RFI #17 / #18

DRAFT (Chapters 1-6)

Regional Facilities Plan

Grant County Sanitary Sewer District

February 2023

Prepared by:

HMB Professional Engineers, Inc

SECTION 1 – REGIONAL FACILTIY PLAN SUMMARY

1.01 INTRODUCTION AND BACKGROUND

Grant County Sanitary Sewer District provides wastewater service to 1,650 residential and commercial customers in and around Crittenden, Kentucky. The City of Crittenden completed a 201 Facilities Plan to evaluate wastewater conveyance and treatment needs for the 20-year planning period. This report was prepared and approved on April 7, 1999. Subsequently, the City of Crittenden relocated the wastewater treatment plant (WWTP) to the current location in 2003.

Grant County Sanitary Sewer District (GCSSD) acquired the ownership of the City of Crittenden WWTP and conveyance systems on June 22, 2004. GCSSD submitted an update to the 201 Facilities Plan to Kentucky Division of Water for approved titled Grant County Sanitary Sewer District – Phase 1 Regional Facility Plan, September 2009.

A State Planning and Environmental Assessment Report (SPEAR) was completed and approved by KDOW November 2, 2009, summarizing the Updated Regional Facility Plan. A copy of the SPEAR and KDOW approval is attached in Appendix A.

The Regional Facilities Plan (RFP) updates the past 201 Facilities Plan and supports the recommendation to expand the WWTP at the current plant site. The plan does not modify the current planning area.

1.02 EXISTING ENVIRONMENT

The existing environment has not experienced any significant changes since the construction of the WWTP in 2003 and conveyance lines in 2009. No large-scale developments have occurred, but the customer base does grow at a relative steady pace based on being location adjacent to Interstate I-75 and in close proximity to the Northern Kentucky area of Boone and Kenton counties. The customer base has remained residential and commercial customers.

1.03 PURPOSE OF THE PLAN

The GCSSD Regional Facilities Plan is a vital step for planning the expansion of the wastewater collection and treatment services in the Planning Area as shown in Figure 1-1.

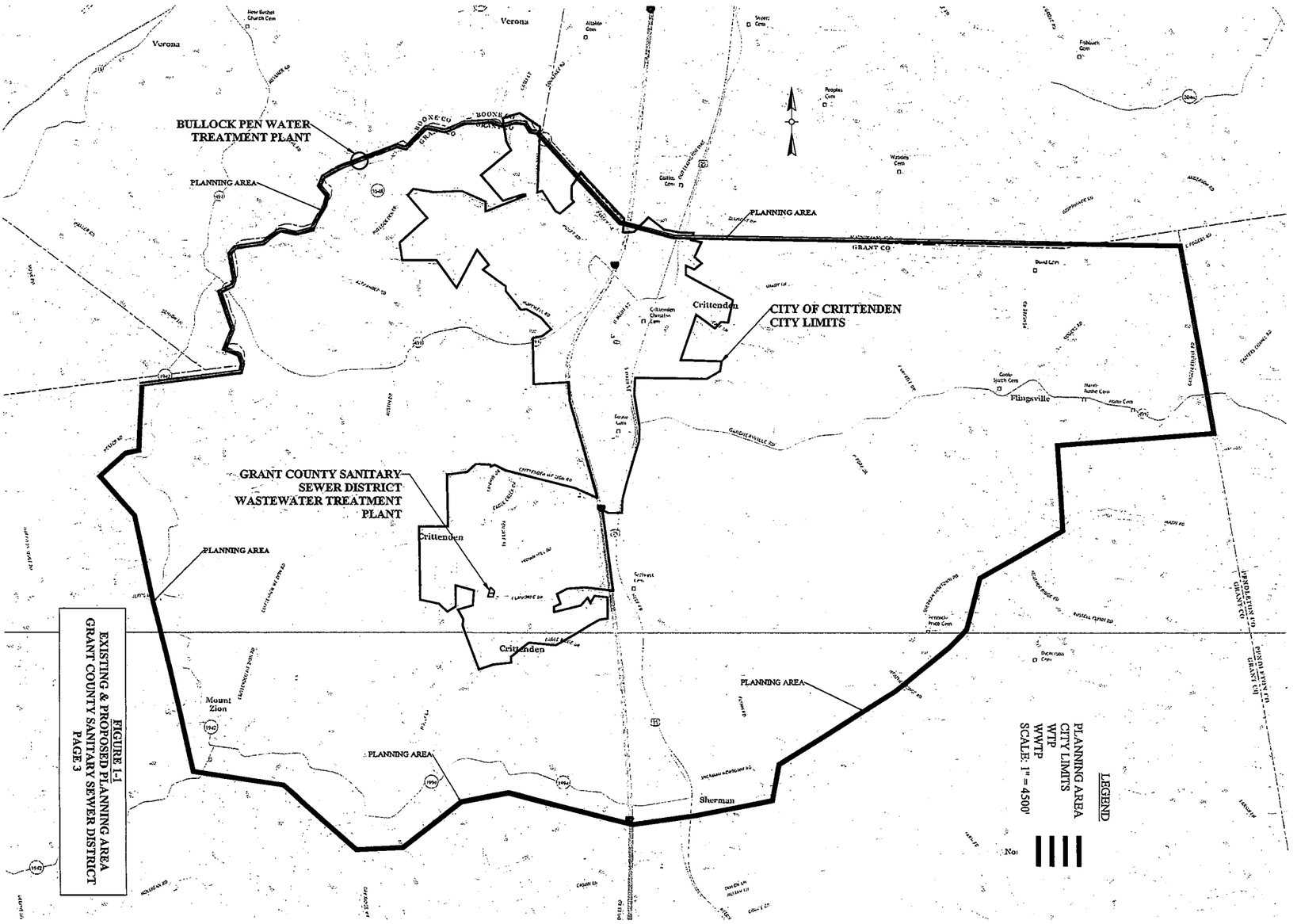


FIGURE 1-1
EXISTING & PROPOSED PLANNING AREA
GRANT COUNTY SANITARY SEWER DISTRICT
PAGE 3

The main purpose of the RFP is to assemble a long-range plan for providing effective and efficient sanitary sewer service to GCSSD customers in the planning area. Another purpose is to identify the improvements required and the recommended priority and timing to meet projected customers' needs in the next 20 years. GCSSD commissioned the study to evaluate the existing wastewater collection system and treatment facilities, establish sewer service needs, evaluate alternatives, and develop design and construction schedules and budgets for the recommended plan.

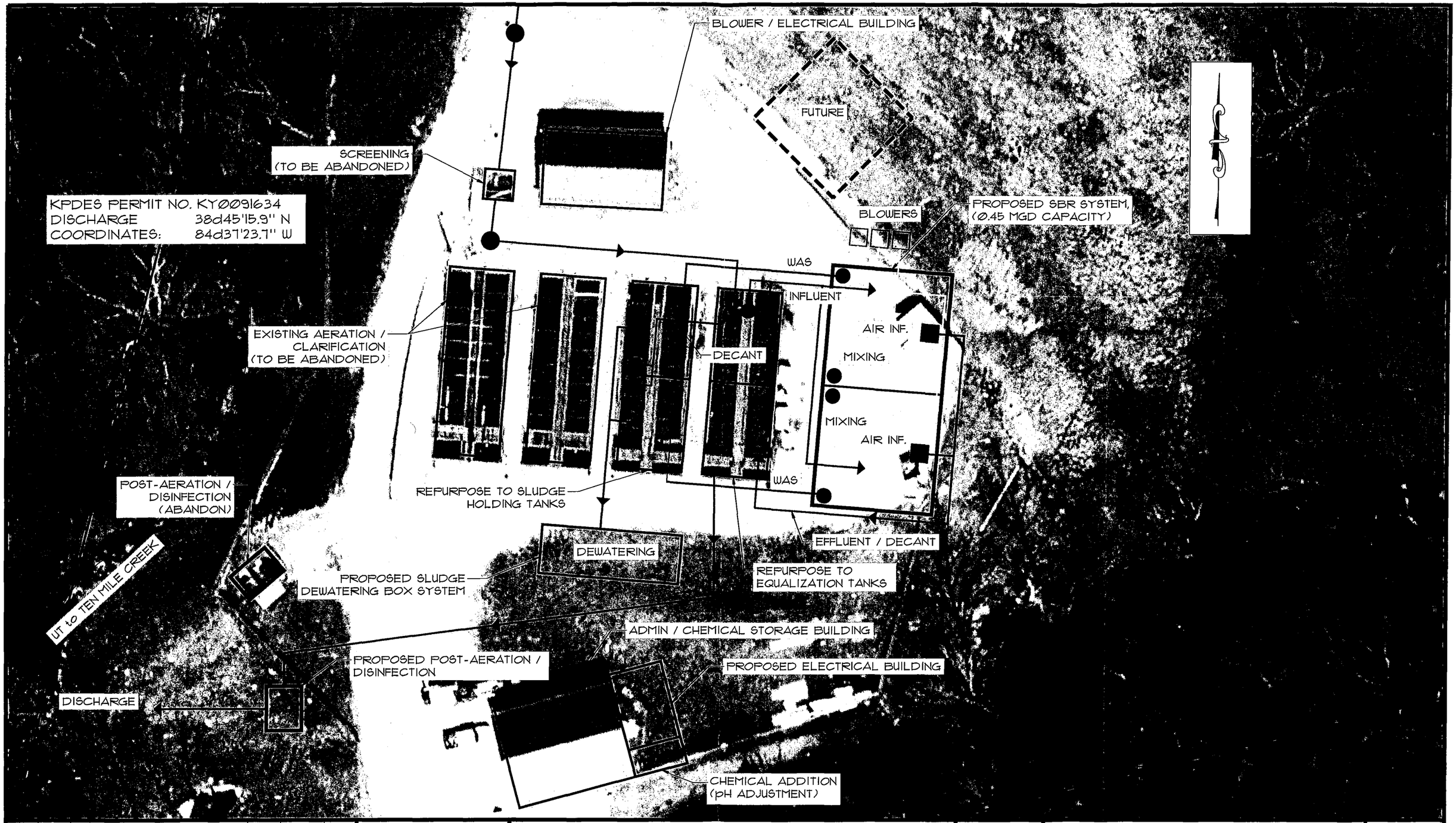
1.04 RECOMMENDED ALTERNATIVES

Recommended improvements to the GCSSD collection system include improvements to KY 491 Pump Station (Alternative No. 3) to upgrade capacity to 420 gallons per minute (GPM) as illustrated in Figure 1-2.

The recommended alternative for treatment facility improvements includes expansion of the GCSSD WWTP to an average daily treatment capacity of 0.45 million gallons per day (MGD) discharging to an unnamed tributary to Ten Mile Creek (Alternative No. 5). The recommended Alternative No. 5 biological treatment will include a two basin Sequencing Batch Reactor (SBR). An existing package treatment plant will be rehabilitated and repurposed to an influent and effluent equalization basin. This will allow averaged flows to discharge into and out of downstream treatment components. The recommended design peak flow is 1.5 MGD. WWTP improvements are illustrated in Figure 1-3.

The WWTP and collection system improvements will be completed within existing properties and easements during the 0-3 year period.

FIGURE 1-2
KY 491 PUMP STATION IMPROVEMENTS
SELECTED COLLECTION SYSTEM ALTERNATIVE
PAGE 5



NO.	DATE	REVISIONS	CHK'D	APPR'D	DATE
C	1/2023	REVISIONS	NAP	PBH	1/2023
B	8/3/22	INITIAL REVISIONS	NAP	PBH	8/3/22
A	03/22/22	INITIAL REVIEW	NAP	PBH	03/22/22

PROJECT: 4223.01 DATE: JAN. 2023
SCALE: 1" = 30'

	NAME	DATE
DESIGNED BY	PBH	1/2023
DRAWN BY	NAP	1/2023
CHECKED BY	PBH	1/2023
RECORD DWGS.		

HMB PROFESSIONAL ENGINEERS, INC
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FIGURE 1-3
GRANT COUNTY WWTP
FACILITIES EXPANSION
CRITTENDEN, KENTUCKY

SELECTED WWTP ALTERNATIVE

1.05 COST OF PROPOSED PLAN

The opinion of probable construction cost for the KY 491 Pump Station Upgrade (0-3 years) is $424,000. With construction contingencies and development services added, the total opinion of probable project cost is $606,400. The opinion of probable construction cost for the GCSSD WWTP Upgrade and Expansion (0-3 years) is $4,911,000. With construction contingencies and development services added, the total opinion of probable project cost is $6,139,000. Therefore, the total opinion of probable project cost is $6,745,400.

GCSSD will need to obtain a total of $6,745,400 in funding for the proposed 0-3 year projects. GCSSD could request to borrow the money from state funds obtaining a loan through Kentucky Infrastructure Authority (KIA), the Clean Water State Revolving Fund (SRF) program, or the United States Department of Agriculture (USDA) Rural Development program.

If funding for the proposed 0-3 year projects were all loan through the SRF program based on 20-years at 2.75% loan, then debt service would be $442,970 per year. Based on increases in operation, maintenance, and replacement and retirement of some old debts the sewer user charges would be increased approximately 31.4%. This would increase the monthly sewer bill for a 4,000 gallon per month customers from $46.43 in FY 2023 to $61.11 in FY 2025.

To ease the impact on customers, GCSSD could implement the required rate increase over a two or three year period.

1.06 PLANNING AGENCY COMMITMENTS TO IMPLEMENT THE PLAN

GCSS has the authority to prepare and implement the recommended projects since it addresses the needs within the GCSSD Planning Area. All recommended projects will be reviewed and approved by KDOW before construction permits could be issued. A revised/updated Pollutant Discharge Elimination System (KPDES) permit would need to be issued and approved.

A resolution has been obtained from the Grant County Fiscal Court accepting the Regional Facilities Plan. No other panning agencies would require further investigation, permits, or approvals to complete the 0-3 year projects.

1.07 SCHEDULE OF IMPLEMENTATION FOR RECOMMENDED PROJECTS

The recommended plan identifies the capital project required to operate, maintain, and expand the GCSSD wastewater system and comply with KDOW requirements. GCSSD will begin implementation of the 0-3 year projects as soon as the RFP is approved by KDOW. The projects identified in the 4-20 year phases should proceed as the need arises. Table 1-1 identifies a schedule for implementing the recommended projects in the 0-3 year period.

Table 1-1
Implementation Schedule for Recommended Projects in the 0-3 Year Period

Project	Task	2023				2024				2025			
		1st Qt	2nd Qt	3rd Qt	4th Qt	1st Qt	2nd Qt	3rd Qt	4th Qt	1st Qt	2nd Qt	3rd Qt	4th Qt
GCSSD WWTP Upgrade & Expansion	**Design**			■	■	■							
	KDOW Approval						■						
	Bidding & Award							■					
	Construction								■	■	■	■	■
	Project Closeout												■
Collection System Improvements (KY 491 Pump Station)	**Design**			■	■								
	KDOW Approval						■						
	Bidding & Award							■					
	Construction								■	■	■		
	Project Closeout										■		

Implementation Schedule for Recommended Projects in the 0-3 Year Period

Table 1-2 identifies a potential schedule for implementing the recommended projects in the 4-20 year period.

Table 1-2
Potential Implementation Schedule for Recommended Projects in the 4-20 Year Period

Project	Task	Potential Schedule
Collection System Improvements (KY 491 Pump Station Parallel 8-inch Force Main)	Design	1/1/2032
	KDOW Approval	1/1/2033
	Bidding & Award	8/1/2033
	Construction	11/1/2033
	Project Closeout	8/1/2034

Potential Implementation Schedule for Recommended Projects in the 4-20 Year Period

Figure 1-4 illustrates development in the planning area during the 20-year planning period.

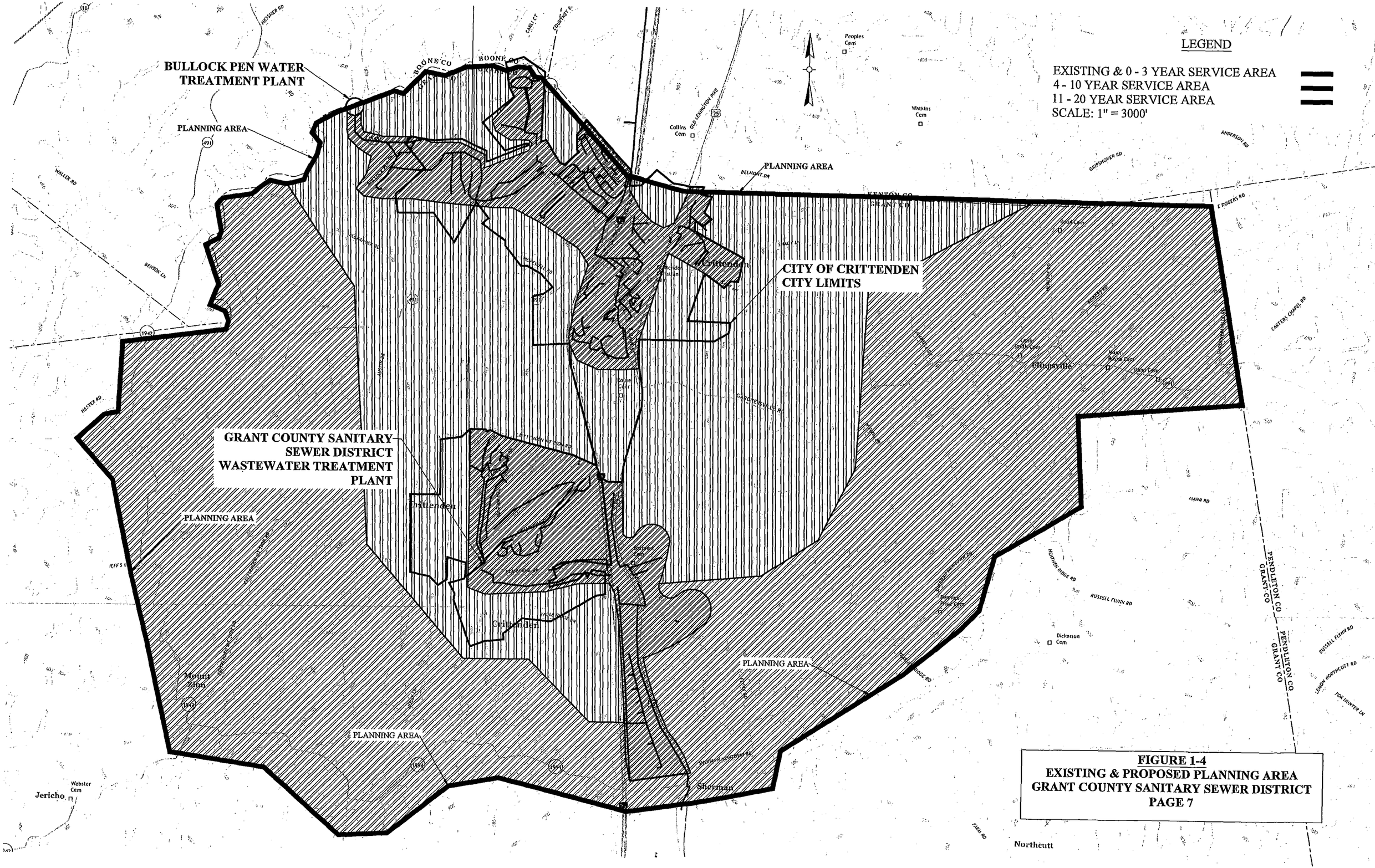

FIGURE 1-4
EXISTING & PROPOSED PLANNING AREA
GRANT COUNTY SANITARY SEWER DISTRICT
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SECTION 2 – STATEMENT OF PURPOSE AND NEED

2.01 INTRODUCTION

HMB Professional Engineers, Inc. (HMB) have been authorized by GCSSD to evaluate current and future wastewater needs within the Grant County Sanitary Sewer District Planning Area.

A Regional Facilities Plan (RFP) is a comprehensive plan for the management of wastewater collection and treatment facilities. The intent of a RFP is to define the most appropriate local solution to providing wastewater collection and treatment for a defined planning area over a defined period of time. Typically, the period is 20 years: however, other periods of time can be used.

A RFP is required for several reasons; including:

1. A specific request of KDOW,
2. By regulation (401 KAR 5:006, Section 2),
3. As part of an enforcement action (i.e., Agreed Order)
4. Addressing potential water quality issues and public health concerns

KDOW request could be triggered by a WWTP being over 90 percent of its design capacity or because of a KDOW sponsored watershed initiative. Regulation 401 KAR 5:006, Section 2 requires a RFP or update to a RFP for any of the following reasons:

1. A new regional wastewater treatment facility is proposed,
2. The equivalent population served by an existing WWTP increases by 30 percent or more,
3. The average daily flow design capacity at an existing WWTP increases by over 30 percent.
4. A regional facility applies for a grant from USEPA or a loan from the State Revolving Fund (SRF) program,
5. A regional planning agency considers a RFP to be in its best interest,
6. An existing RFP (formerly called 201 Plan) has not been updated in the last 10 years.

Based on collected data, the GCSSD WWTP continually accepts flows at 70% of permitted discharges with peak flows exceeding treatment capability to effectively provide adequate treatment. This is based on all flows being pumped to the treatment plant. Also, the treatment system does not have adequate sludge handling and dewatering capabilities. As GCSSD continues to grow, organic loadings, treatment requirements, solids handling, and peak flows will continue to increase.

2.02 PURPOSE AND SCOPE OF REPORT

The purpose to the RFP is to ultimately protect the environment and the health of the residents of GCSSD by providing reliable, cost-effective wastewater collection and treatment for its customers. The RFP is intended to be a road map the development and evaluation of cost-effective wastewater treatment alternatives for GCSSD. Objectives of this plan include:

1. Assessing the condition of the existing collection and treatment systems in GCSSD, i.e., inadequate treatment capacity, infiltration and inflow, sanitary sewer overflows, problems caused by straight line pipes, and failing on-site systems,
2. Providing growth/expansion projections that may be expected in GCSSD,
3. Assessing the feasibility of providing wastewater collection systems to areas of need in the planning area,
4. Providing solutions to remediate operational or component capacity problems of existing package treatment facilities,
5. Identifying alternatives for treating the anticipated wastewater flows,
6. Evaluating and recommending the most favorable alternatives,
7. Providing guidance for implementation of the recommended alternatives with regard to scheduling and financial considerations.

GCSSD WWTP has reliably met its KPDES permit requirement since 2004. There have been occasions when the plant has discharged concentrations exceeding the permit limits.

Though the plant has historically operated well, continued growth, loadings, and peak flows will create the need for increased capacity at the WWTP. If the capacity of the plant is not expanded, the quality of the receiving stream may degrade adversely impacting the environment.

2.03 KDOW CONSIDERATIONS

Since the FRP ultimately needs to be reviewed and approved by KDOW, the report will follow KDOW guidelines. KDOW requires a checklist (guidance document) be followed in the development of the RFP. Review and approval consider environmental and State Clearinghouse reviews in addition to a technical review.

SECTION 3 – PHYSICAL CHARACTERISTICS OF THE PLANNNING AREA

3.02 PLANNING AREA

Figure 3-1 is a map of the existing and proposed GCSSD Planning Area boundary which have the same boundaries, i.e., unchanged. Also, shown on this figure is the location of the GCSSD WWTP and other package WWTP's in and near the planning area. The Bullock Pen Water Treatment Plant location is also shown.

3.03 DEFINE THE PLANNING AREA

The most recent RFP was approved in 1999, however, the RFP was updated and approved in 2009. The planning area in the 1999 RFP remains unchanged throughout all reports including this RFP. The Planning Area includes all of the City of Crittenden, and a good portion of Norther Grant County. The planning area is bisected north and south by Interstate 75 and is bound on the north by the Grant County line. The planning area extend south along US 25 to the community of Sherman. Ten Mile Creek is the largest drainage basin in the planning area. A Quad map of the planning area is included in Appendix B.

BULLOCK PEN WATER TREATMENT PLANT

PLANNING AREA

BOONE CO
GRANT CO

PLANNING AREA

KENTON CO
GRANT CO

CITY OF CRITTENDEN CITY LIMITS

GRANT COUNTY SANITARY SEWER DISTRICT WASTEWATER TREATMENT PLANT

PLANNING AREA

PLANNING AREA

PLANNING AREA

PENDLETON CO
GRANT CO

PENDLETON CO
GRANT CO

LEGEND

PLANNING AREA
CITY LIMITS
WTP
WWTP
SCALE: 1" = 3000'

FIGURE 3-1
EXISTING & PROPOSED PLANNING AREA
GRANT COUNTY SANITARY SEWER DISTRICT
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SECTION 4 – SOCIOECONOMIC CHARACTERISTICS OF THE PLANNING AREA

4.01 HISTORICAL POPULATION

Using census data from the United States Census Bureau, past population histories for Grant County and the City of Crittenden are summarized in Table 4-1. Since 1980, a significant increase in population was noted in the county's growth and from 1990, a significant increase in population for the City of Crittenden was observed.

Table 4-1
Historical Population

Year	City of Crittenden[1]	Percent Change	Population Change	Grant County[1]	Percent Change	Population Change
1980	--	--	--	13,308	--	--
1990	778	--	--	15,737	18.3	2,429
2000	2,568	330.1	1,790	22,384	42.2	6,647
2010	3,815	48.6	1,247	24,662	10.2	2,278
2020	4,021	5.4	206	24,941	1.1	279

Note:[1]Population information for the City of Crittenden and Grant County were obtained from the U.S Census Bureau.

4.02 FUTURE POPULATION

Although, there have been significant population increases in the planning area over the last 30-years, the Kentucky Data Center has projected that Grant County will have a declining population over the next 30-years as shown in Table 4-2. However, for the next 30-years for the planning area, the RFP projects that the planning area population will increase at a rate of 1 percent per year. This is based on the planning area being located along Interstate 75 and being adjacent to Boone and Kenton Counties.

Table 4-2
Future Population

Year	City of Crittenden & Surrounding Planning Area[2]	Percent Change	Population Change	Grant County[1]	Percent Change	Population Change
2020	4,021	--	--	24,941	--	--
2025	4,226	5.0	205	25,106	0.7	165
2030	4,442	5.0	216	25,047	-0.2	-59
2035	4,669	5.0	227	24,951	-0.4	-96
2040	4,907	5.0	238	24,750	-0.8	-201
2045	5,157	5.0	250	24,466	-1.1	-284
2050	5,420	5.0	263	24,186	-1.1	-280

Notes: [1]The Grant County population is based on population projections from the Kentucky Data Center.
[2]City of Crittenden and Surrounding Planning Area for this study are assumed to have a 1.0 percent growth rate per year. This is based on the Planning Area being located along Interstate 75 and adjacent to Boone & Kenton counties which have projected population increase of about 1.4 percent per year.

4.03 INDUSTRIAL AND COMMERCIAL USER

Currently there are about five (5) large users consisting of one (1) industry, three (3) apartment complexes, and one (1) public school. These customers are listed in Table 4-3 indicating average monthly water usage.

Table 4-3
Larger Industrial & Commercial Users

Industrial/Commercial User	Month Water Lines (Gallons)
Triumph Energy Corporation	498,000
Winterwood Properties-Crittenden Place Apts.	481,000
Marble Properties Apts.	380,000
Lightleaf Apts.	276,000
Crittenden Mt. Zion Elementary School	378,000

These larger users account for about 79,000 gallons per day of water usage or about 36 percent of the total discharged from the existing WWTP, based on 218,000 gallons per day.

It might be expected that future growth in the planning area could include the following based the planning area's location along Interstate 75. These include the following:

1. Motels
2. Apartments
3. Restaurants
4. Truck Stop

4.04 MEDIAN HOUSEHOLD INCOME

The median household income for Grant County is $56,746 based on 2020 U.S. Census income data.

SECTION 5 - EXISTING ENVIRONMENT IN THE PLANNING AREA

5.01 INTRODUCTION

GCSSD lies in the Outer Bluegrass physiographic region, as shown in the Kentucky Atlas and Gazetteer. This Outer Bluegrass physiographic region is underlain by limestone and bordered by the Ohio River in the north and is restricted to the central part of the State where Ordovician (and some Silurian, and Devonian) age rocks are exposed at the surface. The Outer Bluegrass is characterized by deeper valleys, with little flat land, because the bedrock in this area is mostly composed of interbedded Ordovician limestones and shales that are more easily eroded than the limestone of the Inner Bluegrass. Septic systems and direct pipes in karst topography can have a major impact on ground water quality.

5.02 GEOLOGY

Based on the United States Geological Survey, the geology around the GCSSD Planning Area consists primarily of Laurel Dolomite and Saluda Dolomite from the Drakes Formation. The bedrock in and around GCSSD can be considered susceptible to karst formations based on underlayment by inter-bedded limestone, calcareous shale, and siltstone-sedimentary rocks of the Ordovician Geologic age. Septic systems and direct pipes in karst topography can have a major impact on ground water quality.

5.03 TOPOGRAPHY

Topography can play an important role in collecting and transporting wastewater. The area has a topography that ranges from nearly level to steep with elevation ranging from 960 feet along the highest ridge tops to 640 feet along the major streams. A chain of ridges running north and south along US 25 forms a natural boundary between the Eagle Creek water shed and the Licking River watershed. The Eagle Creek watershed drains all of the Crittenden area west of US 25, with the eastern portion of the Crittenden area draining to the Licking River.

5.04 SOILS

The US Soils Conservation Service indicates that the GCSSD Planning Area is made up of two major Soils Associations as follows:

1. Eden Association – The lower slopes and valleys of the planning are made up of the Eden Soils. The Eden soils are moderately deep, well drained and slowly permeable. These soils have a loamy or clayey surface and a clayey subsoil.
2. Lowell – Nicholson Associations – The upper portions of the broad gently sloping to sloping ridge tops of the planning area consist of mainly the Nicholson Soils. The Nicholson Soils are deep, moderately well drained and have a slowly permeable fragipan with a surface layer of silt loam. The lower ridge tops and the slopes of the planning consist of the Lowell Soils. The Lowell Soils are deep and well drained with moderately slow permeability. These soils have a subsoil of list loam and a clayey subsoil.

Most of the development in the planning area has occurred in the Lowell – Nicholson Associations.

5.05 SURFACE WATERS

The planning area is located primarily within the Kentucky River Basin Unit, Eagle Creek, Ten Mile Creek Watershed. None of the surface waters segments in the area have been assessed. In 2005, the Kentucky Division of Water awarded funds to the Northern Kentucky Independent District Health Department to develop a Watershed plan for the Ten Mile Creek Watershed and to initiate straight pipe abatement. See the Ten Mile Creek Watershed Based Plan in Appendix C. Within the vicinity of the planning area is Bullock Pen Lake, which was assessed as partially supporting warm water aquatic habitat.

The planning area is not within a designated SWAPP zone, however just north of the City of Crittenden is a designated as a SWAPP Zone 1. The area is not with a designated KDOW priority watershed or a Wellhead Protection Area. The planning area is rated as having moderate ground water sensitivity.

Drinking water service in the planning area is provided by Bullock Pen Water District.

5.06 GROUNDWATER

There are limited groundwater supplies available for domestic and other uses due to the soils and topography of the planning area. Most drilled wells do not produce enough water for a dependable domestic supply of about 100 gallons per day and almost all residents in the planning area depend on the Bullock Pen Water District for water service.

5.07 100-YEAR FLOODPLAIN

Areas prone to flooding should be identified in the RFP. The established flood zones are shown in Appendix D. These zones are based on Federal Emergency Management Data (FEMA). The flood zone maps show the majority of the planning area lies outside any flood prone areas. The existing GCSSD WWTP does not lie inside any established flood zones, however, a portion of the WWTP site has flooded previously during an intense rain event when a culvert running through the site partially clogged. Since then, improvements were made to minimize the changes of this occurring again. Construction in the flood prone areas should be avoided or at least minimized. However, for wastewater collection systems it is essentially unavoidable. Intercepting sewers and pump stations are often constructed within 100-year floodplain. KDOW allows this but requires pump stations to be accessible in the 25-year flood. Electrical gear and controls are to be protected to the 100-year flood elevation.

5.08 LAND USE

The City of Crittenden is responsible for land use planning with the GCSSD Planning Area. Figure 5-1 shows the existing planning and zoning within the planning area.

5.09 ENDANGERED SPECIES

BOONE COUNTY
GRANT COUNTY
Bullock Pen Lake
2363
ARCHIE COLDIRON
EADS ROAD
NORTHERN KENTUCKY TREATMENT CENTER
FRANCES BINGHAM
R-1
ARCHIE COLDIRON
VIOLET ROAD
1545
R-1
R-3
75
HAROLD EADS
WEBB
BRYANT
R-1
HC
25
KENTON COUNTY
GRANT COUNTY
I-1
CHARLES TUNGATE
JOHN E. O'BRIEN
HC
RICHARD SLUKICH
A.L. MARTIN
HC
491
R-3
R-2
R-4
DOROTHY WAGNER GOUGE
JIMMY WAGNER
DOROTHY STONE
SHADY LANE
DONALD MARCH
MARK CAIN
J.B. CURD
HOPEWELL ROAD
ROBERT DEDIER
ROBERT McPHERSON
R.E. CURRY
ARNOLD EASTON
ROYAL JACKSON
HC
RMHP
CBD
R-3
R-2
VANLANDINGHAM
MORGAN
CBD
R-3
CBD
R-1
A-1
A-1
491
CASE LANE
A. HARP
L. PETTIT
PAUL LANTER
R-3
BROWN
A-1
W.A.P. TRUCK DIVISION, INC.
STEVE FRITZ
R-1
A.L. MARTIN
NC
BINGHAM
CALDWELL
H. DUNCAN
DUNCAN DRIVE
C. GIVINS
A-1
GARDENERSVILLE ROAD
2942
CRITTENDEN MT. ZION ROAD
R-3
EAGLE CREEK COUNTRY CLUB
KING ROAD
WILDLIFE ROAD
A-1
INDIAN HILL DRIVE
DOVE LANE
RMHP
R-3
25
KEN RICK DRIVE
75
RUARK ROAD

N
W
E
S
0' 500' 1,000' 1,500'

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COMMONWEALTH OF KENTUCKY

- Corporate Limits
- A-1 Agricultural-One
- R-1 Residential One
- R-2 Residential Two
- R-3 Residential Three
- R-4 Residential Four
- RMHP Residential Mobile Home Park
- HC Highway Commercial
- CBD Central Business District
- NC Neighborhood Commercial
- I-1 Industrial One
- I-2 Industrial Two
- Unincorporated Area

City of Crittenden
Official Zoning Map

HICKS & MANN, INC.
Consulting Engineers
Land Surveyors
Planners
P.O. Box 9
Williamstown, Ky. 41097
(606) 824-5231

FIGURE 5-1
EXISTING PLANNING AND ZONING
GRANT COUNTY SANITARY SEWER DISTRICT
PAGE X

FIG-5-1.DWG
Logan D. Mann
March 25, 1998

SECTION 6 – EXISTING WASTEWATER SYSTEM

6.01 BACKGROUND

This section will examine existing wastewater facilities in the planning area and describe the method and efficiency of the collection and treatment systems.

6.02 ON-SITE DISPOSAL

On-site septic systems in the planning area often fail because of unfavorable soil and geologic conditions discussed in Section 5.02. There are septic systems throughout the planning area, however, no records are available on the number of these systems that have failed or are failing. There are no know straight pipe discharges in the planning area.

6.03 EXISTING COLLECTION AND CONVEYANCE SYSTEMS

The existing wastewater collection system served by the Grant County WWTP consists of mostly gravity sewer lines ranging in size from 6-inch to 12-inch. Most sewers are 6-inch and 8-inch diameters with very limited amounts of 10-inch and 12-inch. Most pipe material is PVC with small amounts of ductile iron. Table 6-1 summarizes this information.

Table 6-1
Existing Collection System

Size (in.)	Pipe Material	Year Installed	Feet
6	PVC	1989	22,096
8	PVC	1989	53,508
10	PVC	2004	2,270
12	PVC	2004	4,594
4	CI	1989	475
8	DI	1980	4,500
8	PVC	2004	8,543
6	PVC	2004	8,100
6	PVC	1995	23,755
MH	4' ⌀	1989	328
MH	4' ⌀	1995	164
MH	4' ⌀	2004	47

Several areas are served by low pressure sewers with approximately 74 individual grinder pump stations. The low pressure pipe ranges in size from 1-1/4-inch to 6-inch with pipe material consisting of HDPE. There are also 24 pumping stations and force mains in the collection system. Force mains range in size from 2-inch to 8-inch and all consist of PVC pipe material. Tables 6-2 and 6-3 summarize pump stations, along with standard force main information. The wastewater collection system is illustrated in Figure 6-1 which indicates the gravity sewer, force main, and pump station layout.

Table 6-2
Existing Pump Stations

Name	Number	Year Installed	Rated Capacity (Feet)	TDH[1] (Feet)	Pump Type
Eads	1	1989	235	107	C[2]
Barley	2	1995	55	94	S[3]
Waller	3		262	72	S
Wheat	4	1995	52	76	S
Bingham	5	2013	260		S
Bradford	6	1995	53	97	S
Miller	7	1998	56	72	S
Brideview	8		54	75	S
Kyley	9		28	57	S
Case	10	1989	158	108	C
491	11	2004	327	181	S
Russell	12	1989	135	107	C
Sayers	13	2003	132	95	S
Vincent	14	1997	21	55	S
Pinhook	15	1993	58	88	S
Greenview	16	1999	273	144	S
Indian Hill	17		80	170	S
Angela	18	2011	72	77	S
Claiborne	19	2004	297	33	S
Claiborne A	20	2011	30	75	S
Claiborne B	21	2011	39	60	S
KOA	22	2011	255	78	S
Kendrick	23	2011	57	153	S
Sherman	24	2011	200	81	S

Note: [1]TDH – Total Dynamic Head
[2]C – Centrifugal Pumps
[3]S – Submersible Pumps

LEGEND

- GRAVITY SEWER LINE
- FORCE MAIN
- PUMP STATION
- PLANNING AREA
- EXISTING PRIVATE PERMIT

SCALE: 1" = 2000'

PUMP STATION LIST	
NO.	NAME
1	EADS
2	BARLEY
3	WALLER
4	WHEAT
5	BINGHAM
6	BRADFORD
7	MILLER
8	BRIDGEVIEW
9	KYLEY
10	CASE
11	KY 491
12	RUSSELL #2
13	SAYERS
14	VINCENT
15	PINHOOK
16	GREENVIEW
17	INDIAN HILL
18	ANGELA
19	CLAIBORNE
20	CLAIBORNE A
21	CLAIBORNE B
22	KOA
23	KENDRICK
24	SHERMAN

PLANNING AREA

Crittenden

CINCINNATI SOUTH CAMPGROUND

Sherman

PLANNING AREA

Crittenden

GCSSD WWTP

BPWD WTP

PLANNING AREA

OLD LEXINGTON PIKE

BELMONT DR

SHADY LN

CORE LN

Collins Cem

Crittenden Christian Cem

S MAIN ST

Rouse Cem

Sechrest Cem

FLYNN RD

SHERMAN NEWTOWN

COURTNEY RD

CARL CT

BARLEY CIR

WALLER RD

HOPEWELL RD

CRITTENDEN MT ZION RD

TEN MILE RD

EAGLE RIDGE DR

CLAIBORNE DR

HOLLY LN

AUSTIN DR

BULLOCK PEN DR

ALEXANDER RD

TEAL RD

MESSMER RD

BOONE CO

GRANT CO

FIGURE X
WASTEWATER COLLECTION SYSTEM
GRANT COUNTY SANITARY SEWER DISTRICT
PAGE X

Table 6-3
Existing Force Mains

Size (in.)	Pipe Material	Year Installed	Footage (Feet)
1.25	HDPE	2004	10,580
1.5	HDPE	2004	581
2	HDPE	2004	7,392
3	HDPE	2004	8,864
6	HDPE	2004	423
2	PVC	1995	3,644
3	PVC	1995	13,728
4	PVC	2004	5,835
6	PVC	2004	19,951
8	PVC	2004	7,392
4	PVC	1995	4,725
6	PVC	1989	12,785

6.04 EXISTING INFLUENT AND EFFLUENT FLOWS

The influent and effluent flows for the years 2019 – 2021 are summarized in Tables 6-4 through 6-9.

Table 6-4
Influent Flows
FY 2019

Months	Flow (MGD)[1]	$CBOD_5$[2] (mg/l)[3]	TSS[4] (mg/l)	Total Nitrogen (mg/l)	TKN[5] (mg/l)
January	0.223	200.75	155.5	50	49.78
Febuary	0.236	122.67	156	71.1	47.43
March	0.2	232.5	145.25	49.05	48.85
April	0.223	194.8	144.8	48.08	48
May	0.215	241.25	129	49.65	49.55
June	0.235	190.9	164.75	29.489	28.55
July	0.204	205.6	169	47.2	47.16
August	0.212	170.55	200.25	46.85	46.95
September	0.222	298	418.5	31.9	31.9
October	0.227	276	311.8	52.9	52.9
November	0.214	301.75	320.25	52.78	52.75
December	0.2	228.67	120.33	33.53	33.27
Total	**2.611**	--	--	--	--
Average	**0.218**	**222**	**203**	**46.9**	**44.8**
Maximum	**1.01**	**302**	**419**	**71.1**	**53**
Maximum Three Consecutive Months	--	**292**	**350**	**56.7**	**49**

Notes: [1]MGD - Million gallons per day

[2]$CBOD_5$ - Carbonaceous Biological Oxygen Five Day Demand
[3]mg/l- Milligrams per liter
[4]TSS- Total suspended solids
[5]TKN- Total kjeldahl nitrogen

Table 6-5
Influent Flows
FY 2020

Months	Flow (MGD)[1]	$CBOD_5$[2] (mg/l)[3]	TSS[4] (mg/l)	Total Nitrogen (mg/l)	TKN[5] (mg/l)
January	0.208	287.6	192.2	38.32	44.22
Febuary	0.24	395.25	283.25	48.65	48.55
March	0.225	321	147.25	52.58	52.35
April	0.203	212.5	112.75	41.25	41.18
May	0.197	141.25	145.5	30.78	30.5
June	0.18	252	212.4	57.4	57.32
July	0.201	240	113.33	31.87	31.23
August	0.211	168.53	151.5	40.7	40.63
September	0.216	308.2	174.2	45.06	44.22
October	0.199	263	228.5	54.53	54.5
November	0.208	206.33	393.5	39.33	39.2
December	0.215	241.44	233.6	39.22	39.1
Total	**2.503**	--	--	--	--
Average	**0.209**	**253**	**199**	**43.3**	**43.6**
Maximum	**1.01**	**395**	**394**	**57.4**	**57**
Maximum Three Consecutive Months	--	**335**	**285**	**47.5**	**48**

Notes:[1]MGD- Million gallons per day

[2]$CBOD_5$ - Carbonaceous biological oxygen five day demand

[3]mg/l- Milligrams per liter

[4]TSS- Total suspended solids

[5]TKN- Total Kjeldahl Nitrogen

Table 6-6
Influent Flows
FY 2021

Months	Flow (MGD)[1]	$CBOD_5$[2] (mg/l)[3]	TSS[4] (mg/l)	Total Nitrogen (mg/l)	TKN[5] (mg/l)
January	0.223	176.05	489.25	42.23	42.08
February	0.23	214.75	267	53.78	53.5
March	--	180.2	104.2	46.84	46.72
April	0.206	271.5	188	40.8	40.33
May	0.213	288.25	270.5	61.38	38.93
June	0.18	211.8	237.6	39.88	39.44
July	0.196	223.2	128.86	36.18	35.3
August	0.183	323.5	131.6	42.92	42.74
September	0.2	254	71.5	29.95	29.63
October	0.19	251.75	138	49.03	49
November	0.208	330	135.2	41.5	41.38
December	0.213	160.18	161	41.83	41.7
Total	**2.242**	--	--	--	--
Average	**0.204**	**227**	**194**	**43.9**	**41.7**
Maximum	**1.01**	**330**	**489**	**61.4**	**53.5**
Maximum Three Consecutive Months	--	**279**	**287**	**49.7**	**47.4**

Notes:[1]MGD- Million gallons per day.

[2]$CBOD_5$ - Carbonaceous biological oxygen five day demand

[3]mg/l- Milligrams per liter

[4]TSS- Total suspended solids

[5]TKN- Total Kjeldahl Nitrogen

Table 6-7
Effluent Flows
FY 2019

Months	Flow (MGD)[1]	$CBOD_5$[2] (mg/l)[3]	TSS[4] (mg/l)	Ammonia Nitrogen (mg/l)	TKN[5] (mg/l)	E.Coli[6] (mg/l)
January	0.226	8.18	19.25	0.43	3.4	11.5
February	0.238	32.63	52.67	0	3.73	19.37
March	0.203	10.13	12	0.35	3.1	46.98
April	0.226	5.34	15.8	0	2.86	22.3
May	0.219	4.65	17	0.09	3.18	44.23
June	0.233	3.35	18.75	0.09	3.38	42.15
July	0.204	0.4	2.8	0	1.06	4.9
August	0.214	0	13.5	1.46	12.88	22.33
September	0.223	1.55	18	0.59	1.54	8.8
October	0.226	2.38	13.6	1.09	2.27	20.6
November	0.215	3.1	19	0.25	1.53	141.48
December	0.203	5.27	15.67	0	1.23	62.2
Total	**2.63**	--	--	--	--	--
Average	**0.219**	**7.6**	**18.2**	**0.4**	**3.35**	**37.2**
Maximum	**1.01**	**32.63**	**52.67**	**1.46**	**12.88**	**141.5**
Maximum Three Consecutive Months	--	**17.0**	**28.0**	**1.05**	**5.56**	**40.0**

Notes:[1]MGD- Million gallons per day.

[2]$CBOD_5$ - Carbonaceous biological oxygen five day demand

[3]mg/l- Milligrams per liter

[4]TSS- Total suspended solids

[5]TKN- Total Kjeldahl Nitrogen

[6]E.Coli- Escherichia Coli Bacteria

Table 6-8
Effluent Flows
FY 2020

Months	Flow (MGD)[1]	$CBOD_5$[2] (mg/l)[3]	TSS[4] (mg/l)	Ammonia Nitrogen (mg/l)	TKN[5] (mg/l)	E.Coli[6] (mg/l)
January	0.21	9.08	24.6	0.48	2.78	10.78
February	0.218	5.6	33.25	0.65	2.78	51.53
March	0.222	5.65	18.5	3.11	5.1	10.88
April	0.208	12.2	9	1.08	2.67	0.5
May	0.201	2.98	4.75	0.07	2.3	29.58
June	0.23	2.18	10.2	0.2	2.33	58.54
July	0.204	2.8	8	0.1	1.47	110.8
August	0.214	1.15	5	0.12	1.06	19
September	0.218	2	12	0.07	2.62	5.8
October	0.263	2.4	14.5	0.39	3.15	610.18
November	0.21	8.6	12.75	1.1	4.23	2.33
December	0.218	4.82	18.4	0.32	3.68	13.68
Total	**2.616**	--	--	--	--	--
Average	**0.218**	**5.0**	**14.2**	**0.64**	**2.85**	**77**
Maximum	**1.01**	**12.2**	**33.3**	**3.11**	**5.1**	**610**
Maximum Three Consecutive Months	--	**7.8**	**25.5**	**1.61**	**3.6**	**211.7**

Notes:[1]MGD- Million gallons per day.

[2]$CBOD_5$ - Carbonaceous biological oxygen five day demand

[3]mg/l- Milligrams per liter

[4]TSS- Total suspended solids

[5]TKN- Total Kjeldahl Nitrogen

[6]E.Coli- Escherichia Coli Bacteria

Table 6-9
Effluent Flows
FY 2021

Months	Flow (MGD)[1]	$CBOD_5$[2] (mg/l)[3]	TSS[4] (mg/l)	Ammonia Nitrogen (mg/l)	TKN[5] (mg/l)	E.Coli[6] (mg/l)
January	0.226	3.85	21.25	0.03	6.2	36.03
February	0.23	8.73	23.25	2.05	5.9	14.93
March	--	45.84	63.8	1.31	12.13	16.8
April	0.209	4.75	22	1.3	4.5	4.93
May	0.217	3.48	11.5	0.08	2.85	12.1
June	0.23	2.08	6.2	1.07	4.1	227.13
July	0.194	2.56	1.4	0.59	3.5	8.12
August	0.203	4.3	6	0.21	3.96	9.58
September	0.202	0	3.25	0.05	12.6	24.03
October	0.21	1.4	22.25	0.11	4	19.68
November	0.21	1.6	28.6	0	2.84	24.7
December	0.217	2.23	12.25	0	3.9	77.93
Total	**2.348**	--	--	--	--	--
Average	**0.214**	**6.7**	**18.5**	**0.57**	**5.5**	**39.7**
Maximum	**1.01**	**45.8**	**63.8**	**2.05**	**12.6**	**227.1**
Maximum Three Consecutive Months	--	**19.8**	**36.4**	**1.55**	**8.1**	**81.6**

Notes:[1]MGD- Million gallons per day.

[2]$CBOD_5$ - Carbonaceous biological oxygen five day demand

[3]mg/l- Milligrams per liter

[4]TSS- Total suspended solids

[5]TKN- Total Kjeldahl Nitrogen

[6]E.Coli- Escherichia Coli Bacteria

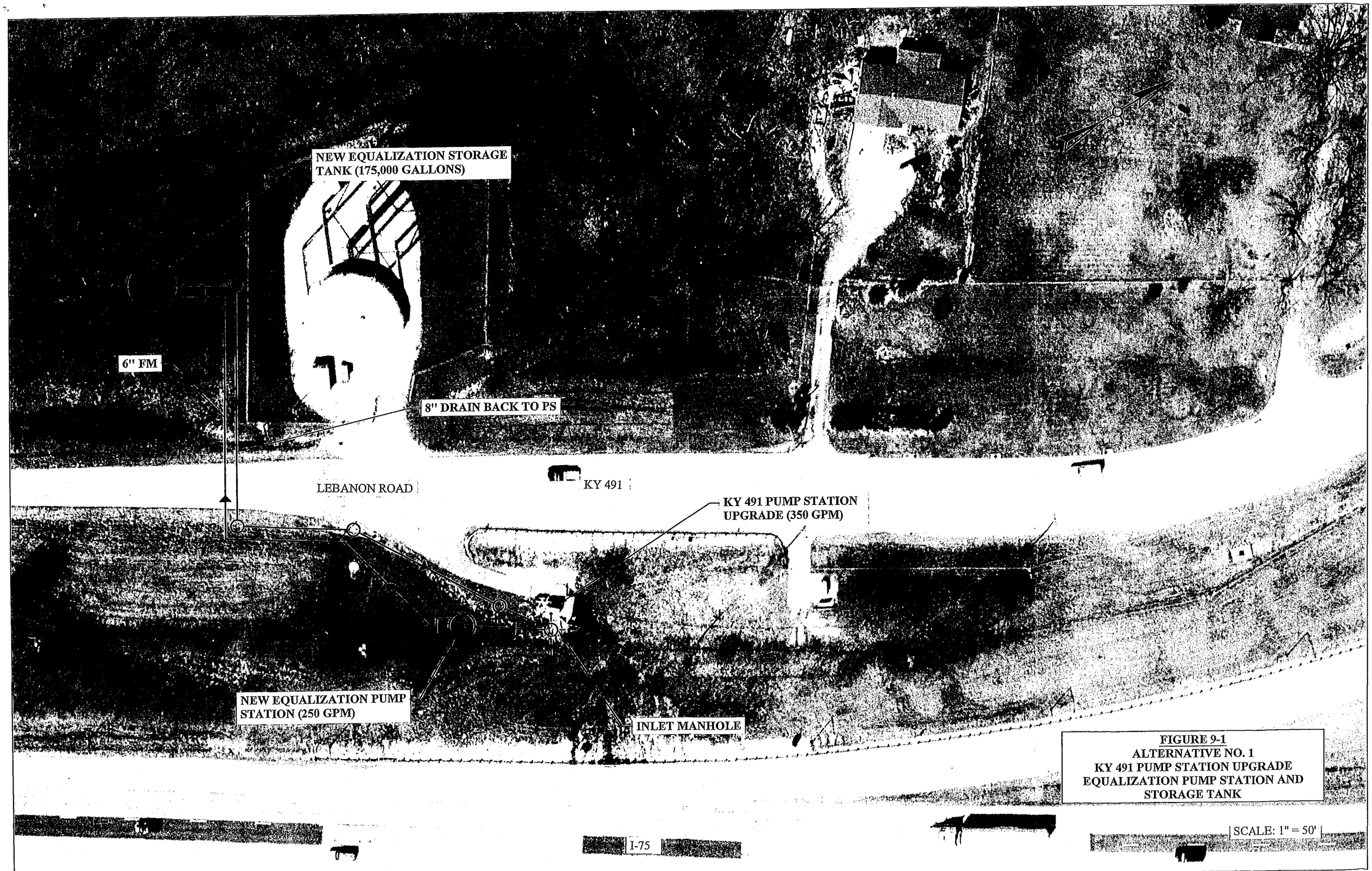

FIGURE 9-1
ALTERNATIVE NO. 1
KY 491 PUMP STATION UPGRADE
EQUALIZATION PUMP STATION AND STORAGE TANK

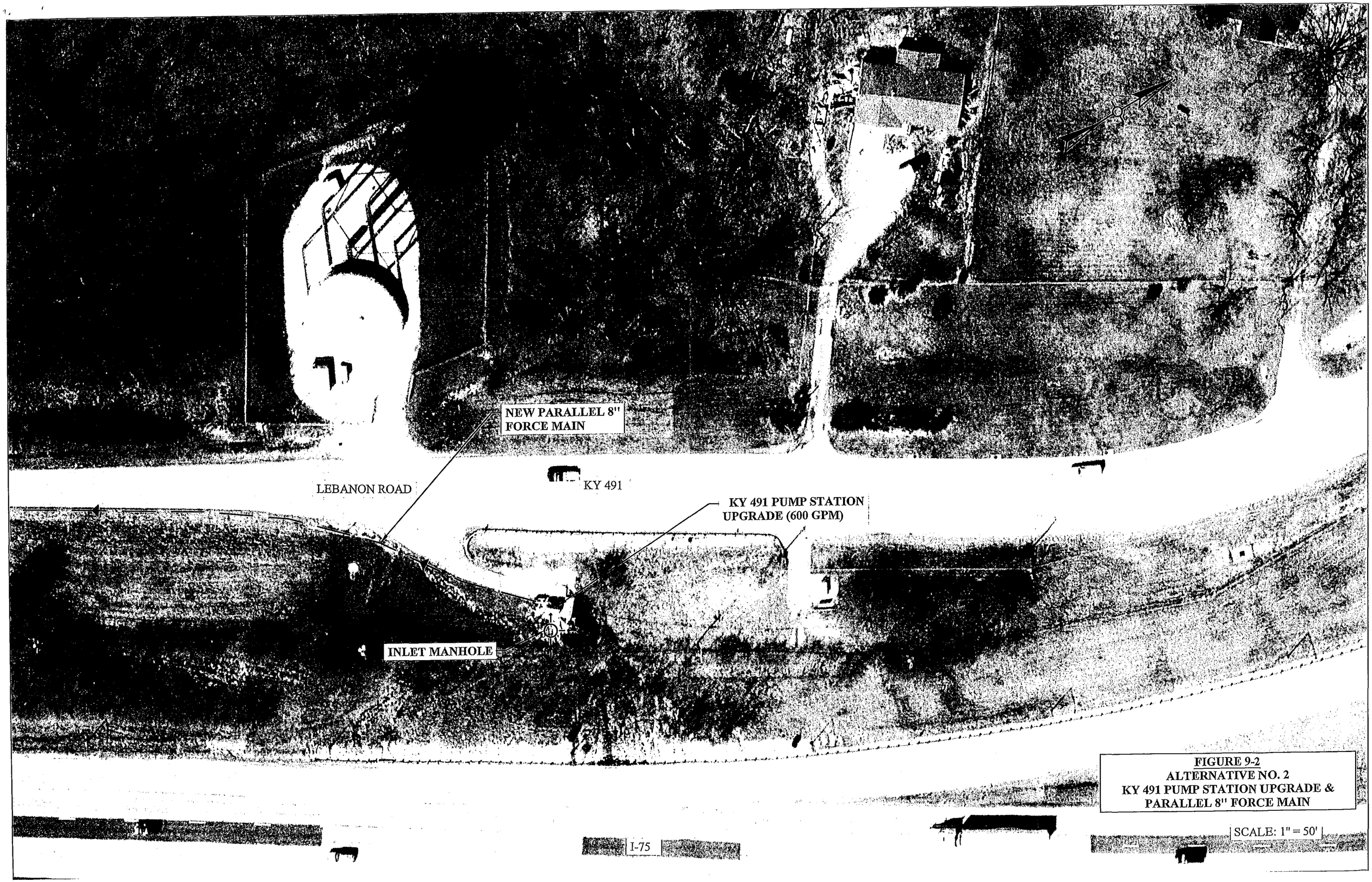

FIGURE 9-2
ALTERNATIVE NO. 2
KY 491 PUMP STATION UPGRADE &
PARALLEL 8" FORCE MAIN

SCALE: 1" = 50'