BLUEGRASS WATER
Utility Operating Company
A CSWR Managed Utility

Wellhead Protection Plan

for

Center Ridge Water District #4

KY0183106, Calloway County

Lake Road
New Concord, KY 42076

WPP Phase I approved April 26, 2004 & WPP Phase II approved June 3, 2004 by the Kentucky Division of Water

Revisions and recertification to be conducted by water system personnel every five (5) years.
Revised by Central States Water Resources EH&S personnel on August 20, 2020

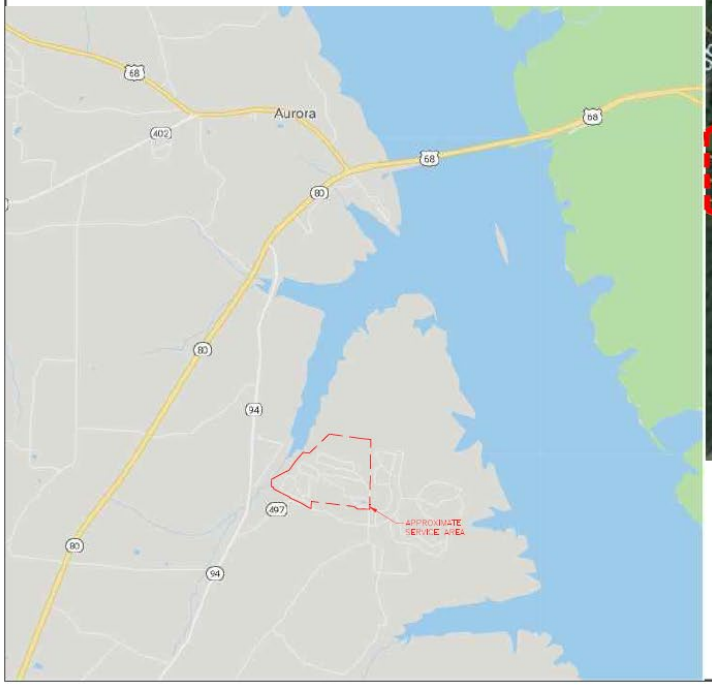
Table of Contents

Attachment 1
Service Area of Center Ridge Water District #4

Legend

Well house

Service area



Utility Note Disclaimer:

The utilities shown hereon are depicted based on the original design plans provided by the system manager. 21 Design Group, Inc performed no field verification of the layout and are unable to determine the exact location of this time. The location represents approximate location only and should not be construed as being 100% accurate. It is shown to provide general layout of the system only and should not be used to interpret encroachments.

21 DESIGN GROUP INC.
ENGINEERING & SURVEYING

Attachment 2
June MOR

KENTUCKY DIVISION OF WATER

Revised 05/26/20

DRINKING WATER BRANCH

MONTHLY OPERATION REPORT (MOR)--ALL WATER SYSTEMS

MONTH & YEAR (mm/yyyy) 06/2020

Indicate one with "X"

	SURFACE WATER
X	GROUNDWATER
	PURCHASE/DISTRIBUTE ONLY

PWS ID :	KY0183106	PLANT ID: A	PLANT NAME:	Center Ridge Water System #4	
PWS NAME:	Center Ridge Water System #4		PLANT CLASS: I	DIST. CLASS: I	
AGENCY INTEREST (AI):	33835		DATE MAILED:		
SOURCE NAME:	Well		COUNTY:	Calloway	

	OPERATOR(S) RESPONSIBLE / IN-CHARGE	CLASS	CERTIFICATION NUMBER
WTP SHIFT 1:	Freddie O'Bryan	IV	595
WTP SHIFT 2:			
WTP SHIFT 3:			
DISTRIBUTION:	Freddie O'Bryan	III	27595

THIS REPORT MUST BE RECEIVED BY THE DIVISION OF WATER AND APPLICABLE FIELD OFFICE NO LATER THAN 10 DAYS AFTER THE END OF THE MONTH.

TREATMENT PLANTS COMPLETE:

1. DESIGN CAPACITY (gpm):	25
2. TYPE OF FILTRATION USED:	
3. DESIGN FILTRATION RATE (gpm/sq. ft.):	
4. PERCENT BACKWASH WATER USED:	0.0
5. DATE FLOCCULATION BASIN(S) LAST CLEANED:	
6. DATE SETTLING BASIN(S) LAST CLEANED:	

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein. Based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possiblity of fine and imprisonment. See KRS 224.99-010 and 401 KAR 8:020. (Penalities under this statute and regulation may include fines up to $25,000 per violation or by imprisonment for not more that one year, or both).

X _____

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

KENTUCKY DIVISION OF WATER - DRINKING WATER BRANCH
WATER TREATMENT PLANT - MONTHLY OPERATING REPORT

PWS ID : KY0183106
PLANT ID: A

APPLICABLE TO ALL PLANTS

REPORT MONTH/YEAR: 06/2020
PAGE 1 **OF** 11

	RAW WATER TREATED	HOURS PLANT OPERATED	COAGULANT		COAGULANT		pH ADJUSTMENT		DISINFECTANT		DISINFECTANT	
							Pre		Pre		Post	
DAY	GALLONS		LBS	PPM	LBS	PPM	LBS	PPM	LBS	PPM	LBS	PPM
1	16,100	10.7									0.10	0.7
2	20,400	13.6									0.10	0.6
3	19,000	12.6									0.10	0.6
4	14,200	9.4									0.10	0.8
5	11,600	7.7									0.10	1.0
6	10,600	7.0									0.10	1.1
7	10,600	7.0									0.09	1.0
8	4,900	3.2									0.04	1.0
9	7,500	5.0									0.06	1.0
10	10,000	7.0									0.07	0.8
11	9,800	6.5									0.07	0.9
12	8,804	5.8									0.07	1.0
13	3,300	2.2									0.02	0.7
14	14,000	9.3									0.10	0.9
15	9,600	6.4									0.08	1.0
16	7,500	5.0									0.05	0.8
17	10,500	7.0									0.06	0.7
18	10,500	7.0									0.06	0.7
19	10,600	7.0									0.06	0.7
20	8,900	5.8									0.05	0.7
21	15,200	10.0									0.10	0.8
22	10,900	7.1									0.08	0.9
23	18,900	12.0									0.10	0.6
24	10,300	7.0									0.07	0.8
25	30,100	20.0									0.24	1.0
26	9,600	6.4									0.07	0.9
27	20,400	13.6									0.14	0.8
28	7,100	4.7									0.05	0.8
29	12,900	8.6									0.07	0.7
30	9,600	6.4									0.06	0.7
31												
TOTAL	363,404	241.0									2.5	
AVERAGE	12,113	8.0									0.1	0.8
MAX	30,100											

NUMBER DAYS IN OPERATION 30

KENTUCKY DIVISION OF WATER - DRINKING WATER BRANCH
WATER TREATMENT PLANT - MONTHLY OPERATING REPORT

PWS ID : KY0183106
PLANT ID: A

APPLICABLE TO ALL PLANTS

REPORT MONTH/YEAR: 06/2020

ANALYTICAL RESULTS (mg/L OR PPM UNLESS OTHERWISE SPECIFIED)

	pH			TOTAL ALKALINITY		TOTAL HARDNESS		CHLORINE RESIDUAL				TURBIDITY (NTU)		
								TOP OF FILTER		PLANT TAP				
DAY	RAW	TOP OF FILTER	TAP	RAW	TAP	RAW	TAP	TOTAL	FREE	TOTAL	FREE	RAW	SETTLED WATER	PLANT TAP
1										0.63				
2										0.62				
3										0.61				
4										0.72				
5										0.67				
6										0.63				
7										0.81				
8										0.52				
9										0.69				
10										0.96				
11										0.68	0.86			
12										0.70	0.76			
13										0.70	0.64			
14										0.72	0.59			
15										0.63	0.71			
16										0.52	0.55			
17										0.62	0.60			
18										0.63	0.56			
19										0.71	0.57			
20										0.62	0.62			
21										0.53	0.63			
22										0.61	0.54			
23										0.71	0.62			
24										0.63	0.58			
25										0.51	0.71			
26										0.62	0.67			
27										0.59	0.67			
28										0.62	0.64			
29										0.72	0.55			
30										0.57	0.37			
31														
AVERAGE										0.65	0.62			

KENTUCKY DIVISION OF WATER - DRINKING WATER BRANCH
WATER TREATMENT PLANT - MONTHLY OPERATING REPORT

PWSID: KY0183106
PLANT ID: A

APPLICABLE TO ALL PLANTS

REPORT MONTH/YEAR: 06/2020

***Please answer Y/N question below this chart.**

ANALYTICAL RESULTS (mg/L OR PPM UNLESS OTHERWISE SPECIFIED)

	FLUORIDE		IRON		MANGANESE		PHOSPHATE		Lowest Daily Chlorine Residual Plant Tap On-Line Chlorine Analyzer		RAINFALL	WATER TEMP. DEGREES
DAY	RAW	TAP	RAW	TAP	RAW	TAP	RAW	TAP	Total		INCHES	F^0/C^0
1									0.63			
2									0.62			
3									0.61			
4									0.72			
5									0.67			
6									0.63			
7									0.81			
8									0.52			
9									0.69			
10									0.96			
11									0.68			
12									0.70			
13									0.70			
14									0.72			
15									0.63			
16									0.52			
17									0.62			
18									0.63			
19									0.71			
20									0.62			
21									0.53			
22									0.61			
23									0.71			
24									0.63			
25									0.51			
26									0.62			
27									0.59			
28									0.62			
29									0.76			
30									0.57			
31												
AVERAGE									Monthly Minimum		Total Rainfall	AVG Temp
									0.51			

Number of readings	30	0.00	
For Free Chlorine, # less than 0.2 mg/L	**0**	Y	
For Chloramines, # less than 0.5 mg/L		N	

Disinfectant Chloramines? (Y/N) **N**

KENTUCKY DIVISION OF WATER - DRINKING WATER BRANCH
WATER TREATMENT PLANT - MONTHLY OPERATING REPORT

PWS ID : KY0183106
PLANT ID: A

ALL WATER SYSTEMS

REPORT MONTH/YEAR: 06/2020

	DISTRIBUTION SYSTEM OPERATION											
	CHEMICALS ADDED			TEST RESULTS								
	CHLORINE BOOSTER	CHLORINE BOOSTER		TOTAL (T) AND FREE (F) CHLORINE RESIDUAL (ppm)								
				NORTH		SOUTH		EAST		WEST		
DAY	LBS	LBS		T	F	T	F	T	F	T	F	
1												
2												
3												
4												
5												
6												
7												
8												
9												
10					0.57							
11					0.96							
12					0.29							
13					0.76							
14					1.27							
15					0.89							
16					0.34							
17					0.84							
18					0.65							
19					0.45							
20					0.54							
21					0.42							
22					1.34							
23					0.82							
24					0.62							
25					0.57							
26					0.44							
27					0.54							
28					0.57							
29					0.45							
30					0.38							
31												
AVERAGE			Average		0.65							
TOTAL			Total Minimum									
			Free Minimum		0.29							
		Total # Chlorine Samples		0	21	0	0	0	0	0	0	
		# Less than 0.2 mg/L/0.5 mg/L		0	0	0	0	0	0	0	0	

Number of Free Residuals	21	Minimum Monthly Free Residual	**0.29**		Y
Number of Total Residuals	0	Minimum Monthly Total Residual	**0.00**	Disinfectant Chloramines? (Y/N)	**N** N
Total # Less than 0.2 mg/L	**0**			Number of days of operation?	**30**
Total # Less than 0.5 mg/L					

KENTUCKY DIVISION OF WATER / DRINKING WATER BRANCH
MONTHLY OPERATING REPORT (MOR) PLANT SUMMARY FORM

PWS ID **KY0183106** MONITORING PERIOD (MMYYYY) **06/2020**

Y
N **NOTE: COMPLETE ALL APPLICABLE FIELDS!!! NOT ALL OF THE FIELDS ARE PRE-POPULATED FOR YOU!!!**

PLANT INFORMATION
APPLICABLE TO ALL PLANTS

PLANT ID	**A**	TOTAL WATER TREATED (gallons)	**363,404**
PLANT NAME	**Center Ridge Water System #4**	AVE. DAILY PRODUCTION (gallons)	**12,113**
AGENCY INTEREST	**0**	MAXIMUM PUMPAGE (gallons per day)	**30,100**

INDIVIDUAL FILTER EFFLUENT TURBIDITY
APPLICABLE TO ALL PLANTS WITH FILTRATION

ANALYTE CODE **0100**

Was each filter monitored continuously? (Y/N)	
Were measurements recorded every 15 minutes? (Y/N)	
Was there a failure of the continuous monitoring equipment? (Y/N)	
If Yes, (1) were individual filter effluent turbidity grab samples collected every four hours of operation? (Y/N)	
(2) was the continuously monitoring equipment repaired within 5 working days? (Y/N)	
Was individual filter level greater than 1.0 NTU in two consecutive measurements? (Y/N)	
Was individual filter level greater than 0.5 NTU in two consecutive measurements after on line for more than four hours? (Y/N)	
Was individual filter level greater than 1.0 NTU in two consecutive measurements in three consecutive months? (Y/N)	
Was individual filter level greater than 2.0 NTU in two consecutive measurements in two consecutive months? (Y/N)	

If any of the last 4 boxes are YES, fill out the Individual Filter Turbidity Sheet and submit with the MOR

COMBINED FILTER EFFLUENT TURBIDITY
APPLICABLE TO ALL PLANTS WITH FILTRATION

ANALYTE CODE **0100**

Number of hours of plant operation	**241.0**
Were samples taken every 4 hours of plant operation? (Y/N)	
Number of samples taken	**0**
Highest single turbidity reading	**0.00**
For all filtration except slow sand filtration:	
Number of samples exceeded 0.1 NTU	
Number of samples exceeded 0.3 NTU	
Number of samples exceeded 1 NTU	
When filtration is slow sand filtration:	
Number of samples exceeded 1 NTU	
Number of samples exceeded 5 NTU	

ENTRY POINT RESIDUAL DISINFECTANT CONCENTRATION
APPLICABLE TO ALL PLANTS

ANALYTE CODE **0999**

Number of days of plant operation	**30**
Were samples taken each day of operation? (Y/N)	**Y**
Number of lowest chlorine samples recorded	**30**
Lowest single chlorine reading	**0.51**
If less than required:	
Was residual restored within 4 hours of plant operation? (Y/N)	
Free Chlorine (for all disinfectants except chloromine):	
Number of samples under 0.2 mg/L	**0**
Total Chlorine (when disinfectant is Chloramine):	
Number of samples under 0.5 mg/L	

CHLORINE DIOXIDE ENTRY POINT MONITORING
APPLICABLE TO PLANTS UTILIZING CHLORINE DIOXIDE

ANALYTE CODE **1008**

Number of days of plant operation	**30**
Were samples taken each day of operation? (Y/N)	
Number of samples taken	**0**
Highest single chlorine dioxide reading	**0.00**
Number of chlorine dioxide samples exceeded 0.8 mg/L	**0**

CHLORITE ENTRY POINT MONITORING
APPLICABLE TO PLANTS UTILIZING CHLORINE DIOXIDE

ANALYTE CODE **1009**

Number of days of plant operation	**30**
Were samples taken each day of operation? (Y/N)	
Number of samples taken	**0**
Highest single chlorite reading	**0.00**
Number of chlorite samples exceeded 1 mg/L	**0**

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein. Based on my inquiry of those individuals immediately responsible for obtaining the information, the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. Violations of 401 KAR Chapter 8 are subject to severe penalties prescribed in KRS 224.99-010, up to $25,000 fine per day per violation and in some cases a violation may subject the violator to prison.

X _____
SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

KENTUCKY DIVISION OF WATER / DRINKING WATER BRANCH
MONTHLY OPERATING REPORT (MOR) SUMMARY FORM

PWS ID KY0183106 MONITORING PERIOD (MMYYYY) **06/2020**

AI 33835 Y N **NOTE: COMPLETE ALL APPLICABLE FIELDS!!! NOT ALL OF THE FIELDS ARE PRE-POPULATED FOR YOU!!!**

PURCHASED		SOLD	
APPLICABLE TO ALL WATER SYSTEMS			
FROM WHOM? (PWS ID)	HOW MUCH? (gallons)	TO WHOM? (PWS ID)	HOW MUCH? (gallons)

DISTRIBUTION RESIDUAL DISINFECTANT CONCENTRATION
APPLICABLE TO ALL WATER SYSTEMS

ANALYTE CODE **0999**

Number of days of operation	**30**	
Were samples taken each day of operation? (Y/N)	**n**	
Number of samples taken:		
FREE	**21**	
TOTAL	**0**	
Lowest single FREE chlorine reading	**0.29**	
Lowest single TOTAL chlorine reading	**0.00**	

Free Chlorine (for all disinfectants except chloramine)
Number of samples under 0.2 mg/L **0**

Total Chlorine (when disinfectant is chloramine)
Number of samples under 0.5 mg/L

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein. Based on my inquiry of those individuals immediately responsible for obtaining the information, the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. Violations of 401 KAR Chapter 8 are subject to severe penalties prescribed in KRS 224.99-010, up to $25,000 fine per day per violation and in some cases a violation may subject the violator to prison.

X

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

KENTUCKY WELL INSPECTION FORM

AUG 06 2001

(1) AKGWA NUMBER: 0004-9096

Attach Well Record Label Here (if applicable)

Note: Water well labels begin with "0", monitoring well labels begin with "8".

(2) OWNER/FACILITY INFORMATION

Well Owner's Name: H&M Homeowners Association, Edward (Last / First / MI)

Mailing Address: 372 Windsong Cir.

City: Murray State: Ky Zip: 42071

Well Address (if different)

City: State: Zip:

Phone: (270) 382-2878

(3) WELL RECORD LABEL LOCATION:

( ) well casing ( ) pressure tank ( ) water pipe
( ) well cap (✓) electric box ( ) not labeled
( ) pump ( ) other

(4) WELL LOCATION

USGS Quadrangle Name: Hico

County: Calloway

Latitude: 36° 44.209 12.54"

Longitude: 88° 08.341 20.46"

(5) PHYSIOGRAPHIC OR HYDROLOGIC REGION

( ) Blue Grass ( ) Ohio River Alluvium
( ) E. Coal Field ( ) W. Coal Field
( ) Miss. Plateau (✓) Jackson Purchase

(6) DRILLER INFORMATION

Who Constructed Well? (✓) unknown

Address:

City: State: Zip:

Date Well Completed: / / 1979 ( ) unknown (Month / Day / Year)

(7) GENERAL

Type of Construction:
(✓) drilled/augered
( ) excavate & backfill
( ) hand dug/blasted

Depth of Well: 200 ft.
( ) measured
(✓) reported
( ) unknown

Static Water Level, ft. below surface:
( ) measured
( ) reported
( ) not measured
(✓) can't be measured

Well Yield: 20
(✓) gpm ( ) gph ( ) gpd
( ) measured
( ) estimated
( ) unknown

(8) SURFACE ANNULAR MATERIAL:

( ) clay ( ) drill cuttings
( ) cement (✓) unknown
( ) open ( ) sand ( ) gravel
( ) concrete pad

(9) WELLHEAD

Is Well Located in a Pit?
( ) yes (✓) no ( ) unknown

Wellhead (casing top):
(✓) well cap ( ) sanitary seal
( ) flush mount ( ) locking cap
( ) open ( ) unknown

Casing Above Ground Level?
(✓) yes ( ) no ( ) unknown
~8" inches above ground.

Discharge Pipe Below Surface?
( ) yes (✓) no ( ) unknown

Pitless Adapter Used?
( ) yes (✓) no ( ) unknown

(10) PUMP DETAILS

Date Installed: / / (✓) unknown (Month / Day / Year)

Pump Type:
(✓) submersible ( ) bailer
( ) turbine ( ) jet ( ) hand pump
( ) none ( ) other ( ) unknown

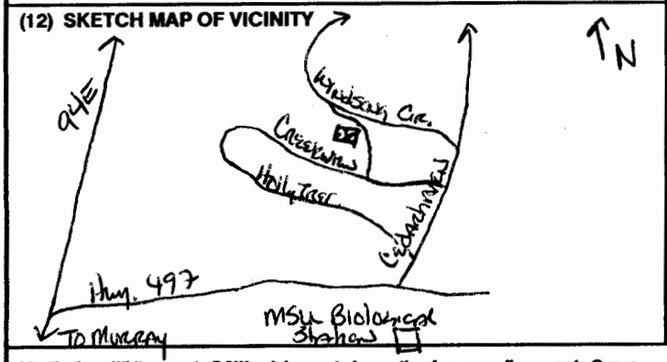
Intake Level: ft. below surface

Electric Connection:
( ) 2 wire (✓) 3 wire ( ) unknown

(11) WELL CONSTRUCTION DETAILS

Feet Below Surface From	To	Casing Inside Dia. (in.)	Casing Type	Casing Wall Thickness (in.)
0	160'	4"	PVC	

(12) SKETCH MAP OF VICINITY



(13) WELL USE (check all that apply)

(✓) domestic ( ) livestock ( ) not used
(✓) public ( ) irrigation ( ) abandoned
( ) industrial ( ) monitoring
( ) other

PWSID# 0183106

Water Withdrawal Permit #

(14) WELL SERVICE

Number of People Served: 112

Number of Service Connections: 35

Any Quantity Problems? ( ) yes (✓) no

Any Quality Problems? ( ) yes (✓) no

If "yes", describe in COMMENTS section, below.

(15) COMPLIANCE TO STANDARDS

Construction in Compliance with KY Standards?
( ) yes ( ) no ( ) unknown (✓) pre-law

If "no", describe in COMMENTS section, below.

(16) RELATIVE LOCATION

( ) upgradient ( ) sidegradient ( ) unknown
( ) downgradient ( ) varying (✓) N/A

(17) INSPECTION INFORMATION

Date of Inspection: 6 / 21 / 01 (Month / Day / Year)

Water Quality Sample Taken: ( ) yes (✓) no

Reason for Inspection:
( ) general survey
( ) specific complaint investigation
( ) spill or incident response
( ) contamination site investigation
( ) enforcement
( ) general water quality analysis
( ) ambient groundwater monitoring
(✓) other WHPP

Program Name and Facility ID#:

Alternate Well ID#:

(18) ELEVATION

480 ft. AMSL

From (✓) ground surface
( ) top of casing

By (✓) map
( ) survey
( ) report
( ) GPS

(19) TREATMENT SYSTEM

( ) none
( ) water softener
( ) ultraviolet
(✓) chlorination
( ) aeration
( ) charcoal filter
( ) sand filter
( ) iron treatment
( ) fluoridation
( ) other

Treatment Bypass Available? ( ) yes ( ) no

(20) OPTIONAL USE

Will Owner Allow State Access?
(✓) yes ( ) no ( ) unknown

Extent of Monitoring Allowed:
( ) collect sample
( ) measure SWL
( ) pump well
( ) complete access
(✓) notification required
( ) other (describe below)

Monitoring Feasibility:

(21) COMMENTS:

Well located inside treatment building, Along dirt road between paved roads.

(22) INSPECTOR IDENTIFICATION

Name: Holcomb Stephanie A (Last / First / MI) Inspector ID#

Agency: ( ) DOW ( ) DWM ( ) CHR ( ) KGS (✓) other KDWA

Signature of Inspector: Stephanie Holcomb Date: 6/21/01

Distribution: White copy to DOW, pink copy to Inspecting Agency, yellow copy to Owner.

Printed with State Funds.

DEP 4051
Revised 3/1/1993

Attachment 4
WHPP Drinking Water Planning Team

Leader:

Jay Favor, CSWR – Director Environmental Health & Safety
Oversees all facility operations for Bluegrass Water UOC. Directs team to carry out operation tasks.

Team:

Ali Alexander, CSWR – Environmental Compliance Officer
Oversees facility compliance with State and Federal Regulations/Statutes.

Stacy Culleton, CSWR – Director Customer Experience
Oversees communications between operators and customers.

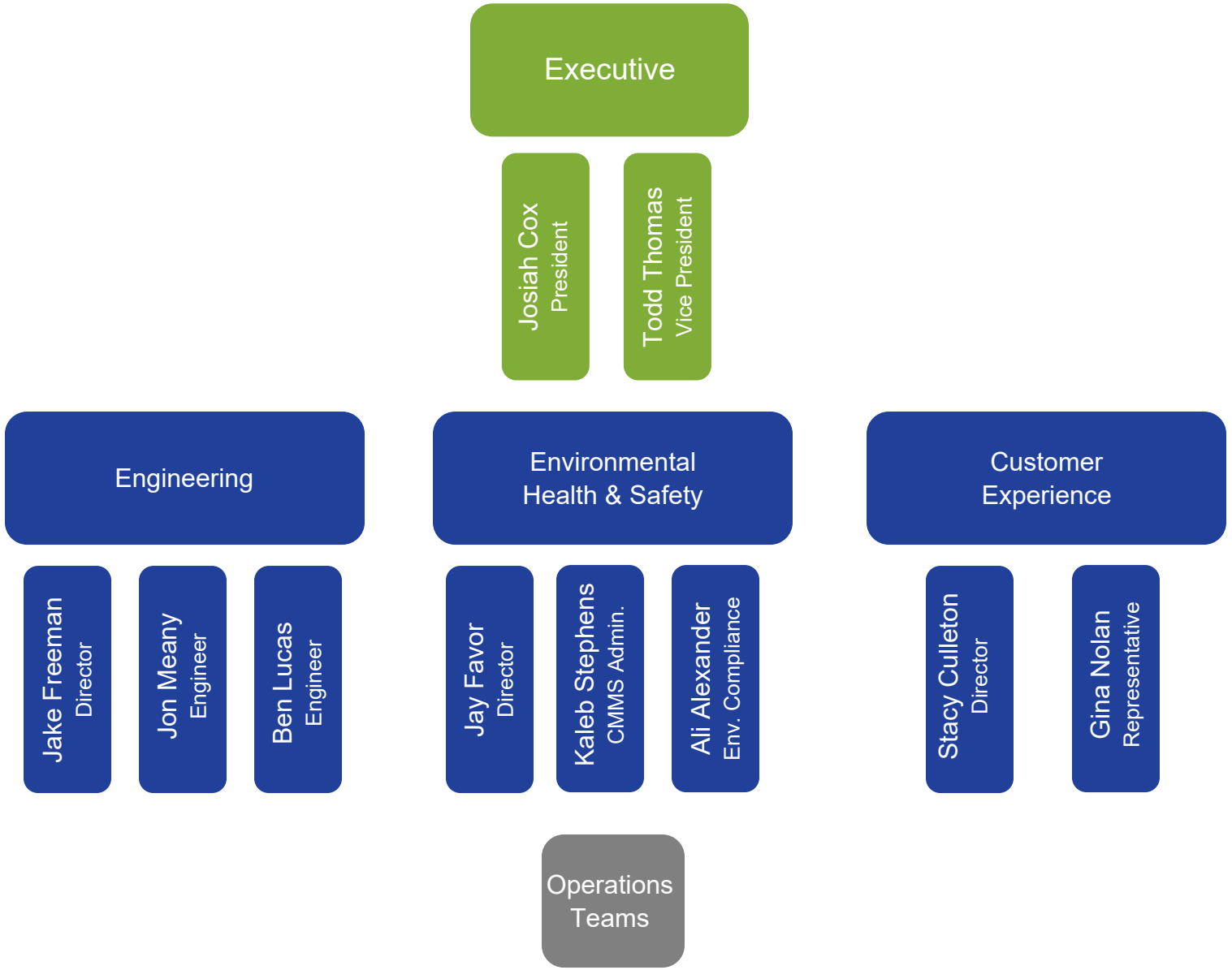
Gina Nolan, CSWR – Customer Experience Representative
Carries out customer communication.

Terry Merritt, Midwest Water Operations – Vice President
Oversees all facility operators and directs staff to carry out daily operation tasks.

Freddie O'Bryan, Midwest – Operator (Primary)
Oversees facility operations.

Cody Kirby, Midwest – Operator (Back-up)
Oversees facility operations.

BLUEGRASS WATER
Utility Operating Company
A CSWR Managed Utility

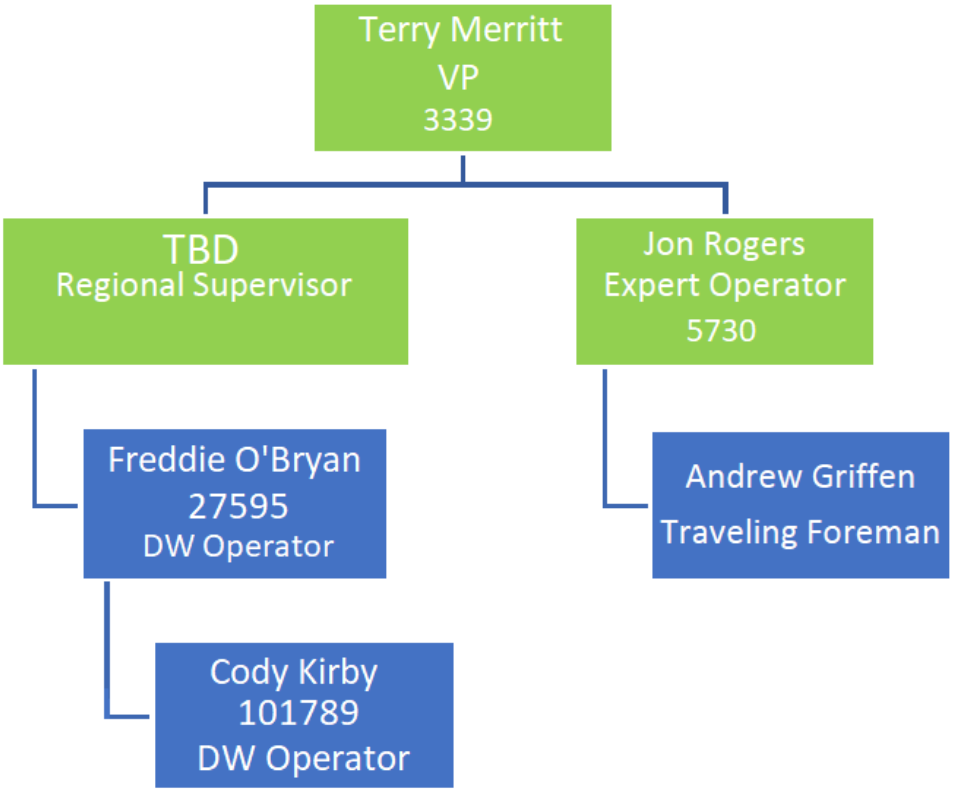


1650 Des Peres Road
St. Louis, MO 63131

314-736-4672

1351 Jefferson Street, Suite 301, Washington, MO 63090 636.432.3001

MIDWEST WATER



Attachment 5
WHPA Delineation Information

Specific information describing the local geology from which the groundwater is obtained is essential in determining aquifer characteristics. Adequate information may typically pe obtained from the U.S. Geological Survey's Hydrologic Atlases or other resources. If well tests or dye tracing are performed, this information should be reported and summarized in this attachment.

Observations of groundwater flow and movement are reported as well as essential aquifer characteristics. These characteristics include the aquifer formation, formation log, porosity, hydraulic gradient, and aquifer thickness. Additionally, the well discharge rate used in calculating the protection areas is reported.

The Center Ridge Water District #4 (previously known as LH&M Homeowner's Association) operates one production well, AKGWA# 4-9096. Lithology is not available for the wells since they were drilled prior to current regulations. Groundwater is obtained from the Fort Payne formation. Due to the southern flow of groundwater in this area, Kentucky Lake is the primary receiver of groundwater discharge (Morgan, 1965).

Porosity of limestone averages 20%. This value was taken from the EPA Seminar Publication, Wellhead Protection for Small Communities (EPA, 1993). This will be the accepted porosity value for wellhead protection area calculations.

The actual open interval of the well is unknown. However, it is assumed there is at least 10 feet of screen within the well. Therefore, H will be assumed to be 10 feet for the calculations.

For the purpose of wellhead protection area calculations, the maximum daily withdrawal was used for the welt's discharge rate. The maximum withdrawal was 21,600 gpd, which calculates to a 2,887.7 ft3/day discharge rate.

Wellhead Protection Area (WHPA) delineation methods will vary depending on the type of the aquifer, degree of confinement, existing data, cost considerations, and management objectives. No one method is applicable to all situations, yet many methods may be acceptable, providing it is appropriate for the given hydrogeologic setting. This attachment details calculations necessary for defining the wellhead protection areas and the methods chosen for delineation.

Methods available for delineating protection areas:

1. Arbitrary Fixed Radius
   A circle of a specified distance is drawn around the well. This method is useful when very little information is known about the water source, however, there is a high degree of uncertainty with this method since it lacks a scientific basis. This method tends to over or under protect the recharge area depending on the location of the wells and potential contaminant sources. The minimum size for WHPA 1 is 400 feet. This criterion is based upon U.S. EPA research regarding the survivability of viruses in groundwater. The research shows that certain pathogenic viruses can survive up to six months in a groundwater environment.

2. Calculated Fixed Radius
   A circle of a specified distance, calculated using time-of-travel criteria, is drawn around the well. The time-of-travel encompasses the zone around a well that water would travel over a specified time. WHPA 1 is based on a 180-day time-of-travel, and WHPA 2 is based on a 10 year time-of-travel. This method requires some data on the hydrogeologic setting and is relatively easy to apply. It offers a significant increase in accuracy over the Arbitrary Fixed Radius but may be inaccurate since it does not take into account factors that influence the transport of contaminants to a well.

3. Hydrogeologic Mapping
   The delineated area is mapped using geological or geophysical data or dye tracing[2] methods. This method utilizes an area's topography, water levels, and sometimes dye tracing results to identify the recharge area of a well or spring. This method is used to define the WHPA 3 of most well sources and with dye tracing to define the protection area for all karst sources.

4. Numerical Flow/Transport Models
   A computer model that determines groundwater flow through the input of specific hydrogeologic information. This method provides a high potential degree of accuracy and may be applied to most hydrogeologic settings. A wide variety of models are available, one of which is WHPA Code, written and made available by the U.S. EPA.

Calculations and Method of Delineation

The Calculated Fixed Radius was used to define the wellhead protection areas (WHPA) for LH&M. This method was chosen over computer modeling due to the lack of specific well information required for modeling. Additionally, the Resort serves a small population and is located in an isolated, rural area. There has been little growth since the resort was constructed and none is expected in the future. The current usage is also expected to remain constant. Therefore, the calculated fixed radius will provide sufficient protection around the well.

$$r = \sqrt{\frac{Qt}{\pi \eta H}}$$

Where:
r = Radius of protection area (ft)
Q = Pumping rate of well (ft3/day)
t = Travel time to well (days)
n = Aquifer porosity
H = Saturated thickness or length of well screen (ft)

Determination of Q:

Q = 21,600 gpd

$$Q = \frac{21{,}600\,gal}{day} * \frac{1\,ft^3}{7.48\,gal} = 2{,}887.7\,ft^3/day$$

Calculation of WHPA 1 - 180-day time-of-travel:

$$r = \sqrt{\frac{Qt}{\pi \eta H}}$$

Where:
r = Radius of protection area (ft)
Q = 28,877 ft^3/day
t = 180 days
n = 0.20
H = 10 ft

$$r = \sqrt{\frac{(2887.ft3/day)(180days)}{\pi(0.20)(10\,ft)}} = \sqrt{82726.5\,ft^2} = 287.6\,ft$$

WHPA 1 will default to the minimum required 400-ft radius.

Calculation of WHPA 2 – 10-year time-of-travel:

$$r = \sqrt{\frac{Qt}{\pi \eta H}}$$

Where: r = Radius of protection area (ft) n = 0.20
Q = 2,887.7 ft^3/day H = 10 ft
t = 3,650 days

$$r = \sqrt{\frac{(2887.7\,ft^3/day)(3650\,days)}{\pi(0.20)(10\,ft)}} = \sqrt{1{,}677{,}509.8\,ft^2} = 1{,}295.2\,ft$$

WHPA 2 will have a radius of 1,295 feet.

WHPA 3 is defined by topographic and hydrologic contours (see Attachment #6).

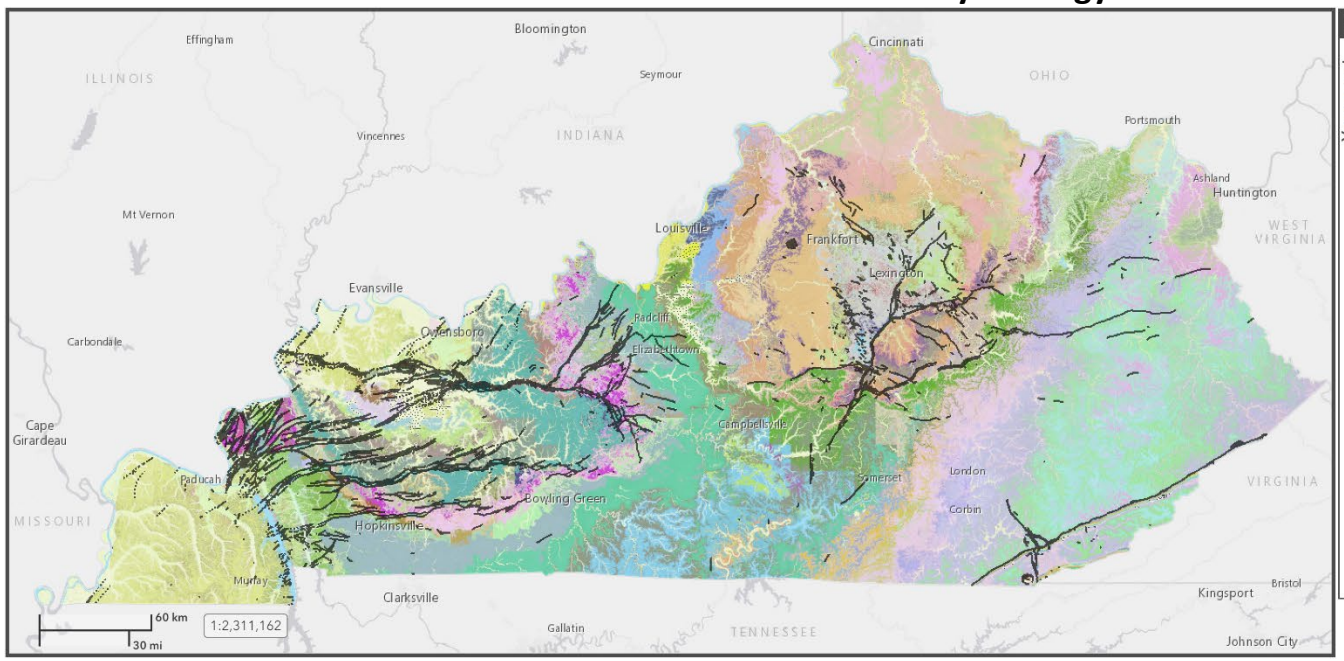
References

[2]Dye Tracing maps the flow pattern of groundwater by the injection and tracking of dyes. This method should be performed by a geologist or professional trained to complete such studies.

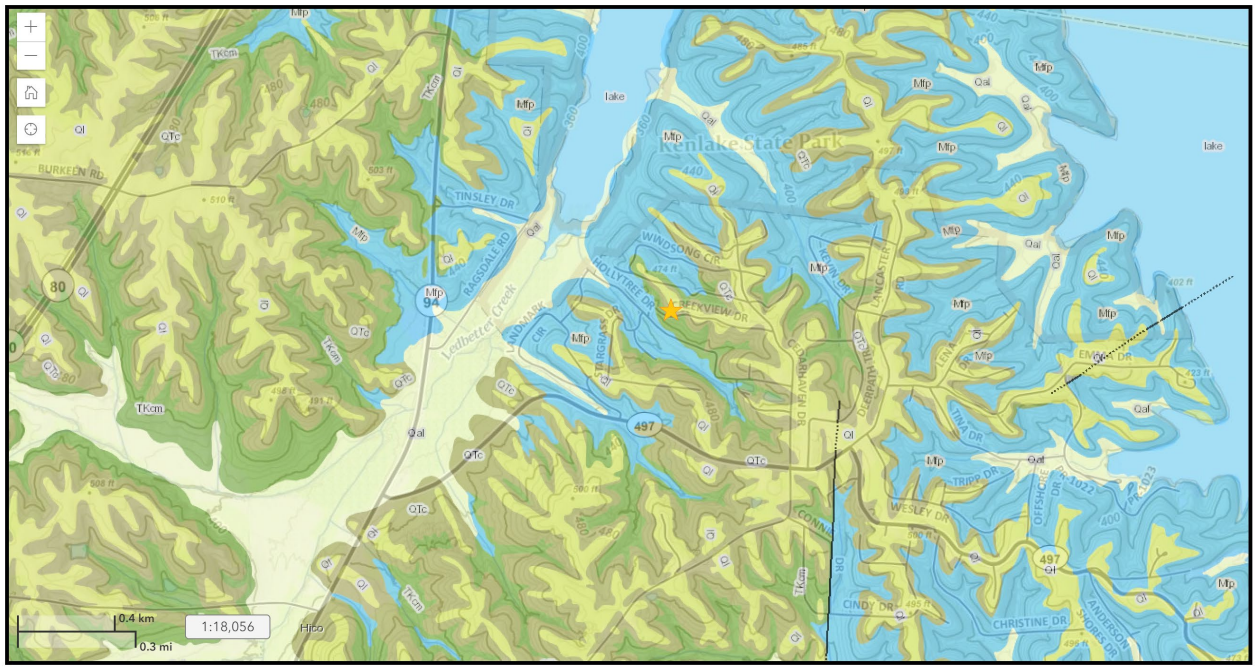
Morgan, J.H. Availability of Groundwater in the Hico Quadrangle, Kentucky: U.S. Geological Survey Hydrologic Investigation Atlas HA-158, 1965.

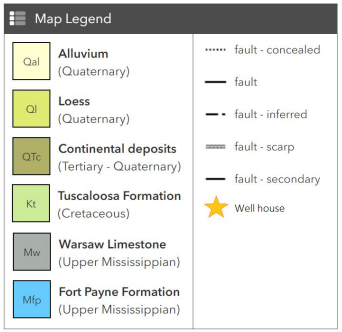
U.S. Environmental Protection Agency. EPA Seminar Publication, Wellhead Protection: A Guide for Small Communities. Office of Research and Development, Office of Water. Washington, D.C., February 1993.

Kentucky Geology

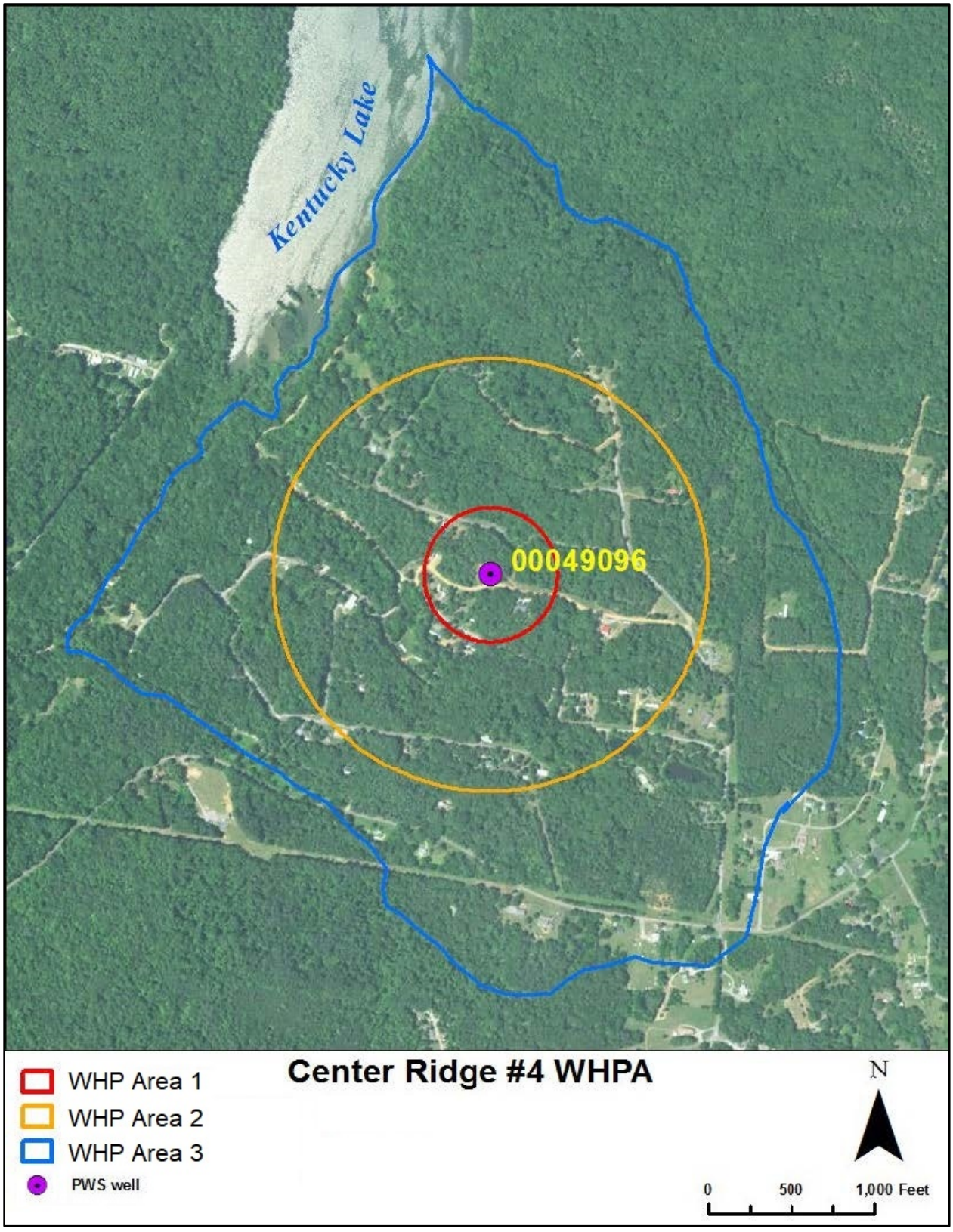


Center Ridge Water District #4 Geology





Attachment 6
Delineation Map

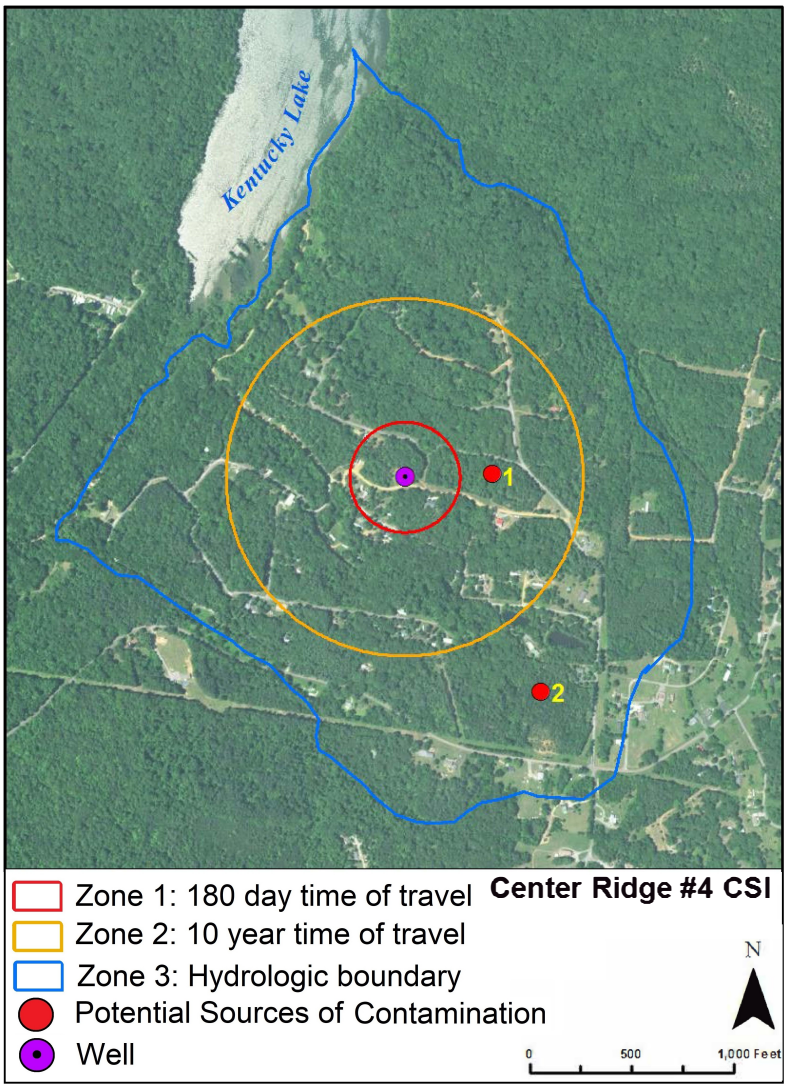


Attachment 7
Contaminant Source Inventory Summary & Map

The Center Ridge Water District #4 (previously LH&M Homeowner's Association) withdraws water from the Fort Payne Formation, which consists primarily of limestone bedrock. The hydrologic sensitivity value for the aquifer rates as a two on a scale of one to three. The wellhead protection area delineation was completed Kentucky Rural Water Association in 2001.

A total of 35 potential sources of contamination are located within the wellhead protection areas. The chart shows the concentration of sources relative to their risk rankings. All of the potential contaminant sources, domestic septic systems, are classified as medium risk. There are no high or low risk sources of contamination within the protection areas.

The surrounding community is a residential area. The susceptibility analysis determined the aquifer's susceptibility to contamination to be a medium risk. This determination is influenced by the nature of the aquifer, which has a medium sensitivity value, as well as the number of septic systems located in the protection area.



Contaminant Source Inventory and Susceptibility Analysis for

Center Ridge Water District #4

Contaminant Source ID #	Contaminant Source/Land Use	Address	Quantity	WHPA	Proximity Ranking	Contaminant Value	Hydrologic Sensitivity	Numeric Rating	Susceptibility Ranking
1	Septic Systems	Center Ridge #4, New Concord, KY	22	2	2	2	4	14	Medium
2	Septic Systems	Center Ridge #4, New Concord, KY	13	3	1	2	4	12	Medium
				Susceptibility Ranking Totals:			High	Med	Low
				35			0	35	0

Attachment 8
Previous Management Strategy and Newly Proposed Management Strategies

The purpose behind managing a wellhead protection area is to minimize the impact of land uses that threaten the quality and quantity of the public's drinking water supply. The underlying theme is simply to prevent pollution. Preventing pollution is the key to keeping groundwater supplies safe and to protect public health. Once a drinking water supply becomes contaminated, the community is faced with the difficult and costly task of installing additional treatment facilities or locating an alternate source.

Virtually all man-made land use activities have the potential to degrade groundwater quality. There are numerous factors that control the impact of land uses upon groundwater. The two most prominent factors are the geology of the area and the type of land use. The geology controls the direction and rate that a contaminant can travel, whereas the land use dictates the quantity and toxicity of the contaminant. This means that a particular land use in a less sensitive geologic setting may never significantly impact groundwater quality, but the same land use in a geologically sensitive setting can render groundwater unusable for human consumption. This is why a management plan must be tailored to each public water system.

The overall strategy of the management plan is to minimize the impact of the threats identified in the contaminant source inventory through regulatory and/or non-regulatory means.

Management Strategies

The Center Ridge Water System #4 possesses no jurisdictional or regulatory authority therefore, it will work within the framework of existing regulations to manage the protection areas. Generic groundwater protection plans for domestic septic systems will be requested from the Division of Water and given to residents.

Attachment 9
WHPP Contingency and Planning

Emergency Response Phone List

Local Emergency Response	Phone Number
Operator: **Freddie O'Bryan**	(270) 331-8482
Ambulance District: **Murray-Calloway Co. EMS**	(270) 753-9333
Fire Department: **Fire-Rescue**	(270) 753-4112
Kentucky State Fire Marshall	(502) 573-0382
Sheriff's Department: **Calloway**	(270) 753-3151
State Highway Patrol: **KSP Post 1**	(270) 856-3721

Kentucky DOW: **Frankfort**	(502) 564-3410
Kentucky DOW RO: **Paducah**	(270) 898-8468
Kentucky Environmental Response Team	(502) 564-2380
24-hr Emergency Response Line	(800) 928-2380
County Health Department: **Calloway**	(270) 753-3381
Kentucky Public Service Commission	(502) 564-3940

Bluegrass Water UOC Customer Service	(866) 752-8982
Jay Favor	(314) 380-8525
Ali Alexander	(314) 380-8533
Stacy Culleton	(314) 380-8546
Gina Nolan	(314) 380-8544

Procedures for Public Notification:
In the event of a water system emergency that would threaten the health or life of the public, use the following procedure. Provide Jay Favor, Ali Alexander, Stacy Culleton, and Gina Nolan a summary of the issue including time of onset, if the KyDOW was notified, and if the County Health Department was notified. Stacy & Gina will draft public notification and directions for customers which will be provided to customers on the Bluegrass Water UOC website, facebook, by email, and/or by direct handout via the operator. Stacy & Gina will coordinate with Ali to communicate with appropriate regulatory authority as needed. If additional notification is needed use the local newspaper as directed.

Potential Future Problems:
The most common scenario that could threaten the water supply is bacteriological and/or chemical contamination from a leaking septic system.

Alternative Water Supply (Short and Long Term):
Bacteriological contamination is mitigated by disinfecting the water system. If there were indicators of bacteriological contamination in the drinking water the facility would be placed on a boil water advisory until the problem is eliminated. If chemical contamination (such as nitrate/nitrite) is discovered in the water the facility would be placed on a do not drink advisory until the source of contamination was discovered and eliminated. If a long-term solution is needed, the facility would add centralized/localized treatment to eliminate the issue. As needed, water could be hauled in for use during these events.

Schedule for Update and Review:
The Wellhead Protection Plan will be reviewed regularly and updated every five years as required by regulation.

Attachment 10
Public Education Material

Energy and Environment Cabinet

Generic Groundwater Protection Plan:
Residential Septic Systems

HOMEOWNER'S SEPTIC SYSTEM GUIDE AND RECORD KEEPING FOLDER

The purpose of 401 KAR 5:037 and this groundwater protection plan is to prevent groundwater pollution. Understanding how your septic system works and following good operation and maintenance practices are the keys to preventing groundwater pollution.

This folder provides you with that information. By carefully reading it and following the guidelines, you will not only protect groundwater, but also should receive many years of trouble-free service from your system.

Keeping records will enable you to better protect and maintain your septic system. In case you sell your house, your records will show a prospective buyer that your system has been properly maintained.

FOR YOUR RECORDS

1. Maintenance Log: Date, what was done and reason for the maintenance (Example: measure sludge and scum layers, pump the tank).

2. Inspection Log: Date, what you observed upon walking over the septic system (Example: any unpleasant odors, soggy soil, lush green grass over the lateral lines, surfacing wastewater).

3. Site Drawing: Show accurately the layout of the system on your lot. Include exact distances of each portion of the system from at least two (2) fixed reference points (corner of house, garage, large trees, property line markers).

4. Any permits or receipts.

5. Residential Address _____

Sketch Septic Tank and Drainlines Location Here																			

Septic System Type:

	Septic tank - drainfield
	Septic tank – constructed wetland - drainfield
	Septic tank – leaching chambers

	Septic tank – low pressure pipe
	Septic tank – sewage lagoon - drainfield
	Septic tank – gravelless pipe

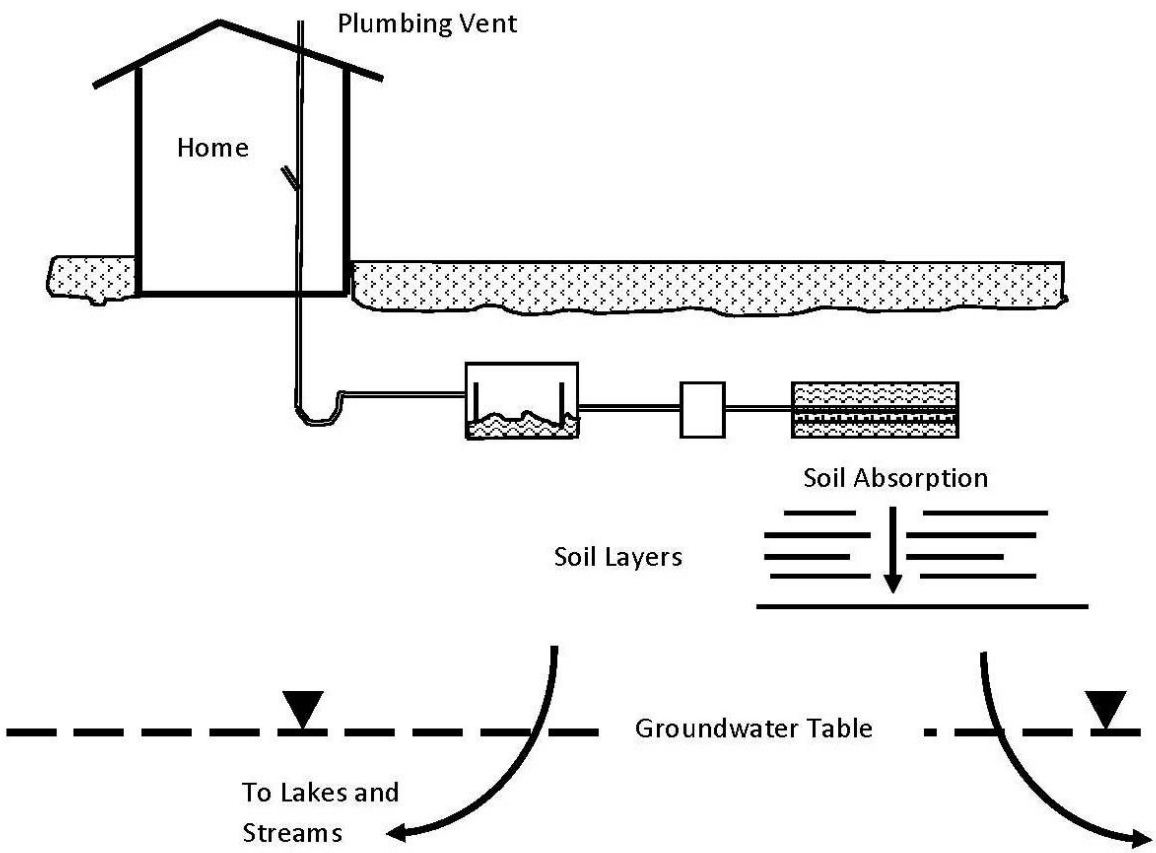
System Inspection Log	
Date	Description

System Maintenance Log

Date	Description

SYSTEM DESCRIPTION

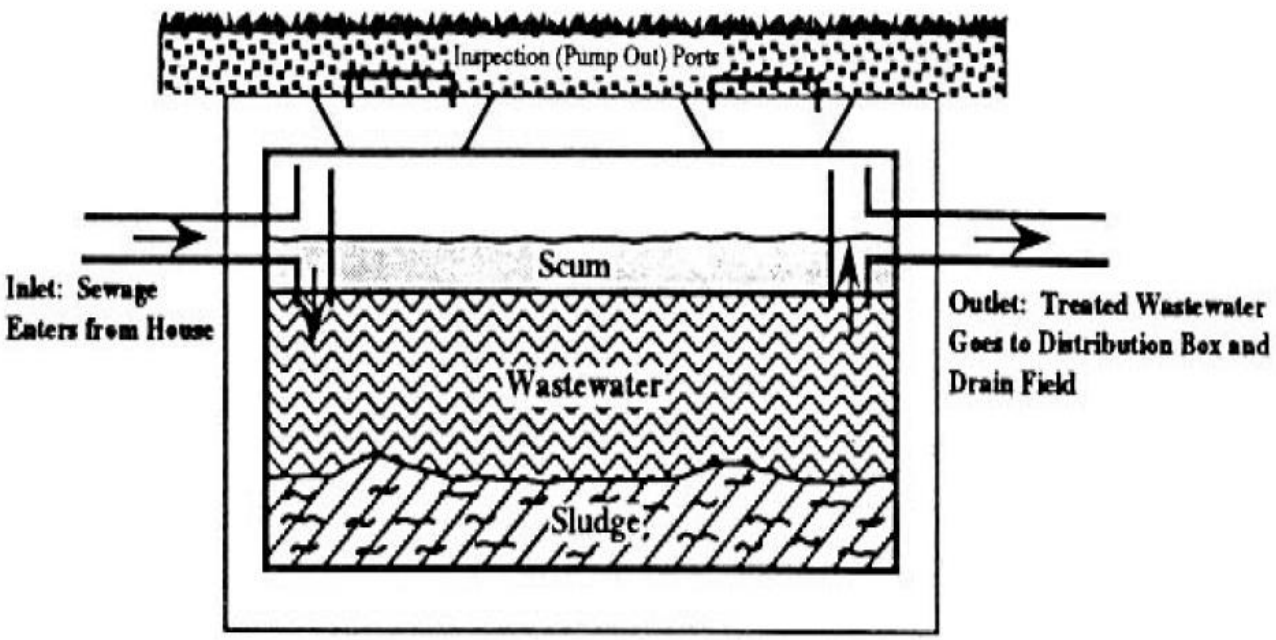
A septic system uses natural processes to treat and dispose of the wastewater in your home. It typically consists of a septic tank and a drainfield (also called a leachfield, lateral field, or subsurface soil absorption beds/trenches). The system accepts both "blackwater" (toilet wastes) and "greywater" (wastes from the kitchen sink, bath tub/showers, and laundry). Water that should not be discharged to the system includes water from foundation or footing drains, roof gutters, and other "clear" water.



Basic System

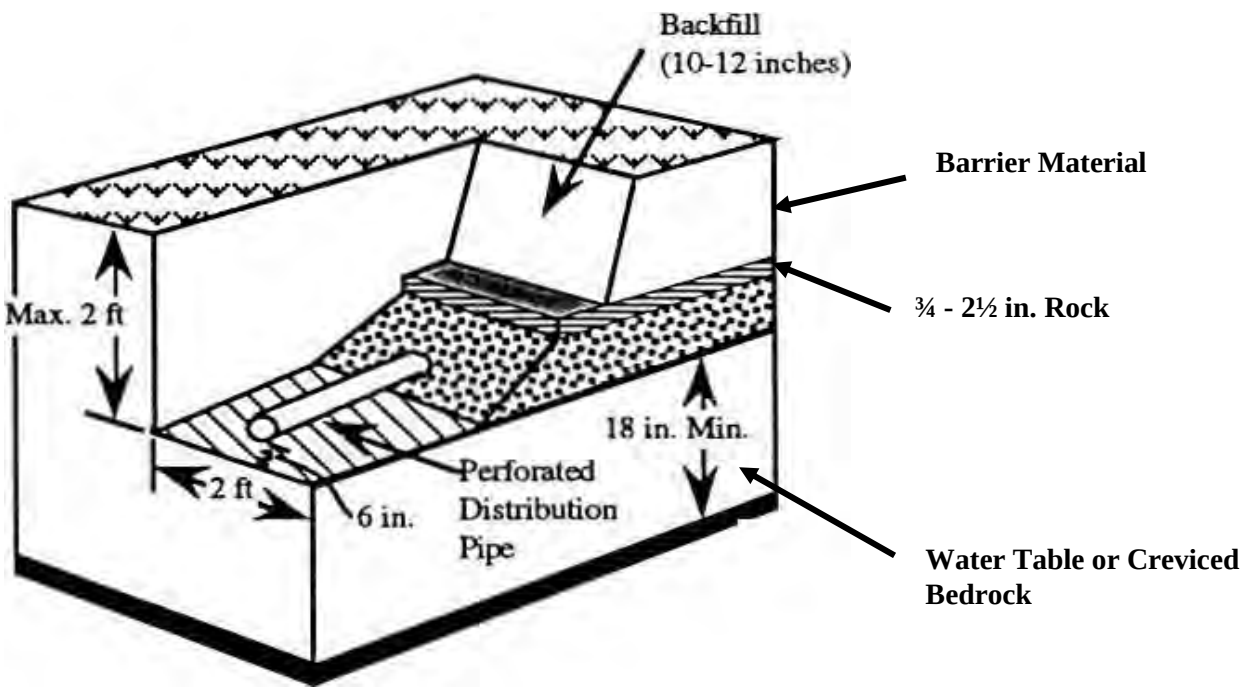
SEPTIC TANK

The septic tank provides the first step in treatment by separating the solids from the liquids. The wastewater is retained in the tank for 24 hours or more. During this time the heavier solids settle the bottom to form a sludge layer while the lighter solids float to the top to form a scum layer. Bacteria break down the solids, producing carbon dioxide, hydrogen sulfide, and other gases in the process. These gases are vented through the plumbing vent on your house roof. Since the bacteria reduce only about 40 percent of the sludge and scum volume, the tank must be pumped regularly (approximately every three to five years) to remove the accumulated solids. If the tank fills with sludge and scum, the solids will overflow into the drainfield and quickly clog the soil, resulting in system failure.



THE DRAINFIELD

The drainfield provides the final treatment of the wastewater and disposes of it through groundwater recharge. The typical drainfield is composed of trenches or beds which are shallow, level excavations installed one to one and a half feet above the groundwater table. Each trench contains a perforated distribution pipe through which wastewater drains into the gravel. The water is stored in the gravel until it can seep into unsaturated soil underlying and adjacent to the trench. As the wastewater moves slowly through the gravel and soil, many of the disease-causing bacteria and viruses are filtered out, or adsorbed and held by the soil particles until they die. Where soils do not permit a drainfield to adequately treat septic tank effluent, an additional or alternative treatment system must be used in conjunction with the drainfield. Alternative systems primarily used in Kentucky are constructed wetlands and sewage lagoons. These alternative systems have their own operation and maintenance guidelines. If you would like information about these guidelines, contact the Groundwater Section.

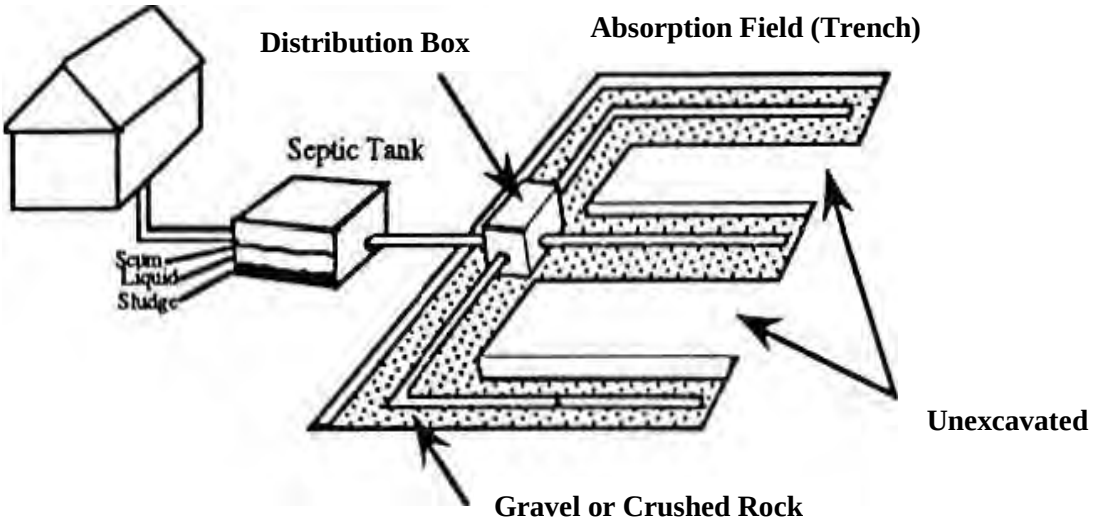


Conventional Rock Drainfield
Trench Cross-Section

TAKING CARE OF YOUR SYSTEM

Your septic system represents a significant investment worth protecting. The old "An ounce of prevention is worth a pound of cure" is so true when it comes to the care of your septic system. If you follow the operation and maintenance guidelines below, your system will function better and last longer, and you will avoid the nightmare and se of a failed system. Most important, your a will not be polluting groundwater.

Conventional Septic System



DO

- Conserve water to reduce the amount of wastewater that must be treated and disposed.
- Repair any leaking faucets and toilets.
- Discharge only biodegradable wastes into system.
- Divert down spouts and other surface water away from your drainfield.
- Keep your septic tank cover accessible for tank inspections and pumping
- Have your septic tank pumped regularly and checked for leaks and cracks.
- Call a professional when you have problems
- Compost your garbage or put in trash.

DON'T

- Use a garbage grinder.
- Flush sanitary napkins, tampons, disposable diapers, condoms and other non-biodegradable products into your system.
- Dump solvents, oils, paints, thinners, disinfectants, pesticides or poisons down the drain. These materials can disrupt the treatment process and contaminate the groundwater.
- Dig in your drainfield or build anything over it.
- Plant anything over the drainfield except grass
- Drive over you drainfield or compact the soil in any way.

If you have any questions or need additional information, contact:

The **Groundwater Protection Program Coordinator**

Kentucky Energy and Environment Cabinet
Kentucky Division of Water
Watershed Management Branch
Groundwater Section
300 Sower Boulevard, 3rd floor
Frankfort, KY 40601
(502) 564-3410

Groundwater Protection Plan Regulation 401 KAR 5:037
http://water.ky.gov/groundwater/Pages/GroundwaterProtection.aspx

Kentucky Cabinet for Health and Family Services
Department of Public Health
Environmental Management Branch
275 E. Main St.
Frankfort, Ky. 40621
(502) 564-4856

Onsite Regulations 902 KAR 10:085
Septic Tank Servicing Regulation 902 KAR 10:170
http://chfs.ky.gov/dph/info/phps/enviromgmt.htm

Homeowner's Manual Onsite Sewage Disposal Systems
http://chfs.ky.gov/NR/rdonlyres/CA014E47-2256-444D-8FE4-84C9FF456C8E/0/onsitesewagemanual.pdf

Check List
for

Evaluating Your Septic System

1. Find and mark the location of the septic system, you should map this information in the space provided in your Groundwater Protection Plan: "Homeowner's Septic System Guide and Record Keeping Folder."

2. When was the septic tank last pumped?

_____

3. If the tank was last pumped over three years ago, or if you have recently moved into the house and don't know when the tank was last pumped, contact a septic tank pumper. Have him service the tank and check the baffles.

4. Do toilets flush slowly and does water drain slowly from sinks and tubs, or does either "gurgle"?

Yes ☐ No ☐

5. Is there any standing water, soggy ground, or smelly liquid in or near the drainfield?

Yes ☐ No ☐

6. Does the ground slope toward the septic system?

Yes ☐ No ☐

7. Are your septic tank and drainfield less than 100 feet from a lake, stream, or pond?

Yes ☐ No ☐

8. Are water-loving trees such as willows, sycamores, birches, or water maples growing within 10 feet of the septic tank?

Yes ☐ No ☐

9. Are there any areas over the septic tank or drainfield where people have frequently driven their cars or trucks?

Yes ☐ No ☐

10. Have any additions been made to the house since the present septic system was installed?

Yes ☐ No ☐

11. Do you have dripping faucets or a toilet that runs continuously or gradually loses water from its tank?

Yes ☐ No ☐

12. Do you put cigarette butts, coffee grounds, cooking fats, disposable diapers, facial tissue, wet-strength towels, or other non-biodegradable materials into your septic tank?

Yes ☐ No ☐

If you have answered YES to one or more of questions 4 - 12, the septic system may not be functioning correctly. Call your local health department, or seek other professional help. Should repair of the system be necessary, be sure to engage the services of a professional who has a groundwater protection plan on file.