EPA United States Environmental Protection Agency

USDA U.S. DEPARTMENT OF AGRICULTURE

Options for Clean Water Solutions

for Harlan County, Kentucky

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Closing America's Wastewater Access Gap Community Initiative

Contents

Harlan County's Options for Clean Water Solutions

Cumberland, Benham, and Lynch are small, rural cities in Harlan County, Kentucky, nestled between the Black Mountain and Pine Mountain chains. These cities are steeped in coal mining history. The area's natural beauty, stunning views of Appalachia, and rich history are features that define this community.

Residents of these cities currently experience challenges with their wastewater systems. For many years, community members have worked to change this situation. Now, with the passage of the Bipartisan Infrastructure Law and EPA's new Water Technical Assistance services, there is momentum to bring wastewater treatment solutions to homes in Harlan County. This document describes treatment technical options and financial resources; it is the product of the work of many organizations and individuals and provides options for clean water solutions for the three cities and surrounding areas.

Closing America's Wastewater Access Gap Community Initiative Pilot: EPA/USDA-RD Partnership

Introduction

The U.S. Environmental Protection Agency (EPA) and the U.S. Department of Agriculture Rural Development (USDA-RD) partnered with six states and three Tribes (two federally recognized and one state-recognized) on the Closing America's Wastewater Access Gap Community Initiative. As a pilot program, this initiative was the first of its kind for EPA and USDA-RD. This initiative provides technical assistance to support capacity to improve wastewater management for the 11 participating communities. EPA and USDA have grant and loan programs to help pay for wastewater system improvements. Recent increases in federal funding offer an opportunity for communities to invest in septic upgrades, connect to nearby treatment systems, or build new sewer and wastewater treatment systems that meet their needs.

EPA offers a range of Water Technical Assistance (WaterTA) for communities to identify water challenges and solutions, build capacity, and develop application materials to access water infrastructure funding. EPA collaborates with states, Tribes, territories, community partners, and other stakeholders to implement WaterTA efforts. The result: more communities apply for federal funding to support quality water infrastructure and reliable water services. Communities can learn more about EPA WaterTA and how to indicate interest in receiving assistance by visiting EPA's WaterTA website.[1]

USDA offers a wide range of water and wastewater assistance for rural communities to obtain the technical assistance and financing necessary to develop drinking water and waste disposal systems. USDA's Water and Waste Disposal Technical Assistance and Training Grants program helps qualified, private nonprofits provide technical assistance and training to identify and evaluate solutions to water and waste problems. It also helps applicants prepare their applications for water and waste disposal loans and grants, and it helps associations improve the operation and maintenance (O&M) of water and waste facilities in eligible rural areas with populations of 10,000 or fewer. Communities can learn more about USDA Water and Waste Disposal Technical Assistance and Training Grants and how to indicate interest in receiving assistance by visiting USDA's website.[2]

> *Wastewater treatment and practicing good stewardship of Looney Creek are important to our communities.*
>
> — Cumberland Councilman Tyler Blair

1 www.epa.gov/waterta

2 www.rd.usda.gov/programs-services/water-environmental-programs/water-waste-disposal-technical-assistance-training-grants

Purpose

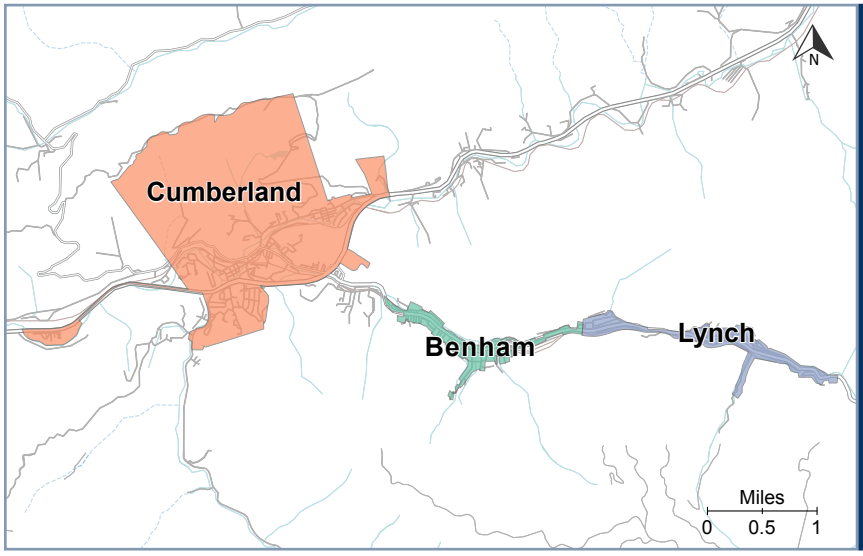
EPA and USDA-RD pilot program staff members worked with the pilot program team—mayors and councilmembers of Cumberland, Benham, and Lynch; the Cumberland Valley Area Development District; local technical assistance providers Rural Community Assistance Partnership (RCAP) and the Kentucky Rural Water Association (KRWA); the Kentucky Infrastructure Authority (KIA); and the Kentucky Energy and Environment Cabinet (KY EEC)—to develop solutions for each city's wastewater issues. This document, *Options for Clean Water Solutions for Harlan County, Kentucky*, outlines potential solutions for improved wastewater treatment approaches in Cumberland, Benham, and Lynch. Residents and city leadership can use this information to estimate costs and select a wastewater solution that meets today's challenges and helps the community thrive.

Over the past year, the pilot program team:

1. **Conducted a community wastewater assessment.** The pilot program team reviewed existing information on wastewater systems in each community and found areas that need improvement. In addition, the team conducted a limited assessment of unsewered areas. This review did not include collecting site information on soils or existing septic systems.
2. **Identified wastewater solutions.** The team identified wastewater solutions and estimated their costs. They considered the communities' long-term needs and outlined a path to apply for funding. State and local officials and community members played key roles in developing these options.
3. **Helped communities identify and seek funding opportunities.** This document outlines federal funding sources and how to apply for funding. It also shows how to pay for construction and long-term costs.
4. **Developed a plan to pay for ongoing costs.** To install and operate a wastewater treatment system, the cities of Cumberland, Benham, and Lynch need to develop a plan to pay for construction and ongoing costs. These costs could include management, O&M, and any potential construction loan repayments. This document offers funding strategies and suggestions to consider, such as low-income rate assistance programs and non-rate revenue programs that other utilities have used.

The Tri-Cities: Cumberland, Benham, and Lynch

The cities of Cumberland, Benham, and Lynch, often referred to as the Tri-Cities, are in Harlan County, nestled in the Appalachian region of southeastern Kentucky (Figure 1). For nearly a century, the mining industry was the economic heart in this region, attracting workers from across the country to set down roots and forge careers. During their economic peak, each of these cities had populations far greater than their current populations, with Lynch's population nearing 10,000 in the 1940s.



Tri-Cities Utilities Fast Facts

- **Cumberland Population: 2,114**
- **Cumberland Median Household Income (MHI): $24,938**
- **Benham Population: 711**
- **Benham MHI: $41,877**
- **Lynch Population: 756**
- **Lynch MHI: $36,778**

Source: KIA Water Resource Info System database

Figure 1. Location of Cumberland, Benham, and Lynch in Kentucky.

Over the past few decades, the Tri-Cities have seen significant population declines due to coal mine closures. Cumberland is the largest city at 2,114 residents, followed by Lynch at 756 and Benham at 711. Reduced coal production is associated with ongoing local challenges, including poverty, unemployment, and lost city revenue from taxes.

Currently, each city owns and operates its own sewage collection system and wastewater treatment plant (WWTP). Aging infrastructure is a continuing problem. Both Lynch and Benham have open wastewater system violations with the KY EEC. In all three communities, holes, cracks, and joint failures in the sewer collection system infrastructure have led to excessive influx of stormwater and groundwater, a problem known as infiltration and inflow (I/I).

> *We have an opportunity with the Bipartisan Infrastructure Law funding coming in to make a historic investment in these communities.*
>
> — Secretary Rebecca Goodman,
> Kentucky Energy and Environment Cabinet

The Potential of Infrastructure Investment

The Tri-Cities would greatly benefit from upgrades to their existing wastewater infrastructure. Currently, their utilities cannot sustain their existing populations, let alone any growth in population. The water quality of Looney Creek and the Poor Fork watershed is at risk, as is the health of residents who depend on these as sources for drinking water. With improved wastewater infrastructure, these communities could support a tourism industry for travelers interested in the area's rich history and outdoor recreational activities.

Community Engagement Feedback

Federal, state, and local partners held a kickoff meeting in November 2022 to establish a vision for success, answer questions, get feedback, and create a plan for achieving the project's goals. The following major points were made:

- Economic development for the Tri-Cities and Harlan County at large is tied to investing in drinking water and wastewater infrastructure.
- A successful solution will include affordable rates for all residents.
- The cities studied wastewater issues in the past and even considered forming a joint sewer agency in 2016, but could not reach a full consensus to approve any action. The three cities have been unable to come together due to varying reasons, such as utility revenue, changing leadership, and a desire for autonomy.

EPA and USDA-RD returned to the Tri-Cities in March 2023 to present the pilot initiative to the residents of the three cities. Residents from each of the cities, along with councilmembers and mayors, attended the session. Major points from this meeting include:

- Water and wastewater are the backbone of the community, and they directly impact public health and the tourism industry.
- The cities use customers' payments for wastewater treatment services to support other city functions.
- The solutions plan needs to be broken down into simple terms for the communities.
- The cities could hire the workforce required to maintain these infrastructure investments from the local area.

Representatives from each of the Tri-Cities joined a series of hybrid (in-person and virtual) meetings hosted by KRWA, with support from EPA, to discuss their city's specific wastewater infrastructure assessments. These meetings allowed the mayors and councilmembers to receive a comprehensive, third-party assessment of the wastewater infrastructure.

In November 2023, an in-person presentation to the cities' councilmembers and residents outlined the alternative wastewater solutions discussed in this report (Figure 2). Community members provided input on the options presented by the pilot program team. The general public voiced the following major points:

- Some community members support a regional option to address all three cities' wastewater needs.
- Community members are willing to support the cities through volunteer work to escalate the project timeline for whichever option is chosen.
- Community members support the cities in pursuing rate study assistance from the technical assistance providers.
- Community members recognize that the cost per customer for wastewater services will increase if the cities receive loan funding; they expressed the need for 100 percent grant funding.
- There are elderly residents with failing septic systems or straight pipes in unsewered areas that cannot afford to pay penalties imposed by the state health department.

Figure 2. Community meeting held by EPA and USDA-RD at the Benham Theater in Benham, Kentucky, on November 9, 2023.

In May 2024, during a final in-person meeting, EPA; USDA-RD; KY EEC; RCAP; KRWA; mayors and city councilmembers from Cumberland, Benham, and Lynch; and residents discussed project updates and regionalization options in detail. The discussion highlighted the following key points:

- The mayors of Cumberland and Benham spoke jointly at the meeting and expressed their commitment to work together on a regional solution to address current wastewater challenges.
- Many residents voiced concern about the condition of the Lynch WWTP and the contamination of Looney Creek from the discharge of inadequately treated wastewater from the Lynch WWTP.
- Participants stressed the importance of obtaining as much grant funding as possible for wastewater improvements to maintain affordable rates for residents.

After the public meeting, members from the pilot program team met with the mayor of Lynch and the city's clerk and attorney, as well as two city councilmembers. As a result of the follow-up meeting, Lynch agreed to work with Cumberland and Benham on a regional solution. The pilot program team agreed to provide a resolution for each city to pass at its next city council meeting and stated their commitment to work with the cities towards a regional solution. Members of the pilot program team agreed to facilitate workshops over the summer with all three cities to discuss and select the regionalization option best suited for the three cities, and to assist in procuring professional engineering services to support funding applications. The goal is to draft the framework of a regionalization agreement by late summer 2024 to allow access to funding for a Preliminary Engineering Report (PER) and design for the collection system improvements.

Wastewater Treatment Options for Lynch, Benham, and Cumberland

Several options exist to address the wastewater and drinking water needs within each city, and to serve unincorporated areas within Harlan and Letcher counties. All costs presented in this report are estimates based on best available information and assume Davis-Bacon prevailing wages; all materials comply with American Iron and Steel and Build America, Buy America; and all other federal and state funding agency requirements are followed. The costs presented also include engineering, permitting, environmental review, legal, and administrative costs, along with a cost contingency.

All three cities have experienced declining populations since coal mining operations ceased. Table 1 shows connection, population, WWTP capacity, estimated current wastewater flows, and sewer rate information for Lynch, Benham (which also currently serves the Clutts area), and Cumberland. Information in the table was confirmed during 2023 site visits.

Table 1. Connections, Population, Flow, and Current Rates for Lynch, Benham, and Cumberland Wastewater Systems

City	Number of Current Active Connections	Number of Inactive Connections[a]	WWTP Average Design Flow, Million Gallons per Day (mgd)	Estimated Average Daily Flow[b] (mgd)	Monthly Cost for First 2,000 Gallons
Lynch	359	60	0.2	0.09	$38.58
Benham (includes Clutts)	290	70	0.25	0.07	$31.00
Cumberland	836	36	0.5	0.21	$39.50
Total	1,485	166	0.95	0.37	–

[a] Inactive connections are sewer connections to a building not currently occupied or used, but which could become active upon occupancy.

[b] Average daily flow estimated using total number of active connections and multiplying by 2.5 people per connection and 100 gallons per day per capita to account for some I/I into the system.

In terms of applying for funding for wastewater treatment options, each city lacks audited financial records, which are required by both the KIA and USDA-RD funding programs. These agencies have stated that a funding applicant must have audited financial statements for the past 3 years to receive funding unless the applicant is a newly created entity. The cities are assembling this information, but still have a lot of work to complete before they can comply with this requirement.

The pilot program team evaluated numerous options assuming various ownership scenarios. The first set of options (beginning on page 10) assumes each city remains independent; other options assume the cities share wastewater infrastructure under interlocal agreements (i.e., no transfer of wastewater asset ownership). Under this arrangement, each city continues to bill its customers and collect revenue for sewer services. Payment for any shared services is accomplished by one city billing another city for provided services through an interlocal agreement. For example, the City of Cumberland currently provides solid waste services for the City of Lynch under an interlocal agreement. Lynch charges its customers for solid waste services and then pays Cumberland for this service.

Another option assumes the cities create a joint sewer agency and transfer wastewater infrastructure ownership. Table 2 provides a comparison between operating under an interlocal agreement and a joint sewer agency.

Table 2. Comparison of Interlocal Agreements and Joint Sewer Agency Options for Shared Wastewater Services

Consideration	Options for Shared Wastewater Services **Interlocal Agreement**	Options for Shared Wastewater Services **Joint Sewer Agency**
Example and structure description	As an example, the City of Cumberland agrees to provide wastewater treatment services for the cities of Benham and Lynch. All three cities enter into an interlocal agreement with Cumberland for how to provide services and assess service fees. Each city remains a distinct governmental entity and continues to provide other city services (i.e., wastewater collection, water, solid waste, roads, law enforcement).	As an example, the cities of Cumberland, Benham, and Lynch, plus Harlan County, agree to form a joint sewer agency under KRS 76.232 and initially have all wastewater conveyed and treated at the existing Cumberland WWTP. Each city remains a distinct governmental entity and continues to provide other city services (i.e., water, solid waste, roads, law enforcement).
Wastewater infrastructure ownership	Each city continues to own, operate, and maintain a portion or all of its wastewater infrastructure, depending how services are shared. For example, Cumberland, Benham, and Lynch enter into an interlocal agreement for Cumberland to provide wastewater treatment services for the cities of Benham and Lynch at the Cumberland WWTP. All three cities maintain ownership of their respective collection systems and Cumberland continues to own, operate, and maintain the Cumberland WWTP.	The joint sewer agency assumes ownership of all wastewater assets. Each city agrees to transfer ownership of the collection systems and WWTPs (including the Cumberland WWTP) to the joint sewer agency.
Sewer rates	Each city continues to bill its customers and collect the sewer rates as established by each individual city, including amounts necessary to pay any costs for shared services as agreed upon in the interlocal agreement.	The sewer rates are established by the joint sewer agency so all residential customers are billed a residential rate and all commercial customers are billed a commercial rate regardless of where they live in the service area.
Payment for services	The city receiving the services pays the city providing the services. For instance, if Cumberland provides wastewater treatment services for Benham and Lynch, the cities of Benham and Lynch pay the City of Cumberland for wastewater treatment services per the terms agreed upon in the interlocal agreement, typically based on the total number of gallons treated in a given month.	The joint sewer agency sends a bill for sewer services to each customer individually; the customer pays the joint sewer agency, typically based on the customer's water meter reading that month. The joint sewer agency uses collected revenue to operate, maintain, and replace all wastewater infrastructure.

Consideration	Options for Shared Wastewater Services **Interlocal Agreement**	Options for Shared Wastewater Services **Joint Sewer Agency**
Funding	Each city applies for funding assistance through grants or low-interest loans to repair or replace various failing components of its system. Funding of shared facilities requires the legal owner to be the funding applicant, using the interlocal agreement to establish how infrastructure funding costs are shared. For the example of Cumberland providing wastewater treatment services for Benham and Lynch at the Cumberland WWTP, Cumberland would apply for funding to finance WWTP upgrades and determine how to recover costs for debt service payments through the interlocal agreement.	The joint sewer agency, as the owner, applies for and receives all funding. Costs for infrastructure system repairs or improvements and associated debt service payments are shared equally across all customers served by the joint sewer agency.

Lynch Wastewater Options

The Lynch wastewater system has approximately 359 active connections and approximately 60 inactive connections. The Lynch WWTP was constructed in 1955 and is rated at 0.20 million gallons per day (mgd). The WWTP consists of the following treatment processes, in order of treatment: a grit chamber, bar screen, primary clarifier, trickle filter, chlorination/dechlorination chamber, and discharge to Looney Creek (Figure 3). A sludge-wasting system pumps sludge to a digester and drying beds above the WWTP; the sludge transfer pump from the digester to sludge drying beds does not work. Lynch has one certified wastewater treatment operator who is responsible for both water and wastewater, plus another part-time assistant. Lynch's certified wastewater operator is on site at the WWTP twice a week for approximately 1 to 2 hours per day to check the bar screens and levels of the chlorine tanks to determine whether to order chlorine.

Figure 3. The Lynch WWTP. The clarifier (left), which is not working properly, has excessive vegetation and provides minimal treatment. The trickling filter (right) is also not working properly. Wastewater enters and discharges through the center piping instead of being evenly sprayed through a pipe that slowly rotates.

Lynch has excessive I/I that overwhelms the WWTP and exceeds the WWTP-rated capacity by at least three times. Per the KIA Water Resources Information Systems (WRIS) database, the Lynch collection system consists of:

- 41,000 feet of 4-inch to 8-inch gravity sewer lines, 28,000 feet of which are clay pipe.
- 1,060 feet of 4-inch and 12-inch force main.
- Two lift stations.

Based on the April 2023 site visit and other information, the following capital improvements were identified:

1. Identify leaks in the existing collection system through smoke testing or other means to address excessive I/I. Lynch has approximately 28,000 feet of old clay pipe that should be replaced, at a minimum.
2. Abandon the existing WWTP, construct a new WWTP, or convey all wastewater to Benham or Cumberland.
3. If a new WWTP is constructed for Lynch, evaluate the existing sludge-handling facilities for adequacy and install a generator.
4. Provide a redundant pump and generator at the WWTP lift station.

Table 3 presents options and costs, assuming Lynch retains ownership of its wastewater infrastructure. Regionalization options are presented later in this document.

Table 3. Lynch Options for Wastewater Infrastructure

Lynch Option 1: Collection system upgrades to address I/I

Regardless of which wastewater treatment alternative Lynch selects, it should address the excessive I/I entering the wastewater collection system. These improvements are integral to any wastewater treatment options implemented. Lynch had approximately 28,000 feet of clay pipe installed in 1960 (per the KIA WRIS asset inventory information), and this report assumes all existing clay pipe and associated manholes will be replaced to reduce I/I. The option of lining existing clay pipe could also be considered but only after extensive video inspection of the clay pipe to fully assess the pipe's structural condition. Additional improvements will likely be needed to further reduce I/I, including replacing or rehabilitating collection lines in addition to the clay pipe, manholes, and lift station wet wells. Smoke testing, video inspection, or other assessments could further identify improvements to reduce I/I.

Expected capital cost range: $6 million to $7 million. This cost is incurred in addition to the other wastewater system and treatment improvements that Lynch needs to conduct.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- Addresses I/I, reducing pumping costs at lift stations.
- Allows Lynch to consider long-term wastewater treatment alternatives.

Cons:

- Lynch may not qualify for funding if they are unable to produce the past 3 years of audited financials.

Lynch Option 2: Construct new WWTP, plus other system improvements (in addition to I/I)

This option assumes Lynch continues to own, operate, and maintain its own collection system and WWTP, and the city treats only the wastewater within its current service area. This option requires Lynch to repair and upgrade its sewer collection (including the I/I work previously described) and construct a new WWTP to maintain compliance. During that process, Lynch will:

1. Abandon the existing WWTP and construct a new WWTP with an initial capacity of 0.11 mgd to serve the current population.
2. Evaluate existing sludge-handling facilities for adequacy.
3. Provide a redundant pump and generator at the WWTP lift station.

Expected capital cost range: $4 million to $5 million. This cost is in addition to the $6 million to $7 million needed to address I/I, for a total cost of $10 million to $12 million for all improvements.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- Violations at the WWTP are resolved.
- Environmental and public health would improve.

Cons:

- Lynch may not qualify for funding if they are unable to produce the past 3 years of audited financials.
- WWTP design of 0.11 mgd would serve the current population, but will need to expand as growth occurs.
- Must have adequately trained and certified operators to oversee the WWTP.

Lynch Option 3: Convey wastewater to Benham, plus other system improvements (in addition to I/I)

For this option, Lynch abandons its WWTP and sends all its wastewater to Benham but continues to own and operate its collection system. This option could be implemented as a first phase to allow the communities to provide adequate wastewater treatment with the proposed improvements while considering other options. Lynch needs to conduct the following improvements:

1. Abandon the existing WWTP and convey all wastewater to Benham.
2. Upgrade the lift station at the WWTP to pump all wastewater to Benham and install approximately 5,000 feet of 6-inch force main to access Benham's existing 10-inch line near Benham City Hall (per KIA WRIS information). This alternative assumes Benham will replace this 10-inch clay line with a new 10-inch PVC line (cost included in Benham's sewer line replacement costs), and the sewer line has the minimum required slope of 0.28 feet per 100 feet. More detailed studies are needed to confirm the best location for connecting the Lynch force main to Benham's sewer collection system, the possibility of gravity flowing from Lynch to Benham, and the adequate capacity in Benham's collection lines.
3. Develop interlocal agreement between Benham and Lynch. As part of this agreement, Benham and Lynch would negotiate the costs for Benham providing treatment of Lynch's wastewater.

Expected capital cost range: $2 million to $3 million. This cost is in addition to the $6 million to $7 million needed to address I/I, for a total cost of $8 million to $10 million.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50 (includes cost to be assessed by Benham to receive and treat Lynch's wastewater).

Pros:

- Violations at the WWTP are resolved, and reliable treatment is provided.
- Environmental and public health would improve.
- Lynch no longer needs a certified WWTP operator.
- Lynch no longer incurs expenses associated with owning, operating, and maintaining a WWTP.
- Benham can use the full capacity of its WWTP.
- Due to shared facilities, this project would receive higher priority from funders and qualify for a reduced interest rate from KIA.
- Costs of WWTP operations are shared by both cities, reducing monthly O&M costs for each community.

Cons:

- Lynch may not qualify for funding if they are unable to produce the past 3 years of audited financials.
- Growth could be limited based on Benham's current WWTP capacity of 0.25 mgd.
- Interlocal agreements have limitations for ensuring timely receipt of payments or financial contributions for shared improvements from all participating cities in comparison to other regional ownership structures, such as a joint sewer agency.

Lynch Option 4: Convey wastewater to Cumberland, plus other system improvements (in addition to I/I)

For this option, wastewater from Lynch and Benham is conveyed to the existing Cumberland WWTP, which then treats all three cities' wastewater. Lynch continues to own and operate its collection system. If all three cities address I/I and populations remain static, the Cumberland WWTP should have adequate capacity to treat all wastewater for at least the next 10 years.

This option may be needed:

- If the Benham WWTP cannot adequately treat wastewater from Lynch.
- As an interim option, until a long-term option is identified to meet the future wastewater needs for the three cities and surrounding areas. If regionalization occurs and a new regional WWTP is identified as the preferred option, it could take up to 10 years for the three cities and counties (if unincorporated areas are included in the service area) to create a new wastewater authority that would oversee a regional facility and construct a new regional WWTP.

In addition to the improvement described in Lynch Option 3, the following system improvements are also needed:

1. Share costs with Benham for a new common sewer line and lift station to convey all wastewater from Benham to the Cumberland WWTP, located approximately 12,500 feet from the Benham WWTP. The cost for these shared facilities should be paid proportionally based on flows. Because accurate flows from each city are not available and are subject to change as I/I is addressed, costs are divided based on current active connections for estimating purposes. Based on information in Table 1:
    a. Lynch has a total of 359 active connections (55 percent).
    b. Benham has a total of 290 active connections (45 percent).
2. Develop an interlocal agreement between Cumberland, Benham, and Lynch. As part of this agreement, Benham and Lynch would negotiate the costs for Cumberland treating Benham's and Lynch's wastewater.

Expected capital cost range: $2 million to $3 million (Lynch's portion of shared conveyance facilities from Benham to Cumberland). This cost is in addition to the $2 million to $3 million needed to convey wastewater to Benham, plus $6 million to $7 million needed to address I/I, for a total cost of $10 million to $13 million.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50 (includes cost to be assessed by Cumberland to receive and treat Lynch's wastewater).

Pros:

- Violations at the WWTP are resolved, and reliable treatment is provided.
- Environmental and public health would improve.
- Lynch no longer needs a certified WWTP operator.
- Lynch no longer incurs expenses associated with owning, operating, and maintaining a WWTP.
- Cumberland can use the full capacity of its WWTP.
- Due to shared facilities, the project would receive higher priority from funders and would qualify for a reduced interest rate from KIA.
- Costs of WWTP operations are shared between all three cities, reducing monthly O&M costs for each community.

Cons:

- Lynch may not qualify for funding if they are unable to produce the past 3 years of audited financials.
- Growth could be limited based on Cumberland's current WWTP capacity of 0.5 mgd.
- Interlocal agreements have limitations for ensuring timely receipt of payments or financial contributions for improvements from all participating cities in comparison to other regional ownership structures, such as a joint sewer agency.

Benham Wastewater Options

The Benham wastewater system has approximately 290 active connections and approximately 70 inactive connections. Benham recently hired a certified operator who also works in Harlan and is onsite at the WWTP after 3:00 p.m. each day. Benham's operator is certified to oversee both the treatment plant and collection system.

The Benham WWTP was constructed in 1965 and renovated in 1995; it is rated at 0.25 mgd. The WWTP consists of the following treatment processes, in order of treatment: grit chamber with screen (has a broken comminutor), two aeration basins (not all aerators are functioning, but two new floating aerators are on site and planned for installation), two clarifiers operating in parallel (one clarifier is offline and needs repair), and a UV reactor (recently repaired; see Figure 4). The WWTP discharges to Looney Creek.

Figure 4. Benham WWTP. Photo by Wesley Turner, KY EEC.

The WWTP often experiences inflows far more than the plant rating of 0.25 mgd due to excessive I/I. The Benham WWTP has open violations due to long-term O&M issues. Per the KIA WRIS database, the Benham collection system consists of:

- 25,700 feet of 4-inch to 8-inch gravity sewer lines, of which 25,000 feet are clay pipe.
- 9,960 feet of 8-inch force main.
- Three lift stations.

The following capital improvements were identified during the April 2023 site visit:

1. Identify leaks in the existing collection system through smoke testing or other means to address excessive I/I. Benham has approximately 25,000 feet of old clay pipe that should be replaced, at a minimum.
2. Repair or replace the comminutor.
3. Repair the broken clarifier (per meeting with Benham on July 6, 2023, this work is completed).
4. Install controls and automation at the WWTP.
5. Install a generator to allow operation during power outages.
6. Install redundant pumps at each lift station.

Table 4 presents options and costs, assuming Benham retains ownership of its wastewater infrastructure. Regionalization options are presented later in this document.

Table 4. Benham Options for Wastewater Infrastructure

Benham Option 1: Collection system upgrades to address I/I

Regardless of which wastewater treatment alternative Benham selects, it should address excessive I/I entering the wastewater collection system. These improvements are integral to any wastewater treatment options implemented. Benham had approximately 25,000 feet of clay pipe installed in 1960 (per the KIA WRIS asset inventory information); this report assumes all existing clay pipe and associated manholes are replaced to reduce I/I. Additional improvements are likely also needed to further reduce I/I, such as replacing or rehabilitating collection lines in addition to the clay pipe, manholes, and lift station wet wells. Smoke testing, video inspection, or other assessments could further identify needed improvements to reduce I/I.

Expected capital cost range: $5.5 million to $6.5 million. This cost is incurred regardless of other wastewater system and treatment improvements conducted by Benham.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- Addresses I/I, reducing pumping costs at lift stations.
- Allows Benham to consider long-term wastewater treatment alternatives.

Cons:

- Benham may not qualify for funding if they are unable to produce the past 3 years of audited financials.

Benham Option 2: Conduct WWTP improvement, plus other system improvements (in addition to I/I)

This option requires Benham to repair and upgrade its WWTP and sewer collection system (including the I/I work previously described) to maintain compliance. During that process, Benham will:

1. Repair or replace the comminutor.
2. Install controls and automation at the WWTP.
3. Install a generator to allow WWTP operation during power outages.
4. Install redundant pumps at each lift station.

Expected capital cost range: $1 million to $2 million. This cost is in addition to the $5.5 million to $6.5 million needed to address I/I, for a total cost of $6.5 million to $8.5 million.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- Violations at the WWTP are resolved, and reliable treatment is provided.
- Environmental and public health would improve.
- The WWTP will have capacity to support future growth or serve Lynch.

Cons:

- Benham may not qualify for funding if they are unable to produce past 3 years of audited financials.
- The city must have adequately trained and certified operators to oversee the WWTP.

Benham Option 3: Convey wastewater to Cumberland plus other system improvements (in addition to I/I)

For this option, wastewater from Lynch and Benham is conveyed to the existing Cumberland WWTP, which then treats all three cities' wastewater. Benham continues to own and operate its collection system but abandons its WWTP. If all three cities address I/I and populations remain static, the Cumberland WWTP should have adequate capacity to treat all the wastewater for at least the next 10 years. This option may be needed:

- If the Benham WWTP cannot adequately treat wastewater from Lynch.
- As an interim option, until a long-term option is identified to meet wastewater needs of the three cities and surrounding areas. If regionalization occurs and a new regional WWTP is identified as the preferred option, it could take up to 10 years for the three cities and counties (if unincorporated areas are included in the service area) to create a new wastewater authority that would oversee a regional facility and construct a new regional WWTP.

In addition to the I/I improvements described in Benham Option 1, the following improvements are also needed:

1. Share costs for a new common sewer line and lift station to convey all wastewater from Benham to the Cumberland WWTP, located approximately 12,500 feet from the Benham WWTP. The cost for these shared facilities should be paid proportionally based on flows. Because accurate flows from each city are not available and are subject to change as I/I is addressed, costs are divided based on current active connections for estimating purposes. Based on Table 1:
    a. Lynch has a total of 359 active connections (55 percent).
    b. Benham has a total of 290 active connections (45 percent).
2. Add redundant pumps at each lift station.

3. Decommission Benham's WWTP.
4. Develop interlocal agreement between Cumberland, Benham, and Lynch. As part of this agreement, Benham and Lynch would negotiate the costs for Cumberland treating Benham's and Lynch's wastewater.

Expected capital cost range: $2 million to $3 million for lift station improvements, the decommissioning of Benham's WWTP, plus Benham's portion of shared conveyance facilities from Benham to Cumberland. This cost is in addition to the $5.5 million to $6.5 million needed to address I/I, for a total cost of $7.5 million to $9.5 million.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50 (includes cost to be assessed by Cumberland to receive and treat Benham's wastewater).

Pros:

- Violations at the WWTP are resolved, and reliable treatment is provided.
- Environmental and public health would improve.
- Benham will no longer need a certified WWTP operator.
- Benham will no longer incur expenses associated with owning, operating, and maintaining a WWTP.
- Cumberland can use the full capacity of its WWTP.
- Due to shared facilities, the project would receive higher priority from funders and qualify for a reduced interest rate from KIA.
- Costs of WWTP operations are shared between all three cities, reducing monthly O&M costs for each community.

Cons:

- Benham may not qualify for funding if they are unable to produce the past 3 years of audited financials.
- Growth could be limited based on Cumberland's current WWTP capacity of 0.5 mgd.
- Interlocal agreements have limitations for ensuring timely receipt of payments or financial contributions for improvements from all participating cities in comparison to other regional ownership structures, such as a joint sewer agency.

Cumberland Wastewater Options

The Cumberland wastewater system has approximately 836 active connections and approximately 36 inactive connections. Cumberland has two certified WWTP operators. The operators are on site in the late afternoon each day for a few hours to check on the plant. The city also has three maintenance staff to assist with repairs.

Figure 5. Cumberland WWTP. Photo by Wesley Turner, KY EEC.

The WWTP was constructed in 1964 with a rated capacity of 0.5 mgd, and an additional trickling filter and clarifier were added around 1993. The city conducted other wastewater system improvements in 2005. According to the mayor, the WWTP was designed to serve as a regional WWTP. It consists of the following treatment processes, in order of treatment: comminutor, bar screens, grit removal, primary clarifier, trickling filter, splitter box, two intermediate clarifiers, secondary trickling filter, final clarifier, chlorine disinfection, dechlorination, flow metered effluent, step aeration, and discharge to the Poor Fork of the Cumberland River. Sludge solids receive treatment in an aerobic digester, drying beds, and landfill disposal (Figure 5). Table 5 provides data on recent flow into the WWTP.

Table 5. Cumberland WWTP Influent Flow Data

Date	Monthly Total (mgd)	Average Daily Flow (mgd)	Maximum Daily Flow (mgd)
October 2022	6.4	0.207	0.28
January 2023	23.4	0.755	1.4
February 2023	26.2	0.936	1.5
March 2023	28.7	0.925	1.4
April 14, 2023	–	0.398	–
April 26, 2023	–	0.394	–

As shown in Table 5, the typical dry-weather flow into the WWTP is approximately 0.207 mgd (using October 2022 data). During wet-weather months—such as January, February, and March 2023—the average daily flow is between 0.755 and 0.936 mgd. These higher flows are caused by I/I entering the sewer collection system. The city repaired two major sewer line breaks in early April 2023. The flows on April 14 and April 26, 2023, show a significant decrease in WWTP influent flows, but they are still almost double the average daily dry-weather flow in October 2022. Given that the system has 836 active connections, and assuming 2.5 people per connection and an average daily flow of 100 gallons per day per person, the average daily WWTP inflow should be approximately 0.209 mgd. This value is similar to the flow measured in October 2022.

According to the KIA WRIS database, the Cumberland collection system consists of:

- 53,200 feet of 4-inch to 8-inch gravity sewer lines, of which 25,000 feet are clay pipe.
- 18,300 feet of 4-inch force main.
- Six lift stations.

The following capital improvements were identified during the April 2023 site visit:

1. Identify leaks in the existing collection system through smoke testing or other means to address excessive I/I. Cumberland has approximately 25,000 feet of old clay pipe that should be replaced, at a minimum.
2. Install new rake on the clarifier.
3. Develop preventative maintenance program.
4. Haul stockpiled sludge off site. Costs include testing and disposal at the local landfill. Costs could be much higher if testing indicates the presence of heavy metals or other contaminants that require disposal at a hazardous landfill. Testing, hauling, and disposing of stockpiled sludge is considered O&M, and typically not eligible for funding as a capital cost.
5. If the Cumberland WWTP provides wastewater treatment for Benham and Lynch, it might need improved solids-handling facilities. A cost estimate is included in this report to install a belt filter press, but Cumberland's solids-handling facilities should be further evaluated to better assess improvements.

Table 6 presents options and costs, assuming Cumberland retains ownership of its wastewater infrastructure.

Table 6. Cumberland Options for Wastewater Infrastructure

Cumberland Option 1: Collection system upgrades to address I/I

Regardless of which wastewater treatment alternative Cumberland selects, it should address excessive I/I entering the wastewater collection system. These improvements are integral to any wastewater treatment options implemented. Cumberland had approximately 25,000 feet of clay pipe installed in 1960 (per the KIA WRIS asset inventory information); this report assumes all existing clay pipe and associated manholes will be replaced to reduce I/I. Additional improvements are likely needed to further reduce I/I, such as replacing or rehabilitating collection lines in addition to the clay pipe, manholes, and lift station wet wells. Smoke testing, video inspection, or other assessments could further identify improvements to reduce I/I.

Expected capital cost range: $6 million to $7 million. This cost is incurred regardless of other wastewater system and treatment improvements conducted by Cumberland.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- Addresses I/I, reducing pumping costs at lift stations.
- Allows Cumberland to consider long-term wastewater treatment alternatives.

Cons:

- Cumberland may not qualify for funding if they are unable to produce the past 3 years of audited financials.

Cumberland Option 2: Conduct WWTP improvement, plus other system improvements (in addition to I/I)

This option requires Cumberland to repair and upgrade its WWTP and sewer collection system (including the I/I work previously described) to maintain compliance. During that process, Cumberland will:

1. Install new rake on the clarifier.
2. Haul stockpiled sludge off site.

Expected capital cost range: $100,000–$200,000. This cost is in addition to the $6 million to $7 million needed to address I/I, for a total cost of $6.1 million to $7.2 million.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- The WWTP maintains compliance with discharge permit limits.
- Environmental and public health would improve.
- The WWTP will have capacity to support future growth or serve Benham and Lynch.

Cons:

- Cumberland may not qualify for funding if they are unable to produce the past 3 years of audited financials.
- The city must have adequately trained and certified operators to oversee WWTP.

Cumberland Option 3: Cumberland WWTP serves Benham and Lynch

For this option, wastewater from Lynch and Benham is conveyed to the existing Cumberland WWTP, which then treats all three cities' wastewater. Cumberland continues to own and operate its collection system. If all three cities address I/I and populations remain static, the Cumberland WWTP should have adequate capacity to treat all wastewater for at least the next 10 years. This option may be needed:

- If the Benham WWTP cannot adequately treat wastewater from Lynch.
- As an interim option, until a long-term option is identified to meet the wastewater needs of the three cities and the surrounding areas. If regionalization occurs and a new regional WWTP is identified as the preferred option, it could take up to 10 years for the three cities and counties (if unincorporated areas are included in the service area) to create a new wastewater authority that would oversee a regional facility and construct a new regional WWTP.

In addition to the I/I improvements described in Cumberland Option 1 and other improvements in Cumberland Option 2, the following improvements are also needed:

1. Modified piping at or near the Cumberland WWTP to accept additional wastewater from Benham and Lynch.
2. Upgraded controls and installation of a belt filter press to improve solids-handling capabilities.
3. Interlocal agreement between Cumberland, Benham, and Lynch. As part of this agreement, Benham and Lynch would negotiate the costs for Cumberland treating Benham's and Lynch's wastewater.

Expected capital cost range: $1 million to $1.5 million for system improvements (modified piping, upgraded controls, and belt filter press) to receive wastewater from Benham and Lynch, plus $100,000–$200,000 for other WWTP improvements. Cumberland, Benham, and Lynch can discuss how best to share the cost of upgrades at the WWTP and what to include in the agreement. These costs are in addition to $6 million to $7 million needed to address all I/I, for a total cost of $7.1 million to $8.7 million.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- The WWTP maintains compliance with discharge permit limits.
- Environmental and public health would improve.
- The WWTP will have the capacity to support future growth or serve Benham and Lynch.
- Due to shared facilities, the project would receive higher priority from funders and qualify for a reduced interest rate from KIA.
- Costs of WWTP operations are shared between all three cities, reducing monthly O&M costs for each community.

Cons:

- Cumberland may not qualify for funding if they are unable to produce the past 3 years of audited financials.
- The city must have adequately trained and certified operators to oversee WWTP.
- Interlocal agreements have limitations for ensuring timely receipt of payments or financial contributions for improvements from all participating cities in comparison to other regional ownership structures, such as a joint sewer agency.

Joint Sewer Agency Options and Costs

The pilot project team evaluated options that include transferring ownership of all wastewater infrastructure (i.e., collection lines, lift stations, and WWTPs) to realize economies-of-scale benefits when all three cities consolidate under one ownership structure. Many cities across Kentucky and the nation have benefited from utility consolidation without the losing their community identity. Participating in utility consolidation demonstrates local governments' willingness to pursue options that best serve residents in providing reliable and affordable sewer services while protecting public health and the environment.

Under Kentucky statute, several approaches exist for sharing services between the three cities that would allow them to continue providing wastewater services to existing customers and expand in the future to serve unincorporated areas in both Harlan and Letcher counties. For instance, a joint sewer agency or similar special purpose governmental entity could be created to oversee all existing wastewater infrastructure (i.e., collection lines and WWTPs) and new infrastructure for unincorporated areas.

The cities of Cumberland, Benham, and Lynch, along with the Harlan County Fiscal Court, considered a joint sewer agency in 2016, but it did not materialize for a number of reasons. However, further loss in population, increased service costs (i.e., electricity, chemicals, materials), and advanced deterioration of existing infrastructure have prompted renewed consideration for exploring options and expanding the service area to include additional customers, thereby achieving greater economies of scale. For the purposes of this effort, it is assumed a joint sewer agency would be formed to provide wastewater services to all three cities, but the approach can be modified if it is within Kentucky statutory boundaries.

Joint Sewer Agency Option 1

For this option, the three cities agree to join with Harlan County to create a joint sewer agency (KRS 76.232) governed by a board of qualified individuals that each represent one of the participating founding entities. The new joint sewer agency will assume ownership of each city's existing wastewater system and WWTP, and would be solely responsible for operating and maintaining all collection lines, force mains, lift stations, and WWTPs (see Table 2 for more details on a joint sewer agency). Incrementally, all wastewater from Lynch and Benham would be conveyed to the WWTP at Cumberland for treatment during the duration of that WWTP's useful life while a new, future regional WWTP is planned, designed, and constructed.

The newly formed joint sewer agency would be responsible for securing operations personnel, funding, and engineering services, as well as managing infrastructure projects affecting each participating entity's wastewater system. These responsibilities include:

- Implementing projects to address I/I and lift station improvements within each city, as previously identified.
- Decommissioning WWTPs at Lynch and Benham.
- Installing new conveyance facilities to serve Lynch and Benham and convey all wastewater to the existing Cumberland WWTP (hereafter referred to as the Regional WWTP).
- Improving the Regional WWTP.
- Conducting inventory, assessment, and valuation of all assets to allow the three cities to transfer assets to the new ownership entity.
- Assuming any existing debt a city may have. For this option, it is assumed all existing wastewater debt is forgiven through favorable refinancing terms as part of any funding issued to the joint sewer agency for wastewater improvements. Benham has an existing sewer bond with a remaining debt of approximately $220,000; Lynch and Cumberland do not have any outstanding wastewater loans or bonds.

Under this option, all customers in each city (totaling 1,485 existing customers, as noted in Table 1) share costs for any improvements. For instance, the joint sewer agency bears all I/I improvement costs and passes them on to all 1,485 customers served by the agency, as opposed to previous options where each city financed its I/I improvements separately. In addition, the joint sewer agency bills each customer individually, as opposed to billing each city or government body separately under an interlocal agreement. This financial model better ensures timely

payments, and all collected customer sewer revenues are used for the wastewater infrastructure O&M, repairs, and replacement. Table 7 presents costs and other information on formation of a joint sewer agency.

Table 7. Joint Sewer Agency Option 1

Existing Cumberland WWTP becomes a Regional WWTP, which treats wastewater from Cumberland, Benham, and Lynch under joint sewer agency ownership

For this option, a joint sewer agency is formed and wastewater from Lynch and Benham is conveyed to the Regional WWTP, which treats all three cities' wastewater. The joint sewer agency secures funding for all improvements and oversees all collection system and WWTP operations. The Regional WWTP should have adequate capacity to treat all wastewater for about the next 10 years provided the joint sewer agency addresses the I/I issues within the collection systems. This option is needed until a new, larger WWTP is built to serve the three cities and potentially the surrounding areas (Joint Sewer Agency Option 2).

The following improvements and activities are needed:

1. Address I/I in each city, as previously described, along with other collection system and lift station improvements. This work needs to be completed first before sending Lynch's and Benham's wastewater to Cumberland to avoid exceeding the Regional WWTP design capacity of 0.5 mgd.
2. New conveyance line and lift stations from Lynch and Benham to convey all wastewater to the Regional WWTP.
3. Modified piping at or near the Regional WWTP to accept additional wastewater from Benham and Lynch.
4. Installation of a belt filter press to improve solids-handling capabilities along with other minor improvements at the Regional WWTP.
5. Decommissioning of Benham's and Lynch's WWTP.
6. Legal and administrative costs to create the joint sewer agency and transfer ownership of assets.

Expected capital cost range: $26 million to $28 million. Assumes wastewater improvements are completed in phases as follows, with corresponding funding obtained in phases:

1. **Phase 1.** Form the joint sewer agency, transfer ownership of all wastewater assets, forgive existing debt, and complete approximately half of all I/I improvements within each city. Estimated cost for this phase is $10.5 million.
2. **Phase 2.** Complete remaining I/I improvements within each city. Estimated cost for this phase is $10 million.
3. **Phase 3.** Construct common facilities (pipe and lift stations) to convey all wastewater from Lynch and Benham to the Regional WWTP, abandon Lynch's and Benham's WWTPs, and improve the Regional WWTP. Estimated cost for this phase is $7 million.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- The Regional WWTP maintains compliance with discharge permit limits.
- Environmental and public health would improve.
- Regionalization projects receive higher priority from funders and qualify for a reduced interest rate from KIA.
- The project improves access to funding since each city is no longer seeking funding on an individual basis, nor do they need 3 years of audited financials.
- Staff are housed within one agency and better able to cover all administrative and operational activities.
- O&M for one WWTP is less expensive compared to three separate WWTPs.
- The joint sewer agency provides increased financial capacity and resilience with a larger customer base to support O&M costs.
- Economies of scale are achieved when bidding improvements across three cities under one construction contract versus each city bidding projects individually, saving money and reducing the time to complete improvements.

Cons:

- Transferring assets and reassigning staff duties could initially be challenging.
- The Regional WWTP has a limited life of approximately 10 years due to its age and current treatment capacity. A new WWTP will eventually be needed, particularly if the service area is expanded.

Joint Sewer Agency Option 2

For this option, the joint sewer agency formed under Joint Sewer Agency Option 1 constructs a new 1-mgd Regional WWTP to serve all three cities within the next 10 years. A new Regional WWTP will be needed because the existing treatment facilities are approaching their useful lives. In addition, a larger WWTP is anticipated to accommodate growth and expansion to unsewered areas. This option assumes:

- All improvements in Joint Sewer Agency Option 1 are completed; the cost for the new 1-mgd Regional WWTP is in addition to all the costs presented in Joint Sewer Agency Option 1.
- The new 1-mgd Regional WWTP is constructed at the same location as the existing Cumberland WWTP site, with the ability to expand to serve population growth within Lynch, Benham, and Cumberland, along with the potential to serve nearby unsewered areas.
- The existing Regional WWTP in Cumberland as described in Joint Sewer Agency Option 1 can maintain full operation while the new 1-mgd Regional WWTP is constructed.
- Nearby parcels are available for purchase to expand the existing WWTP. Note that the current WWTP site is limited in how much expansion can occur. For now, a 1-mgd Regional WWTP is the maximum size plant the site can support. If the region needs additional capacity, the larger WWTP would require a new site.

Under this option, costs for all improvements are shared amongst all customers in each city (total of 1,485 existing customers, as noted in Table 1). Table 8 below presents costs and other information for this option.

Table 8. Joint Sewer Agency Option 2

New 1-mgd Regional WWTP under joint sewer agency ownership

For this option, the joint sewer agency replaces the existing Regional WWTP in Cumberland, which has a capacity of 0.5 mgd, with a new 1-mgd Regional WWTP at the same location on River Road in approximately 10 years. This option requires the following improvements and activities:

1. Purchase of nearby parcels to provide approximately 3 to 4 more acres of land to allow for the expansion.
2. Site improvements, including a levee and emergency access road to address floodplain and flooding concerns.

Expected capital cost range: $15 million to $17 million. This cost is in addition to the costs presented in Joint Sewer Agency Option 1.

Expected monthly O&M costs per customer (does not include loan repayment): $40–$50

Pros:

- The Regional WWTP maintains compliance with discharge permit limits.
- Environmental and public health would improve.
- Regionalization projects receive higher priority from funders and qualify for a reduced interest rate from KIA.
- The project improves access to funding since each city is no longer seeking funding on an individual basis, nor do they need 3 years of audited financials.
- Staff are housed within one agency and better able to cover all administrative and operational activities.
- O&M for one WWTP is less expensive compared to three separate WWTPs.
- The joint sewer agency provides increased financial capacity and resilience with a larger customer base to support O&M costs.
- A larger WWTP allows for the ability to serve new customers, increasing the customer base.

Cons:

- The joint sewer agency will need to purchase nearby parcels to expand the Regional WWTP.
- The site limits WWTP expansion to 1.0 mgd, so a new WWTP site might be needed in the future to accommodate future growth or service area expansion.
- The existing Cumberland WWTP parcel is partially in a floodplain, requiring site improvements with a levee and an emergency access road to address flooding.

Financing Options

The financing options evaluated assume USDA-RD funding, with 75 percent of capital costs covered with a grant and the remaining 25 percent financed with a 40-year loan at an assumed interest rate of 2.375 percent (current poverty interest rate offered by USDA-RD). Funding from the KIA Clean Water State Revolving Fund (CWSRF) program was not evaluated based on the current Intended Use Plan indicating the maximum principal forgiveness awarded is approximately 26 percent of capital costs.

Table 9 provides the estimated monthly rates for O&M plus loan repayment for each option for each city. City officials will need to work with the funding agencies throughout the project development process to determine the level of grant and loan funding available. Funding availability can change based on several factors, including legislative appropriations, the project ranking process, and the number and type of other applications received.

All capital costs include engineering, legal, permitting, and construction costs, as well as a contingency. Costs meet all federal funding requirements.

Table 9. Estimated Monthly Costs for Wastewater Infrastructure Options (Assumes USDA-RD Funding, 75% Grant and 25% Loan)

Option	Capital Cost	Monthly Loan Payment per Residential Customer	Estimated Monthly O&M per Residential Customer	Estimated Total Monthly Cost per Residential Customer (Loan Repayment Plus O&M and I/I)
City of Lynch				
Option 1: Address I/I	$6 million–$7 million	$14–$16	$40–$50	$54–$66
Option 2: Construct new WWTP	$4 million–$5 million	$9–$11	$40–$50	$63–$77 (includes I/I)
Option 3: Connect to Benham	$2 million–$3 million	$5–$7	$40–$50 (includes payment to Benham)	$59–$73 (includes I/I and sewer line to Benham)
Option 4: Connect to Cumberland WWTP	$2 million–$3 million	$5–$7	$40–$50 (includes payment to Cumberland)	$64–$80 (includes I/I, sewer line to Benham, and sewer line to Cumberland)
City of Benham				
Option 1: Address I/I	$5.5 million–$6.5 million	$15–$18	$40–$50	$55–$68
Option 2: WWTP and lift station improvements	$1 million–$2 million	$3–$6	$40–$50	$58–$74 (includes I/I)
Option 3: Connect to Cumberland WWTP	$2 million–$3 million	$6–$9	$40–$50 (includes payment to Cumberland)	$61–$77 (includes I/I and sewer line to Cumberland)

Option	Capital Cost	Monthly Loan Payment per Residential Customer	Estimated Monthly O&M per Residential Customer	Estimated Total Monthly Cost per Residential Customer (Loan Repayment Plus O&M and I/I)
City of Cumberland				
Option 1: Address I/I	$6 million–$7 million	$6–$7	$40–$50	$46–$57
Option 2: WWTP improvements	$0.1 million–$0.2 million	$0.10–$0.20	$40–$50	$46–$57 (includes I/I costs and WWTP improvements)
Option 3: Cumberland WWTP improvements to serve Benham and Lynch	$1.0 million–$1.5 million	$1.00–$1.20	$40–$50	$47–$58 (includes I/I costs and WWTP improvements)
Joint sewer agency (all wastewater assets owned by the agency; each customer pays same rate)				
Option 1: Address I/I in each city; all wastewater treated at Regional WWTP	$26 million–$28 million	$14–$15	$40–$50	$54–$65 (includes I/I costs and conveying all wastewater to Regional WWTP)
Option 2: Build new 1-mgd Regional WWTP	$15 million–$17 million	$7–$8	$40–$50	$61–$73 (includes all improvements in Option 1 plus a new 1-mgd Regional WWTP)

Funding Opportunities

The Bipartisan Infrastructure Law provides additional funding to the CWSRF for loans and grants to small, rural, and disadvantaged communities that can be leveraged with USDA-RD funds to address inadequate water and wastewater systems. There are multiple potential funding sources for the three cities, including USDA-RD and the CWSRF jointly administered by the KIA and KY EEC.

Overview of the CWSRF Program Administered by KIA and KY EEC

Information on the CWSRF included in this report is derived from the State Fiscal Year 2024 Intended Use Plan prepared by KIA and KY EEC.[3] The following is a general summary of Kentucky CWSRF funding terms:

- The Kentucky CWSRF is a low-interest loan program intended to finance public infrastructure improvements.
- CWSRF funding applications are accepted year-round but must be received prior to the deadline established each year as part of the call for projects.
- Eligible projects are placed on a project priority list as part of the Intended Use Plan and ranked for funding. KIA and KY EEC prepare the Intended Use Plan each fiscal year to present the list of potential projects to be funded.
- The current standard interest rate for construction, planning, and design loans is 2.25 percent.
- To be deemed disadvantaged and eligible for the reduced interest rate (currently at 0.5 percent) and principal forgiveness (or subsidy) on a loan, the community's MHI must be less than 80 percent of the state's MHI. As of December 2023, Kentucky's MHI is $55,454, as calculated by the KIA WRIS.
- Communities that qualify for subsidy generally receive principal forgiveness in their assistance agreements.
- To be eligible for additional subsidization, a community must meet at least one of the three disadvantaged community criteria below:
    - A systemwide MHI less than the state's MHI, as calculated by the WRIS.
    - A project area MHI less than the state's MHI, as calculated by the WRIS or by using census tract information.
    - An affordability index ratio of 1.0 or greater, calculated as the annual 4,000-gallon water rate divided by the systemwide or project area MHI and rounded to the nearest tenth.
- A reduced nonstandard interest rate is also applied for projects that meet the definition for regionalization or projects necessary to comply with an agreed order or consent decree. Under the regionalization criteria, an additional 50 points can be added if the project eliminates a package WWTP that is more than 25 years old and if the project eliminates a plant that has received notices of violations resulting in degraded waters within the last 2 state fiscal years.
- Funding eligibility requires 3 years of financial audits.
- The loan term is generally 20 years, but disadvantaged communities can receive a loan term of 30 years.
- Based on the 2024 Intended Use Plan, the amount of subsidy awarded per project ranged from 10 percent to 26 percent, depending on how the project ranked.

3 https://kia.ky.gov/FinancialAssistance/Intended%20Use%20Plans/2024%20CWSRF%20FINAL%20IUP.pdf

Overview of USDA-RD's Water and Environmental Programs: Water and Waste Disposal Loans and Grants

- Through Rural Utilities Service Water and Environmental Programs, rural communities obtain the technical assistance and financing necessary to develop drinking water and waste disposal systems.
- USDA-RD has long-term, low-interest loan financing programs to assist communities with infrastructure costs. There are opportunities for grants combined with loans for communities that qualify.
- Eligibility for funding is based on MHI and population of the community.
- Cumberland, Benham, and Lynch would be considered for other USDA-RD programs such as Persistent Poverty assistance, which can provide a higher percentage of grant funds.
- USDA-RD loans and grants require financial audits, as well as a commitment to revenue collection during the life of the loan.
- For communities receiving loans, the loan term can be up to 40 years based on the expected life of the system.
- The interest rate is adjusted quarterly.
- Special Evaluation Assistance for Rural Communities and Households (SEARCH) grants can assist with funding.
    - The SEARCH program helps very small, financially distressed rural communities with predevelopment feasibility studies, design, and technical assistance on proposed water and waste disposal projects.
    - State and local government entities, nonprofits, and federally recognized Tribes may apply.
    - The service area must be rural, with a population of 2,500 or fewer, and have an MHI that is below the poverty line or less than 80 percent of the statewide MHI.
- Water and Waste Disposal Predevelopment Planning Grants (PPG)
    - The PPG program helps eligible low-income communities plan and develop applications for proposed USDA-RD water or waste disposal projects.
    - State and local government entities, nonprofits, and federally recognized Tribes may apply.
    - The service area must be rural, with a population of 10,000 or fewer, and have an MHI below the poverty line or less than 80 percent of the statewide MHI.
- USDA-RD accepts applications year-round on a rolling basis through RD Apply.[4]
- More information is available is USDA's website.[5]

Current Funding Programs for Septic System Upgrades

- USDA-RD's Single Family Housing Repairs Loans and Grants (also known as Section 504 Home Repair Program) provide loans to low- and very-low-income homeowners to repair, improve, or modernize their homes. It also provides grants to elderly, very-low-income homeowners to remove health and safety hazards.
- The USDA Rural Decentralized Water Systems Grant program helps qualified nonprofits create a revolving loan fund for eligible individuals who own and occupy a home in an eligible rural area (those with a population of 50,000 or fewer). These revolving loan funds come in the form of low-interest loans. The maximum loan amount is $15,000 at a 1 percent fixed interest rate, repaid over a 20-year period. The fund may be used to construct, refurbish, or service individually owned septic systems.

4 https://www.rd.usda.gov/programs-services/rd-apply

5 https://www.rd.usda.gov/programs-services/water-environmental-programs

Benefits of Investing in Wastewater Infrastructure

Public and Community Health Improvement

Exposure to wastewater can have negative health impacts and spread diseases such as salmonellosis, giardiasis, amoebiasis, hepatitis A, viral enteritis, and other diarrheal diseases.[6] Wastewater contains many different types of microbes, which makes it challenging to determine specific causes of illness. Detecting and identifying microbes in wastewater takes time and resources.[7] However, it is well known that exposure to untreated waste negatively affects residents' health and well-being.

Investing in adequate wastewater infrastructure creates a healthier environment for the residents of Cumberland, Benham, and Lynch. Children can play outdoors, residents do not have to worry about their families and pets encountering raw sewage, household plumbing is more functional, and sewage odors are not persistently present. Well-maintained and properly built wastewater treatment systems protect residents from viruses and bacteria. They also reduce environmental pollution, function during rain and storms, and provide a foundation for economic development.

Economic Impact of Wastewater Infrastructure Investment

Although the primary purpose of any wastewater system improvements in the Tri-Cities is to address their sanitation conditions, developing wastewater systems can bring economic benefits and jobs for communities. The *Economic Benefits of Investing in Water Infrastructure* study, commissioned by the Value of Water Campaign and completed by the U.S. Water Alliance in 2017, found that for every $1 million spent on infrastructure construction, over 15 jobs are generated. City leaders in Cumberland, Benham, and Lynch will want to consider school apprenticeship programs and other local workforce development programs to create local employment opportunities for residents once construction-related activities begin.

Infrastructure can provide a strong foundation for the community through improved wastewater treatment and health services for existing residents. The cities of Cumberland, Benham, and Lynch make an attractive location for tourism and the commercial businesses that support it. New businesses can bring jobs, reducing the number of residents that drive to other areas for work. Gravity sewer and centralized treatment are the most flexible wastewater systems for economic development. However, they are also the most expensive to build and maintain at first. Community systems can also be attractive to prospective businesses if the design accounts for the expected flow. Expanding the sewer to new areas, such as the area between Cumberland and Totz, will provide more paying customers and could allow for more reasonable rates as more customers share the costs of infrastructure O&M.

Better water quality in Looney Creek and Poor Fork from improved wastewater treatment by each city would allow for more recreational opportunities in the area, including:

- Improved fishing and boating opportunities (e.g., fly fishing in Looney Creek, a kayak and canoe launch in Cumberland).
- The opportunity for children to play in Looney Creek and Poor Fork without risk of exposure to harmful contaminants.

6 World Health Organization. (2006). *WHO guidelines for the safe use of wastewater, excreta, and greywater* (Vol. 2). https://www.who.int/publications/i/item/9241546832

7 Kaushal, S., & Singh, J. S. (2017). Wastewater impact on human health and microorganism-mediated remediation and treatment through technologies. In J. Singh & G. Seneviratne (Eds.), *Agro-environmental sustainability*. Springer. https://doi.org/10.1007/978-3-319-49727-3_12

More recreational opportunities lead to more tourism and economic development, including:

- Hotels and other hospitality industries.
- Expansion of cabins at Kingdom Come State Park (currently planned; seeking water service from Cumberland).
- Food and restaurant businesses that support tourism.

Impact of Economic Growth on Monthly Rates

In Options 3 for Benham and Cumberland, Option 4 for Lynch, and Joint Sewer Agency Options 1 and 2, wastewater flows would be sent to the Cumberland (or Regional) WWTP for treatment. Larger wastewater utilities have access to capital and may be able to achieve economies of scale by treating wastewater for multiple communities. Once a utility reduces or minimizes their capital and operating costs, the level of funds needed from customers may change. Carefully structured consolidation can help decisionmakers implement equitable rates for customers within a service area and slow future rate increases for all involved. In addition, regionalization projects receive priority points from funding agencies and increase the possibility of receiving favorable funding terms for the proposed project.

Sustaining the Investment Through O&M

Potential Approaches for O&M

The following are challenges each city experiences with O&M:

- Certified WWTP operators for each city are limited in their ability to spend time at the WWTPs because they are working at another facility or being tasked with overseeing other city-owned facilities.
- Either rates are not adequate, or collected sewer revenues are not applied to the wastewater system to properly maintain it.
- I/I creates problems at the WWTPs and needs to be addressed.

The following are considerations for improving O&M of each wastewater system:

- The cities could consider sharing operators through interlocal agreements or through another regional arrangement.
- Each city is encouraged to perform a rate study to better assess appropriate rates and how to use sewer revenues.
- Additional controls would allow operators to view the WWTP or lift station operations remotely and possibly control equipment remotely. This capability could reduce the amount of operator time needed to maintain the lift station and the WWTP operations.

Paying for O&M and the Affordability Challenge

Across the United States, utilities use sewer rate revenues to pay for management, O&M, and loan repayments for wastewater systems. The cities of Cumberland, Benham, and Lynch will need to keep rates affordable for low-income customers but high enough to collect funds to operate and maintain the system(s). This challenge is a key obstacle for utilities across the United States.

The KIA CWSRF program uses the following criteria to identify a community as disadvantaged and eligible for a reduced interest rate and principal forgiveness for funding awarded for wastewater improvements:

- The community's MHI must be less than 80 percent of the state's MHI. As of December 2023, Kentucky's MHI is $55,454, as calculated by the KIA WRIS.
- To be eligible for additional subsidization, a community must meet at least one of these three disadvantaged community criteria:
  - A systemwide MHI less than the state's MHI, as calculated by the WRIS.
  - A project area MHI less than the state's MHI, as calculated by the WRIS or by using census tract information.
  - An affordability index ratio of 1.0 or greater, calculated as the annual 4,000-gallon water rate divided by the MHI and rounded to the nearest tenth.

Table 10 provides an overview of each city's MHI in comparison to the state's MHI value and affordability index based on existing rates. As shown, each city's MHI is less than 80 percent of the state's MHI, and the cities are eligible for both a reduced interest rate and additional subsidization. Also, each city has an affordability index ratio equal to or greater than 1 percent, using current rates. Given this information, it is important to seek funding that limits the amount of loan repayment and the financial burden on existing customers to repay the loan. The customers of most concern have a household income less than the MHI and are most challenged to afford existing or future rates, based on the estimated loan repayment amounts projected in Table 10.

Table 10. MHI and Affordability Index Information

City	MHI (per KIA WRIS)	Less than 80% State MHI ($44,363)	Current Monthly Sewer Rate per 4,000 Gallons	Ratio of Current Monthly Rate to MHI (Affordability Index)
Lynch	$36,778	Yes	$42.48	1.4%
Benham	$41,877	Yes	$34.86	1.0%
Cumberland	$24,938	Yes	$39.50	1.9%

Addressing the Affordability Challenge

It is possible to lower the financial burden of these investments, especially for low-income households. Some local communities and states are developing affordability programs to provide rate assistance to low-income customers. The Low Income Household Water Assistance Program, created in response to the COVID-19 pandemic, was the first program of its kind in the United States, but is only authorized by Congress through 2024. It is unclear whether Congress or the State of Kentucky will continue this program.

Cumberland, Benham, and Lynch, like other local governments and utilities, can build local affordability programs by charging rates on commercial accounts, new customers, or other customer bases. This rate structure would create a pot of money to help other customers during times of need. Customers who have a temporary medical issue or qualify for assistance based on income guidelines can take advantage of this rate structure to pay for water and wastewater services. However, this solution might not work if the Tri-Cities do not have many commercial or industrial accounts that can pay extra to fund it.

Key Takeaways on Affordability

All the wastewater treatment options have a high financial impact on the lowest-income residents of the Tri-Cities and surrounding areas. **Rate assistance programs may be necessary for some households in Cumberland, Benham, and Lynch.**

Loan repayments will cause any option to have a high financial impact on residents of the Tri-Cities. Cumberland, Benham, and Lynch will need to work with the funding agencies to **maximize the amount of grants** for construction of their system.

Economic growth can lower monthly costs of central treatment systems; therefore, **the communities should carefully weigh multiple factors in deciding on a system.**

The Tri-Cities will need multiple approaches to address the financial burden of water utilities for low-income residents, beyond just the programs discussed above. For example, Cumberland, Benham, and Lynch could consider non-rate revenue opportunities such as leasing space on water towers or offering non-traditional services. For example, the cities could consider providing construction services to new projects and charging for the time, although this option would require contract documents with the private sector.

The cities are also encouraged to seek solutions that make future projects affordable, such as sharing infrastructure or regionalization options.

Partners and Roles

The path to clean water is not an easy one. The Tri-Cities have many options to choose from when it comes to new wastewater systems. Many partners in this pilot program will continue to support the Tri-Cities along this journey (Figure 6), including:

U.S. Department of Agriculture Rural Development (USDA-RD). Lead agency (with EPA) providing jointly leveraged technical assistance resources in this pilot program. Funding partner.

U.S. Environmental Protection Agency (EPA) Headquarters and Region 4. Lead agency (with USDA) providing jointly leveraged technical assistance resources in this pilot program.

Kentucky Energy and Environment Cabinet (KY EEC). Agency providing funds through the CWSRF and the environmental permitting authority.

Kentucky Department of Public Health (KY DPH). Permitting authority for the Onsite Sewage Disposal Systems Program.

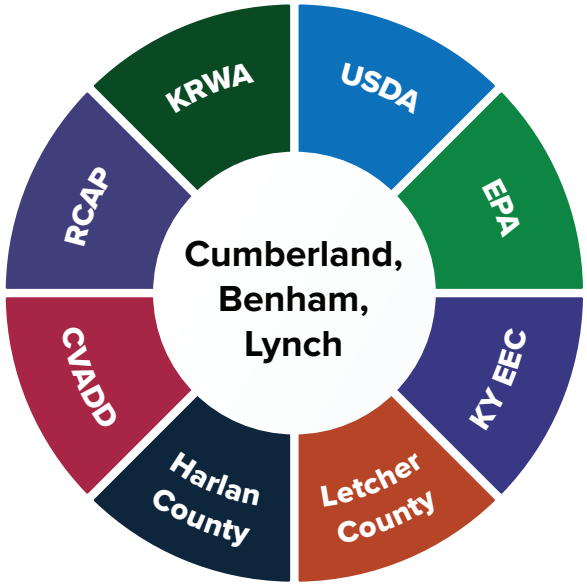


Figure 6. Partners to Cumberland, Benham, and Lynch.

Harlan County and Letcher County Judge Executives. Presiding officers of the fiscal courts that run the counties' executive branches. The offices oversee day-to-day operations and manage departments and personnel.

Cumberland Valley Area Development District (CVADD). Local area development district that serves as the focal point for the federal-state-local partnership for improving quality of life in Kentucky.

Rural Community Assistance Partnership (RCAP). Organization providing technical assistance.

Kentucky Rural Water Association (KRWA). Association providing technical assistance.

Technical Assistance and Support for Cumberland, Benham, and Lynch Moving Forward

Both EPA and USDA-RD fund technical assistance programs that support small, rural, and disadvantaged communities and help them navigate the CWSRF, Drinking Water State Revolving Fund (DWSRF), and USDA-RD funding programs. The ultimate goals of the WaterTA programs are to help communities identify water challenges and solutions, build capacity to address those needs, and develop application materials to access water infrastructure funding. Technical assistance providers can help all three cities understand the funding available through the SRF and USDA-RD programs, as well as deadlines and application requirements. **EPA WaterTA and USDA-RD technical assistance can also assist with preparing and submitting funding applications.** These providers can offer advice as communities consider infrastructure options, financing, and rate structures. Their connections with EPA and USDA-RD can help communities successfully complete projects and programs. Other technical assistance support for Cumberland, Benham, and Lynch can include:

- **Developing a wastewater rate program to build a local "affordability assistance" and asset management program.** Each of the cities or a joint sewer agency could establish a rate program where new, commercial, or industrial customers contribute to an affordability assistance program for low-income residents. EPA's network of Environmental Finance Centers partners with technical assistance providers that specialize in these types of rate programs.

- **Supporting workforce development and staff training.** Each of the cities' utilities will need operations staff for new systems. The technical assistance providers have staff training programs available.
- **Engaging residents in the needs and benefits of a wastewater treatment system.** Customers play a large part in the success of a wastewater treatment system. Technical assistance providers can help engage with and educate residents on topics such as "What Not to Flush," "Management of Fats, Oils, and Greases," why having a wastewater system is important, and how to maintain a septic system. Educational materials are available for residents.

More information can be found at EPA's WaterTA website.[8]

Road Map for Implementation

The mayors and city councils of Cumberland, Benham, and Lynch are considering how to address wastewater treatment needs, but this is just the beginning of the process. Developing wastewater infrastructure takes time. Creating a holistic program to address wastewater needs could take several years. These issues are not easy to resolve, but the effort is worthwhile for the future of these communities. Now is the best time in decades to act, as the Bipartisan Infrastructure Law funds add a boost to water infrastructure across the United States. Over the next year, the Tri-Cities will need to consider options and determine the best path for their collective future.

Immediate Next Steps Ongoing Through 2024

Cumberland, Benham, and Lynch worked with KRWA to conduct sewer system smoke testing to address I/I issues. KRWA offers this technical assistance service at no cost to the communities. RCAP is assisting all three cities in analyzing their water and sewer rate structures. Through this process, RCAP is examining each city's financial audits to ensure that they meet the financial requirements for funding under the Kentucky CWSRF and relevant USDA-RD programs. Both the CWSRF and USDA-RD require financial audits from the past 3 years (2021 through 2023) for the city's enterprise (water/sewer) funds to approve any type of financing. The current statuses of each city's water/sewer audits are as follows:

- Lynch is actively working on the audit for fiscal year 2021 and has yet to start audits for other fiscal years.
- Benham is retroactively completing an audit for 2021 but has not completed audits for 2022 or 2023.
- Cumberland is actively completing audits for 2021 through 2023, and anticipates that all audits will be completed in 2024.

Activities After Alternative Selection

Once the cities decide on a wastewater option, they will have to determine whether to draft ordinances for a regionalization effort or submit applications to fund improvements for each individual wastewater system. Technical assistance providers RCAP and KRWA can assist with assembling funding applications, as well as crafting ordinance language that would equitably serve all three cities. The amount of funding from grants versus loans will need to be determined at the time of the application(s).

8 https://www.epa.gov/water-infrastructure/water-technical-assistance-waterta

Potential Timeline for Wastewater Improvements

The following is a general project schedule for Lynch, Benham, and Cumberland wastewater improvements for two options:

- Convey all wastewater to Cumberland WWTP using interlocal agreements. See Table 11 for estimated timeline.
- Create a joint sewer agency and convey all wastewater to regional WWTP (Joint Sewer Agency Option 1). See Table 12 for estimated timeline.

Table 11. Timeline of Wastewater Improvement Activities, Assuming All Wastewater Is Conveyed to Cumberland Under an Interlocal Agreement

Activity	Tentative Timeline
Identifying sewer line replacement and collection system improvements to address I/I (smoke testing and/or video inspection).	September 2023–June 2024
Working on rate studies and completing audits.	June 2024–August 2024
Completing procurement process for professional services to assist with funding applications, PERs, Facility Plans, and bid documents.	August 2024–September 2024
Developing and finalizing interlocal agreements.	August 2024–November 2024
Consultant prepares PER or Facility Plan and starts preliminary design for sewer line replacement and collection system improvement projects to address I/I.	October 2024–January 2025
Submitting USDA-RD, Appalachian Regional Commission, Community Development Block Grant (CDBG), and KIA funding applications for I/I project.	October 2024–June 2025
Executing sewer line replacement and collection system improvement projects to address I/I; obtaining permits and easements; 30% design completed; cultural and environmental reviews completed.	February 2025–April 2025
Submitting I/I project plans and specs to Kentucky Division of Water (KY DOW) for review and approval; completing plans and specs; bidding project.	April 2025–May 2025
Constructing first round of I/I improvements.	June 2025–November 2025
Developing PER for WWTP and conveyance infrastructure improvements.	July 2025–February 2026
Submitting USDA-RD, Appalachian Regional Commission, CDBG, and KIA funding applications for WWTP and conveyance infrastructure improvements.	October 2025–October 2026
Constructing remaining I/I project improvements.	April 2026–November 2026
Developing plans and specs for WWTP and conveyance infrastructure improvements.	April 2026–April 2027
Submitting WWTP and conveyance infrastructure improvements plans and specs to KY DOW for review and approval; completing plans and specs; bidding project.	May 2027–December 2027
Constructing WWTP and conveyance infrastructure improvements.	January 2028–December 2028

Table 12. Timeline of Wastewater Improvement Activities, Assuming Joint Sewer Agency Is Created and All Wastewater Is Conveyed to Regional WWTP (Joint Sewer Agency Option 1)

Activity	Tentative Timeline
Identifying sewer line replacement and collection system improvements to address I/I (smoke testing and/or video inspection).	September 2023–June 2024
Completing procurement process for professional services to assist with funding applications, PERs, Facility Plans, and bid documents.	August 2024–September 2024
Forming Joint Sewer Agency; developing rates.	August 2024–November 2024
Consultant prepares PER or Facility Plan and starts preliminary design for sewer line replacement and collection system improvement projects to address I/I.	October 2024–January 2025
Submitting USDA-RD, Appalachian Regional Commission, CDBG, and KIA funding applications for I/I project.	October 2024–June 2025
Executing sewer line replacement and collection system improvement projects to address I/I; obtaining permits and easements; 30% design completed; cultural and environmental reviews completed.	February 2025–April 2025
Submitting I/I project plans and specs to Kentucky Division of Water (KY DOW) for review and approval; completing plans and specs; bidding project.	April 2025–May 2025
Constructing first round of I/I improvements.	June 2025–November 2025
Developing PER for WWTP and conveyance infrastructure improvements.	July 2025–February 2026
Submitting USDA-RD, Appalachian Regional Commission, CDBG, and KIA funding applications for WWTP and conveyance infrastructure improvements.	October 2025–October 2026
Constructing remaining I/I project improvements.	April 2026–November 2026
Developing plans and specs for WWTP and conveyance infrastructure improvements.	April 2026–April 2027
Submitting WWTP and conveyance infrastructure improvements plans and specs to KY DOW for review and approval; completing plans and specs; bidding project.	May 2027–December 2027
Constructing WWTP and conveyance infrastructure improvements.	January 2028–December 2028

Concluding Thoughts

As the Tri-Cities move forward with an in-depth analysis of options for wastewater service, EPA and USDA-RD staff and technical assistance providers are ready to support these communities with funding opportunities through the Bipartisan Infrastructure Law. This is a historic time for water infrastructure funding for small, rural communities such as Cumberland, Benham, and Lynch. New funding can help these cities address their current and persistent health challenges and build a prosperous future.

Definitions

The following definitions are based on Kentucky regulations 902 KAR 10:085.

Onsite sewage disposal system or onsite sewage system or onsite system means a system installed on a parcel of land, under the control or ownership of a person, that accepts sewage for treatment and ultimate disposal under the surface of the ground, including:

a. A conventional system consisting of a sewage pretreatment unit, distribution devices, and lateral piping within rock-filled trenches or beds;

b. A modified system consisting of a conventional system enhanced by shallow trench or bed placement, artificial drainage systems, dosing, alternating lateral fields, fill soil over the lateral field, or other necessary modifications to the site, system, or wasteload to overcome site limitations;

c. An alternative system consisting of a sewage pretreatment unit, necessary site modifications, wasteload modifications, and a subsurface soil treatment and dispersal system using methods and technologies other than a conventional or modified system to overcome site limitations;

d. A cluster system; and

e. A holding tank that provides limited pretreatment and storage for offsite disposal where site limitations preclude immediate installation of a subsurface soil treatment and dispersal system or connection to a municipal sewer.

Cluster system means a system designed to:

a. Accept effluent from more than one (1) structure's or facility's sewage pretreatment unit; and

b. Transport the collected effluent through a sewer system to one (1) or more common subsurface soil treatment and dispersal system of conventional, modified, or alternative design.

Low-pressure pipe system means an onsite sewage disposal system consisting of a sewage pretreatment unit, a dosing tank with pump or siphon, a pressurized supply line, manifold, lateral field, and necessary control devices and appurtenances. (These systems are also referred to as STEP sewer systems.)

The following definitions are based on Kentucky regulations 807 KAR 5:071.

Collecting sewers means sewers, including force lines, gravity sewers, interceptors, laterals, trunk sewers, manholes, lampholes and necessary appurtenances and including service wyes, which are used to transport sewage and are owned, operated, or maintained by a sewage disposal utility.

Sewage means ground garbage, human and animal excretions, and all other domestic type waste normally disposed of by a residential, commercial, or industrial establishment, through the sanitary sewer system.

Sewage treatment facilities includes all pipes, pumps, canals, lagoons, plants, structures and appliances, and all other real estate, fixtures, and personal property owned, operated, and controlled or managed in connection with or to facilitate the collection, carriage, treatment, and disposal of sewage for the public, or another beneficial or necessary purpose.

Sewage utility means any person, except a city, who owns, controls or operates or manages any facility used or to be used for or in connection with the treatment of sewage for the public, for compensation, if the facility is a subdivision treatment facility plant, located in a county containing a city of the first class or a sewage treatment facility located in any other county and is not subject to regulation by a metropolitan sewer district (KRS 278.010(5)(c)).

Appendix A. Drinking Water Infrastructure Options: Lynch, Benham, and Cumberland

The water systems serving each city were evaluated as part of the pilot project. The water systems for the three cities were interconnected approximately 10 years ago. The interconnection system consists of two booster pump stations and segments of a dedicated transmission main. However, the Benham distribution system is used for a portion of the interconnection, and this arrangement creates hydraulic issues. One of the booster pump stations is in Cumberland, which the pilot program team visited in April 2023. Cumberland had drained all the water from the line and pumps to avoid damage from freezing a few years ago. The other pump station is in Benham. This pump station was locked, and the key could not be located, so the pump station was not inspected. Neither pump station is equipped with a generator. The entity created to oversee the transmission mains and pump stations no longer exists. Therefore, there is no current legal owner of the pump stations and associated piping. If the cities consider regionalizing the water system (either through interlocal agreements or formation of a new special purpose governmental entity), the existing interconnection infrastructure should be evaluated to better assess whether it can be used along with other necessary improvements.

The following is a summary of each city's water system and a preliminary list of necessary infrastructure improvements.

Lynch

The Lynch water treatment plant (WTP) was constructed in 1925 and has a capacity (with all filters online) of 950,000 gallons per day.[9] Since 1925, two major improvements have been made:

- A redundant sedimentation basin and two filters were installed in the 1950s.
- New backwash pumps were installed around 2011 to replace the tank used for backwashing.

EPA conducted an inspection of the Lynch WTP on October 26, 2022. The following is a partial list of the observations noted during the inspection:

- Standing water exists across the pipe gallery.
- High service pumps and backwash pumps are leaking excessively.
- Several chemical containers are housed in the pipe gallery without secondary containment.
- The clearwell has a crack adjacent to the creek, which allows water to enter. The system attempted to seal the crack; however, infiltration from the creek impeded complete sealing. Lynch remains on a boil water advisory (issued in 2021) due to the leaking clearwell.
- Filter 2 is out of service.
- The valve of Filter 4, which feeds water from the settling basin, cannot be closed completely. During the backwash process, the valve remains partially open, possibly allowing backwash water to enter the treatment process.
- The sludge valves of the sedimentation basin are out of service. The sludge has not been removed from the sedimentation basin since 2004. If the sludge is not removed, it will reach the filtration process. The sludge includes organic matter that will decompose in the basin if not removed, affecting the quality of the water.

9 Kenvirons, Inc. (February 2010). *Tri-Cities Water and Sewer Utilities Interconnection Feasibility Study Cumberland, Benham, and Lynch, Harlan County Kentucky*. Prepared for Cumberland Valley Area Development District, London, Kentucky.

- The continuous turbidity monitoring equipment is out of service. To measure turbidity, the operator is taking grab samples every 2 hours.
- The system does not have emergency generators.

The pilot program team visited the WTP on April 25, 2023, and identified the following additional items:

- The WTP lacks continuous, online chlorine monitoring. A surface water system the size of Lynch is allowed to take grab samples; based on Lynch's population, the system is required to take at least two grab samples per day. Based on the daily log sheet available from the date of the site visit, the operator is taking at least two chlorine residuals per day. The WTP is not equipped with any turbidity or chlorine residual alarms to alert the operator of a problem. The chlorine residual could fall below the required minimum of 0.2 milligrams per liter at entry to distribution without the operator knowing for more than 4 hours.
- The drinking water system has numerous leaks that result in the loss of over 60 percent of water sent to the distribution system from the WTP. Lynch has leak detection equipment but insufficient staff to conduct leak detection. Leaks are thought to exist on service lines or abandoned sections of the water distribution system that are not properly capped. Parts are needed to fix leaking service lines.
- The water meters are old and need to be replaced. Lynch is incrementally replacing meters and needs approximately 320 new meters. Lynch prefers the new meters to be radio-read and integrated with billing software.

The Lynch WTP is almost 100 years old, and the structural integrity of the plant should be assessed prior to performing upgrades. The WTP most likely needs to be replaced, rather than rehabilitated or upgraded, to reliably produce safe drinking water. In addition, distribution and service line replacements are needed to address leaks within the system. A detailed cost analysis was not performed for the water system; however, based on the site visit, major infrastructure updates will be needed.

Benham

The Benham WTP was constructed in 1976 and has a rated capacity of 300,000 gallons per day. The source consists of surface water captured from the Looney Mine discharge, located about 1.5 miles east of the WTP. The mine water flow drastically decreases in the summer months, during which time Benham draws water from Looney Creek through a fire hose by placing a temporary pump in the creek. The Looney Creek source is subject to higher turbidities (greater than 50 Nephelometric Turbidity Units, or NTUs) than the mine source water (typically less than 5 NTU). The operator decreases the flow rate through the plant when higher turbidity occurs. The raw water is pumped from the intake to the WTP.

The KY EEC conducted their most recent sanitary survey of the Benham water system on January 12, 2018. This survey found that no significant deficiencies hindered the system from maintaining compliance with the Safe Drinking Water Act (SDWA). The KY EEC cited one non-significant recommendation: "Benham should maintain a line break log per 401 KAR 8:150, Section 4 (2)(h). Ensure all required information is recorded."

Benham has one certified water operator who oversees both the WTP and distribution system. Benham's water system has an excessive number of leaks (over 66 percent of produced water is lost to leaks) and generates over three times as much water as needed to meet system demands. The operator has fixed over 40 leaks, but water loss continues to be high. The operator believes the leaks are mostly on service lines. Benham has concerns about the long-term reliability of the existing raw water source from the old, abandoned mine shaft.

The following is a preliminary list of capital improvements identified for Benham's water system:

- Add a redundant high-service pump.
- Convert the dry-feed system for alum to a liquid chemical feed system for better control of the chemical feed.
- Install permanent raw water pumps for pumping from Looney Creek.
- Obtain a permit for creek withdrawal.
- Implement telemetry to allow remote control of the raw water pumps.
- Conduct leak testing, identify water mains and service lines for replacement, and develop a schedule for replacing water mains and service lines.

- Install a new 300,000-gallon finished water storage tank for redundancy. The existing 300,000-gallon storage tank was inspected in March 2016, and needs significant repairs and rehabilitation.

A detailed cost analysis was not performed for the water system, but major infrastructure updates will be needed based on findings from the site visit.

Cumberland

The Cumberland water system currently has 1,050 active connections, which include connections within the city and in the area between Cumberland and Totz. The Cumberland WTP was constructed in 1936 with upgrades in 1958, 1984, and 1992.[10] This WTP is rated 1 mgd. The Cumberland WTP could benefit from upgrades, including online chlorine analyzers and turbidimeters, along with improved controls and alarms. The Cumberland distribution system has an excessive number of leaks. Per March 2023 data, approximately 17 million gallons were treated at the WTP (excluding backwash water), but approximately 1.6 million gallons were sold based on customer meter readings. The Cumberland mayor believes that several large meters are not working correctly; however, there are significant leaks within the distribution system.

A detailed cost analysis was not performed for the water system. However, based on the site visit, major infrastructure updates will be necessary to address leaks within the distribution system, add new meters, and perform upgrades at the WTP.

10 Kenvirons, Inc. (February 2010). *Tri-Cities Water and Sewer Utilities Interconnection Feasibility Study Cumberland, Benham, and Lynch, Harlan County Kentucky*. Prepared for Cumberland Valley Area Development District, London, Kentucky.

Appendix B. Wastewater Infrastructure Options: Totz Area, Harlan County

Another potential component of the Harlan County project is assessing wastewater infrastructure needs for the Totz area, including the unincorporated area between Cumberland and Totz. Totz is an unincorporated community of approximately 57 homes, located approximately 7 miles southwest of Cumberland. Cumberland currently provides water service to the unincorporated area between Cumberland and Totz, including the community of Totz. Each home in this area is assumed to have a septic system as its wastewater treatment system. There is no immediate need to provide centralized sewer services to this area, based on a visual inspection of the area between Cumberland and Totz in April 2023 that showed no clear signs of septic system failure as well as discussions with the Harlan County Environmental Management staff. A recent issue with permitting an onsite system on a small lot required the lot owner to apply for a state discharge permit (not yet issued). The Totz area and the unincorporated area between Cumberland and Totz could require improved sewer services in the future, given the concentrated pockets of dense development in this area and lack of adequate locations to install onsite systems.

The option of providing improved sewer service for the Totz community (57 homes) is evaluated here for future planning purposes. Assuming 2.5 persons per residence and an average daily flow of 100 gallons per day per person, the design average daily flow is calculated at 14,250 gallons per day. Three options are considered to serve the Totz community, and one option is considered for providing centralized sewer to the entire area between Totz and Cumberland.

Totz Community Option 1. Replace failed or inadequate individual onsite wastewater treatment and dispersal systems for approximately 14 of the 57 homes in Totz (assumes approximately one-fourth of the homes need a new onsite system). This option is challenging due to the small lot size, proximity to steep areas, inadequate soil, and the location of lots near the river within the floodplain. These challenges may require advanced and innovative treatment systems. The cost of advanced treatment systems varies from approximately $20,000 to $35,000. Any treatment and dispersal system will require site evaluation, soil analysis, and a site-specific design conducted and prepared by an individual qualified in the State of Kentucky. The cost estimate for this alternative is approximately $448,000, including site evaluation, design, and construction.

Totz Community Option 2. Install a centralized sewer collection system for all 57 homes in Totz and a new package WWTP with discharge to the Poor Fork of the Cumberland River under a National Pollutant Discharge Elimination System (NPDES) permit. The cost estimate for this project is approximately $5 million, but more information is needed to further refine costs.

Totz Community Option 3. Install septic tank effluent pump (STEP) systems on each lot for the western portion of Totz and gravity sewer for the eastern portion of Totz to serve all 57 homes, with all effluent discharging to a new package WWTP and treated effluent discharging to the Poor Fork of the Cumberland River under an NPDES permit. The cost estimate for this project is approximately $5 million, but more information is needed to further refine costs.

Totz Area Option 4. Install a central collection system to serve all homes between Cumberland and Totz, including the community of Totz, and convey all wastewater to the new regional WWTP. A preliminary estimate to provide centralized sewer to this area is approximately $27 million. More details are needed to further explore this option. This option requires that the 1-mgd regional WWTP previously described (Joint Sewer Agency Option 2) be constructed with adequate capacity to serve these homes.

O&M costs are not developed for these options, because they are viewed as future considerations. If the joint sewer agency is formed, it could assume responsibility for overseeing wastewater improvements within the Totz area.

Appendix C. Wastewater and Drinking Water Infrastructure Options: Letcher County

A portion of Letcher County was studied for both wastewater and water needs. This area consists of homes near and along U.S. Route 119 from the Harlan/Letcher County line to the junction of Route 119 and Route 932, continuing on Route 932 to the Virginia border. This area was identified as an area of concern due to limited availability of quality groundwater for drinking water purposes, along with health concerns for Collier Creek residents. Approximately 440 homes exist within this area. Based on a visual inspection in April 2023 and discussions with the Letcher County Environmental Management staff, there is no immediate need to provide centralized sewer services or other wastewater alternatives for this area. Each home is assumed to have a septic system as its wastewater treatment system. However, this area could require future evaluation as development occurs or if existing onsite systems fail. The Letcher County Water and Sewer District has agreed to oversee drinking water facilities for this area once a water source is available. Two options exist to serve this area with safe and reliable drinking water.

Letcher County Area Option 1. Extend the Cumberland water line from its current termination point at the Harlan/Letcher County line. Additional improvements to the Cumberland water system are needed for this option, with an estimated cost of $2.5 million. The Letcher County Water and Sewer District would be responsible for the water main extension at the Harlan/Letcher County line, pump station, and storage tank needed to serve Phase 4 of the project area (approximately 158 homes along Route 119 and Route 3619). This option has an overall estimated cost of $4.4 million.

Letcher County Area Option 2. Extend the water line available at the Virginia state border down Route 932. Facilities were constructed years ago to serve the approximately 60 homes in Kentucky along Route 932, with water supplied by the Wise County Public Service Authority. Negotiations are ongoing between the Letcher County Water and Sewer District and the Wise County Public Service Authority on how best to serve the homes near the Virginia state border.

Members of the pilot program team are involved with these efforts, and solutions are already underway. Further cost and analysis will continue under a separate effort from this pilot project. If a joint sewer agency is formed, it could be expanded to oversee drinking water services for this part of Letcher County.

Limitations

Any systems and associated cost estimates discussed in this draft analysis are preliminary and not intended to serve in lieu of a Preliminary Engineering Report prepared by a professional engineer licensed in the relevant jurisdiction.

Alternatives have been developed at a high level with desktop tools and have not been informed with survey data or field reconnaissance work. Further field evaluation is needed to verify these alternatives in subsequent work following this assessment and solutions plan.

Treatment and dispersal systems designed by licensed design professionals are based on soil evaluations, flood elevation evaluations and variances, permitted discharge limit determinations, and unforeseen factors that cannot be determined without onsite field surveys and evaluations beyond the scope of this draft assessment.