 41071
Contact: Antoinette C. Ruschman
Phone: (859) 341-9989
Fax: (859) 341-5081
Email: antoinette@cardinallabs.com

Northern Kentucky Water District

700 Alexandria Pike Ft. Thomas KY 41075
Contact: Mary Carol Wagner
Phone: (859) 441-0482
Fax: (859) 441-1863
Email: wagner@nkywater.org

Region 8/9

Morehead State University Microbiology Laboratory

444 Ashland Ave. Morehead KY 40351
Contact: Justin Mason
Phone: (606) 783-2961
Fax: (606) 783-5045
Email: jrmason@moreheadstate.edu

Region 10/11

Appalachian States Analytical, LLC

181 Longview Drive Pikeville KY 41501
Contact: Ama Bentley
Phone: (606) 437-5616
Fax: (606) 437-0615
Email: ama@appalachian-states.com

Ashland Drinking Water Microbiology Laboratory

4040 Winchester Avenue Ashland KY 41101
Contact: William E. Stambaugh
Phone: (606) 327-2058
Fax: (606) 327-2070
Email: monk8874@yahoo.com

McCoy & McCoy Laboratories, Inc.

173 Island Creek Road Pikeville KY 41501
Contact: Amanda Hall
Phone: (606) 432-3104
Fax: (606) 432-3171
Email: a.hall@mccoylabs.com

Mineral Labs, Inc.

309 Parkway Drive Salyersville KY 41465
Contact: Sharlonda Matthews
Phone: (606) 349-6145
Fax: (606) 349-6102
Email: sharlonda@minerallabs.com

Region 12

(No certified labs in this region)

Region 13

Barbourville Utility Commission Laboratory

938 N. U.S. 25E Barbourville KY 40906
Contact: Eric Trent
Phone: (606) 546-3189
Fax: (606) 546-4206
Email: buclab@barbourville.com

Corbin City Utilities Commission

60 West Hinkle Street Corbin KY 40701
Contact: James P. Hampton
Phone: (606) 528-5975
Fax: (606) 528-4848
Email: james.hampton@corbinutilities.com

Region 14

Fouser Environmental Services- Adair County

555 Griffin Springs Road Campbellsville KY 42718
Contact: Maggie Mahan
Phone: (859) 753-4101
Fax: (270) 465-2216
Email: adairfes@gmail.com

Somerset Water Plant

5400 S. Hwy 27 Somerset KY 42502
Contact: Pat Harris
Phone: (606) 561-4626
Fax: (606) 561-6208
Email: pharris@cityofsomerset.com



Region 15N

City of Paris Microbiology Laboratory

700 Scott Avenue Paris KY 40361

Contact: Cohen Swiney

Phone: (859) 987-2118

Fax: (859) 987-2123

Email: cswiney@paris.ky.gov

Environmental Services Branch / Centralized

Laboratory Facility

100 Sower Blvd. Suite 104 Frankfort KY 40601

Contact: Michael Goss

Phone: (502) 564-6120

Email: michael.goss@ky.gov

Fouser Environmental Services

165 Camden Avenue Versailles KY 40383

Contact: Smantha Horn

Phone: (85) 873-6211

Fax: (859) 873-5115

Email: lab@fouser.com

Frankfort Plant Board

200 Coffee Tree Rd. Frankfort KY 40601

Contact: Shannon Young

Phone: (502) 352-4349

Fax: (502) 227-4130

Email: syoung@fewpb.com

Georgetown Water Laboratory

214 West Main Street Georgetown KY 40324

Contact: Kim Cooch

Phone: (502) 863-7819

Fax: (502) 863-9284

Email: kcooch@gmwss.com

Hall Environmental Consultants, LLC

1376 Danville Road Loop #1 Nicholasville KY 40356

Contact: Randy Shelley

Phone: (859) 885-3331

Fax: (859) 885-4613

Email: rshelley@hallenvironmental.net

Kentucky American Water

2400 Richmond Road Lexington KY 40502

Contact: David Shehee

Phone: (859) 335-3670

Fax: (859) 335-3388

Email: david.shehee@amwater.com

KY Division of Laboratory Services

100 Sower Blvd. Suite 204 Frankfort KY 40601

Contact: Isabelle Berberian

Phone: (502) 782-7713

Fax: (502) 564-0041

Email: Isabelle.Berberian@ky.gov

McCoy & McCoy Laboratories, Inc.

2456 Fortune Drive Suite 160 Lexington KY 40509

Contact: Arianna Lageman

Phone: (859) 299-7775

Fax: (859) 299-7785

Email: arianna@mccoyleabs.com

Microbac Laboratories, Inc.

2520 Regency Road Lexington KY 40503

Contact: Lisa Martin

Phone: (859) 276-3506

Fax: (859) 278-5665

Email: lisa.martin@microbac.com

Region 15 S

Richmond Water Lab

216 Bend Road Waco KY 40385

Contact: Lonnie Banks

Phone: (859) 369-5389

Fax: (859) 369-0091

Email: lbanks@richmondutilities.com



APPENDIX E

EWTS Testing Requirements

The information below summarizes the tests required for drinking water samples taken from an EWTS.

Testing Summaries	
Free Chlorine	Chlorine can be present in water as free chlorine and as combined chlorine. Both forms can co-exist in the same solution. However, only free chlorine can be analyzed independently. Free chlorine is in a solution as hypochlorous acid or hypochlorite ion. The HACH Pocket Colorimeter estimates the concentration of the free chlorine by measuring the intensity of the color produced when the reagent is added to the sample.
Turbidity	Turbidity is a measurement of the optical property of water – the amount of light that is scattered and absorbed by particles in the sample. It requires the use of a nephelometer or turbidimeter to compare a formazin solution to the sample. Turbidity is reported in Nephelometric Turbidity Units (NTU).
Total Coliform and <i>E. coli</i> (TC/EC)	The TC/Presence-Absence (P-A) test for coliform group uses a 100 mL of sample and provides qualitative information on the presence or absence of coliforms. TC/P-A is intended for use on routine samples collected from distribution systems or water treatment plants. The TC/Presence-Absence (P-A) test also uses a fluorogenic substrate to detect the enzyme B-glucuronidase, which is produced by <i>E. coli</i> .

Table 3: Testing Summaries

Frequency of Filter Change and Testing

Refer to the table below for information on when each filter should be changed based on manufacturer specifications under optimal conditions. Filters may require changing more frequently because of high turbidity and decreased water flow. When a decrease in water flow is observed, replace the sediment filter.

Note: There is no gauge on the EWTS to track how many gallons of purified water have been produced. EWTS trained operators should track the amount of gallons produced by the amount of containers that are filled with water.

EWTS	Filter Change
FW-120-M	Filter set should be replaced every 6,000 gallons
FW-300-M	Filter set should be replaced every 25,000 gallons
FW-1200-M	Filter set should be replaced every 50,000 gallons
FW-1200-P	Filter set should be replaced every 50,000 gallons
Outpost 12	Filter set should be replaced every 150, 000 gallons

Table 4: Filter Changes