REGIONAL FACILITIES PLAN

FOR THE

PINEVILLE UTILITY COMMISSION

BELL COUNTY, KENTUCKY

VOLUME I
REPORT & FIGURES

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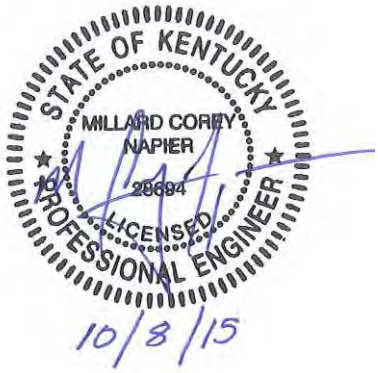

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SECTION 1 – REGIONAL FACILITY PLAN SUMMARY

A. GENERAL

The Facilities Plan presents a comprehensive sewerage master plan designed to address the area's long term wastewater infrastructure needs in the most cost effective manner. This executive summary presents the purpose and objectives of the Facilities Plan, provides a brief project background, describes the approach used to evaluate the wastewater collection and treatment systems, and presents a brief summary of conclusions and recommendations. Special emphasis is given to the immediate future periods, Phase 1 (0-2 years), and Phase 2 (3-10 years).

The purpose and objectives of the Facilities Plan are as follows:

- Through a "desktop" evaluation, identify collection system and wastewater treatment plant infrastructure problems and develop a comprehensive sewerage master plan to systematically and cost effectively address the problems.
- Develop a master plan for sewerage improvements (short and long term) in anticipation of residential developments, available businesses, commercial, and industrial zoned areas.
- Prioritize projects in chronological order based on the need of the project, and establish a rough budget for planning purposes.
- Establish a preliminary funding strategy using grants, low interest loans, and any other contributions, to finance capital improvements.

The City of Pineville, Kentucky, is served by a public sewerage system that is owned and operated by the Pineville Utility Commission. As with many older cities and towns throughout Kentucky, an aging and deteriorating collection system contributes significant infiltration and inflow to the wastewater treatment plant.

Although the Utility has experienced difficulties dealing with the wet-weather flows for the last few years, and despite the lack of additional treatment capacity, the WWTP has been able to consistently meet the facility's KPDES discharge permit limits.

Without continuous and systematic repairs, rehabilitation, and future planning, the sewerage system's capacity may inhibit future development and growth in the planning area.

To address these vital issues, the Utility Commission has authorized the preparation of a comprehensive wastewater infrastructure master plan (i.e. 201 Facilities Plan), in accordance to the DOW and the regional facility plan guidance. The most recent Facilities Plan for Pineville was prepared by Howard K. Bell Consulting Engineers, in 1990.

1. Collection System:

Through site tours, meetings, and discussions with the Public Works Staff, as well as review of pumping stations and collection system observations, a comprehensive sewer system inventory was prepared which identified the collection system status and current problems. In general, the following problem categories were identified:

A.) Much of the collection system in problem areas is aging. Some of the sewers were constructed in the 1950s and have never been replaced or upgraded. Infiltration, root and debris intrusion, deteriorated or collapsing pipes all contribute to potential flow restrictions and backups within the system. The majority of the aging collection system was constructed using vitrified clay pipe and is typically located below the water table.

B.) The condition of many of the interceptor sewers is unknown as they have never been inspected by the Utility. In some cases there are no records of their location or field conditions. Limited video inspection conducted over the last few years revealed a collection system riddled with debris accumulation, collapsed sections of pipe, root intrusions, infiltration through cracks and joints, and inflow through illegal connections

(i.e. roof leaders and sump pumps) which in all, contribute to the system's capacity limitations.

C.) The combined stormwater system in the downtown area is contributing an excessive amount of wet-weather flow to the collection and treatment system. This excess amount is estimated at 0.412 MGD on average. This volume is in excess of 50% of the WWTP's rated capacity. The actual peak volume may be much higher than the estimated value, if the two (2) permitted combined sewer overflow structures were to be eliminated. As such, the collection system is currently under a Consent Judgment to address discharges from the referenced combined sewer overflow structures.

D.) Approximately 40% of the pumping stations are operating with aging pumps and controls, and may be inadequate to convey peak flow during wet-weather conditions. Since all the flow is conveyed to the treatment plant using force mains (no gravity flow), the pump station capacity limitations pose potential bypass violations, and hinder future area growth/expansion due to inadequate capacity.

Having assessed the collection system infrastructure status, the most logical approach involves a series of chronological planned projects which systematically address the most prevalent problems. This step-wise approach/plan will aim to reduce system inflow and infiltration volume, eliminate stormwater contribution, eliminate two permitted CSO structures, and resolve associated water quality problems due to the large dilution effect from wet-weather flow. This approach will optimize the collection system in terms of conveyance and storage capacity to handle future growth as the need arises. The recommended approach to addressing collection system needs is as follows:

a. Design and construct Stage 1 of the stormwater and sewer separation project in the downtown area, and address immediate major pumping station needs at a cost of approximately $3,100,000 (Phase 1).

b. Perform additional sewer system evaluation surveys (SSES) of the major interceptors and major problem areas within the collection system, design and complete Stage 2 of the stormwater project in the downtown area, and address lower priority pumping station improvements needs within the planning area for this term, at a cost of approximately $6,600,000 (Phase 2). In doing so, eliminate the two (2) permitted CSO structures and achieve compliance with the imposed consent judgment.

c. Furthermore, continue the sewer rehabilitation surveys and repair work, address future sewer line extensions to meet the projected 124,000 LF of new sewer lines to be constructed, and perform necessary pump station upgrades at a cost of approximately $12,900,000 (Phase 3). In doing so, eliminate some of the failing septic systems and straight pipes found in the rural sections of the planning area, along with the elimination of the Ferndale Apartments package WWTP, and the Mountain View Nursing Home package WWTP in Ferndale.

2. Wastewater Treatment Plant:

A comprehensive evaluation of the Pineville Wastewater Treatment Plant (WWTP) was performed which included wastewater plant tours, review of plant design criteria, unit process evaluations, and review of operational data for the plant since 2008. A comprehensive list of plant maintenance, and equipment replacement needs, was also developed through discussions with plant operators and staff.

The current WWTP meets secondary treatment effluent standards and consists of the following treatment trains:

- Biological treatment
- Effluent disinfection
- Solids handling and disposal

The regional 0.72 MGD WWTP must comply with the Kentucky Pollutant Elimination System (KPDES) Permit. Over the last couple of years, the influent flow to the plant has been averaging around 90% of the plant's rated capacity, while the influent loadings rates are often above what the plant was designed to treat for.

During wet-weather flows, the influent flow has been as high as 3 times the plant's average design capacity. In addition, some of the 22-year old equipment and components are showing signs of fatigue and aging, and will need to be replaced soon.

Future growth projections as identified in this report, indicate that the current facility cannot handle the projected flow, or treatment, over the proposed planning period.

Due to the immediate need of additional capacity, a plant expansion and improvements to the WWTP is recommended. Based on the assumptions that the downtown stormwater contribution will be significantly eliminated, and that sewer rehabilitation efforts will reduce the remaining I/I contribution to approximately 20%, the projected plant capacity of 1.2 MGD is recommended, to meet the demands of the proposed planning period. This additional capacity will support the planned growth from the identified areas and provide the initial capacity and infrastructure for the planned industrial park development.

Due to the lengthy planning and design process often involved with WWTP projects, this project will be initiated in Phase 1, and is expected to be constructed and placed in operation sometime during Phase 2 (3-10 years).

The capital cost of this project is approximately $9,500,000 and the steps to initiate and secure funding for this project will need to begin immediately.

Performing the much needed pump station upgrades, sewer line extensions, stormwater and sewer rehabilitation, along with increasing the capacity of the regional WWTP, will potentially help the planning area decrease the various system impairments, restore the streams and water of the state to their original and intended uses, and help safeguard public health and other natural resources.

The projected number of sewer customers is expected to increase by approximately 50% over the course of the proposed planning periods. It is estimated that up to 400 additional residential customers will be gained, along with several light commercial and industrial customers. Similarly, approximately 800 acres of land use may be reallocated and provided with sewer services.

Table 1.0 summarizes the anticipated cost breakdown of the wastewater infrastructure needs, as identified by this report.

TABLE 1.0

SUMMARY PROJECT COST

Project	Phase 1 (0-2 Years)	Phase 2 (3-10 Years)	Phase 3 (11-20 Years)
WWTP Expansion	$100,000	$9,400,000	N/A
Stormwater Rehabilitation	$2,300,000	$5,900,000	N/A
Sewer Line Extensions	$0	$0	$10,909,388
Sewer Rehabilitation	$0	$180,000	$350,000
Pump Station Upgrades	$817,000	$534,500	$1,567,500
Total:	$3,217,000	$16,014,500	$12,826,888

B. RECOMMENDED PLAN

The 201 Study has identified a large number of projects over the next twenty years. Each project needs, should be revisited and reevaluated on a case by case scenario prior to the actual design phase. As priority projects are completed, their results shall be assessed, and incorporated in formulating the next project objectives and design criteria.

For the immediate future, the Utility Commission needs to proceed with the work on the stormwater and sewer rehabilitation in the downtown area and pump station improvements identified during Phase 1 and Phase 2. The proposed WWTP expansion can take place soon thereafter, or concurrently based on available resources and funding.

Once system capacity is restored/gained, new sewer customers can be added to the system as identified by this Study.

SECTION 2 – STATEMENT OF PURPOSE & NEED:

A. GENERAL:

The current influent wastewater treatment plant flow at the Pineville WWTP has reached the plant's design capacity. Therefore, the Pineville Utility Commission has requested to do an evaluation of the existing sewer system (treatment and collection) to investigate and review compliance with the current and upcoming (future) design regulations and effluent discharge permit standards.

The scope of the system evaluation and analysis was to:

- Evaluate and assess existing infrastructure (WWTP and collection system),
- Plan for future development and growth, and
- Establish a Plan of Action that will be feasible, time-sensitive, and in accordance with the area's growth plan.

B. COMPLIANCE AND ORDERS STATUS:

As of March, 2015, there are no pending or active Notice of Violations, or Orders, with regards to the current WWTP system. The plant is currently meeting all the NPDES effluent concentration limits, and is within compliance with the percent removal concentrations. With strategic planning and funding availability, the Utility can make sure the plant continues to operate in the same, or better manner for the next 20 years.

Future WWTP challenges to consider include more stringent effluent discharge limits to the Cumberland River, which would imply/require additional treatment requirements at the current WWTP. In addition, maintenance, replacement, and upgrades to the already aging equipment are also a concern and an issue that will require attention and additional resources in the years to come.

Similarly, the collection system is currently under a Consent Judgment to address discharges from the two (2) permitted, combined sewer overflow (CSO) outfalls.

The consent judgment requires the following from the Utility:

1) Develop, finalize, submit, and implement plans for the continued improvement of the sewage collection system, plus the WWTP;

2) Develop and maintain an approved combined sewer operational plan (CSOP) to implement combined sewer overflow control;

3) Implement the nine minimum controls (NMC) delineated in EPA's 1994 CSO Policy;

4) Develop and implement a long-term CSO Control Plan per EPA's 1994 Policy. Part of the plan is to abate the impact of CSO on water quality, and

5) Generate and submit an annual report for the twelve (12) month period ending on December 31st no later than February 28th of each year to the Cabinet that describes its progress in complying with this Consent Judgment.

C. WATER QUALITY PROBLEMS:

The Pineville planning area (PA) includes three distinct drainage basins located within the Upper Cumberland watershed. The drainage basins are delineated as the Cumberland River Basin, the Straight Creek Basin, and the Left Fork Basin. Refer to Table 2.0 for the estimated breakdown of surface area covered per basin and population density estimates. Runoff from these three (3) basins eventually reaches the Cumberland River. Most of the current population and sewer services within the PA are located within the Cumberland River basin. The remaining part is nearly equally split between the Straight Creek and Left Fork basins.

TABLE 2.0 AREA & POPULATION BY DRAINAGE BASIN		
Drainage Basin	Area (Acres)	Percent Population
Cumberland River	22,848	65
Straight Creek	8,576	20
Left Fork	5,261	15
TOTAL	36,685	100

i) Cumberland River Basin

The majority of this basin is forested with mountainous terrain. However, in the Western portion of the basin, lies the City of Pineville. This basin contains the majority of all developed land use categories (residential, commercial, and public/semi-public) in the Planning Area. Non-urban residential development parallels U.S. Highways 25E and KY Highway 119 to the South and East. The community of Four Mile is located on the northwest corner of the basin. The majority of Pineville's future residential and commercial land will be developed in this basin. The proposed industrial park site noted elsewhere in this report, will be constructed in this basin as well.

ii) Straight Creek Basin

Similarly, the majority of this basin is also forested with mountainous terrain. The existing residential development is linear in fashion paralleling Kentucky Highways 66 and 221. Limited future residential development is expected in this basin over the next 20 years. Some scattered commercial establishments also are found in this basin.

iii) Left Fork

Similarly, the majority of this basin is also forested with mountainous terrain. Non-urban residential development exists along KY 66. Some scattered commercial establishments are also found along this highway. Limited future residential development is expected in this basin over the next 20 years.

Over the last few years, several streams in these 3 drainage basins were cited for not meeting their intended use (purpose) due to some form of violation. The quality of these waters usually varies from severely degraded to clean enough for swimming, fishing, or use as drinking water source. Agricultural activities seem to be the leading source of water pollution in these waters, along with disease carrying pathogens, often associated with untreated or poorly treated animal and human wastes. Contaminated runoff containing agricultural nutrients and chemicals along with resource extraction (coal mining activities) is widely prevalent. Similarly, although groundwater quality is considered relatively good in eastern Kentucky, isolated groundwater pollution incidents are being reported in areas of sensitive Karst terrain. Pollution activities typically involve spills, leaking underground storage tanks, sedimentation/siltation waste sites, agricultural runoff, and occasionally untreated sewage. Among the noted streams within the planning area that have been placed on the State's 305(b) report include:

- Left Fork of Straight Creek

  Pollutant: Sedimentation, siltation, turbidity, total suspended solids

  Suspected Sources: Coal and surface mining, crop production, upstream source

- Straight Creek

  Impaired Use: Warm water aquatic habitat

Pollutant: Sedimentation, siltation, specific conductance/turbidity

Suspected Sources: Channel erosion, loss of Riparian Habitat, surface mining

- Yellow Creek

  Impaired Use: Primary contact recreation water

  Pollutant: E-coli

  Suspected Sources: Urban runoff/storm sewers, unspecified domestic waste

- Stoney Fork

  Impaired Use: Warm water aquatic habitat

  Pollutant: Sedimentation/siltation, turbidity

  Suspected Sources: Coal mining, loss of Riparian Habitat, stream erosion, site clearance.

- Sims Fork

  Impaired Use: Warm water aquatic habitat

  Pollutant: Sedimentation/siltation

  Suspected Sources: Surface mining

- Cannon Creek

  Impaired Use: Warm water aquatic habitat

  Pollutant: Sedimentation/siltation

  Suspected Sources: Dredging, loss of Riparian Habitat.

Refer to Appendix F, Exhibit 1, for a complete list and description of these noted areas.

Portions of the upper Cumberland River were also cited for elevated fecal coliform levels over the last decade originating from wastewater treatment plants and straight pipes, according to the Upper Cumberland River TMDLE Fact Sheet and other related reports

found in Appendix F, Exhibit 2. The fecal pollution was often attributed to direct and straight pipe discharges. Considerable work has been accomplished over the last decade by the Division of Water, local municipalities, the East Kentucky PRIDE Initiative, and the general public, to reduce the fecal coliform contamination. Work done to reduce the levels included legislation (Senate Bill 18) to require septic tank certification, better control and monitoring of existing WWTP operations along the Cumberland River, and more advocacies and funding of projects to protect surface waters.

A portion of the upper Cumberland River from S.R. 2014 Bridge to Pineville S.R. 66 bridge and from S.R. 219 to Harlan is still under a swimming advisory.

EPA has also approved or established TMDLs (total maximum daily load) for fecal coliform and/or E-coli, for Straight Creek, Cumberland River segment 650.6 to 654.4, and Left Fork of Straight Creek, within the planning area.

As noted earlier, these drainage basin discharges often originate from insufficient or failing treatment levels from septic tank systems, small package treatment plants, or even from straight pipe systems. This is not surprising when one considers the fact that only an estimated 40% of the households in rural sections are connected to public sewers.

Extending infrastructure (as recommended by this Plan) to some of these remote rural sites will benefit the environment and the health of these individuals by eliminating the threat of fecal coliform contamination to public waters and potential pollution of private well systems. Several existing package treatment plants may be eliminated by such projects.

Collecting all the pollutants and conveying the untreated wastewater to a single point of treatment will eliminate widespread form of pollution, will enable the untreated sewage to receive proper attention by certified and well-trained personnel, and will make

monitoring and compliance by Kentucky Division of Water (DOW) personnel easier to keep track of.

Neglecting to address these potentially hazardous problems, the fecal and other pollutant contamination can spread to a wider area, infiltrate into the groundwater and public water sources, and potentially harm human health. Without proper attention, maintenance and necessary upgrades, the existing and aging infrastructure cannot provide the same service as it did when it was first placed in service. Therefore, planning to upgrade, replace or maintain the sanitary sewer system is a vital necessity for the prosperity and growth of this region. If the Pineville Utility Commission fails to extend services to the surrounding areas that request or need service, then more individual septic tanks and drain field lines will be dispersed over these rural areas. With the flood-prone areas and the steep terrain associated with this region, proper installation and maintenance of septic systems may be very difficult and potentially a health hazard to the home owner and the adjacent general public.

D. ENVIRONMENTAL PROBLEMS:

As noted, a certain number of streams in the planning area are not meeting their designated use due to pathogens, nutrients, and pH impairment, most likely caused by ineffective wastewater treatment and conveyance systems, and/or ineffective or historical mining operations. Potential sources of these impairments are discussed below:

Municipal Wastewater Treatment Plants:

There is only one regional wastewater treatment plant located within the planning area, and is located in Pineville. The current plant (0.72 MGD) discharges into the Cumberland River at River Mile 652.8. According to

recent historical records, the Pineville WWTP has been in full compliance and without any significant violations.

Package Wastewater Treatment Plants:

Package wastewater treatment plants are small treatment facilities that are often privately owned and can cause significant pathogen impairment problems when not operated properly. As of 2014, there are five (5) such facilities within this planning area, but none are experiencing water quality problems to our knowledge. The total capacity of all the package WWTPs within the planning area is estimated at approximately 100,000 GPD.

Straight Pipes:

A straight pipe consists of a sewer line originating from a house or building that discharges raw (untreated) wastewater directly into a receiving stream or river. As a result, straight pipes constitute a significant source of pathogen impairment to streams.

At the beginning of 2000 and according to the PRIDE Water Quality Assessment Report I, Table 2.4 (Appendix F, Exhibit 2), it was estimated that Bell County had approximately 376 straight pipes. The location of these illegal discharges is approximately illustrated on Exhibit 2 (Figure 2.3) in Appendix F. According to those figures, it is estimated that the current number of straight pipes located within the planning area is probably less than 100.

Failing Septic Systems:

According to the Cumberland Valley Area Development District and the PRIDE Assessment Report (Table 2.5, Appendix F, Exhibit 2), it is estimated that there were approximately 426 failing septic systems in Bell County. This is somewhat reflective of the fact that soils in this region may be inadequate to support traditional septic systems. According to Exhibit 2 (Figure 2.4) Appendix F, it is estimated that around 200 failing septic systems may be currently found within the planning area.

Illegal Dumps:

It is estimated that there were approximately 38 illegal dump sites within Bell County (Table 2.6, Appendix F, Exhibit 2). These illegal sites often are a source of chemical contamination to surface waters as well as a breeding ground for insects and other parasites. Approximately 20 illegal sites may be currently found within the Planning Area according to Exhibit 2 (Figure 2.5) Appendix F.

Mining Operations:

Improperly operated mining operations contribute to acid mine drainage, erosion, and siltation, which can severely impact aquatic species and river/stream geology. It is estimated that there were approximately 31 mines (underground and surface) within the Bell County area (Table 2.7, Appendix F, Exhibit 2). Approximately 10 mines may be currently located within the planning area Exhibit 2 (Figure 2.6) in Appendix F.

E. CAPACITY COMPARISON:

Part of the existing sewer infrastructure appears to have met its life expectancy. As such, future projects will need to address maintenance and operation of the existing facilities, as well as planning for future growth and development.

Projected flow for this area over the next 20 years is likely to increase according to the projections covered in the next section of this report. The current average flow to the WWTP (0.70 MGD) over the last two years is near the system's rated treatment capacity of 0.72 MGD. It is expected that by the time the wastewater treatment plant is upgraded and goes on-line, the projected treated flow will be in excess of 0.8 MGD. Thus, careful and timely planning is needed to avoid losing future potential customers due to lack of treatment capability, or tampering with potential effluent discharge violations. In a similar fashion, the collection system will need to be extended further out in the planning area to pick up new customers in newly developed areas and to eliminate straight pipe discharges in currently developed areas. Based on projections, it is estimated that the collection and conveyance system footage can potentially increase from 111,000 LF to more than 250,000 LF over the next 20 years.

Nearly all the pump stations in the PA will need to be upgraded or replaced during the next planning period to keep up with the flow demand and the corrosive nature of the sewage environment. Several new force mains carrying the raw wastewater to the WWTP will also be required to match the new flow demand from the future growth areas. In order to assess the future growth in the planning area while giving attention to potential financial constraints, the system expansion, upgrades, and improvements will need to be made in multiple stages or phases. The stepwise work to reduce and eliminate the combined sewer overflows currently under way, will need special attention and strategic planning due to the

flow implications associated with such actions. Depending on the planned stormwater action, the sanitary sewer flows may go up or down drastically. These actions will need to be followed closely by conducting follow up flow monitoring studies. Such feedback information will need to be utilized by the Commission to frequently revisit and reassess the system capacity and needs. As such, the suggested master plan and proposed project schedule details will be discussed in more depth, in the following sections.

SECTION 3 - PHYSICAL CHARACTERISTICS OF THE PLANNING AREA

A. PLANNING AREA:

The original Pineville Planning Area (Figure 1) is located in central Bell County, and roughly contains 60 square miles (approximately 37,000 acres), including the City of Pineville. The planning area boundaries were previously determined from major area natural features. The southern boundary follows the Cumberland River Valley from Four Mile in the west, to Callaway area in the east. The northern boundary includes the drainage areas of Straight Creek (Rella Area) and Left Fork (Camp Ritter Area).

Pineville, the County Seat of Bell County, is located on the Cumberland River where Straight Creek joins the Cumberland River. Pineville is located approximately 13 miles north of Middlesboro, Kentucky, 74 miles northeast of Knoxville, Tennessee; 119 miles southeast of Lexington; 199 miles southeast of Louisville; and 200 miles southeast of the Covington-Cincinnati area.

The planning area is served by one federal and several state highways. U.S. Highway 25-E traverses the planning area in a northwesterly direction, serves several local population centers, and provides through-access to I-75 to the west. State Highways 119, 221, 66, and a portion of 987 provide local and regional transportation. All highways except State Highway 987 converge at Pineville.

Two branches of the CSX Railroad run through Pineville. One spur terminates at Manchester to the northeast, while the main line provides access to Louisville, Lexington, and Cincinnati.

Pineville is a fourth-class city governed by a Mayor and eight Councilmen. The Mayor is elected to a four-year term, while the Councilmen serve two-year terms.

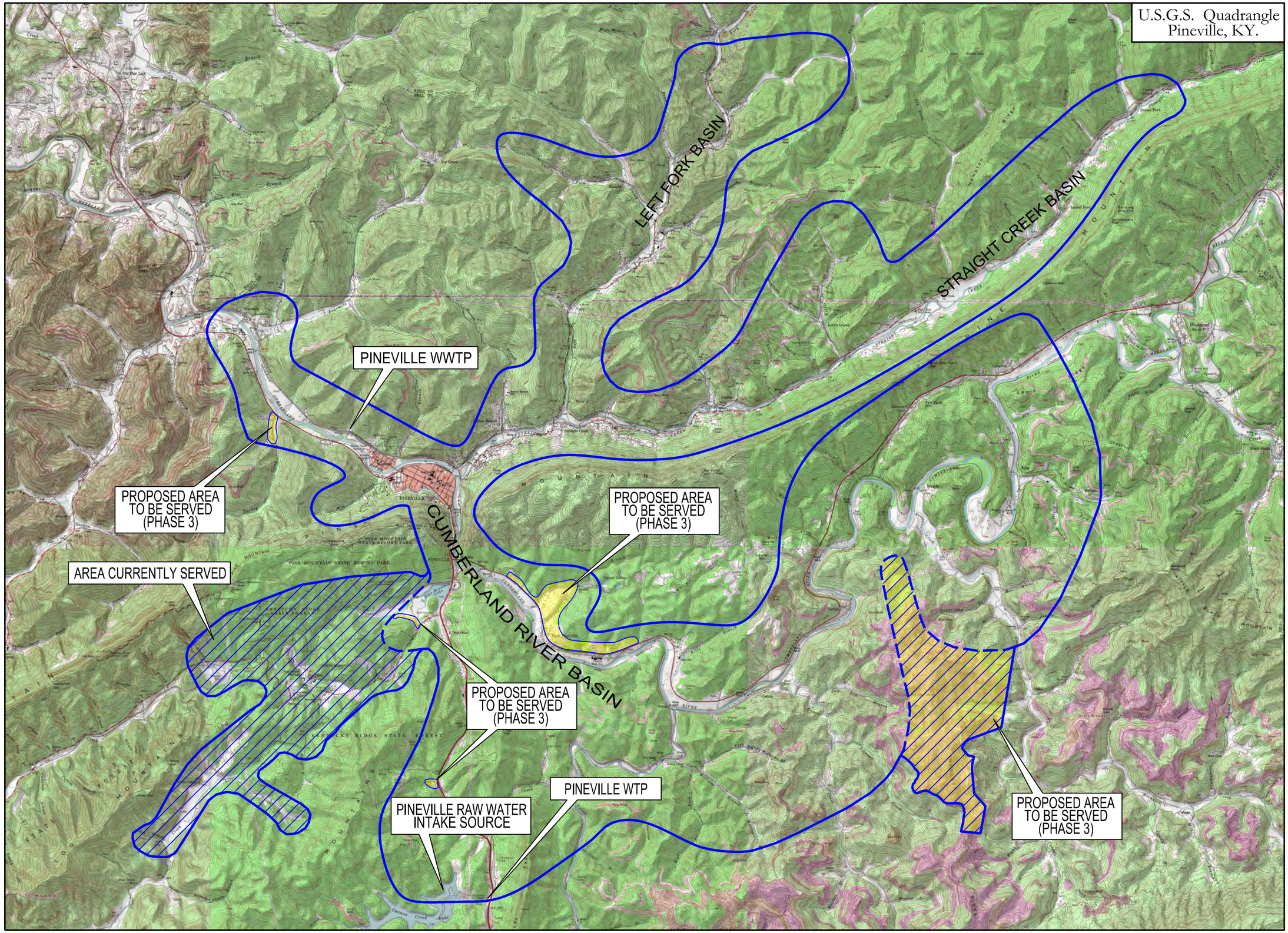

FIGURE 1 - PLANNING AREA
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 6000'

LEGEND

- ORIGINAL PLANNING AREA BOUNDARY
- PROPOSED PLANNING AREA BOUNDARY
- PROPOSED SERVICE AREA

Project Number: 11055-00
Date: AUGUST 2014

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The Bell County government is administered by a County Judge elected to a four-year term and eight Magistrates, each serving a four-year term.

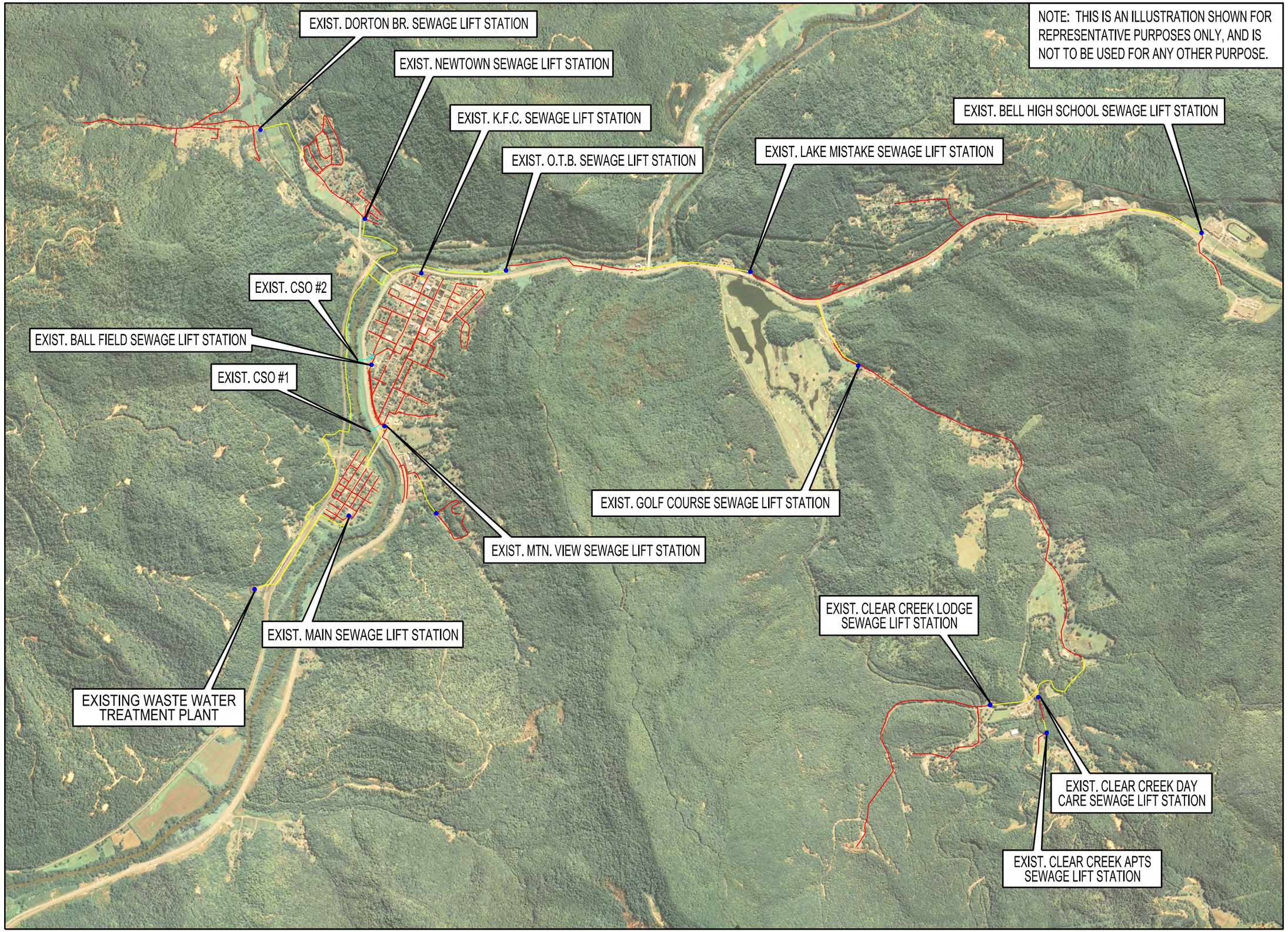
Domestic services such as water supply and sewage treatment are limited in development, by the large rural areas and rugged topography. The Pineville Utility Commission supplies the City Proper and parts of the rural areas of Bell County with water and sewer services.

Plumbing characteristics and statistical information for Pineville City residences are provided in Appendix D. Almost 91% of the housing units appear to be fully serviced in terms of water and sewer. The remaining 9% lack some, or all plumbing facilities. Only 1.5% of the residences are not served by any piped water.

Bell County residents, however, are much more dependent upon their own resources. Approximately half of the units obtain water from private supplies, and few of the non-Pineville residents are sewered. Most of the total Bell County units are served by conventional means of sewage disposal, such as septic tanks, package wastewater treatment plants, etc.

The public sewage collection system surrounds the City of Pineville as delineated on Figure 2 attached. Within the existing sewerage area, Pineville Utility Commission owns and operates a 0.72 MGD extended aeration (lagoon) wastewater treatment plant which is located on the west part of the planning area. The WWTP, which was built in 1992, discharges secondary type treated effluent into Cumberland River at Mile 652.8. As of January 2015, it serves an estimated 717 residential customers, 128 commercial and institutional customers, and no major industrial customers (total customers = 845).

Five (5) small package wastewater treatment plants exist within the Planning Area that are of environmental concern. The small wastewater treatment plants vary in capacity



NOTE: THIS IS AN ILLUSTRATION SHOWN FOR REPRESENTATIVE PURPOSES ONLY, AND IS NOT TO BE USED FOR ANY OTHER PURPOSE.

FIGURE 2 - EXISTING SEWER SYSTEM REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

SCALE: 1" = 2000'

LEGEND

- EXISTING GRAVITY LINE
- EXISTING FORCE MAIN
- EXISTING CSO STRUCTURE
- EXISTING LIFT STATION/WWTP

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from approximately 1,000 GPD to 21,000 GPD. Each of the package treatment plants is privately owned.

The primary water source for Pineville is Cannon Reservoir (Figure 1). The water treatment provides mainly turbidity removal and finished water stabilization due to the large water distribution network. The water service network consists of approximately 1,663,700 linear feet (315 miles) of water pipelines, 24 water storage tanks, 24 booster pump stations, and miscellaneous other system appurtenances. The Water Treatment Plant (WTP) serving Pineville and the surrounding areas is located near the Ferndale Community and is capable of treating 4.2 MGD (@ 5 GPM/Ft^2 filtration rate). The treatment process includes upflow adsorption clarification followed by gravity filtration. Finished water is disinfected with bleach and periodically conditioned with fluoride and polyphosphates. The plant was last upgraded in 2002.

There are no permitted sludge (biosolids) disposal sites and there are no permitted landfill sites within the planning area. Sludge generated by the current WWTP and WTP facilities, is either pumped and hauled to the Middlesboro WWTP, or transported elsewhere by pump and haul contractors. The Pineville Utility Commission also owns and operates a sewage collection system that consists of approximately 81,000 linear feet of gravity lines, approximately 30,000 linear feet of force mains, and several hundred sanitary sewer manholes. The majority of the system was constructed in 1950 and has never been replaced or upgraded. The majority of the gravity lines are constructed using vitrified clay or PVC. Some sections of ductile iron may exist also. Force mains are either PVC, cast iron, or ductile iron. The pipe sizes range from 4”- 12” for force mains and 6”- 54” for gravity lines. The manholes are mainly of concrete or brick construction, with metal frames and lids.

There are 13 sanitary lift stations (see Figure 2 for the approximate location of each sanitary lift station) that convey raw wastewater to the WWTP. The majority of the raw wastewater entering the WWTP is conveyed via the main pump station located less than one (1) mile away from the WWTP site. The main lift station utilizes a 12" force main and pumps directly to the WWTP. Two other sanitary sewer pump stations (OTB and Newtown) also pump raw wastewater directly to the plant.

Recent growth in the sewer service area, not previously included in the original PA, includes the areas of Clear Creek and the Pine Mountain State Park. As a result, several pump stations and several miles of force main were extended over the last few years to provide service to these customers.

Therefore, the planning area boundaries are expected to change as a result of the recent, and planned future growth described elsewhere in this report.

B. LAND USE:

Land use within Bell County has been confined by topographical and flooding constraints. In general, the development potential of areas characterized by a slope greater than 15% is severely limited. Similarly, development within flood plain areas has also been restricted.

Developed land areas within the planning region are indicated on Figure 3 and summarized on Table 3.0. Most of these areas border stream valleys, where land is fairly level, but not susceptible to flooding. Other areas, made available through reclamation efforts of mined lands, are located in more isolated regions. A third type of development generally occurs along major roadways if adjacent land is sufficiently level.

Land use types, or categories within the planning area include; residential, commercial, vacant, and public.

U.S.G.S. Quadrangle
Pineville, KY

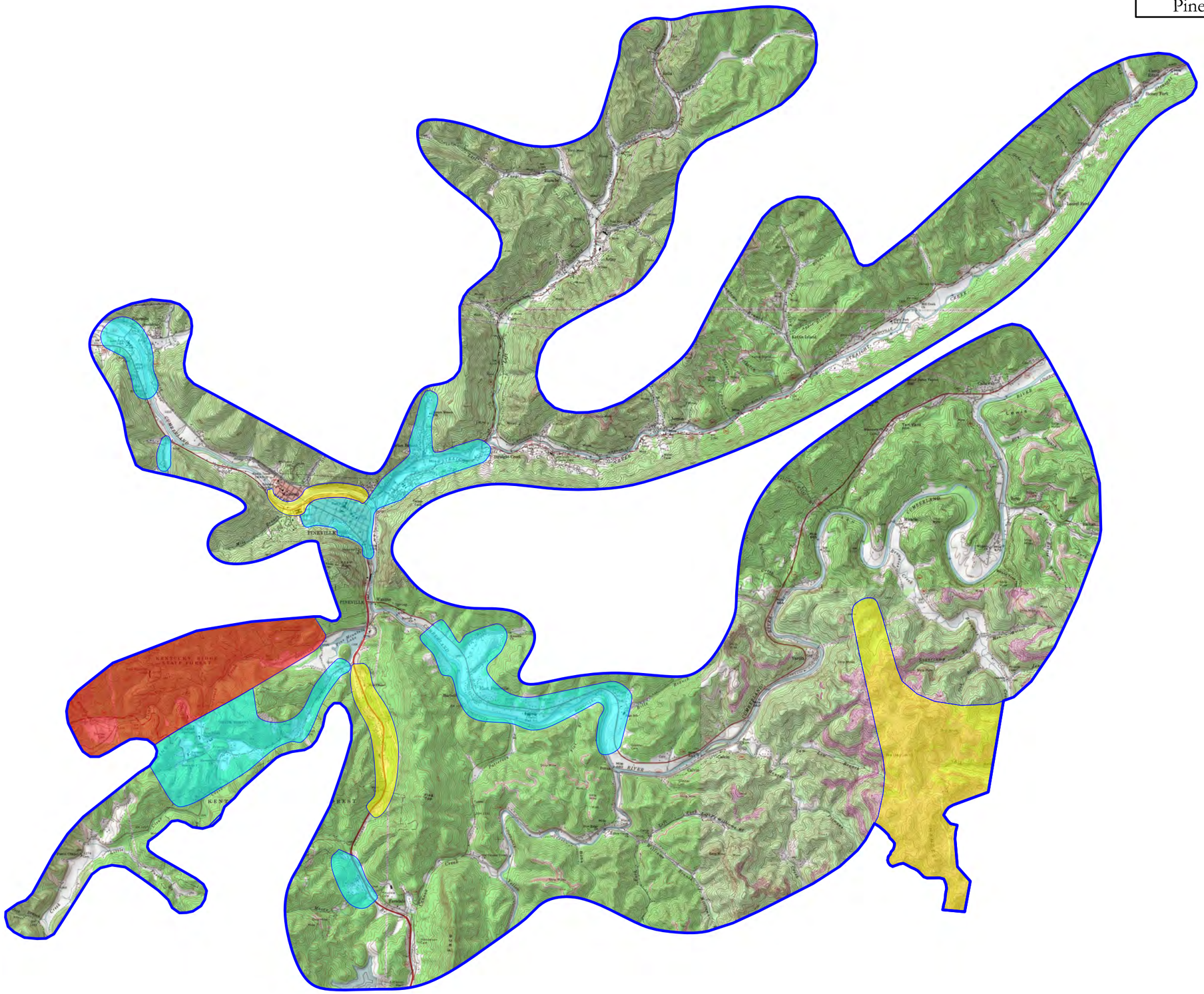

FIGURE 3 - LAND USE MAP
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

SCALE: 1" = 6000'

LEGEND

- VACANT
- RESIDENTIAL
- COMMERCIAL / INDUSTRIAL
- PUBLIC

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The areas delineated were not defined by type due to the lack of zoning ordinances outside the Pineville City Limits. Regional development is typically characterized by areas of mixed residential and commercial compositions. Industrial complexes are not available or generally small in nature and thus are not depicted on Figure 3.

The vacant land use designation includes forested or mined mountain slopes with linear residential development located at intervals along highways and streams. These residential units are scattered and not considered typical urban development.

TABLE 3.0

LAND USE BY DRAINAGE BASIN

Basin	Area (acres)	Developed Land Use (Acres)			
		Residential	Commercial	Public/ Semi-Public	Vacant
Cumberland River	22,848	754	121	533	21,440
Straight Creek	8,576	411	6	9	8,150
Left Fork	5,261	181	2	1	5,077
Total	36,685	1,346	129	543	34,667

Residential land use represents approximately 66 percent of the developed land in the Planning Area. Suitable residential land is somehow limited in the Planning Area since most desirable land has already been developed, leaving areas which are inadequate due to slope and soil conditions.

The majority of the houses found in the Pineville Planning Area are single-family dwellings. A significant portion of the residential units in the Planning Area has occurred in a linear fashion parallel to highways. This type of development is found in all three basins. Subdivided residential and multi-family developments are found in the Cumberland River Basin. Commercial land use represents approximately six (6) percent of the developed land in the Planning Area. The greatest concentration of commercial development exists along the main streets in Pineville. Other commercial development is

scattered along the main routes through the Planning Area (KY 221, KY 66, and U.S. 25E and State Highway 119) and at intersections.

Public and semi-public land occupies approximately 27 percent of the developed land use category. Public land use varies from churches, to City-owned property and parks, and a 470-acre segment of the State-owned Kentucky Ridge State Forest.

The remainder of the Planning Area (approximately 95.0 percent of the total area) is considered vacant or non-urban residential. The land is used for agriculture or mining, or is left idle due to severe terrain restriction. The only other significant land use in the area is for railroads which presently use approximately 27 acres.

Future projections indicate growth in the form of residential sewer subdivisions and limited industrial/commercial growth. Additional growth may originate from servicing areas currently served with alternative sewer systems, along with providing services to individual residences scattered throughout the Planning Area. Some non-mining industrial growth is predicted in Pineville and surrounding areas. Similarly, some additional commercial growth is predicted to occur along State Highway 119 and U.S. 25E.

To meet future needs, the following land use types and approximate acreage is projected:

300 acres residential

20 acres commercial

10 acres public

453 acres industrial

SECTION 4 – SOCIO-ECONOMIC CHARACTERISTICS OF THE PLANNING AREA:

A. GENERAL:

Population projections attempt to predict future growth and where it will occur for planning purposes. It is difficult to predict major factors such as natural catastrophes, changes in ways of life, medical innovations, large developments, industrial expansions, fuel shortages, or other unpredictable events, but in order to provide a basis of planning, a projection to the future population is essential. Anticipated future populations are most confidently determined by intensive studies of past and present trends and then correlating this data with knowledge of the areas being analyzed. As such, residential population projections will be made by considering the city population currently served by the Utility, along with the projected rural areas (within the Planning Area) to be served in the next 20 years, as identified by this report. Population projections made in this report will be made for the discrete intervals of 2016-2017 (Phase 1), 2018-2026 (Phase 2), 2027-2036 (Phase 3).

Population information utilized by this report was obtained from the U.S. Census Bureau, interviews with County/City personnel, and public information available on the internet. According to the U.S. Census (Appendix D) and Table 4.0 below, the total population of Pineville in 2000 was 2,093. By 2010, the population was 1,732, representing a decrease of just over 17%.

TABLE 4.0 PINEVILLE POPULATION RECORDS			
Year	**1990**	**2000**	**2010**
Population	2198	2093	1732

Similarly, the population growth in the County (Bell) was also reported to be on the decline between 2000 and 2010 according to Table 4.1. The county population in 2000 was 30,060, while in 2010 had declined to 28,691. This represents a decline by just under 5%. Unlike the City and County population, the State (KY) population for the same 10-year period grew from 4,041,769 to 4,339,367 people. The equivalent annual rate of growth for the State is approximately 0.74%.

TABLE 4.1 BELL COUNTY POPULATION RECORDS									
Year	1990	1995	2000	2005	2006	2007	2008	2009	2010
Population	31,506	30,919	30,060	29,130	28,960	28,794	28,836	28,667	28,691

For the purpose of this planning report and based on the historical declining records, no annual growth rate will be utilized.

Table 4.2 summarizes the projected population for Pineville for Phase 1, Phase 2, and Phase 3 based on the previously reported annual growth rate of zero percent.

TABLE 4.2 PROJECTED POPULATION FOR PINEVILLE			
Population in 2010	Phase 1 2016-2017 Population	Phase 2 2018-2026 Population	Phase 3 2027-2036 Population
1,732	1,732	1,732	1,732
Gain in Population	None	None	None

B. ECONOMY:

The 2010 labor force for Bell County was approximately 10,232. Refer to Table 4.3, in which approximately 1006 people were unemployed. The area serves as a commercial and service center for the surrounding communities and counties. Most of the manufacturing and industrial firms are located in Middlesboro, just south of Pineville.

TABLE 4.3 GENERAL EMPLOYMENT CHARACTERISTICS (2010)	
Major Employment Group	Employment (Bell County)
TOTAL	9,226
Agricultural	703
Education/Health Care	2,671
Manufacturing	847
Trade and Services	4,092
Government	468
Other (Including Mining)	445

The following criteria outline the potential for future commercial/industrial development in the Pineville labor market area:

(a) There is a current estimated labor supply of 16,530 men and women available for industrial jobs in the labor market area.

(b) The area is served by rail, air, and commercial trucking lines.

(c) The area is supplied with electric power, natural gas, and propane.

(d) Pineville has at least one site identified and available for future industrial use.

(e) The area is served by public and private schools.

(f) Four universities, four senior colleges, one junior college, one vocational-tech school, and three community colleges are within 100 miles of Pineville. Two area vocational education centers are also located in Pineville.

Based on the Utility's records, there are currently approximately 717 residential customers and 128 commercial/institutional customers. According to the water sales usage breakdown (Appendix H, Memorandum No. 1) and assuming 90% of the water sales enters the sewer system (0.9 x 62% = 55%), approximately 55% of the wastewater is generated from commercial/institutional sources. Based on the current plant flow of 0.7 MGD, the commercial/institutional contribution would be approximately 0.55 x 0.7 = 0.385 MGD.

Personal income in Bell County rose to $14,627 in 2010; however, it is still below the State and National averages. The State has recently determined a 9.0 percent unemployment rate in Bell County.

Based on the above assessment, the Planning Area is capable and can sustain additional growth and additional job creations. Such a potential needs to be acknowledged and incorporated in the strategic planning of the region.

Some potential industrial/commercial growth, along with residential growth, is anticipated from the development of the Pine Mountain Industrial Park development. The proposed park will include a 500 acre development in an area that is not currently served with sewer. Some limited system growth due to the proposed park development will be considered in the next planning period, despite no immediate industrial user commitments, or a definite project schedule for the proposed park development.

SECTION 5 – EXISTING ENVIRONMENT IN THE PLANNING AREA:

A. WATER QUALITY ASSESSMENT:

The Pineville Planning Area falls within the Upper Cumberland Basin and as such, its water quality assessment resembles that of the watershed. Some streams and creeks are still considered relatively pristine while others are negatively impacted by pollution stemming from mining, oil and gas well development, agriculture, package plants, other permitted small flow discharges, timber harvesting, land development, etc. Causes of pollution include sedimentation, siltation, specific conductance, pathogens, nutrients, entrophication, and other unknown sources.

Due to the geological formations and rugged landscape of this region, the water quality of the watershed is affected as such. Water quality is typically described with low pH due to the soil/geology, low buffering capacity, an abundance of ions from minerals, presence of pathogens, high total dissolved solids (specific conductivity), high suspended solids from land disturbances, and periodic nutrient pollution, despite the nature of the geology.

Public and private water withdrawal points are scattered throughout the area and as a result, there is a growing concern and awareness to protect these water supplies for drinking water purposes. Several wells and surface waters are contaminated from untreated human sewage from failing septic systems and straight pipe discharges.

The entire planning area is within the Source Water Assessment and Protection Program (SWAPP) zones for the Knox County and Barbourville Utility Commissions.

Similarly, a wellhead protection program is in existence along Straight Creek in the area between Kettle Island and Stoney Fork.

Any future work in such areas will need to be coordinated with the appropriate authorities/utilities to avoid potential conflicts with water quality preservation.

Area-wide streams identified to have impaired water quality were briefly described and listed previously in Section 2.

B. WETLANDS:

Wetlands provide diverse habitats for wildlife foraging and reproduction, refuge for a wide variety of mammals, reptiles, amphibians, and fish, as well as great places for recreation such as wildlife spotting, hunting, or canoeing. They also can provide floodwater storage, groundwater flow moderation, sediment removal, nutrient cycling, and water purification. According to the National Wetlands Inventory System (refer to Appendix N) this area is rich with wetlands. The sites identified on the referenced inventory system are typically based on aerial photography observations, and are subject to further field verification for accuracy.

Since many valuable functions of wetlands are being lost due to their being drained, filled for farmland, development, or mining, future infrastructure projects need to avoid or minimize further impact to the few remaining wetland areas within the planning area as much as possible.

Once a specific project is identified, an environmental assessment will be completed to examine the project's impact to the environment and any wetland areas. Until then, no further work will be performed with regard to wetland protection or restoration.

C. HYDROLOGY:

The site of Pineville as a settlement location was probably affected to a certain degree by the confluence of Straight Creek and the Cumberland River. Most early settlers chose such locations because of the accessibility of a water source for domestic and

transportation purposes. The benefits of such a location also included disadvantages, particularly during flooding conditions. In most locations, development could occur outside of the immediate flood-prone areas, but the rigorous topographical constraints present at the Pineville site restricted the degree of such outside development. Population growth, although steady, was slow until 1977, when construction of the Pineville Levee was completed. This levee protects a majority of the low land areas within the City Limits.

Flood conditions are normally initiated by severe or pro-longed precipitation events. Such events contribute large amounts of runoff and overland flow to intercepting creeks and tributaries. Each tributary lies within a drainage basin defined by topography, and functions to collect and transport runoff to downstream locations. The confluence of one or more tributaries with the main river involves an accumulation of runoff water from several drainage basins. Local flooding at such sites is likely to be severe.

The increased frequency of flood occurrence also appears to be related to development in watershed areas. The native watershed conditions provided a buffering capacity which minimized the occurrence of major floods. Vegetation intercepts much of any precipitation event, thereby reducing the amount of runoff flow and the resulting contribution to individual waterways. It also increases the amount of time required for runoff to reach these waterways. This vegetative buffering capacity has been largely altered by recent development practices. Open areas have been created by farming, clear cutting, strip mining, and urban developments, allowing precipitation to collect in more concentrated areas. Runoff rates in these areas have been increased from roadway construction, stream channelization, and culvert installations. Transmission of greater discharges during shorter time periods to downstream locations has resulted in increased flooding. These effects are particularly severe in regions where tributary confluences with

the main river are common, and are most damaging because of the population concentrations generally located at such sites.

The Pineville Planning Area is part of the Upper Cumberland Basin and it includes five drainage basins which drain to the Cumberland River as it flows toward the Ohio River.

TABLE 5.0
WATER QUANTITY CHARACTERISTICS FOR STREAMS IN PLANNING AREA

Stream	Drainage Area (sq. mi.)	Average Flow (cfs)+	7Q10 (cfs)	Maximum Discharge (cfs)+	Water Quantity Problems+
Cumberland River	809	1,398	24.0	57,900	Severe Flooding
Yellow Creek	92	112	4.5	9,980	Flooding
Clear Creek	46	---	0	---	None
Straight Creek	97	---	0.2	---	Flooding Near Mouth
Brownies Creek	40	---	0	---	Flooding

For future reference, the predicted discharges by these drainage areas and tributaries during flood conditions are provided in Table 5.0.

In addition to small residential wells and springs, the Planning Area receives water from Cannon Reservoir, southeast of Ferndale. This reservoir was constructed on Cannon Creek as a water supply for Pineville. The WTP serving Pineville and the surrounding areas is located at the base of the Cannon Creek Dam, along Highway 25E. The original WTP was rated for 1.35 MGD. An addition to the WTP was constructed in 2000. Since the new addition, the old WTP has been abandoned and the new plant has been re-rated to operate the filters at 4.2 MGD (5 GPM/Ft^2). The average water consumption in 2014 was approximately 2.3 MGD. The high water production compared to the wastewater treated is due to the fact the utility serves water customers outside the planning area. The raw water supply appears to be ample for the growth predicted in this report.

As noted before, the City is located on alluvial terraces of the Cumberland River at the confluence of Straight Creek. This area has a history of flooding and a floodwall was constructed to protect the City. The alluvial areas in Pineville and parts of Wallsend are located within the protected area.

The Corps of Engineers has prepared a floodplain study of the Area. Flood protection for the protected area inside the levee was set at elevations between 1,017 and 1,021 feet MSL. Refer to Appendix G for more information.

The 100-year flood will be mainly considered for the purpose of this report. This flood occurs an average of once every 100 years, but may occur more or less frequently within a given time period. The 100-year flood is of the same probability as the intermediate regional flood defined by the U.S. Army Corps of Engineers.

Tributary basins of the Cumberland River would be affected from combinations of locally-derived high water and backflow from the Cumberland River. Most of the basin areas below 1,017 feet of elevation would be flooded. Although this area is not large, it does contain the majority of the planning area population. Effects of past floods within the area have been severe.

The current WWTP facility is located outside the floodwall protected area, in the Wallsend area, and discharges treated wastewater to the Cumberland River at River Mile 652.8. The 100-year flood elevation at this location is set at 1,017 feet. Future plant expansion or improvements to the current facilities will need to be designed to remain operational at, or above, that flood elevation.

Future projects located inside the levee, will be protected from the 100-year threat and thus will not require further floodproofing.

Other such improvements to the current infrastructure will need to consider and minimize intrusion of water from such flooding. The extent of flood protection and reliability will need to be investigated on a case-by-case scenario, once a project is clearly identified.

i) Point Sources of Pollution:

Section 2 discusses point sources from wastewater treatment facilities that may impact the hydrology of the Planning Area. These locations need to be closely monitored and visited on a frequent basis to ensure compliance with regulated effluent permits and other guidelines. Steps to eliminate known point sources need to be taken as opportunities arise.

ii) Non-Point Source of Pollution:

Pollution to the Cumberland River at Pineville, is often minor, and usually introduced from upstream sources. Due to the large volume of water and the dilution effect, pollution is often hard and difficult to detect and pin-point. However, regional mining activities periodically cause significant pollution to smaller streams such as Yellow Creek, Clear Creek, Straight Creek and Brownies Creek. These non-point sources are described in Section 2 of this report.

D. TOPOGRAPHY

The Pineville Planning Area is located in Bell County in the extreme southeast corner of the State of Kentucky. Bell County is a gateway to the Eastern Kentucky Coalfield. The County borders Virginia to the east, Tennessee to the south, Harlan County to the north, and Knox County to the west. Pineville itself is located in the densely populated valley of the Cumberland River at the gap where the river cuts through Pine Mountain.

The planning area boundaries are typically defined by topographical factors that parallel watershed divisions as closely as possible. In areas where entire drainage basins could not be incorporated, planning areas were defined by contour intervals, and tended to approximate the elevation patterns established by ridge formations.

Land elevations within the planning area fluctuate widely due to the rugged terrain. Mountainous areas, characterized by sandstone formations, are common throughout the Kanawha section. Although the medium elevation of the planning area is approximately 1,200 feet, several mountain formations exceeding 2000 feet are present. Pine Mountain peaks at 2,313 feet. Pineville, located on an alluvial terrace, is at elevation 1,015; the wastewater treatment facility is located at approximately 1,040 feet. Land elevations between 980-1100 feet are associated with river floodplains.

Most level land within the planning area (Refer to Figure 4 attached) is contained within the floodplain of the Cumberland River. The floodplain, averaging 1,600 feet in width at Pineville, rises 25 feet above the river channel, creating some rough local terrain, but providing some protection against the flood waters of the river.

Steep slopes abound in the area; the steepest are at the gap in Pine Mountain at Wasioto, where slope exceeds 50 percent. The slope of most developed land is less than ten percent along the river and less than 15 percent along Straight Creek.

As a result of the topography, the sanitary sewer collection system has to utilize sanitary sewer lift stations to overcome elevation differences. Use of lift stations often result in higher system O&M costs, potential for formation of septic conditions in the collection system, potential for sewage overflows during pump/power outages, and other related nuisances.

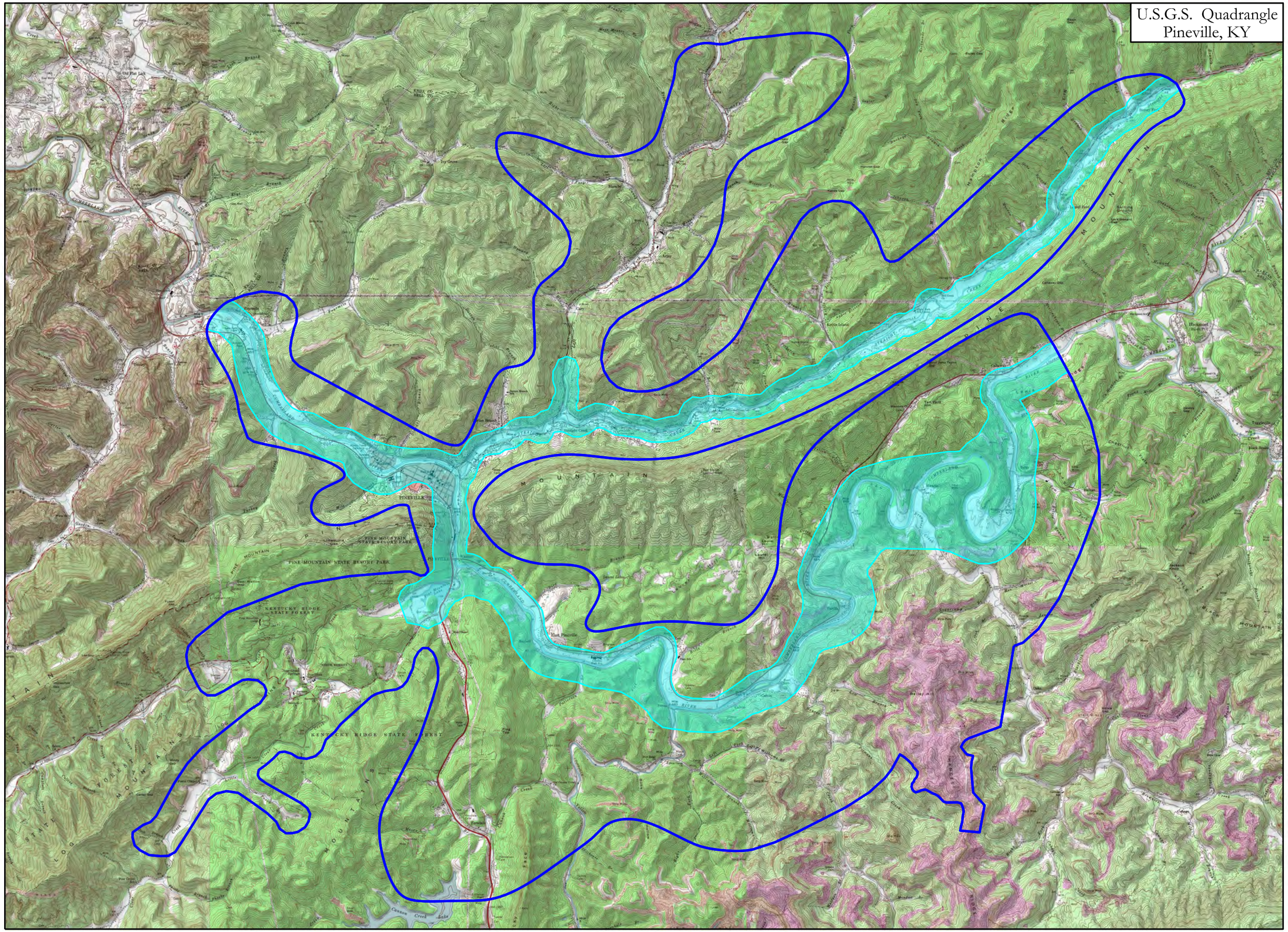

FIGURE 4 - REGIONAL FLOOD PLAIN MAP
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 6000'

LEGEND

PLANNING AREA BOUNDARY

100 YEAR FLOOD PLAIN

Project Number: 11055-00
Date: AUGUST 2014

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Septic conditions in sanitary sewers often cause the release of Hydrogen Sulfide gas (H_2S) and formation of by-products that tend to corrode sewer appurtenances such as steel or cast iron pipe, manhole lids, pump station equipment, etc. The impact at the WWTP facility is often associated with strong odor release and corrosion problems at the plant's headworks. Additional power consumption is often required at the WWTP due to the septic nature of the waste thus requiring more air transfer to meet acceptable treatment standards.

To overcome some of the above problems, standby generator sets may be considered along with the application of chemical feed systems to combat odor and pipe corrosion in future pump station installations and upgrades.

Excessive slopes and close proximity to surface waters are additional constraints one has to deal with when considering alternative on-site treatment and disposal options, such as drip irrigation or septic drain field lines.

The construction of such systems in this type of topography requires relatively excessive amount of land and provisions for redundancy which often make the project cost prohibitive and environmentally unsuitable.

All future sanitary projects will consider the topography and be designed to be operational under the 50-year flood elevation (minor pump stations and sewer lines) or be operational above the 100-year flood elevation (major pump stations and wastewater treatment plant), unless they are located inside the levee protected area.

E. GEOLOGY:

The Pine Mountain Overthrust Fault is a most outstanding feature because along the south side of the fissure, bedrock was raised to form the Pine Mountain ridge, which extends from Tennessee, approximately 125 miles through eastern Kentucky to Virginia.

The one break in the mountain is the gap at Pineville through which the Cumberland River flows; this gap was also the path of Wilderness Road through which the earliest Kentucky settlers traveled.

Of engineering significance is the sheared north face of Pine Mountain which can be subject to landslides and rockfalls. The U.S.G.S. reports frequent damage to nearby highways and railroads due to earth movement. The south side of the mountain shows signs of movement toward the river.

The remainder of the planning area is characterized by the Breathitt formation and alluvium. The Breathitt formation is composed of siltstone, sandstone, and claystone, with lesser amounts of coal and clay. Very little limestone is present. Siltstones are gray, micaceous, and may be fossilized. Sandstones and claystones may also contain fossil plants. Sandstones range from feldspathic in the upper formation to micaceous in lower horizons. In general, they are gray and are characterized by an abundance of minerals and rock fragments. Claystones are dark or light gray and may contain ironstone at many locations. Clays commonly underlie coal beds.

Alluvium, produced from flowing water, characterizes much of the Cumberland River and adjoining tributary valleys. This material generally consists of silt and clay, with minor amounts of sand and gravel. Former river channels may have deposited high-level material of similar nature. In general, these areas are most conducive to habitation, and contain the greatest groundwater supplies.

The economics of area geology associated with mining are of great significance to the Planning Area. Several million tons of Pennsylvanian coal are estimated recoverable in the Hance Formation (Post-Lee) in the Middlesboro North Quadrangle, and in the Varilla

Quadrangle. The coal in the Breathitt Formation has been deep mined since 1889, and augered in recent years until few important coal beds remain.

Other resources show limited significance in the area. Limestone is quarried in the Devonian strata of Pine Mountain and oil and gas are suspected under the Middlesboro Syncline.

The existing rock formations and flood prone areas within the planning are make construction of sewer infrastructure challenging at best. Rock excavation is generally time consuming, expensive, and often requires special equipment to be used. Blasting which may be used under controlled circumstances, can often bring more issues to the table than originally though and is often used with care and consideration.

Due to the nature and geology of the area, knowledge of these challenges is critical in making sound project decisions and cost effective selections that will blend with the area surroundings.

F. GROUNDWATER:

Domestic water supplies in most of Kentucky have been limited in development to surface streams and shallow fresh groundwater. Deeper fresh and slightly saline water supplies may be important in determining future development areas. The distribution and composition of these supplies is generally dependent upon geological formations.

Freshwater aquifers are generally associated with alluvial deposits, but may also occur in geologic formations. The occurrence of saline water within a geologic formation may be due to the following factors: retention of salty water within the rock formation as the formation was deposited; dissolution of salt from within the formation or from adjacent substrate; or entrance of salt water into the formation after it was deposited.

The definitions of fresh and saline water are dependent upon chemical composition. Water having a total dissolved solids concentration of less than 1000 ppm is classified as fresh, and can be used for most purposes. Saline water is defined as having a total dissolved solids content of more than 1000 ppm. Saline water is restricted in some use operations, and may require pretreatment.

The change in groundwater quality from fresh to saline occurs at the fresh-saline water interface. The interface is not a plane, but a zone of varying thickness. Chemical changes within this zone are gradational rather than abrupt, and are best detected by chemical analyses. The thickness of the zone within the state appears to range from less than 100 feet to more than 500 feet.

Depths from the ground surface to the zone are also variable. The maximum depth of fresh water, or the minimum depth to saline water, can be determined by subtracting the interface contour depth from the altitude of the land surface. Fresh water supplies of drinking water within the planning area appear to be located within the upper 200-300 feet of the substrate. Availability appears to be influenced by the composition of the underlying rocks, and surface and subsurface drainage patterns.

Normal groundwater movement is affected by the composition of underlying rocks. Groundwater movement in the planning area occurs primarily in small openings along joint systems, fractures, and bedding planes. In addition, some flow may occur through the interstitial openings of medium and coarse-grained sandstones. The permeability of these formations has been a factor in affecting their development.

Average domestic water requirements per capita have been calculated to be 70 GPD (gallons per day). Drilled wells are more productive and produce increase water supplies

than spring sources. Almost 75% of the drilled hillside wells produce 70 gpd. Wells located on hilltops or ridges yield smaller quantities of water.

Valley bottoms, comprised of rock formations, are more productive. Most drilled wells in these areas produce at least 500 gpd. Valleys of the Cumberland River and adjoining large tributaries may contain alluvial deposits. A few wells produce more than 500 gpd, but most are adequate for only minimum domestic requirements.

The availability of groundwater is also influenced by the formation of alluvial areas in surface drainage basins. Large depositions are associated with the Cumberland River and its main tributaries. Areas of silt and clay, combined with sand and gravel, function as groundwater storage aquifers. These aquifers are important resources to the large populations associated with these valleys.

Most wells drilled in valley bottoms of either the Breathitt, Lee, or Post-Lee Formations yield sufficient water for a modern domestic water supply. Wells drilled into Mississippian rock lying below drainage in faulted areas may yield enough water for a small municipality.

Aquifers recharged within the Planning Area are those along faults, such as the Pine Mountain Overthrust, White Mountain, Dorton Branch, and Rocky Face Faults. Additionally, alluvium is recharged within the area.

Groundwater supplies around the City of Pineville are not sufficient to meet the population demands. Low yields have necessitated the development of surface water as an alternative to groundwater supplies.

Groundwater is the major water supply for rural customers in the planning area. In general, the groundwater quality is considered generally good, however, sensitive Karst areas tend to contribute to groundwater pollution incidents from activities such as, spills,

leaking underground storage tanks, waste sites, agricultural and mining runoff, animal feed lots, fertilizer applications, and untreated sewage. The Breathitt Formation yields moderately to extremely hard water with noticeable amounts of iron, whereas Lee and Post-Lee Formations yield water that is soft. Salty water can be obtained at depths over 200 feet.

Before construction of Cannon Reservoir, Pineville obtained its supply from the wells on Pine Mountain.

Typically, pollutants found in groundwater supply include atrazine, alachlor, iron, nitrates, fluoride, benzene, manganese, sulfur, etc.

As a result of the Karst terrain and flood prone areas combination, groundwater intrusion can contribute significantly to surface water flow and quality. Often with high groundwater table and an aging collection system riddled with broken vitrified clay pipe and leaky joints, groundwater infiltration is a major part of the wet-weather flow entering the system. Groundwater infiltration can reduce the sewer lines capacity to carry its intended flow, and can significantly alter the operations at the local WWTP. Groundwater contribution can occupy a significant volume in any given WWTP, can cause an increase in O&M cost to treat the excess flow, and if not handled adequately, can potentially lead to effluent discharge violations due to the hydraulic surcharge.

G. SOILS:

The occurrence of a group of soils, with or without common characteristics, but geographically associated in a repeating pattern, constitutes a soil association. There are four (4) general soil associations within the Planning Area: Shelocta-Jefferson Dekalb, Shelocta-Rock Outcrop, Shelocta-Jefferson-Weikert, and Whitley-Stendal. These soil associations and distributions are depicted in Figure 5, summarized in Table 5.1, and

U.S.G.S. Quadrangle
Pineville, KY

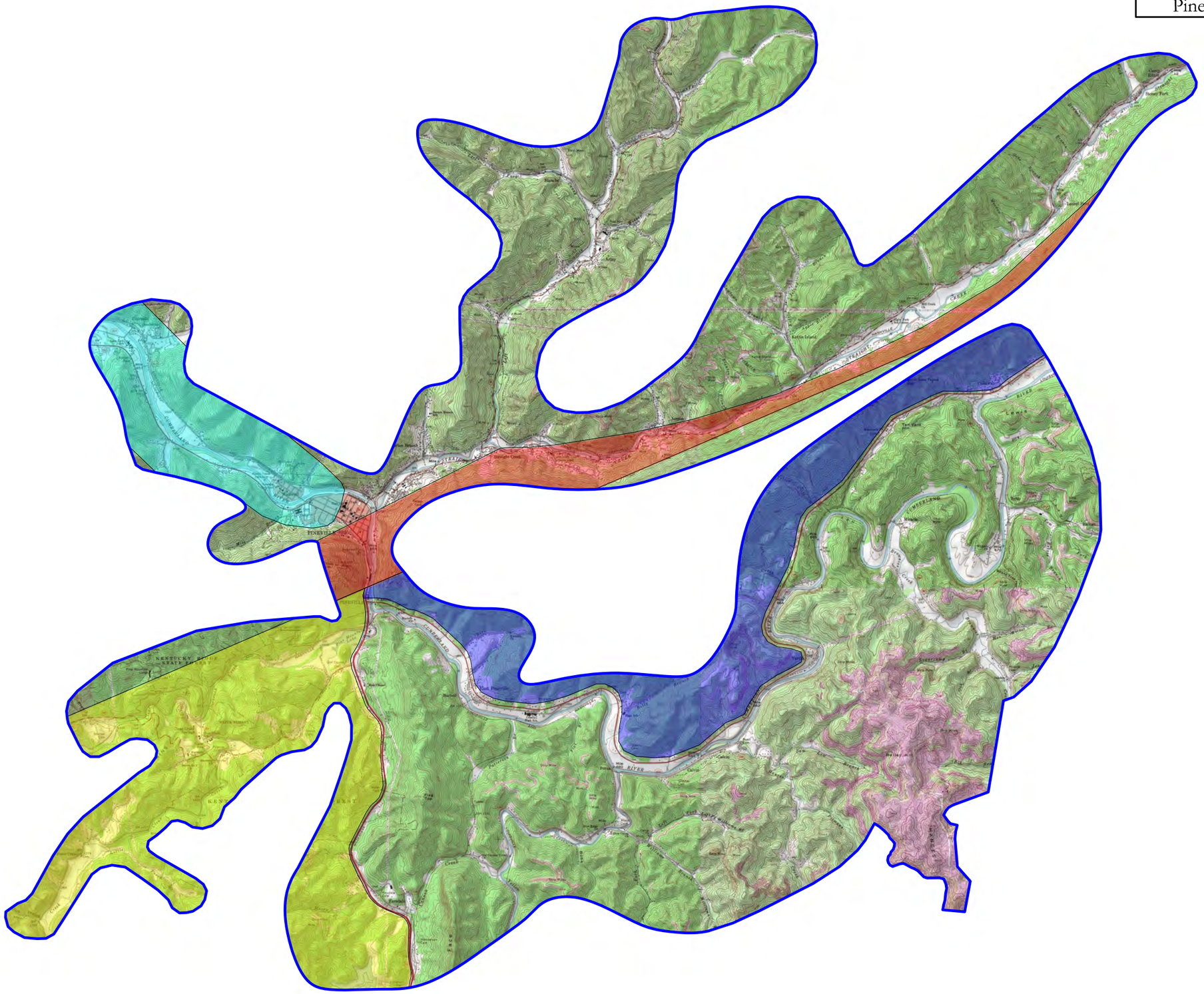

FIGURE 5 - REGIONAL SOIL MAP
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 6000'

LEGEND

- SHELOCTA - JEFFERSON - DEKALB
- SHELOCTA - ROCK OUTCROP
- SHELOCTA - JEFFERSON - WEIKERT
- WHITLEY - STENDAL

Project Number: 11055-00
Date: AUGUST 2014

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described in more detail below. These soils are usually formed on steep slopes from acid sandstone, siltstone or shale, and in most cases, can be classified as shallow soils of low fertility which naturally support hardwood forests. The floodplain soils, Whitley-Stendal, are often deep and level with usually a high water table. These soils are suited for agriculture.

TABLE 5.1

SOIL CHARACTERISTICS WITHIN THE PLANNING AREA

Soil	Slope (%)	Depth to Bedrock (Ft.)	Depth to Seasonal Water Table (Ft.)	Permeability (In./Hr.)	Septic Tank Limitations	Development Limitations
Shelocta	30-60	4	6	0.63-2.0	Severe	Severe
Jefferson	20-50	5	6	2.0-6.3	Severe	Severe
Dekalb	12-30	2	6	6.3	Severe	Severe
Rock Outcrop	Over 75	0	---	---	---	---
Weikert	30-50	1	6	2.0-6.3	Severe	Severe
Whitley	6-12	3	6	0.63-2.0	Slight	Slight
Stendal	0-4	5	1	0.63-2.0	Severe	Severe

The Whitley-Stendahl soil association is alluvial in nature and mainly contains many minor soil groups. The Latham-Shelocta association is most common to the hilly and mountainous regions. Information pertaining to both associations was made available from the U.S. Soil Conservation District and the Bell County Conservation District.

The Latham-Shelocta association consists of steep, deep, well-drained, very stony soils on rough mountainsides. These soils are mainly formed in material from acid sandstone, siltstone, shale, or combinations of all three. Stones and boulders are common, especially along steep drainageways. In some areas they may cover as much as 10% of the surface.

Latham soils have a brown silt loam surface soil and a yellowish-red silty clay subsoil. The substratum is mostly shale with some soil material between the one to three inch flat fragments. These soils are well-drained and are on steep or very steep mountain sides. Slopes may range from 20-60%, but are generally 30-50%. Depths to soft shale and the seasonal water table both exceed four feet.

Shelocta soils are also well-drained and on steep or very steep mountainsides. Slopes may range from 20-60%, but are generally 30-50%. These soils have a brown gravelly silt loam surface soil and a strong brown gravelly silt loam or gravelly silty clay loam subsoil. Depth to sandstone or shale often exceeds three feet, while depth to the seasonal water table usually exceeds six feet. Permeability is often moderate (0.63-2.0 inches per hour).

The Whitley-Stendahl soil association is characterized by gently sloping to sloping, deep, well-drained soils on ridgetops and side slopes, and nearly level, deep, somewhat poorly drained soils on floodplains. These soils are formed in residual or alluvial material from sandstone, siltstone, shale or combinations of all three.

Whitley soils have a brown silt loam surface soil and a yellowish-brown silty clay loam subsoil. These soils are well-drained and include minor areas of Elk and Allegheny soils. Slopes may range from 0-12%, and average 6%. Depth to sandstone exceeds three feet whereas depth to the seasonal water table exceeds six feet. Permeability is moderate (0.63-2.0 inches per hour) and flood hazards are slight.

Stendahl soils are located on nearly level alluvial areas bordering streams. Slopes do not exceed 4%, and soils are poorly drained. Soils are characterized by a brown silt loam surface and a brown silt loam subsoil with gray mottles. Permeability is moderate, although depth to seasonal water table may be only 0.5 to 1.5 feet. The flood hazard of

these soils can be severe at times. Other soils found within these lowlands include the Bonnie, Morehead, Cotaco, Cuba, and Huntington silt loams.

The impact of soil in the collection system is not as severe as in the case of treatment and disposal. Soil characteristics are important and critical when it comes to water dispersion or land application of treated wastewater from a septic tank or an on-site wastewater treatment system. A poorly porous or highly porous area will not be suitable for an on-site disposal field. Thus a fine balance between the soil types shall exist in order to utilize the soil characteristics in treating wastewater in nature and with a high population not served by public sewers. The threat and potential for groundwater and surface water contamination from poorly drained soils can be severe if not taken into consideration.

The Department for Natural Resources and Environmental Protection classifies the entire area as “severely limited for septic tank usage” due to slope, depth to bedrock, or high water table.

The Soil Conservationist and County Health Department report waste disposal problems due to poorly drained Whitley-Stendal soils. Also, the soils in the Straight Creek drainage area are often too shallow for septic tank fields, resulting in groundwater contamination in unsewered areas.

According to the U.S.G.S., a landslide hazard exists for most of the planning area. This hazard is reportedly due to a combination of steeply sloped bedrock, high plasticity in soil and unvegetated slopes from mining or lumbering operations. Eliminating most of the on-site wastewater treatment systems, along with the poorly operated septic tanks and drain fields, is one way to protect the water quality of surface and groundwater sources. Extending public sewer to such areas should be a high priority and shall receive the appropriate consideration.

Poor or unstable soils can present challenges to the construction of collection system appurtenances, due to the poor or unpredictable environment. Careful examination of the underlying areas is often crucial, time consuming, and often costly. Having such previous knowledge will be critical in designing new infrastructure in a more feasible and timely manner.

H. BIOLOGY:

Endangered and threatened species reported in Bell County by the Kentucky Department of Fish & Wildlife include the Indiana Bat, Small-Footed Myotis, Red-Cocked Woodpecker, Bobcat, and Spotted Skunk.

Once a specific project is identified, the impact and vicinity of the project to such species will be further investigated. Since there are no projects with immediate release date, no further action will be taken.

I. ARCHAEOLOGICAL & HISTORICAL:

There are several State Historical sites within the Planning Area. Among the sites include: Burchfield House, Cumberland Ford House, J.J. Gibson House, Marcellus Jordan Moss House, and St. Anthony's Mansion. Currently, there are no Federal Historical sites according to the Federal Register.

Similarly, there are six (6) State Archaeological sites within the Planning Area. Once a new project is identified, the clearinghouse will be contacted to assess the impact of such a project to any nearby Historical or Archaeological resources. Until then, no more work will be conducted.

K. OTHER RESOURCES:

Environmentally sensitive areas worth mentioning here include the Pine Mountain State Park, which borders the 201 Area. The park offers recreational facilities to the area.

No known projects are anticipated within or near this site.

SECTION 6 - EXISTING WASTEWATER SYSTEM:

A. PUBLIC WASTEWATER TREATMENT PLANT:

The Pineville Wastewater Treatment Plant (WWTP) is a 0.72 MGD treatment facility that serves the City of Pineville and parts of its surrounding areas. As of 2014, the facility discharges an average daily flow of 0.70 MGD according to Table C.1, Appendix C. The plant receives raw sanitary wastewater and stormwater runoff from a combined sewer system. Raw wastewater and stormwater enter the plant through a network of force mains and pump stations. A total of 3 pump stations discharge directly into the plant's headworks using the same 12" force main. Currently, there is no gravity flow of raw wastewater entering the plant. Gravity collection exists only in the downtown Pineville area and in certain other areas outside the City Proper. The collection system currently has two (2) permitted, combined sewer overflow structures that periodically discharge overflow to the Cumberland River. The WWTP (Figure 6) consists of a completely mixed aerated lagoon system (extended aeration), headworks, secondary clarifiers, a sludge holding basin, along with other supporting facilities. It is owned and operated by the Pineville Utility Commission. The plant discharges treated effluent into the Cumberland River at River Mile 652.8. The WWTP is in good standing despite running at near full capacity, and is not currently violating or exceeding any of the effluent discharge limits established by the current KPDES Permit (KY 0024058). Refer to the copy of the KPDES permit included in Appendix (A).

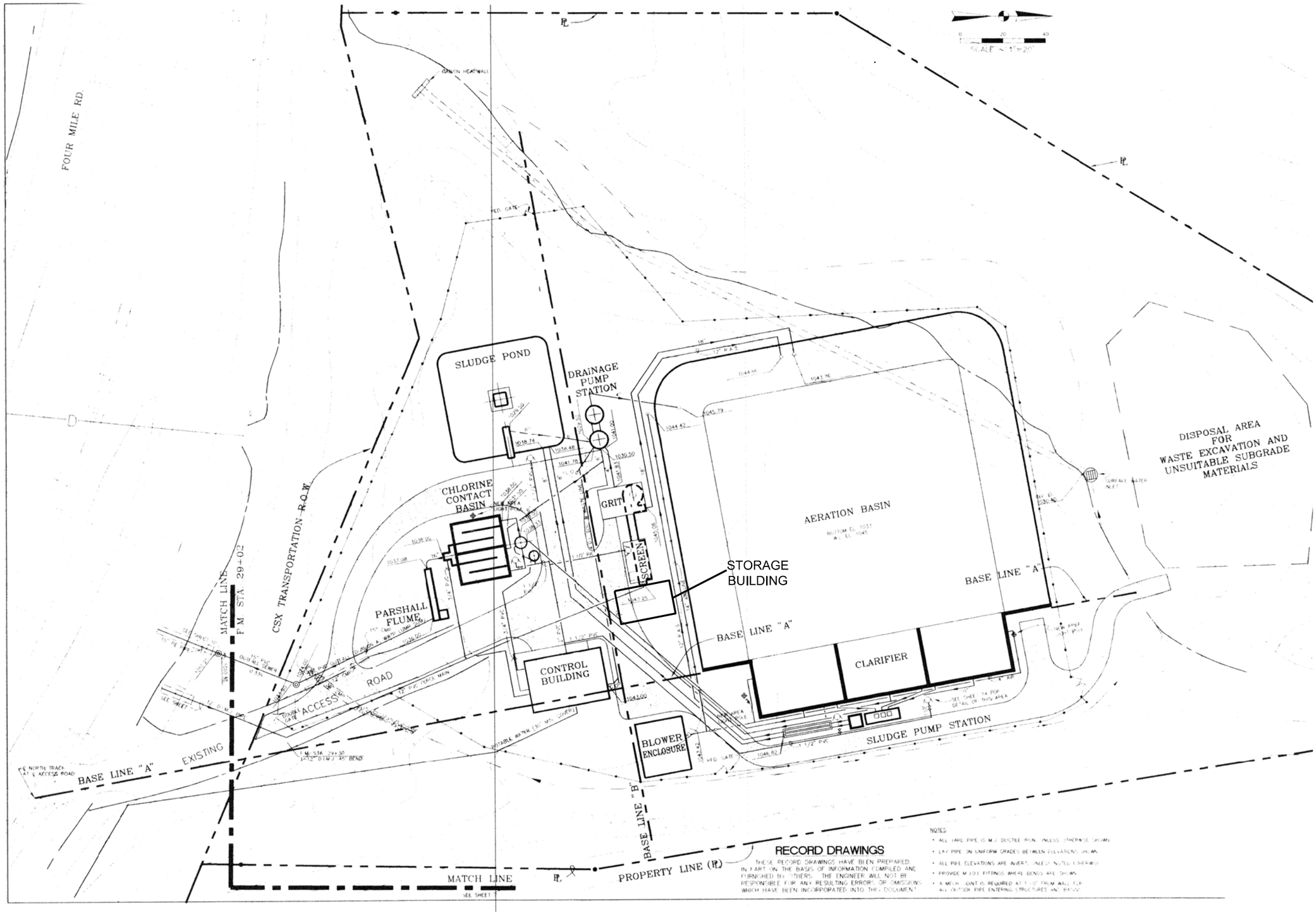

FIGURE 6- EXISTING WWTP SITE LAYOUT PLAN
REGIONAL FACILITIES PLAN
PINERVILLE, KENTUCKY

Project Number: 11055-00
Date: APRIL 2014

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M:\WATER & SEWER\11055-00\WORK\DGN\FIGURES (08-26-2014)\FIG-6- EXISTING WWTP LITE LAYOUT PLAN.DGN

The current flow and wastewater characteristics processed by the plant are as follows:

i. Wastewater Characteristics:

The 2013-2014 average Biochemical Oxygen Demand (BOD_5) strength of the influent wastewater was approximately 260 mg/L while the effluent BOD concentration was approximately 12.0 mg/L. This represents a BOD removal efficiency across the WWTP of more than 95%. The influent BOD strength ranges from approximately 119 mg/L to 809 mg/L. The current average influent BOD concentration is at the upper limit of domestic type wastewater strength (concentrations above 250 mg/L are considered high strength) and below the plant design influent concentration of 300 mg/L.

Similarly, the average Total Suspended Solids (TSS) concentration entering the plant was approximately 406 mg/L in 2013-2014. The average effluent TSS concentration was 19 mg/L. This represents a TSS removal efficiency across the WWTP of more than 95%. The range of influent TSS concentration is from 168 mg/L to 1,530 mg/L. The current average influent TSS concentration of 406 mg/L is currently exceeding the plant's design influent concentration of 300 mg/L, and is considered high strength.

The average ammonia-nitrogen effluent concentration in 2013-2014 was approximately 7.8 mg/L. The range of effluent concentration is from 3.3 mg/L to 17.9 mg/L. The effluent concentration of ammonia is temperature related and as one would expect, it increases during the winter months. The plant does not currently monitor influent ammonia-nitrogen concentration, thus the percent removal is unknown.

The effluent dissolved oxygen (DO) concentration is typically around 7.3 mg/L. There are no records of the raw influent DO concentration.

The average effluent phosphorous concentration is about 1.3 mg/L. The range of effluent phosphorous concentration is from 0.4 mg/L to 4.15 mg/L. The plant does not currently monitor influent phosphorous concentration, thus the percent removal is unknown.

The average effluent total nitrogen concentration is about 9.0 mg/L. The range of effluent total nitrogen concentration is from 3.3 mg/L to 20 mg/L. The plant does not currently monitor influent total nitrogen concentration, thus the percent removal is unknown.

Since the plant receives combined sanitary sewer and stormwater runoff, the above concentrations often reflect the impact of such contribution. One would expect that the "actual" concentration of BOD would be slightly higher than the number reported if the dilution factor from the stormwater runoff was to be eliminated.

Similarly, the concentration of TSS may be "actually" lower than the reported value if the dilution factor from the stormwater was to be eliminated. Such correlation is evident from examining and comparing daily wet and dry weather flows from the monthly operating reports (MORs).

The impact of the "dilution factor" will be further considered in the "Environmental Setting" section of this report, and when the future plant expansion is considered.

ii. Flow Analysis:

The WWTP has an influent and effluent flow meter for monitoring and control purposes. The influent flowmeter is an 8" electromagnetic unit located on a 12" force main just before the plant's headworks. It has been installed in January of 2012. The plant did not have an influent flowmeter before that date. The effluent flowmeter is an ultrasonic unit mounted over a 9" parshall flume located before the outfall line to the Cumberland River.

The effluent flowmeter has been installed and is in service since the plant was built. It was used by the plant all along to record the flow treated by the facility. Since it is the unit with the longest service record, it will be used by this study to characterize the flow magnitude processed by this plant. The average daily recorded flow in 2013-2014 was 0.70 MGD. This value is near the plant's rated capacity and well past the 80% utilization rate. Based on the information recorded on the MOR's, the highest peak daily flow in the last 2-3 years has been as high as 1.8 MGD, while the averaged (over a period of time, in this case from 2013-2014) peak daily flow was approximately 1.2 MGD. Similarly, based on the MOR's, the dry weather daily flow (no rainfall contribution) is typically as low as 0.55 MGD.

The design peak flow capacity of the current plant is 2.8 MGD (1,945 GPM) based on a design peak to average ratio of 3.9.

As noted earlier, the WWTP receives no gravity flow. All raw wastewater comes from the "Main", "OTB", and "Newtown" lift stations. The main lift station has a rated capacity of approximately 2,100 GPM (with all pumps running). The Newtown Pump Station is rated for approximately 400 GPM, while the OTB Station is rated approximately 600 GPM. The estimated theoretical flow that can be experienced when all of the above pump stations operate simultaneously ranges from 300 GPM to 2,500 GPM. When the total force main flow exceeds 1,945 GPM, the hydraulic capacity (and performance in general) of most equipment and unit operations at the WWTP is often exceeded. This is a common problem/occurrence in systems where the influent flow is coming from force mains only, and where the "combined" pump rate exceeds the average plant capacity rating. This occurrence may be periodic in nature, but nevertheless, can leave significant distraction and impact to the normal operations of the system.

The wet-weather contribution is not easy to determine or calculate based on the limited information available. It often depends on the weather, the amount of I/I entering the system, the amount of stormwater contribution, and the amount escaped from the two (2) permitted CSO systems. There are several ways to calculate the wet-weather contribution and will be examined next.

One way to estimate the average wet-weather flow contribution into the plant is to use the Clean Water State Revolving Fund (CWSRF) method which utilizes the average of the 3 highest consecutive monthly average daily flow rates in a given period. Subtracting the average dry weather daily flow from the above averaged number should give you the estimated wet-weather contribution or I/I.

Therefore, based on the data records in Appendix C, the highest consecutive 3 flows in the recent months were 0.986 MGD, 0.919 MGD, and 0.816 MGD recorded in March, April, and May of 2013. The average number of the three is 0.907 MGD.

Therefore, the average I/I contribution is estimated as:

= 0.907 MGD – Average Dry Weather Flow

= 0.907 MGD – 0.55 MGD = 0.357 MGD

Similarly, other methods used to estimate the wet weather flow contribution are as follows:

<u>Method B:</u>

Calendar Year 2013:
Average Wet-Weather Flow Contribution = Averaged Plant Peak Flow – Average Daily Flow (from Exhibit C.1, Appendix C)
= 1.28 MGD – 0.74 MGD
= 0.54 MGD

Method C:

Average Wet-Weather Flow Contribution in 2010 (year chosen to match year of water consumption records) = Average Plant Flow – Average Water Consumption (from Appendix H, Memorandum No. 1)

= 0.55 MGD – 0.214 MGD
= 0.340 MGD

For the purpose of this study, we will consider all 3 methods acceptable and equally valid, therefore the wet-weather flow contribution will be defined to be the average of all 3 methods, or

$$\frac{0.357 \text{ MGD} + 0.54 \text{ MGD} + 0.340 \text{ MGD}}{3}$$

Therefore, Average Wet-Weather Contribution = 0.412 MGD

The 0.412 MGD wet-weather contribution is approximately 58% of the average daily flow, but typical for a combined sewer system.

Without any flow records of the amount of stormwater overflowing from the two (2) permitted CSO systems, one (1) would expect this wet-weather contribution and the total plant influent flow to increase dramatically if the two (2) permitted CSO systems are eliminated without first separating the sanitary and stormwater collection systems. Based on the current utilization of the existing WWTP, this theoretical excess flow won't be able to receive any treatment prior to its release into the river.

iii. System Description:

The WWTP is located at the end of Wallsend Hollow Road, Northwest of Pineville. Refer to the USGS Map (Figure 2) attached for the exact location.

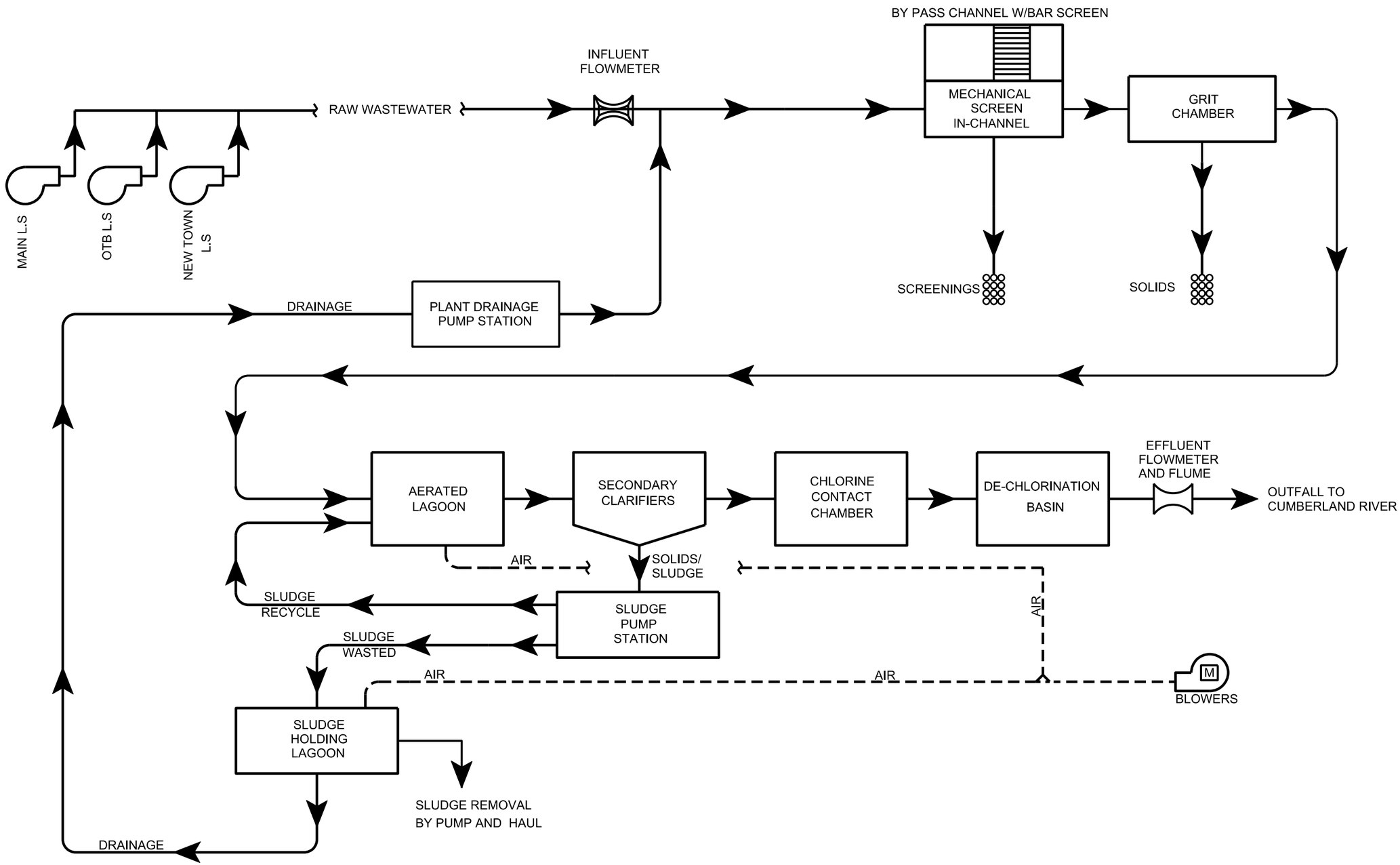
The facility was built in 1992 and consists of secondary treatment type unit operations. The facility receives raw wastewater from Pineville and the surrounding areas.

Raw wastewater is pumped (refer to Figure 7) into the facility via a 12” PVC force main and is discharged into the Headworks structure. The wastewater flows through a mechanical coarse bar screen and then into a vortex type grit chamber before it is discharged into the extended aeration lagoon system (Biolac System, refer to the Biological Lagoon Section in Appendix E). The lagoon system which consists of an earth basin covered with a liner, is equipped with a suspended diffused aeration system to provide aeration and mixing to the mixed liquor. Mixed liquor then flows into three (3) secondary clarifiers that are integrated into the lagoon design.

Clear supernatant overflows into the secondary clarifier weir troughs, and it is then discharged into the chlorine contact basins. Chlorine gas is used for treated wastewater disinfection.

Sulfur dioxide is added to the effluent stream of the chlorine contact basins for de-chlorination. Treated effluent flow is measured and recorded at the effluent parshall flume prior to its release into the Cumberland River.

Other support facilities found at the WWTP site include; the control and laboratory building, the blower building, the sludge holding basin, the gas chlorine and sulfur dioxide equipment and storage rooms, and miscellaneous pump stations within the WWTP site. There are no emergency standby generator sets serving the collection system, thus there is no flow coming into the plant during power outages. If a power outage occurs, wastewater can normally travel by gravity through the plant and slowly discharge into the Cumberland River.



FLOW SCHEMATIC DIAGRAM

EXISTING LAGOON WASTEWATER SYSTEM

FIGURE 7 - CURRENT WWTP PROCESS LINE DIAGRAM
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

Project Number: 11055-00
Date: MAY 2014

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M:\Water & Sewer\11055-00\Work\DGN\Figures (08-26-2014)\FIG-7 Current WWTP Process Line Diagram.dgn

A more detailed description of the existing unit operations is included below:

iv. System Components:

a) Headworks:

The headworks consist of pretreatment type unit operations such as flow measurement recording, screening, and grit removal.

The raw wastewater is discharged via a 12” force main into the headworks channel, and goes through a mechanical coarse bar screen with 1” bar opening space. Coarse material removed by the bar screen is mechanically raked to the top of the concrete channel and is manually removed and disposed into a nearby dumpster by the plant operator. A similar type manual bar screen is available in a “bypass” channel next to the mechanical unit. Screened wastewater travels through the headworks structure and is discharged into a vortex-type grit chamber. The induced velocity profile of the 8’ diameter grit basin promotes settling conditions for the grit to separate and mechanically removed by the grit equipment. Grit material removed by the unit is collected in a dumpster and disposed to the landfill along with the headworks screenings. Neither the mechanical screen, nor the grit handling unit utilize a screenings compactor or classifier, thus the solid material removed appears to contain large volume of moisture. In January 2012, an 8” diameter electromagnetic flow meter was installed on the 12” force main entering the plant.

b) Aerated Lagoon and Secondary Clarifiers:

The extended aeration system is a pre-engineered system as manufactured by Parkson Corporation and called Biolac Biological Treatment System. It consists of a completely mixed aerated lagoon having approximate dimensions (plan view) of 166’ x 142’. The usable water level dimensions are approximately 160’ x 139’ and a side water depth of 12’. The sidewalls of the lagoon are sloped.

The approximate usable volume is 1,600,000 gallons. It consists of 9 suspended air headers equipped with 15 suspended aeration devices per header.

The lagoon has approximately 2’ of a free board. Three (3) secondary clarifiers (rectangular type) are integrated into one side of the lagoon system. A flexible baffle wall is used to create a physical barrier between the aeration lagoon and the clarifier basin. Each clarifier has a 12’ side water depth, and 18’ of total depth. The surface area of each clarifier is approximately 900 ft^2. The clarifier supernatant is collected in a double-sided v-notch weir trough (56’ total length per clarifier) and conveyed into the chlorine contact chamber. The sidewalls of the clarifier are sloped as well.

c) Blower Building & Blowers:

The blower building houses the three (3) positive displacement blowers supplying air to the aerated lagoon basin. Each blower has a 40 HP motor and is rated at approximately 1,000 CFM (Roots Model 711 URAI). All the blowers are connected together to a 14” header discharge line. The blower building is approximately 22’W x 26’L x 12’H and is exposed to the elements on 4-sided open walls. Inlet and discharge silencers, intake filters, and other accessories are available. The three existing blowers appear to be in good working shape.

d) Sludge Storage Basin:

A 45'L x 45'W (usable dimensions) sludge storage lagoon is available. Its designed depth is 12' and has a 2' freeboard. Sludge wasted from the secondary clarifier is fed into the holding basin via an 8" diameter force main. Supernatant from this basin is returned into the aeration basin via the plant drainage pump station. The earth basin is sloped with a 1:1.5 ratio and has an approximate volume of 60,000 gallons. Ultimate sludge disposal is disposed via contract pump and haul operations. Liquid sludge is typically taken to another location (Middlesboro's WWTP) by a pump and haul contractor for further processing. There are no means to process (dewater) liquid sludge at this facility. Aeration is normally provided in the sludge lagoon using a single aspirator unit.

e) Chlorination and Dechlorination System:

Disinfection is provided by using a dual chlorine contact chamber with approximate dimensions of 22' x 28' x 9' SWD (approximate volume 41,469 gallons). Chlorine is fed into the influent box of the chlorine contact chamber. A sulfur dioxide system, similar to the gas chlorine system, is also available for dechlorination at the effluent box of the chlorine basin. The chlorination and dechlorination systems utilize 150 lb. gas cylinders and mechanical, chemical induction units to provide the mixing effect between gas and water.

f) Pumping Systems:

The two (2) pump stations associated with the WWTP operations include; the plant drainage pump station, and the sludge (RAS/WAS) pump station.

a. Plant Drainage Pump Station:

The station is made up of a wet-well, a valve box, and two (2) 125 GPM submersible pumps. The wet-well receives drainage/sludge flow from the chlorine contact chamber, the headworks drains, and the sludge holding lagoon supernatant. It returns the flow to the aerated lagoon.

b. Sludge (RAS/WAS) Pump Station:

The sludge pump station consists of three (3) suction lift Gorman Rupp pumps installed adjacent to the secondary clarifiers. The pumps remove sludge from the clarifiers and send the flow to either the sludge holding lagoon or back to the aerated lagoon. Discharge location is selected manually by the plant operator. Each pump is rated at approximately 330 GPM @ 11' TDH (GR Model T4A3-B, 5 HP).

g) Other Support Facilities:

(i) Effluent Parshall Flume:

There is a 9" parshall flume on the effluent channel to record and monitor treated effluent discharged into the Cumberland River.

(ii) Water Supply System:

Potable water is available.

(iii) Electrical Service:

The facility has 3-phase power, with 240- and 480-volt motors.

(iv) Control Building and Instrumentation

A Control/Lab Building (40’ x 28’) is available. The building houses major instrumentation, laboratory facilities, storage areas, and office space.

v. Unit Operations Rated Capacity:

The following table (Table 6.0) summarizes the rated capacity of the major unit operations in the WWTP. Refer to Appendix C for a copy of the Design Calculations used to rate these facilities under current industry design standards:

TABLE 6.0

RATED CAPACITY SUMMARY (EXISTING WWTP)

Unit Operation	Rated Capacity	Comments
1. Aerated Lagoon	1.3 MGD	Assuming lagoon is free of solids and based on BOD not to exceed 300 mg/L and HRT of 30 hours
2. Secondary Clarifiers	1.1 MGD 2.7 MGD	Based on average flow Based on peak flow
3. Chlorination Contact Basin	1.7 MGD 3.4 MGD	Based on average flow Based on peak flow
4. Blower Capacity	3,000 CFM	Total of 3 blowers
5. Sludge Holding Basin	3 days storage (HRT)	Volume is too small for this plant. Lagoon is undersized.
6. RAS Pumping System	990 GPM	Three pumps running. Meets 150% RAS suggested flow.
7. Grit System	4.0 MGD	Peak flow
8. 9” Effluent Parshall Flume	5.73 MGD	Maximum flow
9. WAS Pumping System	330 GPM	Using one RAS pump as needed.

vi. System Deficiencies and/or Repairs Required:

During the course of the WWTP evaluation, the following deficiencies and plant repairs were identified:

a) Headworks:

- The mechanical screen appears to allow too many floatable and coarse materials to flow through into the downstream basins. Smaller size opening screen is recommended. Large debris often comes in during stormwater events and tends to clog or blind the mechanical screen.
- The screenings removed are usually wet in nature, contribute additional weight (higher disposal and transportation fee), and have high vector attraction potential.
- The rate of incoming flow (instantaneous) is often above the plant's average design rated capacity, and frequently exceeds the hydraulic capacity of the equipment.

b) Grit Chamber:

- Similarly, the grit material removed by the current equipment has a large volume of water, contributing to excess weight and vector attraction potential.

c) Aerated Lagoon:

- Some floating materials were visible.
- High influent flow during wet-weather conditions will periodically wash solids into and out of the secondary clarifiers.
- A RAS flow meter is not available.

- Due to the large size of the lagoon cell, flow short-circuiting is noticeable.
- There was a very high mixed liquor concentration in the lagoon at the time of our visit. Consider wasting sludge more often.

d) Sludge Lagoon:

- Thick crust of algae and floating solids was visible on the surface.
- More frequent solids removal is recommended.
- There is no backup (secondary) sludge holding basin. The sludge lagoon appears to be too small for the needs of this plant.
- There is no sludge removal capability available. The plant operators rely on pump and haul operations to remove sludge from the sludge lagoon.
- The single aspirator unit is not often working, and based on its location, it's hard to reach for day to day operations or maintenance. New aeration system is recommended.
- Based on current plant performance, the sludge lagoon provides only a 3-day storage capability. As a result, excess sludge is repeatedly recycled and stored in the aeration basin, thus the extremely high MLSS concentration buildup in the aeration basin.

e) Blowers and Blower Building:

- The blower capacity appears to be adequate. A spare unit is recommended for redundancy.
- The blower building is open to all four sides (only cover available) and can be very loud at times.

- Due to the high MLSS concentration in the aeration lagoon, more air requirements are needed to keep the content aerobic and well mixed.

f) Secondary Clarifiers:

- Signs of rusted weir plates, troughs, and miscellaneous metals were detected.
- Scum and floating material was visible in the clarifier.
- There are no means to isolate any of the clarifiers for maintenance or repairs.
- Need to investigate better scum removal and ultimate disposal.
- Some algae growth was detected on the tank interior and equipment.

g) Chlorination/Dechlorination Systems:

- System includes one unit of each device. No redundancy is available. Additional systems are recommended.
- Dual chlorinator and sulfonator units with automatic alternators are recommended.
- Draining sludge from the chlorine contact basin back to the aerated lagoon shall not be practiced frequently to avoid potential chlorine inhibition. Sludge should be wasted in the sludge lagoon instead.

h) Pumping Systems:

Plant Drainage Pump Station:

- Means to selectively return plant drainage back to the headworks or the sludge holding basin is not available and needs to be considered.

Sludge Pump Station:

- No flow meter to record RAS or WAS is available.

- No backup pumps are available. A spare unit is recommended.

i) Support Facilities:

(Buildings, Electrical, etc.)

- The Administration Building needs repair (cracked walls, settlement, etc.).
- No standby emergency power is available. A standby generator set is recommended.

vii. Future Growth:

Based on the plant's assessment in terms of service and physical condition, the facility has reached its rated capacity and capability. A plant expansion along with various component upgrades is much needed and overdue. The preliminary size and type of the future plant expansion is covered under Section 8 of this report.

The need for this project is immediate. Due to the long design and construction process usually involved with WWTP expansions, this project needs to be initiated in Phase 1 (1-2 years from now) and extend into Phase 2 (3-10 years) for completion.

B. PACKAGE WASTEWATER TREATMENT PLANTS:

Several school districts, housing complexes, and healthcare facilities located within the planning area are served by individual package sewage treatment plants (point discharges). These point discharges are described below and shown on Figure 8.

i. System Description:

a) Ferndale Apartments (KPDES Permit #KY0078182):

This plant serves the Ferndale Apartment Complex which contains approximately 124 apartment units, just off Highway 25E off Old Ferndale Road. The plant holds a 0.05 MGD discharge permit.

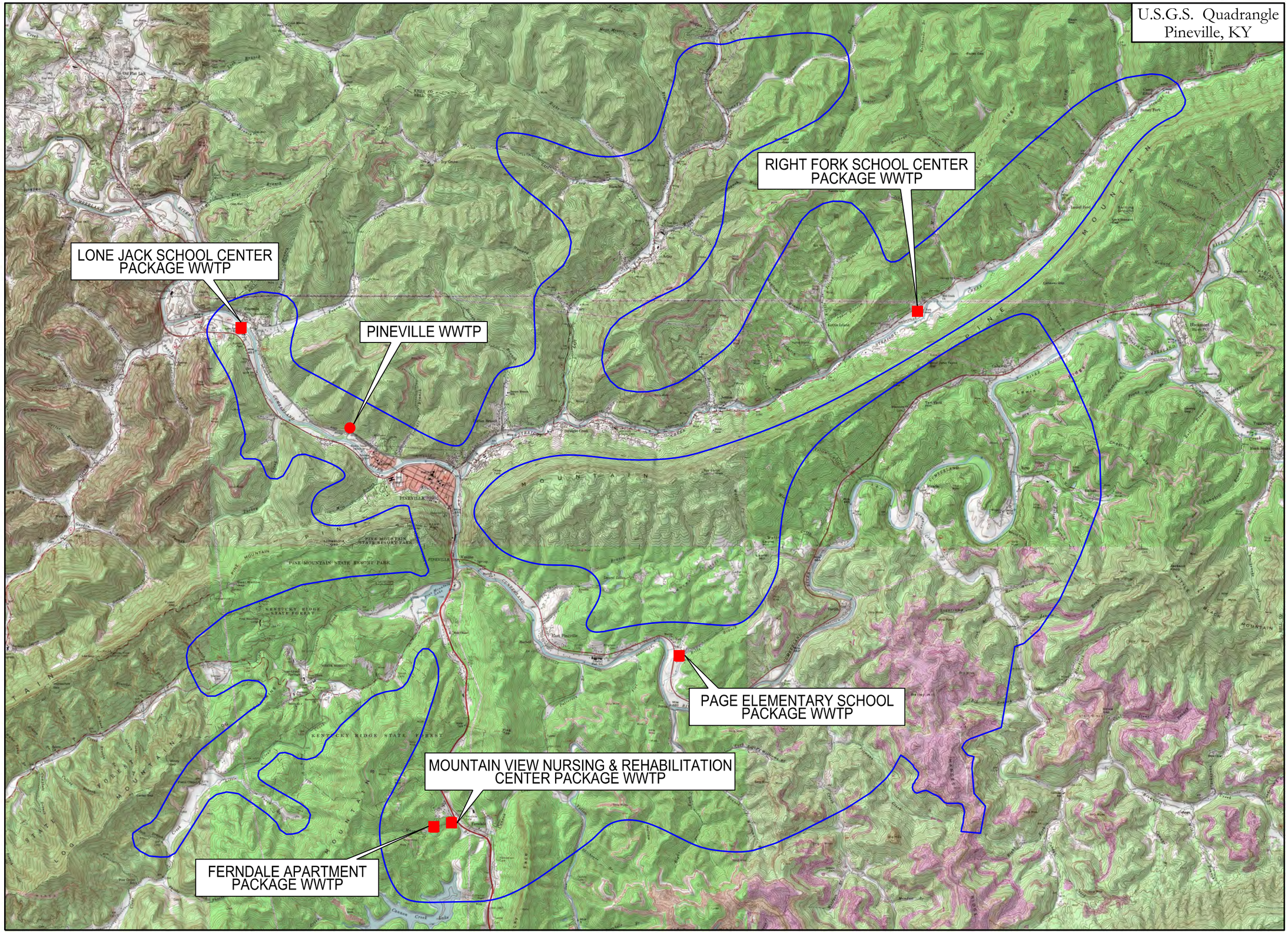

FIGURE 8 - EXISTING POINT DISCHARGES REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 6000'

LEGEND

- PLANNING AREA BOUNDARY
- PINEVILLE WWTP
- PACKAGE WASTE WATER TREATMENT PLANT

Project Number: 11055-00
Date: AUGUST 2014

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b) Mountain View Nursing & Rehabilitation Center (KPDES Permit #KY0042218):

This plant serves a 122-bed health care facility and holds a 0.021 MGD discharge permit.

c) Page Elementary School (KPDES Permit #KY0073920):

This plant serves an elementary school just off State Highway 119 and holds a discharge permit of 0.006 MGD.

d) Right Fork School Center (KPDES Permit #KY0073946):

This plant serves a school just off State Highway 221 and holds a discharge permit of 0.005 MGD.

e) Lone Jack School Center (KPDES Permit #KY0096164):

This plant serves a school just off US 25E and holds a discharge permit of 0.001 MGD.

ii. System Deficiencies/Repairs Required:

Each of the listed package treatment plants is privately owned and operated. The physical condition or performance status of these facilities is not known. Therefore, the implementation of any repair action is the responsibility of the package plant owner and the Kentucky Department of Environmental Protection. Extending public sewer to these locations and eliminating privately owned package plants will be advantageous to the local residents and in favor of the Pineville Utility Commission.

C. COLLECTION AND CONVEYANCE SYSTEM:

i. General:

The areas served by the sewer system include the downtown business district of the City as well as the residential area surrounding the business district, the Dorton Branch community, the U.S. 25-E corridor throughout the Pineville City Limits boundary, Clear Creek/Highway 190, Wallsend, Ridgewood Circle, and the Log Mountain and Newtown Communities.

Over half of the collection system is more than 50 years old, and some of which is clay pipe that needs to be replaced.

In general, the collection system consists of gravity lines, force mains, sanitary sewer manholes, pump stations, air release valves, and other such sewer appurtenances.

Gravity lines vary in size from 6” to 18”. Most lines are made of clay. Some PVC and ductile iron pipe is also used.

Force mains are found from 4” to 12” in size. They are mostly PVC with some portions of ductile iron.

The sanitary sewer manholes are typically 4’ in diameter and are made of precast concrete or brick and mortar in some cases.

The pump station infrastructure is further described in another part of this section.

ii. Flow Composition and Breakdown:

The current system consists of approximately 81,000 LF of gravity lines, 30,000 LF of force main, and 13 sanitary lift stations that serve this area. The pump sizes vary from 75 GPM to 1200 GPM. Approximately 845 sewer customers are served by this collection and conveyance system. There are approximately 717 residential customers and 128 commercial/institutional customers. According to the sanitary sewer usage breakdown (Appendix H), approximately 45% of the wastewater is generated from residential sources and 55% from commercial/institutional sources.

Based on the current average flow of 0.70 MGD and based on 45% residential usage, the average flow per residential customer is:

$$\frac{0.45 \times 700{,}000 \text{ GPD}}{717 \text{ Residential Customers}} = 439 \text{ GPD/Customer}$$

Similarly, if we consider the current population of 2,050 people and based on 45% residential usage, the average per capita rate:

$$= \frac{0.45 \times 700{,}000 \text{ GPD}}{2{,}050 \text{ People}} = 154 \text{ GPD/Capita}$$

Comparing the above two usage rates to typical planning standards of 350 GPD/customer and 70 GPD/capita respectively, one can detect that the system is taxed with higher than typical wet-weather flow from infiltration/inflow and stormwater contribution.

iii. I&I Contribution and Sewer Rehabilitation:

The collection system at Log Mountain, Highway 190 (including Clear Creek and the Pine Mountain State Park), Dorton Branch, Newtown, and Kentucky Avenue (from Flocoe to McDonalds Pump Station) is new with relatively new PVC pipe. The rest of the collection system in downtown Pineville and Wallsend areas is made up of old clay pipe.

Based on the previously estimated customer usage rates, the collection system is currently experiencing significant infiltration/inflow. The extent of the "true" I/I contribution is not yet identified due to the impact of the stormwater contribution from the combined sewer system.

Based on the City's records, not much effort has been devoted to identify or quantify true I/I, since most of the effort is recently devoted to separating the stormwater system from the sanitary part, and in potentially eliminating the two permitted CSO systems.

Future projects may involve purchasing videography equipment to conduct sewer line inspections, and conducting regional flow studies to identify and quantify I/I contributions.

The timeframe for this potential work is tentatively scheduled for Phase 2 (3-10 years) and Phase 3 (11-20 years). Repairs to previously identified I/I work will be scheduled accordingly based on the severity of the problem and funding available. Some of this work may be combined with ongoing stormwater separation due to the nature of the work.

iv. Stormwater Contribution and Rehabilitation:

The majority of the downtown Pineville area is served by a combined sewer system. This combined sewer system serves approximately 450 residential/commercial customers.

The combined sewer system contains two permitted combined sewer overflows (CSOs).

Neither overflow structure has a flowmeter, thus the quantity or frequency of overflow to the Cumberland River is unknown (undocumented).

As a result, the extent of the "true" stormwater contribution to the downtown collection system and receiving wastewater treatment plant is not clearly identified.

One CSO is located near the Ballpark Pump Station and one near the McDonalds (Mountain View) Pump Station. Refer to Figure 9 for the approximate location of these two (2) permitted overflows. A flow monitoring and inspection study conducted in 2011 identified significant flows in the combined sewer system along Virginia Avenue. A previously completed project in the Kentucky Avenue area was completed in 2010 that separated significant portions of the stormwater and sanitary sewer flows.

Planning is underway to try to eliminate the two remaining permitted overflows from the collection system. Removing the two overflows (without separating the stormwater and sanitary sewer systems) and allowing the combined sewer flow to reach the

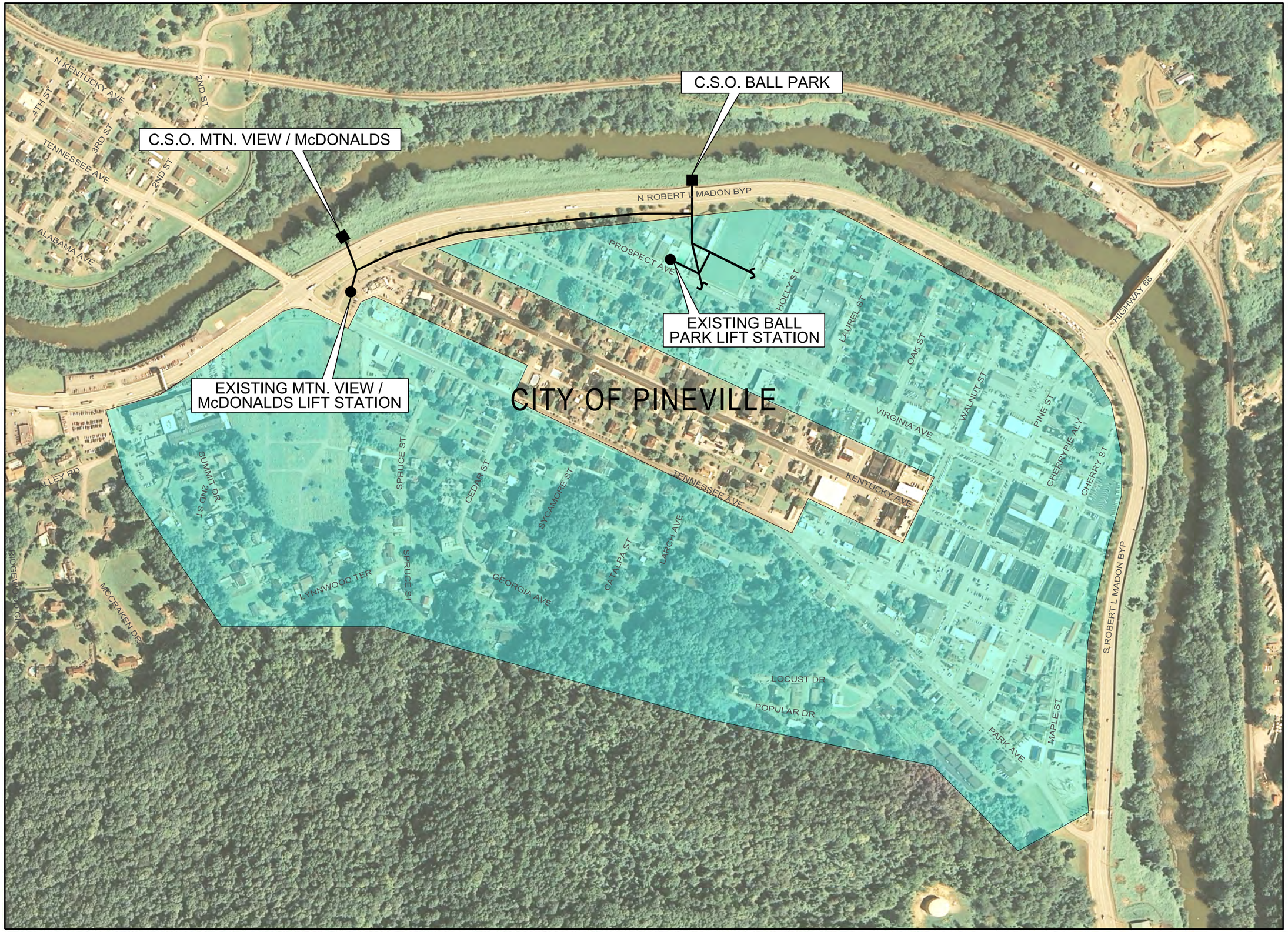

FIGURE 9 - PERMITTED COMBINED SEWER OVERFLOWS REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 400'

LEGEND

- COMBINED SEWER SYSTEM
- COMBINED SEWER OVERFLOW
- LIFT STATION

Project Number: 11055-00
Date: AUGUST 2014

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rest of the collection system and WWTP, will be detrimental to both systems due to the high volume of wet-weather flow.

A step wise and long term plan to separate the sanitary and stormwater systems in downtown Pineville, followed by CSO eliminations, is the preferred and ideal approach. The following is a list of potential projects to separate the City's combined sewer system, and to eliminate the two (2) CSO structures.

Future Projects:

- Separate the existing combined sewer along Virginia Avenue from Mountain View Avenue to the intersection of Holly Street, as well as along Holly Street and Prospect Avenue near the City Pool. Separate the sanitary sewer from the 25E storm drain system and direct it into the Ballpark Pump Station.
- Separate sewers along the rest of Virginia Ave and joining streets Laurel, Oak, Walnut, Pine and Cherry Street. Eliminate odor issue near Courthouse Square, especially corner of Pine Street and Virginia Avenue (First State Financial).
- Separate sewers along Tennessee and Park Ave and joining streets.
- Separate sewers along Spruce Street, Horseshoe Drive, and South of Tennessee Ave along Cedar and Catalpa Street.
- Eliminate CSO @ Ball Park Pump Station.
- Eliminate CSO @ McDonalds (Mountain View) Pump Station.

Due to the nature and cost of the work identified above, the proposed work will be tentatively scheduled for Phase 1 (1-2 years) and Phase 2 (3-10 years).

v. Pump Stations:

The force main system includes approximately 30,000 LF of force mains and 13 sanitary pump stations. The majority of the lift stations are submersible type lift stations

utilizing a wet-well and a valve box. The majority of pump stations appear to be handling the current flow without any overflows; however, several pumps and equipment have reached their design life expectancy and will need to be replaced/upgraded soon. The pump stations that receive stormwater contribution see a large variation of incoming flow rates and see a fairly large volume of debris. Debris is responsible for buildup in some of the wet-wells and force mains. This results in reduced volume and transfer capacity.

This extra volume of flow and debris is ultimately transferred to the WWTP or captured (debris) in the pump station wet-wells along the way. Refer to Table 6.1 and Appendix K (photo gallery) for a list of observations and system evaluation based on a recent lift station evaluation survey.

The force mains range in size from 4" to 12" in diameter. Materials available include PVC and ductile iron.

Similarly, pump station wet-wells are mostly out of concrete. A couple of "can" type (steel tanks), wet-wells are in operation.

Based on the pump station evaluation process, a tentative list of pump station projects has been formulated for future Phase 1 (1-2 years) and Phase 2 (3-10 years):

1) Replacement or upgrades to the KFC Pump Station (Phase 1).
2) Replace pumps and control cabinet, install plug and check valves in a valve box at Bell High Pump Station (Phase 1).
3) Upgrade/replace McDonalds (Mountain View) Pump Station (Phase 1).
4) Upgrade/replace Lake Mistake Pump Station (Phase 1).
5) Upgrade/replace Ball Field Park Pump Station (Phase 1).
6) Replace pumps and controls at the Clear Creek Day Care Pump Station (Phase 1).

TABLE 6.1 PUMP STATION EVALUATIONS

STATION ID	STATION NAME	STATION LOCATION	NUMBER OF PUMPS	PUMP SIZE (HP)	PUMP BRAND	CAPACITY (GPM)	VFD's	OBSERVATIONS	HYDRAULIC PERFORMANCE RATING	CORRECTIVE ACTION NEEDED	ACTION TIME PERIOD	LAT/LONG
1	BALL FIELD	Bill Adams Drive	2	5 HP	Myers	225± GPM	NO	Pumps cannot keep up with flow.	POOR	ENLARGE CAPACITY	0-2 YRS.	83°42'0.843"W 36°45'53.923"N
2	MCDONALD'S	Mt. View at Tennessee Avenue	2	15 HP	Myers	350± GPM	NO	Steps bad, no retainage time, control panel needs to be replaced.	POOR	ENLARGE CAPACITY	0-2 YRS.	83°42'17.931"W 36°45'51.534"N
3	KFC STATION	Cherry Street	1	1 HP	Myers	75± GPM	NO	Bad guide rails, check valves, piping, steps, air vent, no spare pump.	POOR	OVERHAUL OR REPLACE	0-2 YRS.	83°41'35.296"W 36°45'42.412"N
4	DORTON BRANCH	Dorton Branch at RR Tracks	2	4.7 HP	ABS	340± GPM	YES	Built in 2008. No problems noted.	GOOD	NONE	11-20 YRS.	83°40'55.40"W 36°46'17.41"N
5	NEWTOWN	Hwy 66 at Jones Ave	2	40 HP	ABS	400± GPM	YES	Built in 2008. No problems noted.	GOOD	NONE	11-20 YRS.	83°41'20.783"W 36°45'54.444"N
6	OFF TRACK BETTING (OTB)	Hwy 25E at Park Ave	2	70 HP	ABS	600± GPM	YES	Station 2+ years old. No problems noted	GOOD	NONE	11-20 YRS.	83°41'35.719"W 36°45'23.569"N
7	LAKE MISTAKE	Hwy 25E at Harbell Road	2	7.5 HP	Myers	200+ GPM	NO	Wetwell in need of total rehab. Valve vault ok.	GOOD	LARGER WETWELL	0-2 YRS.	83°41'37.404"W 36°44'29.417"N
8	CLEAR CREEK LODGE	Hwy 1491 at Clear Creek Bible School	2	25 HP	Myers	400+ GPM	NO	Station in good mech shape, rebuilt in 2009. Needs fencing.	GOOD	NEW FENCE	3-10 YRS.	83°43'38.661"W 36°43'37.743"N
9	CLEAR CREEK DAYCARE	Day Care at Clear Creek Bible School	2	7.5 HP	Myers Grinder	Not Currently Available	NO	Water level high	POOR	REPLACE GRINDER PUMPS WITH NON-CLOG	0-2 YRS.	83°43'36.631"W 36°43'28.119"N
10	CLEAR CREEK APTS.	Hwy 190 at Clear Creek Bible School	2	2.5 HP	Myers Grinder	Not Currently Available	NO	Guide rail mounts need replaced. 110V power supply available. Need 3 phase power.	SATISFACTORY	REPLACE GRINDER PUMPS WITH NON-CLOG (3 PHASE). NEW CONTROLS.	3-10 YRS.	83°43'47.142"W 36°43'26.48"N
11	GOLF COURSE	Hwy 190 at PMSP Golf Course	2	2.5 HP	Myers Grinder	Not Currently Available	NO	Guide rail mounts need replaced. 240V single phase available. Need 3 phase power.	SATISFACTORY	REPLACE GRINDER PUMPS WITH NON-CLOG (3 PHASE). NEW CONTROLS.	3-10 YRS.	83°42'4.402" W 36°44'6.328"N

TABLE 6.1 PUMP STATION EVALUATIONS (CONTINUED)

STATION ID	STATION NAME	STATION LOCATION	NUMBER OF PUMPS	PUMP SIZE (HP)	PUMP BRAND	CAPACITY (GPM)	VFD's	OBSERVATIONS	HYDRAULIC PERFORMANCE RATING	CORRECTIVE ACTION NEEDED	ACTION TIME PERIOD	LAT/LONG
12	BELL HIGH	Bell High School	1	15 HP	Peabody & Barnes	Not Currently Available	NO	Needs complete rehab from control cabinet to pumps. No valve pit. No spare pump.	POOR	REHAB - LARGE CAPACITY	0-2 YRS.	83°41'29.688"W 36°42'48.95"N
13	MAIN PUMP STATION	Wallsend at Sixth Street	4	3 at 47 HP 1 at 20 HP	Flygt	1000 GPM 600 GPM	NO	Guide rails need rehab. Says pump needed in valve pit. No flowmeter.	GOOD	NEW GUIDERAILS. STRUDLY GENERATOR SET. FLOWMETER VFDs/CONTROLS	3-10 YRS.	83°42'42.634"W 36°45'59.578"N

7) Add fence to the Clear Creek Lodge Pump Station (Phase 2).

8) Replace electrical service, pumps, guide rails, controls at Clear Creek Apartments Pump Station (Phase 2).

9) Replace electrical service, pumps, guide rails, controls at the Golf Course Pump Station (Phase 2).

10) Add new guiderails, controls, VFDs, flowmeter, and standby generator set to the Main Lift station (Phase 2).

Additional pump station projects to be accounted during Phase 3 include:

1) Dorton Branch Upgrades/Rehabilitation;

2) Newtown Upgrades/Rehabilitation;

3) Off Track Upgrades/Rehabilitation.

Note: The off-track pump station may be moved to Phase 2 if the industrial park development is accelerated. See explanation elsewhere in this report.

vi. Future Growth Areas:

Based on general anticipated population projections and the projected planning area modifications, the collection system can potentially grow significantly in size over the next 20 years.

A list of potential sanitary sewer line extensions within the Planning Area is identified and described below:

1) Ferndale area line extension (including elimination of Mountain View Nursing and Ferndale Apts. package plants) (148 customers expected during Phase 3).

2) Turkey Creek line extension (including Patterson-Slusher Road (formerly, John Ore Road) and Lovell Lane (formerly H&B Partin Lane) (40 customers expected during Phase 3).

3) State Highway 119 Corridor to Page School area, line extension (200 customers expected during Phase 3). (The elimination of Page Elementary School package plant may be considered also. Such additional treatment/conveyance capacity has not been considered in this report).

4) Pine Mountain Regional Industrial Authority's (PMRIA-Asher) Industrial Park and line extension (453 acres of land expected during Phase 3).

5) Walnut Lane Area line extension (12 customers expected during Phase 3).

D. OPERATION & MAINTENANCE:

The operation and maintenance of the existing infrastructure is an ongoing battle for every utility and staff member. Some of the major issues are described below as it applies to the WWTP facility and to the collection system.

The WWTP facility operates in an extended aeration mode. The facility has demonstrated the capability to handle the average rated design flow and the periodic peak design flow rate. The instantaneous flow rate for the average design flow of 0.72 MGD would be approximately 500 GPM. Similarly, the instantaneous flow for the peak design flow rate would be 2.8 MGD or approximately 1,945 GPM.

Since the plant receives only pumped wastewater from a number of lift stations (range 300 GPM to 2,500 GPM) in the collection system, the incoming flow rate is often above the average plant design flow. Similarly, on many occasions, the plant design peak flow capacity is also exceeded.

The constant push of equipment and unit operations to operate at or above their "design" rated capacity is causing excessive wear on components, and makes electrical/mechanical parts draw more electrical power than usual. Such erratic loading behavior often decreases the plant's overall performance and creates unpredictable effluent

quality. A relatively steady flow pattern without the lows and peaks is more ideal for the operation of most biological systems.

Some of the plant O&M issues, as previously described, include lack of equipment redundancy, ineffective screening of solids, inadequate sludge handling facilities, inability to isolate and do maintenance and repairs to the existing secondary clarifiers, and lack of secondary power from secondary feed or through a standby generator set.

Similarly, the collection system is faced with significant stormwater contribution, I/I problems, along with an aging pump station inventory. Most of the mechanical units have passed or are approaching their life expectancy and will soon need to be replaced. Electrical upgrades in some of the existing lift stations are also something that will need to be addressed.

Bringing some of these pump stations to current standards and maintaining the current WWTP under compliance will be a tough challenge for the O&M personnel during the next few years. A proactive approach of performing system maintenance on an annual basis along with a good monitoring and recording program is strongly recommended.

The combined sewer system presents many challenges to the system. Operation and maintenance issues like dilution of wastewater strength, high concentration of suspended solids, introduction of large size debris into the collection system, and high peak flow rates; are a few of the problems associated with combined sewers.

The dilution effect is brought about when stormwater is introduced into the sanitary sewer stream. The combination of the two alters the flow rate and concentration of pollutants in the waste stream. These fluctuating flows and concentrations tend to present problems to the WWTP operations. As a result, more resources are spent to combat these types of problems. Resources may involve: higher solids production at the plant, more

power consumption to convey the stormwater flows, higher recycle rates to supply enough BOD to the otherwise weak influent BOD, clogging of mechanical equipment with large size debris, etc. Separating the combined sewer system to dedicated stormwater and sanitary sewer collection systems will be the ideal solution. In the meantime, and while the Utility is working to achieve such a goal, there may be other short-term solutions that may be utilized to relieve some of the current problems.

Adding coarse bar screens to the major pump stations feeding the WWTP should be considered if the stormwater separation project is discontinued. This solution will eliminate clogging of downstream equipment and sewers/force mains from happening at such a high frequency.

Consideration may also be given to the use of surge basins at some of the large pump stations receiving stormwater contribution. This solution will help system hydraulics and will provide a more uniform flow pattern over the course of the day, may help stabilize the dilution effect with high and low concentrations, and could potentially eliminate some sewer overflows.

Dealing with large size and volume of debris, along with excessive flows at some of the pump stations will be eliminated or reduced once the stormwater system is separated from the sanitary sewer system in the downtown areas.

The operation and maintenance staff includes the chief plant operator and three (3) workers that help with the wastewater treatment plant and collection system operations.

As with every other “growing” system, the manpower and equipment resources will need to be revisited on a frequent basis to assess the potential of keeping up with ongoing problems and system needs. The management as such, will need to be proactive in forecasting such needs and to budget for staffing needs and equipment purchases.

Implementation and enforcement of various management and operational procedures, such as the ones required by the current consent judgement, should become a priority for the Utility. Such plans will keep the Utility in compliance and create the backbone/structure for long term sustainability.

SECTION 7 - FORECASTS OF FLOW & WASTE LOADS IN THE PLANNING AREA

A. FUTURE SYSTEM REQUIREMENTS:

The following calculations illustrate the steps and design criteria used to establish future design flows for the three design phases (periods) established previously. These design flows apply mainly to the WWTP and its future development. The growth and development of individual sewer collection areas, or pump stations, will need to be handled separately, and on a case-by-case scenario, as the need arises, and over time.

The design flow for each period will be computed based on the summation of:

The current average flow, the future residential contribution, the future commercial flow, the future industrial flow, and the future non-excessive I/I flow.

i) Average flow, current:

The current average flow is estimated to be 0.70 MGD based on the plant information provided in Appendix C.

ii) Establish Future Residential Contribution:

a) Assuming population growth correlates to future customers, the future growth during the next 20 years will include contributions from population growth within the current service area along with known or projected, proposed infrastructure projects within the future planning area.

- Population growth for Phase 1 = 0 units (refer to Table 4.2)

  Therefore, assuming the industry standard 70 GPD/capita for future residents

  Estimated flow contribution = 0 units x 70 GPD/capita = 0 GPD

- Similarly for Phase 2,

  Estimated flow contribution = 70 GPD/capita x 0 units = 0 GPD

- Similarly, for Phase 3

  Estimated flow contribution = 70 GPD/capita x 0 units = 0 GPD

b) Future residential development in the next 20 years is estimated to be 400 customers according to the Utility.

The future development in the immediate area was estimated based on the following assumptions:

Potential Future Growth Areas:

Ferndale Area	=	148 Homes (Phase 3)
Turkey Creek/Lovell Lane Area	=	40 Homes (Phase 3)
Highway 119 to Page School Area	=	200 Homes (Phase 3)
Walnut Lane Area	=	12 Homes (Phase 3)
Total Estimate:	=	400 Units

Due to the limited plant capacity, no new homes will be served during Phase 1. For design and planning purposes, it is estimated that approximately 60 new homes (out of the projected 400 or so homes) may be constructed/served in Phase 2, and the remaining 340 homes will be built in Phase 3. Any new sewer service will need to come following the plant expansion. Therefore, the estimated flow contribution based on the industry standard 350 GPD/household, including some minor I/I contribution will be:

Phase 1 = 0 Homes x 350 GPD/Home = 0 GPD

Phase 2 = 60 Homes x 350 GPD/Home = 21,000 GPD

Phase 3 = 340 Homes x 350 GPD/Home = 119,000 GPD

Therefore, future residential flows to be used by the master plan study are as follows:

Phase 1 = 0 + 0	=	0 GPD
Phase 2 = 0 + 21,000	=	21,000 GPD
Phase 3 = 0 + 119,000	=	119,000 GPD
Total	=	140,000 GPD

iii) Establish Future Commercial and Institutional Flow: The commercial and institutional portion will be based on the following breakdown:

- Nursing Home Contribution:
  75 Beds x 100 GPD/Bed = 7,500 GPD
- School Contribution:
  700 Students x 35 GPD/Student = 24,500 GPD
- Motel Contribution:
  100 Rooms x 100 GPD/Room = 10,000 GPD
- Restaurant(s) Contribution:
  200 Seats x 35 Gal/Seat = 7,000 GPD
- Retail Stores Contribution:
  100,000 Ft^2 x 100 GPD/1,000 Ft^2 = 10,000 GPD

Subtotal = 59,000 GPD

Total Future Commercial & Institutional Flow = 59,000 GPD

Similarly, assume 20% of the future commercial and institutional customers will be developed during Phase 2. Phase 3 will handle the remaining portion.

Phase 1 = 0 x 59,000 GPD	=	0 GPD
Phase 2 = 0.2 x 59,000 GPD	=	11,800 GPD
Phase 3 = 0.8 x 59,000 GPD	=	47,200 GPD
Total	=	59,000 GPD

iv) Establish Future Industrial Flow: The industrial portion will be based on the development of the Asher PMRIA Industrial Park which plans to develop an area of approximately 453 acres of light duty industrial services. Utilizing an estimated flow of 1,000 gals/acre, for medium to light industrial users, this park can potentially generate, 453 acres x 1,000 gal/acre = 453,000 GPD (average flow). Since this park development is still in the developing stages, and without any known industrial users in mind, it will be assumed that only a small portion of this park will be utilized during the 20-year study period. As such, we will assume that approximately 20% of this park will be developed in Phases 2 and 3 of this study. The remaining portion (80%) will be developed outside the 20-year period and beyond the scope of this report.

Therefore, assume Phase 2 will see 10% development, with the other 10% coming in Phase 3 respectively.

Phase 2 = 0.1 x 453,000 GPD	=	45,300 GPD
Phase 3 = 0.1 x 453,000 GPD	=	45,300 GPD
Total	=	90,000 GPD

Therefore, the future growth projections from residential, commercial, and industrial sectors will be:

Phase 1 = 0 GPD + 0 GPD + 0 GPD	=	0 GPD
Phase 2 = 21,000 GPD + 11,800 GPD + 45,300 GPD	=	78,100 GPD
Phase 3 = 119,000 GPD + 47,200 GPD + 45,300 GPD	=	211,500 GPD
Total	=	289,600 GPD

v) Establish Future Non-Excessive I/I Contribution Flow:

It was determined previously that the wet-weather contribution rate (due to I/I and stormwater) in the existing system was approximately 58 percent of the current average flow.

This is somehow excessive flow for the size of this system; therefore, for estimating purposes, we will use an allowable rate not to exceed 20% of the future flow.

For estimating purposes, we will assume I&I contribution to be:

Phase 1: 0.2 x 0 GPD = 0 GPD

Similarly, Phase 2: 0.2 x 78,100 GPD = 15,620 GPD

Phase 3: 0.2 x 211,500 GPD = 42,300 GPD

vi) Establish Reserve Capacity: Allow 25% of the estimated future growth flow for additional reserve capacity due to unforeseen conditions,

i.e. Phase 1 Reserve Capacity Contribution = 0.25 x 0 GPD = 0 GPD

Phase 2 Reserve Capacity Contribution = 0.25 x 78,100 GPD = 19,525 GPD

Phase 3 Reserve Capacity Contribution = 0.25 x 211,500 GPD = 52,875 GPD

Establish Future Design Flows:

Phase 1 = 700,000 GPD + 0 GPD + 0 GPD + 0 GPD

= 700,000 GPD

Similarly, Phase 2 = 700,000 GPD + 78,100 GPD + 15,620 GPD + 19,525 GPD

= 813,245 GPD

Similarly, Phase 3 = 813,245 GPD + 211,500 GPD + 42,300 GPD + 52,875 GPD

= 1,119,920 GPD

Therefore, for design purposes, we will assume a future WWTP average daily capacity of 1.2 MGD will meet the needs of this system during the next 20 years.

B. WASTE LOAD ALLOCATION (WLA):

Based on the existing infrastructure and the projected growth in the planning area, Waste Load Allocation (WLA) information was requested for the projected planning growth of the area and was utilized in preparing this report. The preliminary planning limits as established by the Kentucky Division of Water are summarized below. A copy of the official letter is included in Appendix H.

The planning limits requested were for the 20-year plan option and for a 1.2 MGD average daily flow WWTP.

1) WWTP Influent Design Criteria Justification:

BOD =	350 mg/L
TSS =	450 mg/L
Alkalinity =	100 mg/L
Total Phosphorous =	9.0 mg/L
Peak/Average Flow Ratio =	3.7
Peak Design Flow =	1.2 MGD x 3.7 = 4.5 MGD
pH =	6-8
TKN =	40 mg/L
Ammonia-Nitrogen =	30 mg/L

2) WWTP Effluent Design Limits:

a. Current NPDES Permit and Future WLA Limits:

BOD Concentration =	30 mg/L (monthly average)
TSS Concentration =	30 mg/L (monthly average)
Ammonia-Nitrogen Concentration =	20 mg/L (monthly average)
Dissolved Oxygen =	2.0 mg/L
pH =	6-9
Ecoli Bacteria, #/100 ml =	130
Total Phosphorous	Monitor
Total Nitrogen	Monitor

b. New WWTP Effluent Design Criteria:

BOD Concentration =	20 mg/L
TSS Concentration =	20 mg/L
Ammonia-Nitrogen Concentration =	5.0 mg/L
Dissolved Oxygen =	3.0 mg/L
pH =	6-9
Total Nitrogen =	10 mg/L
Total Phosphorous =	2.0 mg/L
Ecoli Bacteria, #/100 ml =	100

3) Biosolids Handling:

Sewage Sludge Biosolids shall be stored and treated on site to meet Class B Requirements.

The ongoing stormwater separation work is to be noted here, and frequently revisited as previously reported. This deficiency or dynamic effect may prove critical in determining "true" peak flow rates experienced by the plant from the simultaneous operation of several pump stations and fluctuating flows. For the purpose of this study, the theoretical peak to average flow ratio factor of 3.7 will be used. Refer to Appendix H for sample calculations and justification in determining the 3.7 factor used here.

Similarly, the collection system is periodically experiencing stormwater contribution and stormwater overflows. When the collection system receives stormwater contribution, the wastewater strength is set to be impacted by such. The organic concentrations of BOD and Ammonia-Nitrogen may be reduced due to the dilution effect, while inorganic concentrations such as TSS may increase with the stormwater addition. These spiked and/or diluted concentrations may be far from the true concentrations of raw BOD, TSS, and ammonia nitrogen. Therefore, the Owner is advised to maintain good record keeping practices and note significant changes to the collection system operations over the next several years in order to better profile the true raw wastewater characteristics of the influent flow.

Similarly, nearly all the stormwater overflows that occur from the collection system, is unaccounted as of this date. If the overflows are to be eliminated in the immediate future, without separating the stormwater flow from the sewerage flow, then the actual flow entering the plant may be much higher than what is reported in the MORs and in this report.

For design purposes and to account for the incremental growth accomplished in the projected 3 Phases, the same effluent treatment standards will be utilized/incorporated in each phase. The reliability classification of Grade C assigned for this treatment facility (by DOW) will require the pre-treatment processes along with the primary and disinfection steps to be on a standby powered system, and have redundancy with most major equipment/unit operations. Consideration to the use of nutrient removal processes is also noted in the proposed WLA guidelines. All these new requirements and design guidelines will be considered here, but will need to be revisited/updated during the design phase of the WWTP project.

SECTION 8 – EVALUATION OF ALTERNATIVES

The Pineville Utility Commission is committed in serving the public, and trying to meet the challenges during the next 20 years while preserving the environment and its intended purposes. Among the major tasks to be addressed in the immediate and long term design periods include: providing additional wastewater treatment capacity, extending sewer services to areas that have no public sewer, separate and eliminate stormwater sources from entering the sanitary sewer system, while providing ongoing operation and maintenance to the existing aging collection and conveyance sewer system.

The various options considered for each of the above tasks are described in more detail below.

A. WASTEWATER TREATMENT PLANT ALTERNATIVES:

The following wastewater treatment alternatives were considered:

Alternative No. 1 – "Do Nothing"

Alternative No. 2 – Regionalization

Alternative No. 3 – Direct Discharge to Surface Waters

Alternative No. 4 – No Discharge

A.1. <u>Alternative No. 1 – "Do Nothing":</u>

The option to do nothing was considered, but was dismissed due to the immediate need of additional treatment capacity to meet the future residential and other planning area flow requirements. Without the additional treatment capability and capacity, it will be a matter of days or months before the plant will start experiencing effluent discharge violations and potential overflows into the Cumberland River. The City does not have any more time to wait or postpone this decision any longer. The decision to expand the current WWTP is already behind schedule according to the State and Federal Guidelines that

require municipalities to prepare plans for expansion once their plant flow reaches 80% of the plant's capacity. The current plant is utilized at 97% of its rated hydraulic capacity and is receiving influent pollutants at a higher rate than what was designed for. At this hydraulic and excess loading rate, most of the equipment is functioning at their limit. The equipment draws more power to operate, is not as effective as once was, and have a higher risk of failure due to the heavier load exerted.

A sewer connection moratorium is typically enforced (by the State) to Towns and municipalities that operate their WWTP near their design rated capacity. Such an enforcement action is thus eminent and will be detrimental to the area growth and any potential construction projects that may be underway. An immediate and expedited plan of action is thus required in this case.

A.2. Alternative No. 2 – Regionalization:

Regionalization or connecting to another nearby wastewater treatment plant or collection system is always a viable option in areas where other larger facilities are already in-place. In this case, Pineville Utility Commission serves an area in Bell County where there are no other treatment facilities of this or greater magnitude and within a reasonable range. The nearest large size facility is located in Middlesboro, Kentucky, which is more than 5 miles away. Therefore, this alternative was not considered any further. Trying to send the flow to the Middlesboro facility will be cost prohibitive for Pineville, and will also put the Middlesboro plant over its rated capacity. Currently, Middlesboro is experiencing an average daily flow of 2.85 MGD. Adding another 1.2 MGD to its daily flow will bring the Middlesboro plant influent flow to approximately 4.0 MGD, which is much over its rated capacity (3.6 MGD).

A.3. Alternative No. 3 – Direct Discharge to Surface Waters:

Under this consideration, the Owner can either build a new facility at a new location to handle the projected flow or consider expanding the current facility. Adding a second treatment facility to the collection system usually involves doing modifications to parts of the collection system, purchasing additional land for the new WWTP facility, obtaining a new NPDES Permit for the new outfall line, utilizing additional manpower to staff the new WWTP, additional operating and maintenance costs, etc., etc. Since this option (operating two WWTP facilities) would be more complex and potentially more expensive, it will not be pursued any further. The options to expand the current facility (two alternatives, Options 3A and 3B) and the option (Option 3C) to build a new plant at a new location (and abandon the current plant) will be evaluated in more detail here.

Additional treatment options that were briefly considered but not covered in much detail, included the Sequencing Batch Reactors (SBR) and the Integrated Fixed Film Activated Sludge (IFAS) System.

The SBR process was eliminated due to the additional footprint required by the SBR tank, the post-equalization basin, and the disk filters, along with challenges during the Construction Phase, and the extra pumping cost associated with the process. Similarly, the IFAS process was also considered, but not pursued further due to the additional capital and O&M costs associated with the process. Option 3A described in this section, is a simpler treatment version of IFAS, that can be retrofitted in the future to operate as an IFAS System.

Based on the population projections established previously in this report, and using the following design wastewater concentrations, the preliminary design criteria for the proposed systems are listed below:

For planning and comparison purposes, the same design criteria were utilized for all the treatment options considered in this report. All current problems and repairs required at the current

WWTP that are listed in Section 6 of this report would be fully addressed by each of the following treatment options.

a) Future Design Criteria:

Design lifetime = 20 years
Average design flow = 1.2 MGD
Peak to average flow ratio = 3.7
Peak design flow = 3.7 x 1.2 = 4.5 MGD
Current Q avg. = 0.70 MGD
Average Design BOD5 – influent = 350 mg/L
Average Design TSS – influent = 450 mg/L
Average ammonia nitrogen influent = 40 mg/L

Desired effluent BODs concentration = 20 mg/L
Desired effluent TSS concentration = 20 mg/L
Desired effluent Ammonia concentration = 5 mg/L
Desired DO concentration = 3.0 mg/L

b) Average Design Loading Rates:

BOD loading rate = 1.2 MGD x 350 mg/L x 8.34 = 3,502 lbs/d

TSS loading rate = 1.2 MGD x 450 mg/L x 8.34 = 4,503 lbs/d

TKN loading rate = 1.2 MGD x 40 mg/L x 8.34 = 401 lbs/d

Refer to Appendix E for Preliminary Design Calculations for a 1.2 MGD (average daily flow) WWTP utilizing the options considered below:

A3.1 - Treatment Option No. 3A – Upgrade and Reuse Existing Infrastructure - Lagoon System

A. Description:

This option examines the construction of new separately built and operated secondary clarifier basins, and utilizing the current clarifier area in the existing biological (aeration) lagoon for additional aeration (biological) volume. The extra aeration volume gained, and the separation of the two unit processes, will enhance the treatment performance of the system and allow for the increase in the plant capacity. The proposed treatment system will incorporate the use of anoxic and aerobic zones along with the addition of floating baffles and mixers in the anoxic zone. The

proposed treatment process will consist of influent mechanical fine screens (6mm opening), a grit chamber, a surge basin, sludge and drain pump stations, an internal recycle pump station, an anoxic basin, a completely mixed, extended aeration basin, secondary clarifiers, U.V. disinfection system, aerated sludge holding tanks, dewatering equipment, an effluent post-aeration and recycle water station, a blower/electrical building, a dewatering building, along with other support facilities. Some of the existing equipment and infrastructure will be re-used where possible.

Under the proposed option, raw wastewater will be pumped into the new mechanical screens and existing grit chamber. “Controlled” effluent from the grit chamber will flow into the biological train while any excess flow (overflow above a predetermined rate of flow) will be diverted into the new off-line surge basin. The biological train will consist of an anoxic (denitrification) zone, an aerated zone, and secondary clarifiers.

Clear supernatant from the clarifiers will be disinfected using ultraviolet light and metered prior to its release into the river. A new effluent post-aeration and recycle water station will be constructed also.

Solids removed from the clarifiers will be stored and further stabilized in aerated sludge holding tanks prior to further processing via a new dewatering equipment (rotary fan press). Processed cake sludge will be finally transferred to a landfill for ultimate disposal. Screenings removed from the headworks screens and grit chamber will be dewatered, compacted, and ultimately sent to the landfill also.

Any overflow sent to the off-line surge basin will be stored on a temporary basis until the influent flow subsides to a preset value. The stored flow will then be pumped back into the system so it can be mixed with the raw wastewater for further treatment. For budgeting purposes, the estimated storage volume of the diurnal surge basin will be approximately 825,000 gallons (Appendix E), or equivalent to approximately 12 hours of diurnal flow storage.

B. Selection Criteria:

The criteria used to evaluate this option include:

1) BOD/TSS Removal:

The expected BOD and TSS removal efficiency for the proposed treatment will be approximately 85-95% of the incoming strength. Typical effluent quality concentrations are expected to be in the range of 5-20 mg/L of TSS and 5-20 mg/L of BOD.

2) Nutrient Removal:

The expected total nitrogen removal efficiency under the proposed operation is approximately 60-75% of the incoming strength. Similarly, the expected phosphorous removal will be approximately 60-70% of the incoming strength. Chemical addition will be added to enhance phosphorous removal rates.

3) Process Control/Flexibility:

Process control is expected to be relatively easy and resembles that of any other activated sludge type biological process. Operational controls include amount of air available in the aeration basins, internal and sludge recycle rates, food/microorganism (F/M) ratio, raw wastewater strength, etc.

Dissolved Oxygen (DO) instrumentation and process control will be provided for aeration and mixing purposes.

4) Ease of Operation:

The operation and maintenance of the proposed treatment facility is not cumbersome and does not require close supervision. The biology and operation of this process will be similar to the one experienced by the existing plant. The utilization of anoxic zones is expected to produce additional operational cost savings and improve denitrification. The proposed U.V. disinfection system will replace the current chlorine and

sulfur dioxide gas systems. The new addition is expected to make performance and system control much easier for the plant operators.

5) Land Required:

Additional space within the existing or adjacent property boundary will be required for the construction of the new sludge holding basins, new surge basin, new U.V. disinfection channel, new dewatering building, new headworks extension, new clarifiers, and miscellaneous other support facilities.

The estimated area required for the WWTP expansion is approximately 1.5 acres. An additional 2 acres of land will be required, if a 2-day storage surge tank (versus the 12-hour diurnal storage provided above) is required. The 2-day storage volume is estimated at 2.9 million gallons (Appendix E). Refer to Figure 10 for a typical site layout plan.

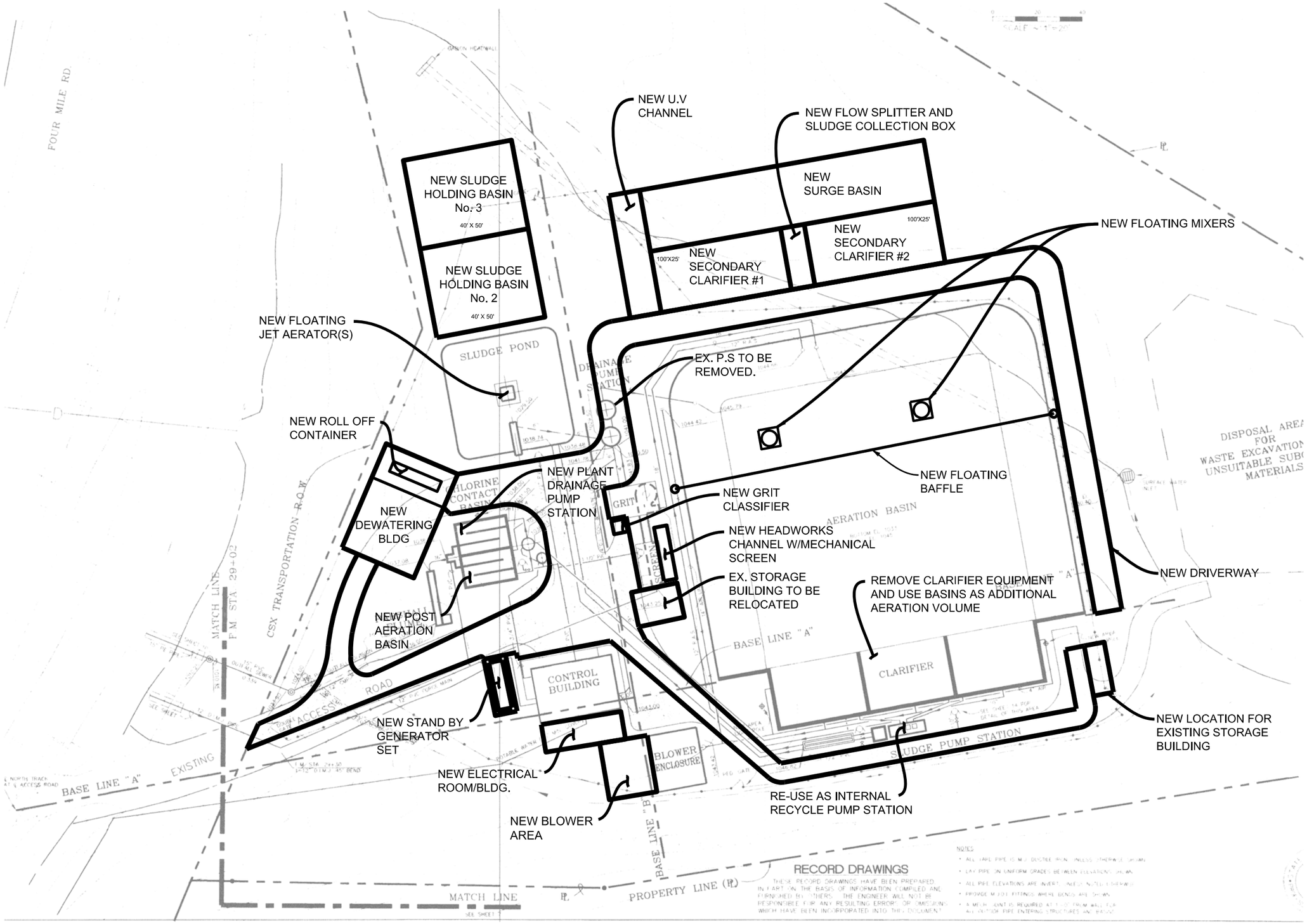
The existing clarifier volume will be retrofitted and reused as biological treatment volume. The new secondary clarifiers will utilize rectangular basins to minimize footprint requirements.

6) Schematic Diagram:

Refer to the attached Flow Schematic Diagram (Figure 11) for an illustration of the proposed wastewater and sludge flow path details.

7) Construction Cost Estimate:

The estimated cost of construction, including contingency, for the WWTP expansion is $8,500,000. Refer to the manufacturer's literature and unit prices in Appendix E and the Construction Cost Estimate Sheet (Table B-1 in Appendix B) for the breakdown of components and other associated work. An additional $1.5 Million Dollars (approximately) will be required if a 2-day storage surge tank (to handle peak flow design) is required, instead of the 0.825 million gallon tank specified.



SITE LAYOUT PLAN

LAGOON TREATMENT SYSTEM

FIGURE 10 - OPTION 3A SITE LAYOUT PLAN
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

Project Number: 11055-00
Date: MAY 2014

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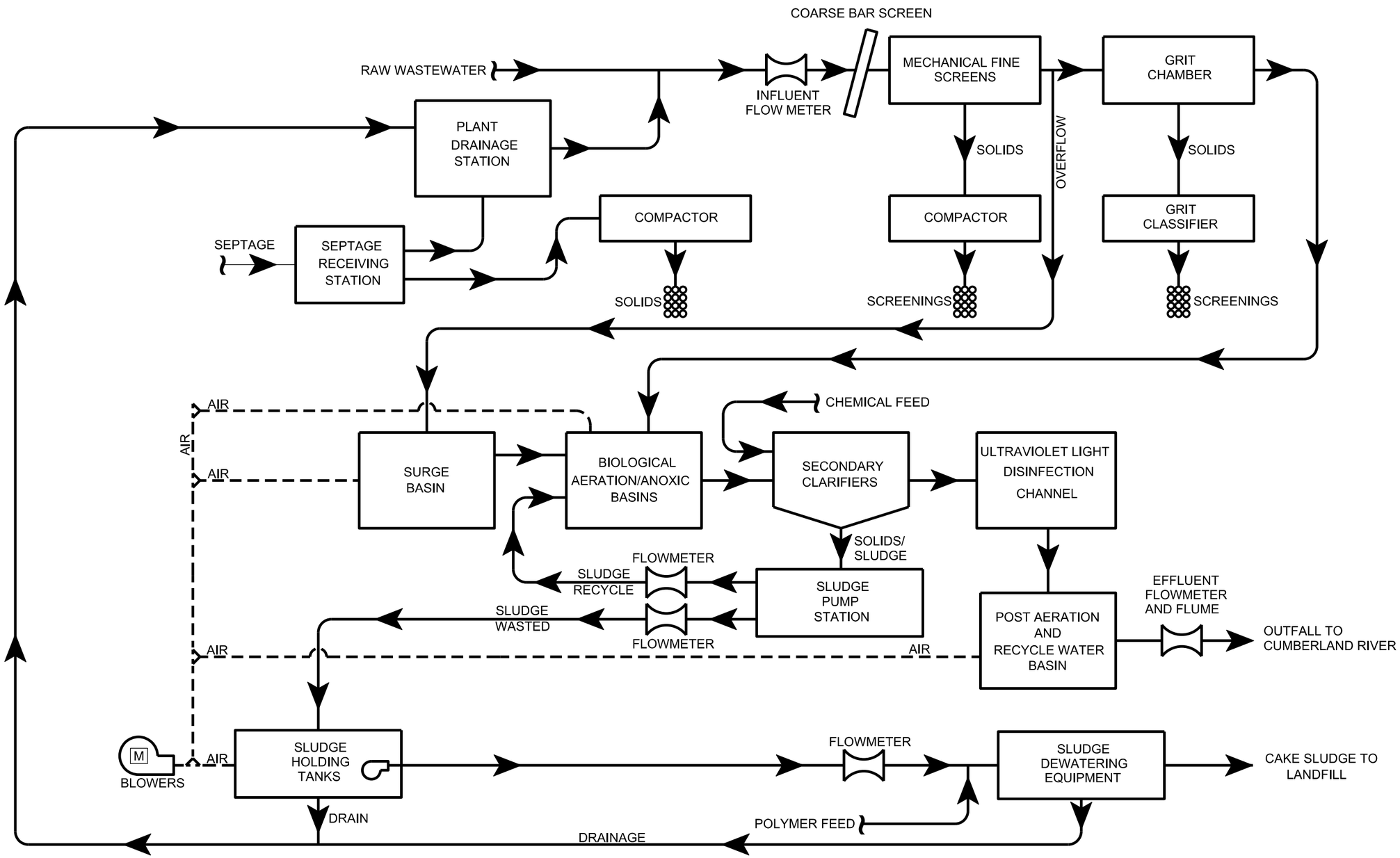
M:\WATER & SEWER\11055-00\WORK\DGN\FIGURES (08-26-2014)\FIG-10 OPTION 3 A SITE LAYOUT PLAN 2.DGN



FLOW SCHEMATIC DIAGRAM

LAGOON TREATMENT SYSTEM

FIGURE 11-OPTION 3A FLOW SCHEMATIC DIAGRAM
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

Project Number: 11055-00
Date: MAY 2014

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M:\Water & Sewer\11055-00\Work\DGN\Figures (08-26-2014)\FIG-11 Option 3 A Flow Schematic Diagram.dgn

8) Construction Period & Adaptability:

The estimated construction period utilizing the above referenced components is approximately 16 to 18 months. This period includes time for mobilization, shop drawing review and approval, component fabrication, demolition, construction, installation, start-up and final inspection.

Careful coordination between new construction and retrofitting the existing tanks will need to be utilized. Modifications to any of the existing tanks shall be conducted during low flow periods and under an accelerated construction schedule.

9) Annual Operation & Maintenance Budget:

The projected annual O&M cost for the proposed facility operating at full capacity is estimated at $396,850 per year. O&M costs during the start-up year (66% plant utilization) are expected to be approximately 2/3 of the stated value (i.e. approximately $264,566). The O&M cost includes expenses for parts replacement, utilities, sludge processing and disposal, and other miscellaneous items as noted on the O&M sheet (Table I - 3.0) in Appendix I. This O&M cost relies heavily on the projected power and chemical cost for this type of a facility. It is generated for comparison purposes only, between the alternatives considered here, and is not to be used to replace the current O&M cost of the existing WWTP.

10) Present Worth Analysis:

Based on the projected annual O&M cost, the present worth value for the recurring O&M costs based on 20-year project period and 4.9% discount rate is estimated at $4,311,366. Refer to Table J-1 in Appendix J.

11) Specified Manufacturer and Other Suppliers:

Specified manufacturer is: Parkson Corporation.

Other equal suppliers will be considered.

C. Advantages and Disadvantages:

Some of the major advantages and disadvantages associated with this option are summarized on Table 8.0 below:

TABLE 8.0 ALTERNATIVE NO. 3A – ADVANTAGES & DISADVANTAGES	
Advantages	**Disadvantages**
Less costly than other options considered	The construction phase may have some minor interference with existing unit operations.
Re-use most of the existing infrastructure	Additional costs associated with rock excavation.
Close familiarity with current biological treatment process	No room for future expansion.
Reliable system performance	No lagoon redundancy.
Low O&M cost and minimum space requirement	
Improvements will address most/all current plant deficiencies noted	Reuse of some existing aging equipment.

A3.2 - Treatment Option No. 3B – Upgrade and Reuse Existing Infrastructure-Membrane Bioreactor System

A. Description:

The use of the extended aeration lagoon system utilizing submerged membranes for effluent polishing was also examined. The proposed treatment system will include new coarse screen, new mechanical fine screens (2 mm opening), a grit chamber, an off-line surge basin, sludge and drain pump stations, a plant drainage station, an anoxic/aerated biological reactor, submerged membrane bio-reactors, ultraviolet light disinfection system, a recycle water and post-aeration station, aerated sludge holding tanks, dewatering equipment and housing facilities, an electrical/blower building, controls and instrumentation, and other supporting facilities. The

process will be designed to produce tertiary effluent quality (effluent BOD, TSS, phosphorous, and nitrogen concentrations of less than 5 mg/L) for direct discharge into the Cumberland River. Part of the existing equipment and infrastructure will be re-used where possible.

Under the proposed option, raw wastewater will go through new mechanical fine screens (2mm opening) and the existing grit chamber. Effluent from the grit chamber will flow into the anoxic zone of the biological system for denitrification. The wastewater will then flow into the aeration zone for nitrification. An off-line surge basin will be utilized to control and equalize flow sent to the biological system.

Submerged membranes will be installed in separate aerated tank(s) following the existing aeration basin. The submerged membranes will filter the MLSS concentration and send a tertiary type effluent into the U.V. system for disinfection. Following disinfection, the treated effluent will be partially aerated and released into the Cumberland River via the existing outfall line. A new recycle water station will be utilized.

Solids removed from the aeration basins will be stored and further stabilized in aerated sludge holding tanks prior to further processing via the new dewatering equipment (rotary fan press). Cake sludge will be transferred and disposed to the landfill. Screenings removed from the headworks screens and grit chamber will be dewatered, compacted, and ultimately sent to the landfill also.

Flow temporarily stored in the surge basin will be pumped into the headworks once the influent flow subsides to a pre-set low level. The diurnal surge basin will be designed to provide approximately 12 hours of storage based on a 2,000 GPM overflow rate. The approximate storage volume will be 1,400,000 gallons (Appendix E). This volume is greater than Option 3A (considered previously) since MBR basins are most economical when designed with a peak to

average flow ratio of 2.0, and not 3.7 as the peak/average ratio considered for the entire WWTP. Excess flow over the 2.0 ratio will be temporarily stored in the proposed surge basin.

B. Selection Criteria:

The criteria used to evaluate this option include:

1) BOD/TSS Removal:

The expected BOD and TSS removal efficiency for the proposed treatment will be approximately 90-99% of the incoming strength. Effluent concentrations of BOD and TSS are expected to be less than 5 mg/L, respectively.

2) Nutrient Removal:

The nitrogen removal efficiency is expected to be in the range of 70-80% of the incoming concentration. Similarly, the total phosphorous removal will be approximately 60-70% of the incoming strength. Chemical addition will be retrofitted to enhance phosphorous removal rates.

3) Process Control/Flexibility:

Biological process control is very similar to the previously described two-stage anoxic/aerated treatment systems. Parameters such as DO, mixing, sludge recycle, sludge wasting, and the F/M ratio will need to be closely monitored. Membrane system control and backwash requirements will be handled automatically via the system controls. A certain level of experience with PLC and other automation will be required. Multiple membrane banks will provide redundancy and flexibility with variable flow rates.

4) Ease of Operation:

Just like other previously noted biological process, a certain effort of plant supervision will be required. Control of the membrane system will be maintained automatically by the system's PLC. Some moderate level of control and instrumentation

knowledge is required. A semi-manual control option will also be available. Due to the number of banks and membrane modules, more piping and valves will be involved with this process.

5) Land Required:

Additional space within or adjacent to the existing property boundary will be required for the following new structures: new membrane bio-reactors, new sludge holding tanks, new headworks channel, new 1.4 million gallon surge basin, new dewatering building, and miscellaneous other support facilities.

The estimated area required for the WWTP expansion is approximately 2.0 acres. Refer to Figure 12 for a typical site layout plan.

The existing lagoon will be retrofitted and reused as an anoxic/aerated biological treatment tank.

6) Schematic Diagram:

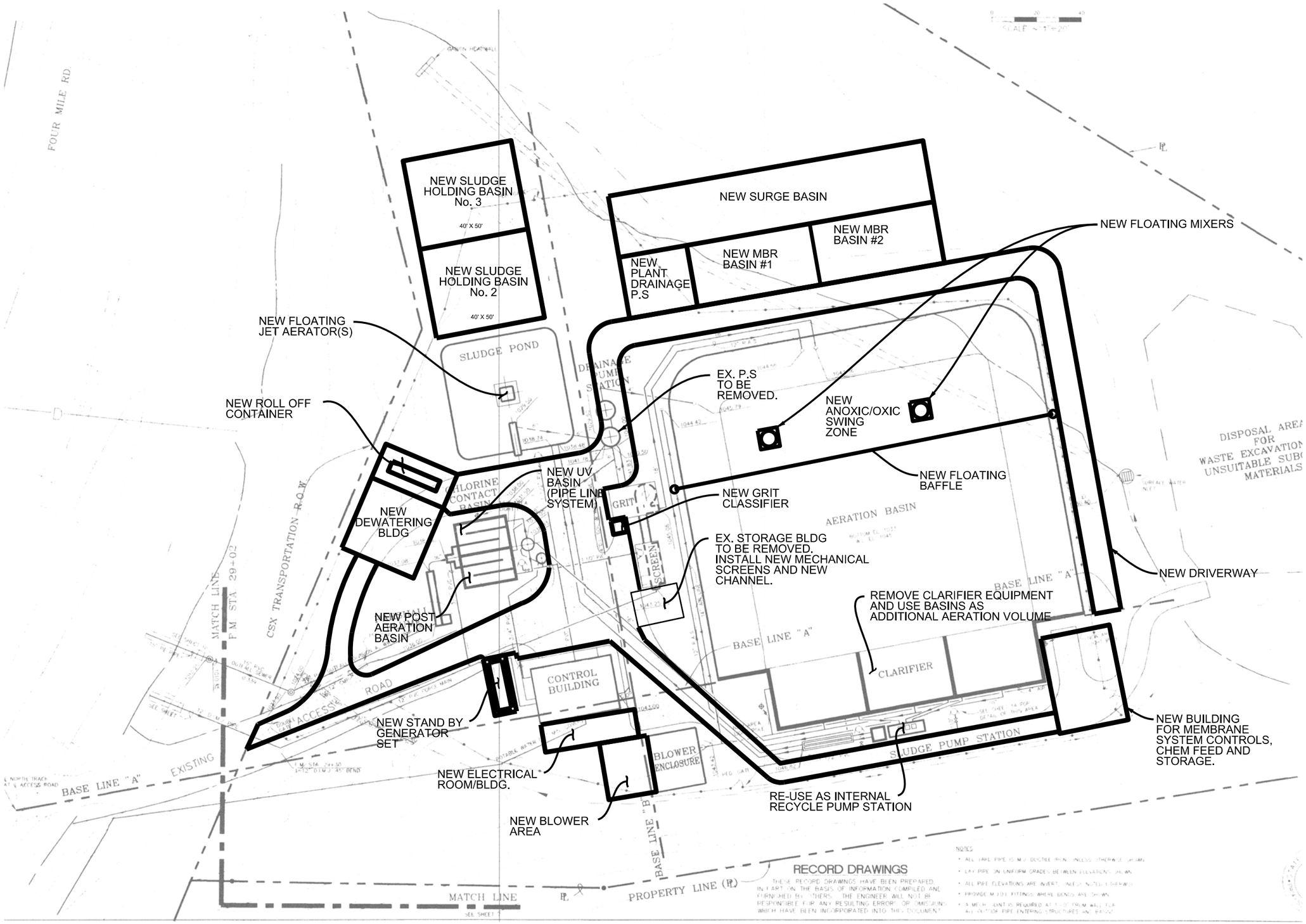
Refer to the attached Flow Schematic Diagram (Figure 13) for an illustration of the proposed wastewater and sludge flow path details.

7) Construction Cost Estimate:

The estimated cost of construction, including contingency, for the WWTP expansion is $14,000,000. Refer to the manufacturer's literature included in Appendix E and the Construction Cost Estimate Sheet (Table B-2 in Appendix B) for the breakdown of components and other associated work.

8) Construction Period & Adaptability:

The estimated construction period utilizing the above referenced components is approximately 16 to 18 months. This period includes time for mobilization, shop drawing



SITE LAYOUT PLAN

MEMBRANE BIO-REACTOR TREATMENT SYSTEM

FIGURE 12 - OPTION 3B- SITE LAYOUT PLAN
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

Project Number: 11055-00
Date: MAY 2014

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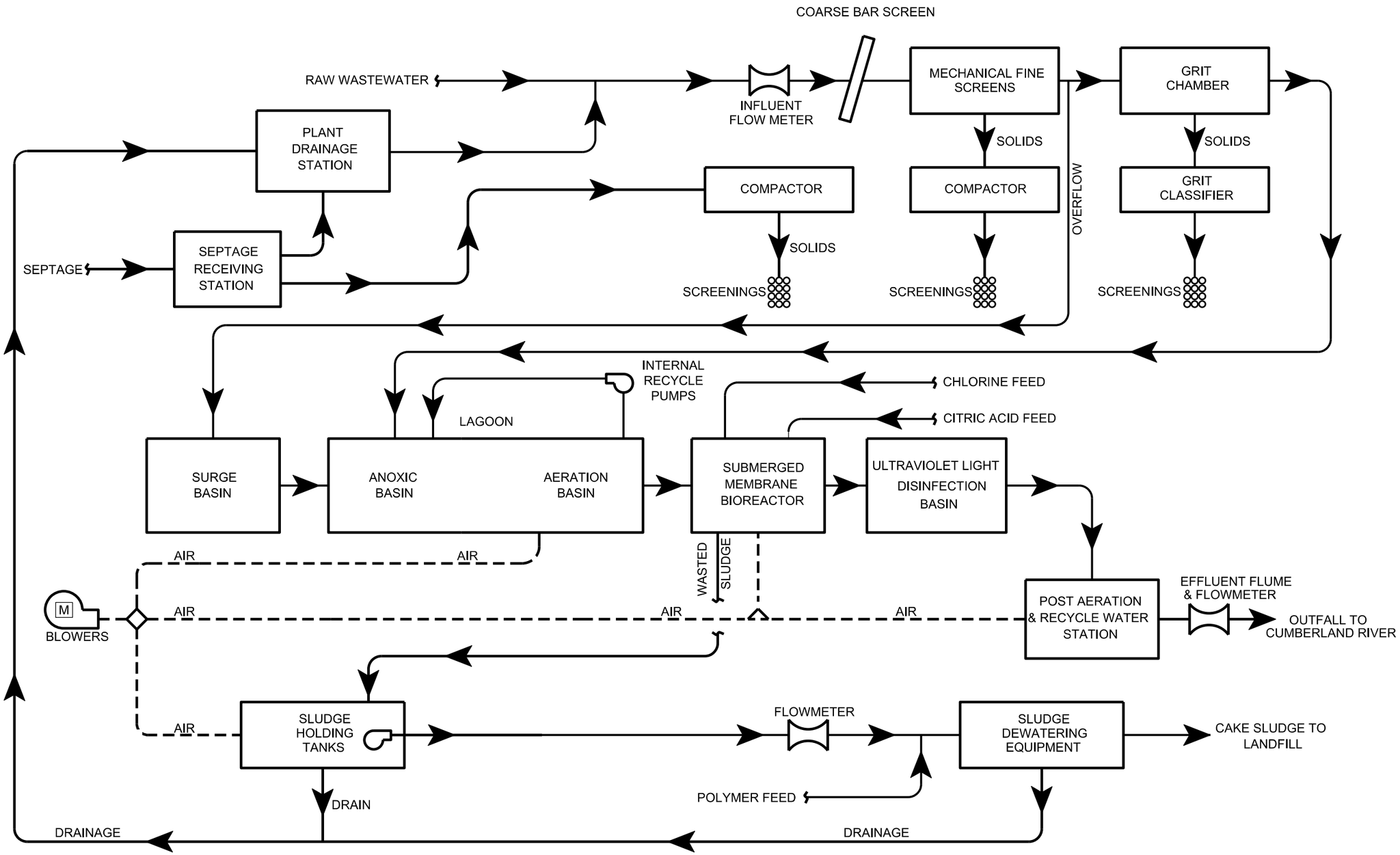
M:\WATER & SEWER\11055-00\WORK\DGN\FIGURES (08-26-2014)\FIG-12 OPTION 3 B SITE LAYOUT PLAN.DGN



FLOW SCHEMATIC DIAGRAM

MEMBRANE BIO-REACTOR TREATMENT SYSTEM

FIGURE 13-OPTION 3B FLOW SCHEMATIC DIAGRAM
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

Project Number: 11055-00
Date: MAY 2014

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M:\Water & Sewer\11055-00\Work\DGN\Figures (08-26-2014)\FIG-13 Membrane Bio_Reactor Treatment System.dgn

review and approval, component fabrication, demolition, construction, installation, plant start-up, and final inspection.

The construction of new structures will involve very little or no significant impact to the current plant operations.

9) Annual Operation & Maintenance Budget:

The projected annual O&M cost for the proposed facility operating at full capacity is estimated at $668,230 per year. O&M costs during the start-up year (66% plant utilization) are expected to be approximately 2/3 of the stated value (i.e. approximately $445,486). The O&M costs include expenses for parts replacement, utilities, sludge processing and disposal, and other miscellaneous items as noted on the O&M sheet (Table I – 3.2) included in Appendix I. This O&M cost relies heavily on the projected power and chemical cost for this type of a facility. It is generated for comparison purposes only, between the alternatives considered here, and is not to be used to replace the current O&M cost of the existing WWTP.

10) Present Worth Analysis:

Based on the projected annual O&M costs, the present worth value for the recurring O&M costs based on 20-year project period and 4.9% discount rate is estimated at $7,259,634. Refer to Table J-2 in Appendix J.

11) Specified Manufacturer and Other Suppliers:

Specified manufacturer is: Kruger, Inc.

Other representative suppliers to be considered include: Aqua-Aerobics; GE Water Technologies; Siemens.

C. Advantages and Disadvantages:

Some of the major advantages and disadvantages of this alternative are summarized in Table 8.1:

TABLE 8.1 ALTERNATIVE NO. 3B – ADVANTAGES & DISADVANTAGES	
Advantages	**Disadvantages**
State of the art technology	Some interference with existing unit operations
Exceptional effluent quality	Large space requirements
Stable and reliable treatment	High capital cost of construction
Excellent nutrient removal capability	High O&M cost
Minimum disturbance of treatment operations during construction	Additional cost associated with rock excavation
Improvements will address most/all current plant deficiencies noted	No lagoon redundancy
	No room for future expansion
	Reuse of some existing aging equipment

A3.3 - Treatment Option No. 3C – Construct a New WWTP at a New Site – Oxidation Ditch System

A. Description:

An alternative approach to expanding the current WWTP facility, is to construct a new WWTP facility at a different location within the current sewer service area. This option will allow the City to consider other treatment technologies that may require larger footprint for construction, and to provide room for further plant expansion in the future. The current location of the WWTP does not allow for future growth unless considerable amount of additional property can be

purchased from the adjacent owners. Under this option, raw wastewater from the collection system would need to be diverted to the new treatment facilities (Figure 14). The existing WWTP will need to be utilized as a transfer station with an off-line surge basin (Figure 15) to control and regulate flow sent to the new WWTP. This controlled flow, will then be transferred into the new WWTP using a new 16" force main. Refer to Figure 16, for a schematic sequence of operations at the new transfer L.S.

The current WWTP site will need to be modified to house a 2.9 million gallon (preferred size by Owner) short term surge basin. Most of the existing facilities will be reused where possible for cost savings.

For preliminary planning purposes, the new WWTP can be built on the northern part of the service area along the Cumberland River so the site will be away from most residential areas. The new site will have enough land for future plant expansion. The new facility will be designed to use the extended aeration activated sludge process similar to the current plant operations.

The proposed treatment option (selected for comparison purposes only, not a final selection) will involve the use of an oxidation ditch system (extended aeration) to provide the biological treatment required. The oxidation ditch is typically an oval-shaped channel equipped with mechanical aerators (diffusers, brush aerators, or radial flow aerators) to aerate and circulate the incoming raw wastewater. It operates in an extended aeration mode with long hydraulic detention and solids retention times. It is simple to operate and forgiving to surge flows and loadings.

Other system components would include: an influent flow measuring flume, an off-line surge basin (constructed at the site of current WWTP), sludge and drain pump stations, mechanical screen(s), a grit chamber, secondary clarifiers, U.V. disinfection system, post-aeration basin,

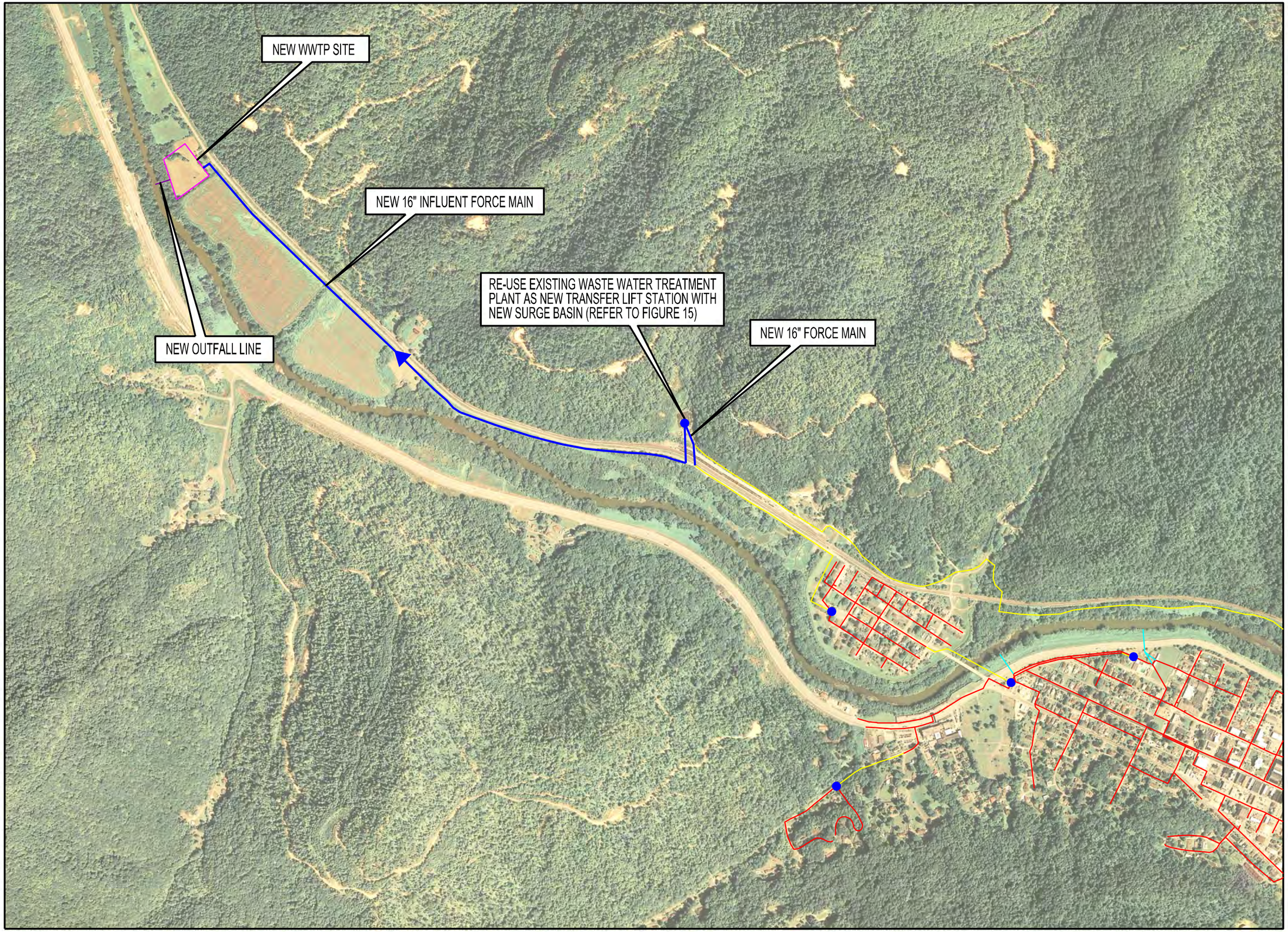

FIGURE 14 - OPTION 3C - COLLECTION SYSTEM UPGRADES
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 1000'

LEGEND

- EXISTING GRAVITY LINE
- EXISTING FORCE MAIN
- EXISTING OVERFLOW
- PROPOSED OUTFALL
- PROPOSED FORCE MAIN
- EXISTING LIFT STATION/WWTP

Project Number: 11055-00
Date: AUGUST 2014

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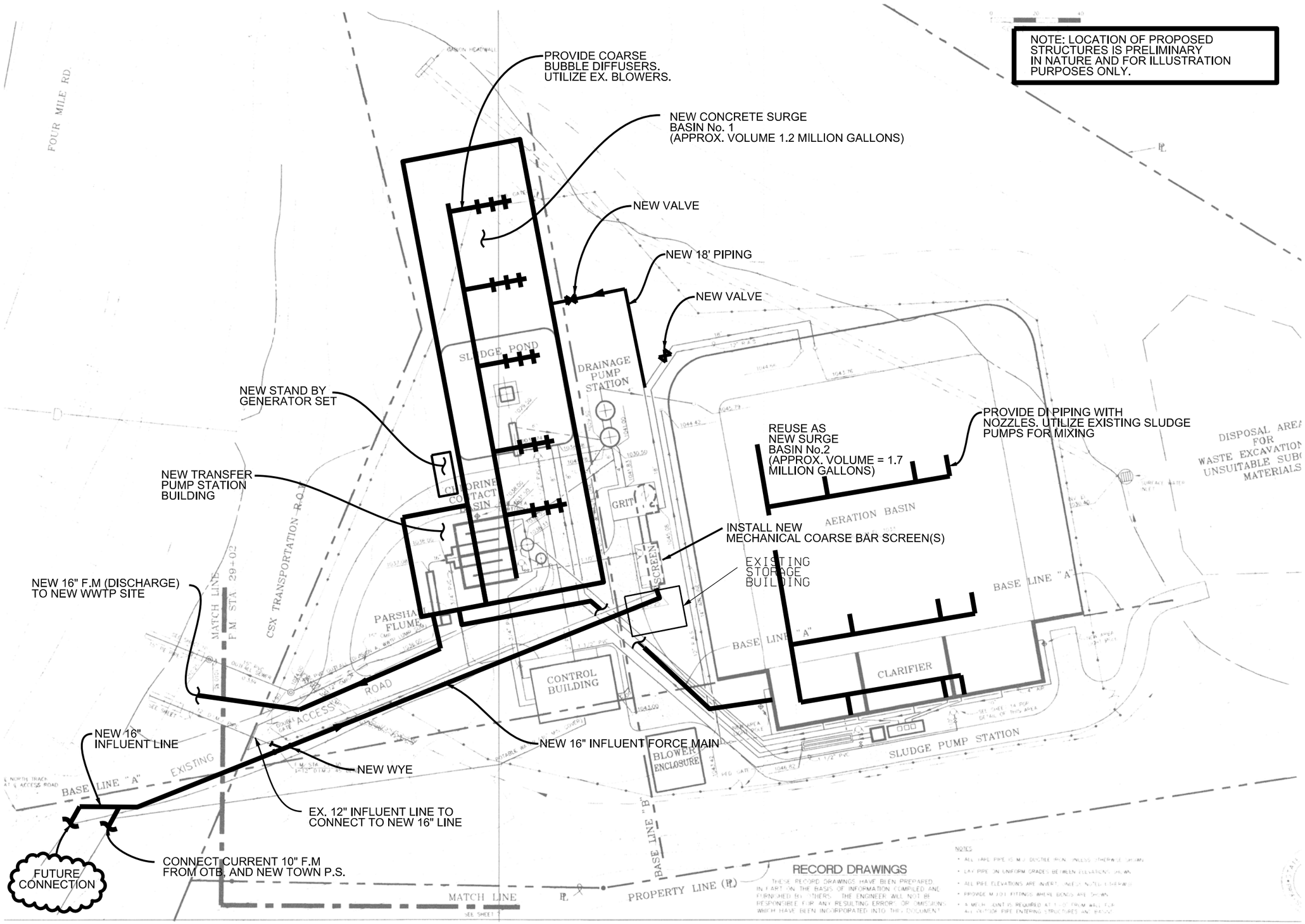

SITE LAYOUT PLAN

EXISTING WASTEWATER TREATMENT PLANT

FIGURE 15 - OPTION 3C - NEW TRANSFER LS
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

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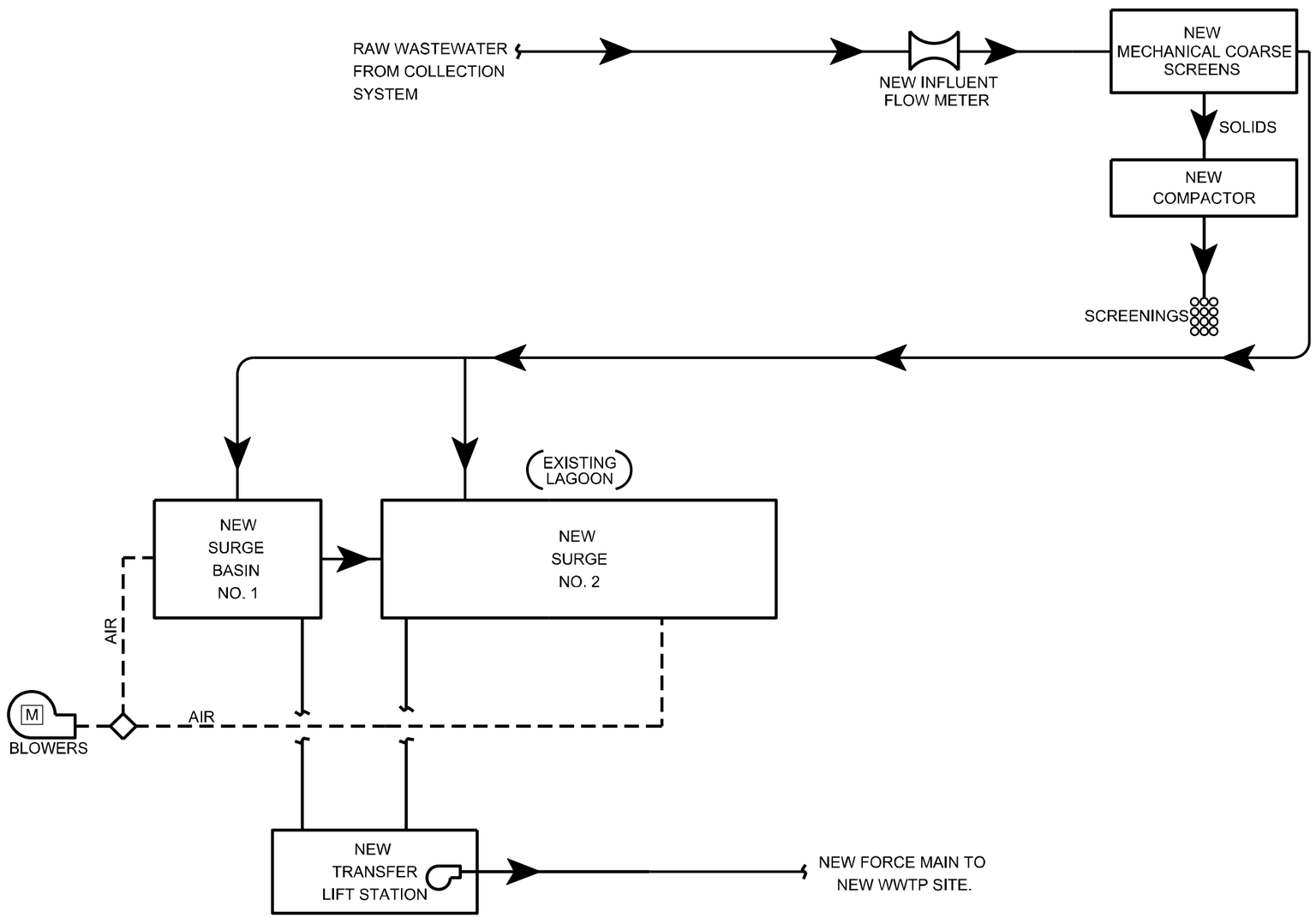

FLOW SCHEMATIC DIAGRAM

NEW TRANSFER L.S

FIGURE 16-OPTION 3B FLOW SCHEMATIC DIAGRAM
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

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recycle water station, aerated sludge holding tanks, sludge dewatering equipment, a dewatering/blower/electrical building, plus other supporting facilities.

Under the proposed option, raw wastewater will go through the new mechanical fine screens and a new grit chamber before it is discharged into the oxidation ditch.

The effluent box of the grit chamber will equally distribute the flow into the two biological trains consisting of an oxidation ditch followed by circular center feed secondary clarifiers. Each oxidation ditch will consist of an anoxic (denitrification) and an aerobic (nitrification) zone. The zones will be equipped with aerators and mixers to provide the required air for mixing and bacteria growth. The effluent mixed liquor from the oxidation ditch will be clarified by two (2) center feed circular clarifiers.

Supernatant from the clarifiers will be disinfected using ultraviolet light and metered prior to its release into the Cumberland River via a new outfall line. Post-aeration using diffused air will be provided.

Solids removed from the clarifiers will be stored and further stabilized in aerated sludge holding tanks prior to further processing. A new dewatering rotary fan press unit will be used to produce cake sludge to be transferred and disposed to the landfill (as currently practiced). Screenings removed from the headworks screen and grit chamber will be dewatered, compacted, and ultimately sent to the landfill.

Raw wastewater stored in the off-line surge basin will be pumped into the headworks of the new plant once the influent plant flow subsides to a preset low level. The surge basin will be designed to provide an approximate storage volume of 2.9 million gallons. This volume will be equivalent of 48 hours detention of overflow at a 1,000 GPM rate. The size of the surge basin is greater than the size used in Options 3A and 3B. This is the preferred size, according to the

Owner's preferences, however, due to the land restrictions in the existing WWTP boundaries, it was not considered in either Options 3A and 3B.

The current WWTP will be decommissioned and abandoned under this option.

A new outfall line will be constructed as part of the new WWTP site.

B. Selection Criteria:

The criteria used to evaluate this option include:

1) BOD/TSS Removal:

The expected BOD and TSS removal efficiency for the proposed treatment will be approximately 92-98% of the incoming strength. Typical effluent quality concentrations are expected to be in the range of 5-15 mg/L of TSS and 5-15 mg/L of BOD.

2) Nutrient Removal:

The expected total nitrogen and total phosphorous removal efficiency under the conventional operation of the oxidation ditch is approximately 50-60% of the incoming strength. However, with minor process and operational modifications (such as providing anoxic/oxic zones and increasing the nitrate recycle rate), the nitrogen removal rate can be as high as 70%. Chemical addition will be retrofitted to enhance phosphorous removal rates.

3) Process Control/Flexibility:

Process control is usually achieved by controlling the: F/M ratio, the volume of returned activated sludge (RAS), the nitrate recycle, and the volume of oxygen supplied. Due to the long detention time, the process can easily handle periodic hydraulic and shock loading conditions without major upsets in treatment or effluent quality. Operators can turn off or turn down aerators as needed to promote de-nitrification or to reduce power requirements and energy costs at various flow rates. Dissolved oxygen and oxidation

reduction potential (ORP) instrumentation, VFDs, and a PLC can be utilized to control the aeration and mixing system. The process is adaptable to several operational modes. Two trains will be provided to enable the plant to operate at different flow rates and to allow for system maintenance and redundancy.

4) Ease of Operation:

The biological treatment process is relatively easy to operate and maintain, and requires less supervision than a conventional activated sludge type process. The use of the anoxic zone is expected to produce cost operational savings. The biology of the proposed system is the same as the existing process.

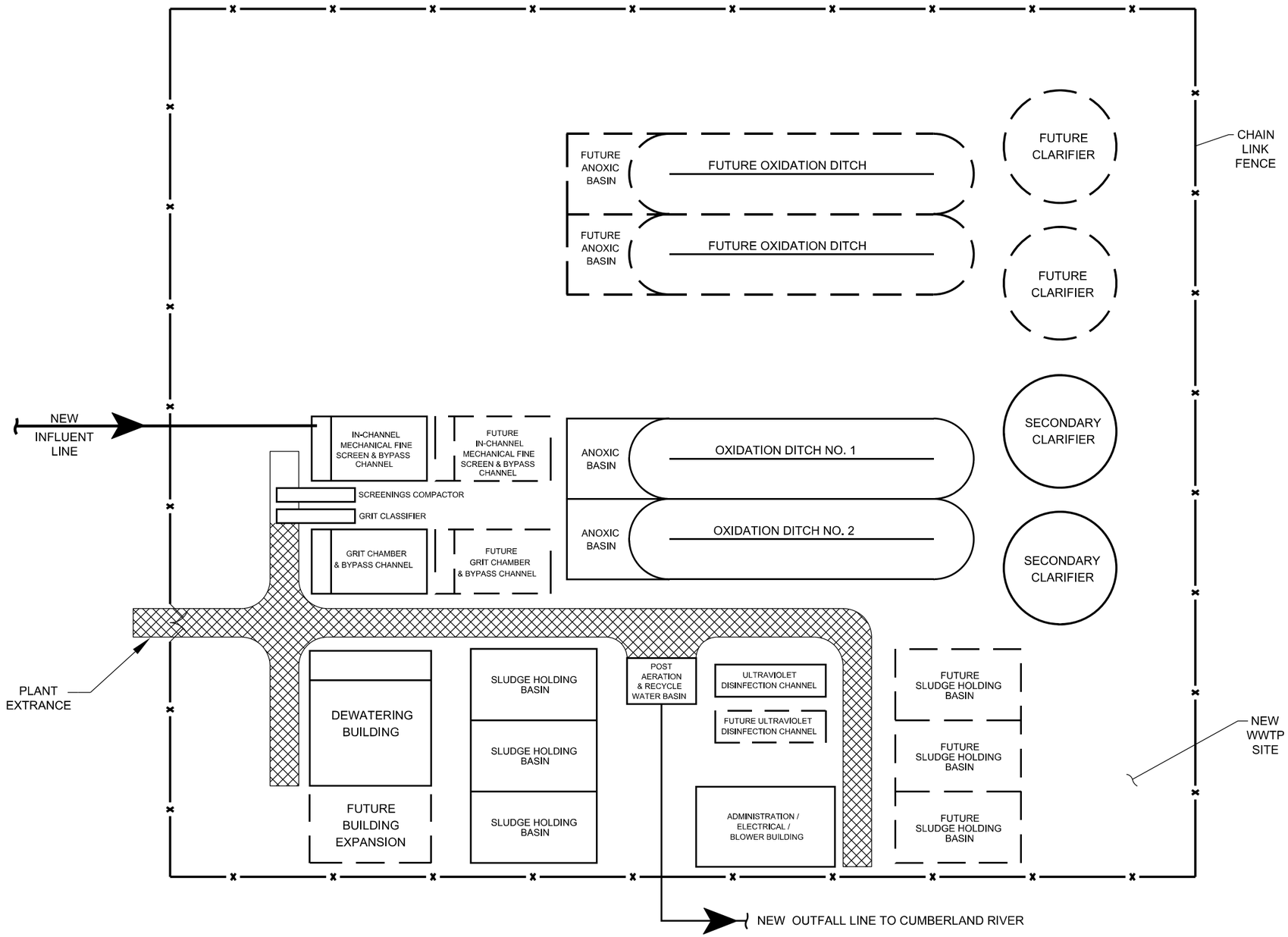
5) Land Required:

Land will be required to construct the new structures to include: new 2.9 million gallon surge tank, new oxidation ditch reactors, new secondary clarifiers, new headworks, new dewatering building, new blower and electrical building, new U.V. disinfection channel, and miscellaneous other support facilities. The site of the existing WWTP will be used to construct the off-line surge basin and the new transfer lift station.

The estimated area required for the new WWTP site is estimated at approximately 20 acres. This area will include space for a future plant expansion. See Figure 17 for a typical site layout plan. The proximity to a nearby blue water stream will be required for discharge of treated effluent.

6) Schematic Diagram:

Refer to the attached Flow Schematic Diagram (Figure 18) for an illustration of the proposed wastewater and sludge flow path details.



SITE LAYOUT PLAN

OXIDATION DITCH TREATMENT SYSTEM

FIGURE 17-OPTION 3C- SITE LAYOUT PLAN
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

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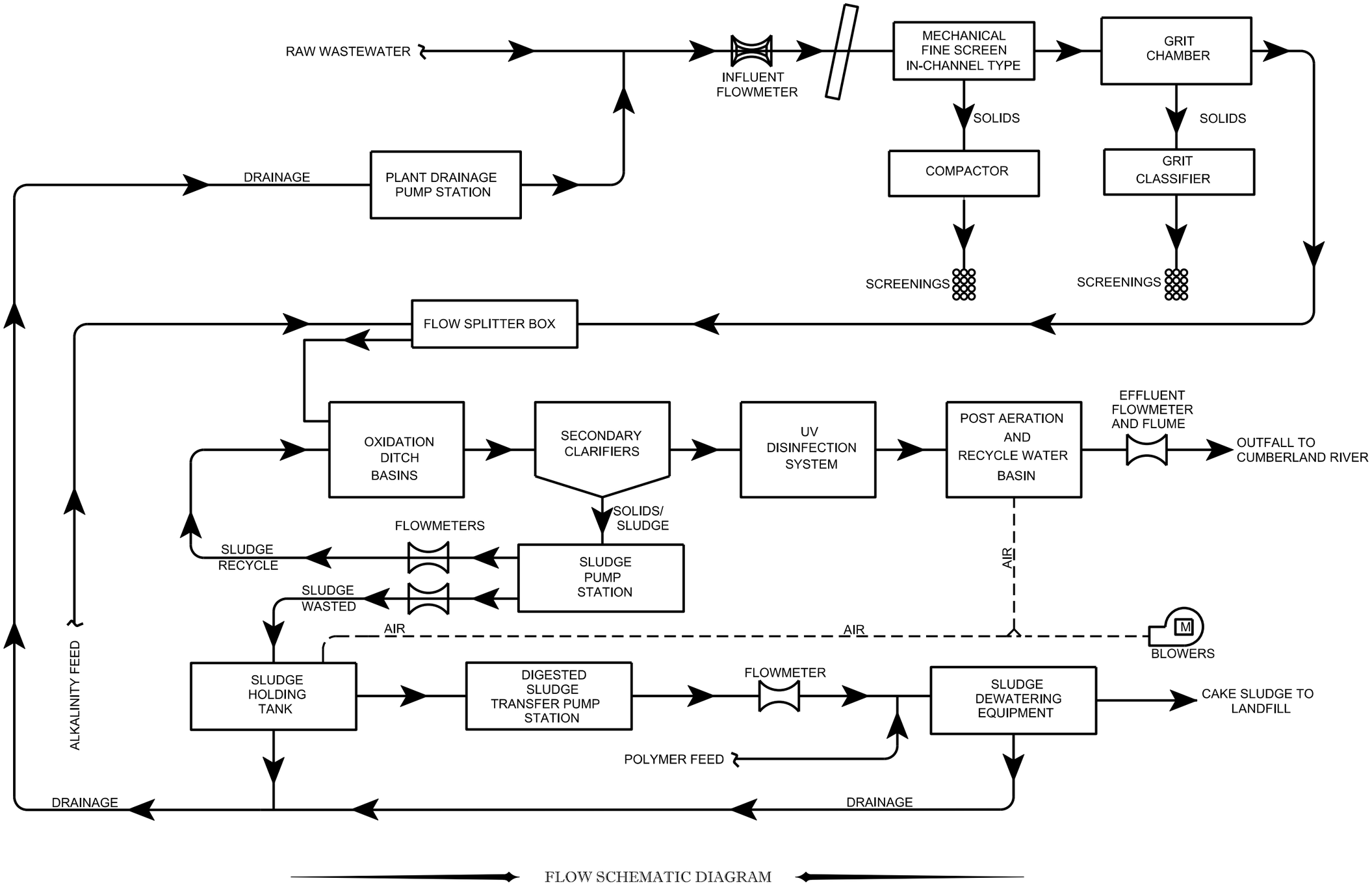

FLOW SCHEMATIC DIAGRAM

OXIDATION DITCH TREATMENT SYSTEM

FIGURE 18-OPTION 3C FLOW SCHEMATIC DIAGRAM
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

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Date: MAY 2014

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M:\Water & Sewer\11055-00\Work\DGN\Figures (08-26-2014)\FIG-18 Option 3 C Flow Schelmatic Diagram.dgn

7) Construction Cost Estimate:

The estimated cost of construction, including contingency, for the new WWTP is $11,000,000. Refer to the manufacturer's literature in Appendix E and the Construction Cost Estimate Sheet (Table B-3 in Appendix B) for the breakdown of components and other associated work. In addition to the cost of the new WWTP, additional project construction costs will include: cost to purchase land for the new WWTP, modifications to existing sewer collection system, cost for new outfall line, and easement acquisitions for all new sewer lines.

An approximate cost for these additional items is listed below:

a.	New Site for Second WWTP & Easement Acquisition Costs	=	$300,000
b.	New Sewer Line Extensions (Force Main and Outfall) 10,000 LF of 16" FM @ $150/LF	=	$1,500,000
c.	New Transfer Lift Station (Pumps, Building, Generator, Coarse Bar Screen(s), Surge Basin @ Existing WWTP) Refer to Table B-4 in Appendix B	=	$3,500,000
	Subtotal	=	$5,300,000

Therefore, the total construction cost for this option would be approximately:

11,000,000 + 5,300,000 = $16,300,000

8) Construction Period & Adaptability:

The estimated construction period utilizing the above referenced components is approximately 18-20 months. This period includes time for mobilization, shop drawing review and approval, component fabrication, construction, installation, modifications to existing collection system, equipment start-up and final inspection. Construction of this facility should have minimum impact to the existing plant operations.

The design and construction of a new WWTP will require the issuance of a new NPDES Permit at a new outfall location. This action usually requires environmental impact studies and

public hearings to assess the environment status and impact to the adjacent property and environment. Such studies are usually extensive and lengthy in time to process. The environmental impact study portion for the new WWTP Facility and new sewer line extensions is expected to last an additional year to the design phase of such a project. An arbitrary WWTP location was used under this study for estimating purposes. Further consideration shall be given to the site location at a later timeframe, and if such action is warranted.

9) Annual Operation & Maintenance Budget:

The projected annual O&M cost for the proposed facility operating at full capacity is estimated at $366,850 per year. O&M costs during the start-up year (at 66% plant utilization) are expected to be approximately 2/3 of the stated value (i.e. approximately $244,566). The O&M cost includes expenses for parts replacement, utilities, sludge processing and disposal, and other miscellaneous items as noted on the O&M Sheet (Table I – 3.3) included in Appendix I. This O&M cost relies heavily on the projected power and chemical cost for this type of a facility. It is generated for comparison purposes only, between the alternatives considered here, and is not to be used to replace the current O&M cost of the existing WWTP.

10) Present Worth Analysis:

Based on the projected annual O&M cost, the present worth value for the recurring O&M costs based on 20-year project period and 4.9% discount rate is estimated at $3,985,447. Refer to Table J-3 in Appendix J.

11) Specified Manufacturer and Other Suppliers:

Specified manufacturer is: Lakeside.

Other equal suppliers to be considered include: Envirodyne Inc., Kruger, EIMCO, etc.

C. Advantages and Disadvantages:

Some of the major advantages and disadvantages of this alternative are summarized in Table 8.2.

TABLE 8.2 ALTERNATIVE NO. 3C – ADVANTAGES & DISADVANTAGES	
Advantages	**Disadvantages**
Similar biological process	An additional pump station to build and operate
Ease of operation and process flexibility	High footprint requirements
Well-suited option for future expansion	Modifications to existing collection system can be costly
High effluent quality	Additional land requirements and cost
Low O&M cost	New outfall location
Less volume and better sludge characteristics	Longer design, planning, and construction period
All new equipment	
New plant can potentially handle and treat more flow than rated capacity due to oversized surge basin	

A.4. - Alternative No. 4 – No Discharge:

The option to eliminate discharge to the surface waters of the State (by using drip irrigation to discharge treated water) was also considered, but was eliminated, due to the poor soil conditions available, the large area required for the drip irrigation field, the proximity to the floodplain, and the steep terrain that surrounds the immediate area. Reuse of any treated water in a large scale operation, is also not a viable option for the long run without any commitments from potential

"buyers". Means to recycle/reuse a small part of the treated water will be accomplished by the upgraded WWTP.

A.5 - Economic Analysis & Evaluation:

a) Analysis & Evaluation:

The analysis and evaluation of the proposed treatment alternatives was conducted by a review team made of engineers, plant and system operators, and the system director. A review session took place to establish the criteria to evaluate and select the best option.

The criteria established by the team to evaluate the proposed options were:

b) Present Worth Cost:

The present worth cost for each alternative was determined by considering the capital cost of construction, the annual operation and maintenance cost, a 4.9% discount rate, and based on a 20-year annual construction debt service. Refer to Appendix J for sample calculations and to Table 8.3 for summarized results.

TABLE 8.3

ECONOMIC ANALYSIS SUMMARIZED RESULTS

Option	Capital Cost	Annual O&M Cost	Present Worth Recurring O&M Cost	Present Worth Value (From Appendix H)	Rank Based on Cost
3A-Lagoon System	$8,500,000	$396,850	$4,311,366	$12,811,366	1st
3B-Membrane System	$14,000,000	$668,230	$7,259,634	$21,259,634	3rd
3C-Oxidation Ditch System (See Note 1)	$16,300,000 (See Note 2)	$366,850 (See Note 3)	$3,985,447	$21,185,447	2nd

Note 1: This option considers a new oxidation ditch WWTP at a new site.
Note 2: This cost includes new WWTP at new site, system modifications, and upgrades.
Note 3: This cost includes O&M cost for the new WWTP only.

c) BOD, TSS, and Nutrient Removal:

The capability and potential to remove BOD, TSS, and nutrients from the wastewater stream was considered.

d) Process Control and Flexibility:

Each option was analyzed and evaluated based on the control elements involved, the number of units involved, operation flexibility, redundancy, and ability to adapt to changing conditions.

e) Ease of Operation:

The degree of operational difficulty, extent of chemical analysis, manpower requirements, water testing, and type of equipment involved was also considered.

f) Land Required:

The construction and equipment clearance acreage involved with each option was also considered.

g) Ease of Construction:

The constructability and startup of the expanded facility was evaluated to comply with the project intent.

For each criterion, a relative score of 1 (less favorable) to 5 (very favorable) was assigned to each alternative. The raw scores of each criterion were then multiplied by a weighting factor to amplify the ranking of more important criteria relative to those of less important criteria.

The ranking results are summarized below in Table 8.4.

TABLE 8.4 RANKING OF TREATMENT ALTERNATIVES									
System Alternative	Economic Analysis	BOD, TSS, and Nutrient Removal	Process Control and Flexibility	Ease of Operation	Land Requirements	Ease of Construction	Raw Score	Weighted Score	Ranking
Weighing Factor	30%	20%	10%	10%	20%	10%			
Lagoon System	5	3	3	5	4	4	24	4.1	1st
Membrane System	3	5	2	3	5	3	21	3.7	3rd
Oxidation Ditch	4	4	4	4	3	5	24	3.9	2nd

Based on the findings of the above analysis and evaluation, the option to expand the existing lagoon system by providing improved aeration and new clarifier capacity was selected. It is recommended that the preliminary engineering work for this project be initiated during Phase 1. The construction and completion of the project shall be scheduled for Phase 2.

B.) COLLECTION SYSTEM ALTERNATIVES:

The collection system involves four (4) distinct areas of work; 1) rehabilitation of existing sewer infrastructure such as sewer lines, manholes, etc., 2) new sewer line extensions, 3) pump station upgrades, and 4) storm water collection system rehabilitation. Proposed work and alternatives in each of these four areas will be explored in more detail below:

B.1 Sewer Rehabilitation Projects & Alternatives:

To initiate a sewer rehabilitation project it typically involves a preliminary phase where the project area is identified and evaluated for deficiencies. Once the deficiencies are identified, the corrective action is chosen based on the severity of the project, available options, and the available funding.

In Pineville's case, the collection system inside the City limits is the most concentrated and aged portion of their system thus this area shall be the main focus for sewer rehabilitation work over the next 10 years. Areas outside the city limit are relatively new in comparison and are not expected to have many deficiencies. Therefore, work on these outside sections will be scheduled during the third phase (11-20 years).

As such, we believe it would be in the Utility's best interest to engage in a long term plan to perform preliminary rehab work such as CCTV inspection, flow monitoring, smoke testing, line cleaning on their entire gravity sewer system over the next 20 years. Any corrective measures identified as a result of the preliminary rehab work, should be taken thereafter based on the severity of the problems identified and available funding. Such investigative work shall be summarized in the form of Sewer System Evaluation Survey (SSES) reports.

Due to the nature of the work, some of the proposed sewer rehabilitation work may be incorporated along with the proposed stormwater rehabilitation projects described previously and as further discussed elsewhere in this section.

The proposed sewer rehabilitation work and alternatives over the next 20 years are as follows:

B.1.1 Phase 1 (0-2 Years):

Any sewer rehabilitation projects associated with this phase will be incorporated with the stormwater rehabilitation project already underway. No additional projects have been identified for this period. Refer to the stormwater project section for more details.

B1.2 Phase 2 (3-10 Years):

Phase 2 projects will involve work in the downtown Pineville area. Such work shall focus on inspecting and evaluating the sewer line conditions in the area of interest. Tasks to be performed include CCTV, line cleaning, flow monitoring, mapping services, manhole inspections, smoke testing, flow studies, etc. It is estimated that approximately 24,000 LF of sewer line will need to be investigated in the downtown area. Therefore, it is recommended that the Utility assign resources and schedule such work accordingly. Table 8.5 provides a preliminary guideline for such work and an approximate cost estimate for budgetary purposes. The Utility can modify/alter such schedule based on available resources and current work schedule. Due to the ongoing stormwater related projects already scheduled for Phase 2, this work is scheduled towards the end of Phase 2. Part of this work may be combined with the ongoing stormwater separation projects and thus corrected or expedited accordingly.

Following the preliminary work scheduled to be conducted during Phase 2 (Years 2018-2026), the Utility will need to prioritize the necessary sewer rehabilitation work and schedule such work accordingly. Since no such projects are yet defined, no additional monetary value will be assigned for work in Phase 2.

B1.3 Phase 3 (11-20 Years):

The sewer rehabilitation work scheduled for Phase 3 (Years 2027 – 2036) will focus on inspection services outside the downtown Pineville area and any scheduled repair work identified during Phase 2. Areas to be investigated outside the downtown area include Clear Creek, Log Mountain, Newtown, Wallsend, and Dorton Branch. Approximately 56,000 LF of sewer lines will need to be inspected over this period.

Based on the previous recommendations, a similar work schedule and budget is provided for this period on Table 8.6. The additional sewer inspection work will be scheduled late in this period to follow any anticipated repair work identified during Phase 2.

TABLE 8.5 SEWER REHABILITATION PROJECTS (PHASE 2)			
Year	**Work Description**	**Estimated Quantities**	**Estimated Project Cost**
2020	Inspection Services in Downtown Pineville (TV Work, Flow Monitoring, Line Cleaning & Smoke Testing – Typical)	4,000 LF	$30,000
2021	Inspection Services in Downtown Pineville Area	4,000 LF	$30,000
2022	Inspection Services in Downtown Pineville Area	4,000 LF	$30,000
2023	Inspection Services in Downtown Pineville Area	4,000 LF	$30,000
2024	Inspection Services in Downtown Pineville Area	4,000 LF	$30,000
2025	Inspection Services in Downtown Pineville Area	4,000 LF	$30,000
	Total:	24,000 LF	$180,000

No alternative action has been presented for the sewer rehabilitation work since there are no specific projects identified. Typical options available during such work are summarized below for future references and budgeting purposes.

a) Lines: Sewer line rehabilitation can be addressed by; replacing the line section with a new sewer line, slip-lining a section of existing pipe with a liner, making a point repair to address a crack/leak on a pipe, and root removal.

b) Manholes: Similarly, manhole rehabilitation can be addressed by; complete replacement of the manhole, application of a manhole coating or liner, manhole ring and lid replacement, root removal, point repair, and other such specific work.

TABLE 8.6 SEWER REHABILITATION PROJECTS (PHASE 3)			
Year	**Work Description**	**Estimated Quantities**	**Estimated Project Cost**
2027	Reserved for Repair Work	TBD	TBD
2028	Reserved for Repair Work	TBD	TBD
2029	Reserved for Repair Work	TBD	TBD
2030	Inspection Services in Clear Creek Area	8,000 LF	$50,000
2031	Inspection Services in Clear Creek Area	8,000 LF	$50,000
2032	Inspection Services in Clear Creek/Log Mtn. Area	8,000 LF	$50,000
2033	Inspection Services in Log Mountain Area	8,000 LF	$50,000
2034	Inspection Services in Newtown/High Rise Area	8,000 LF	$50,000
2035	Inspection Services in Wallsend/Hospital Area	8,100 LF	$50,000
2036	Inspection Services in Dorton Branch Area	8,000 LF	$50,000
	Total:	56,100 LF	$350,000

B1.4 Economic Analysis & Evaluation:

No economic analysis is provided here since there are no alternatives to consider at this stage.

Refer to Figure 19 for a summary and an illustration of the proposed sewer rehabilitation projects.

B.2. Sewer Line Extension Projects & Alternatives:

The City of Pineville currently provides sewage collection and treatment for residences located within the City of Pineville and other areas within Bell County. While all of the residences within the city are currently served, there are densely populated areas outside of the city that are still in need of sewage collection service. Several areas have been identified to extend sanitary sewer infrastructure over the next 20 years. These areas include; Turkey Creek, Ferndale, the State Highway 119 Corridor, Walnut Lane Area, and the Pine Mountain Regional Industrial Park (PMRIA).

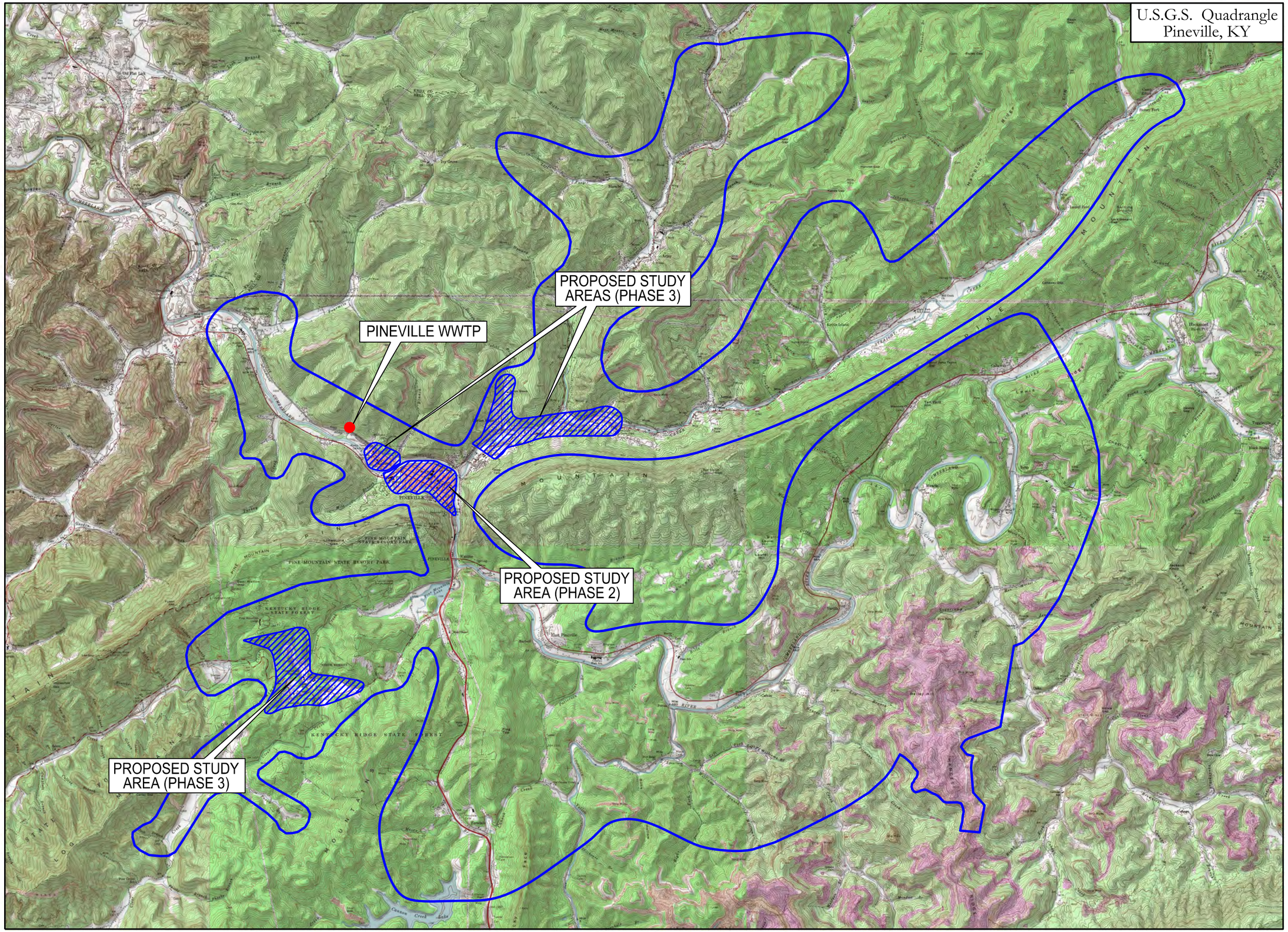

FIGURE 19 - PROPOSED SEWER REHABILITATION PROJECTS REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 6000'

LEGEND

- PLANNING AREA BOUNDARY
- PINEVILLE WWTP
- PROPOSED REHAB / STUDY AREA

Project Number: 11055-00
Date: AUGUST 2014

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The scope of each of these projects and the number of new customers to be gained by such a project is discussed in more detail below. Several hundred septic systems and straight pipes will be eliminated by extending public sewer to these areas. The elimination of two (2) package treatment plants that serve the Ferndale Apartment Complex and the Mountain View Nursing & Rehabilitation Center, is also part of the scope of work.

B2.1 Phase 1 (0-2 Years):

Due to the limited available plant capacity, and the anticipated work on the stormwater sector, no sewer line extension work will be scheduled during this period. Additional plant capacity is required before additional customers can be added to the system.

B2.2 Phase 2 (3-10 Years):

The proposed plant expansion, and the remaining anticipated work on the stormwater sector will occupy the Utility during Phase 2 also. Therefore, no sewer line extensions will be scheduled for this period also.

B2.3 Phase 3 (11-20 Years):

All of the proposed sewer line extension work will need to be scheduled for Phase 3 (Years 2027-2036), and once additional plant capacity becomes available. Such capacity may become available by either reducing I/I or by expanding the WWTP.

The proposed sewer line work for the development of the Industrial Park may be moved into Phase 2 as described later in this report, provided the proposed plant expansion project is underway or completed already. Without additional plant capacity, the current WWTP and existing collection system will not be able to handle additional flow from new industrial customers.

a) Turkey Creek Line Extension & Alternative:

This future potential service area is located just north of the existing sewerage area. Up to 40 potential new customers can be gained by extending sewer to this location. Due to the relatively flat topography in the project area (Figure 20), this potential area would be served by gravity lines. Sewage conveyance from this area back into the existing collection system will be accomplished via one (1) sanitary sewer pump station and approximately 11,000 LF of 4" PVC force main. For budgetary purposes, approximately 6,000 LF of new gravity sewer lines and approximately 30 manholes would be constructed during this project. The estimated construction cost for this project is $1,055,700. A detailed construction cost estimate is provided in Appendix B, Table B-5. An alternative to the gravity collection system would be to use a low pressure sewer system (Figure 21). The low pressure sewer system will serve the proposed area utilizing small size force mains and individual septic tank effluent pumps (STEP). Wastewater collected in this system will discharge into a sanitary sewer pump station as previously described and ultimately conveyed to the existing collection system. The estimated construction cost for this alternative is $900,000. A detailed construction cost estimate is provided in Appendix B, Table B-6.

Similarly, another alternative to this option would be to construct a new package WWTP at, or around the Turkey Creek area to serve these future customers. Under this alternative, a new NPDES Permit will be required. The site for the new WWTP will need to be identified and secured. The discharge from such a plant will be to Turkey Creek. The various options considered here, along with others, will need to be revisited during the preliminary phase of such a project. In addition, the existing collection system in Pineville

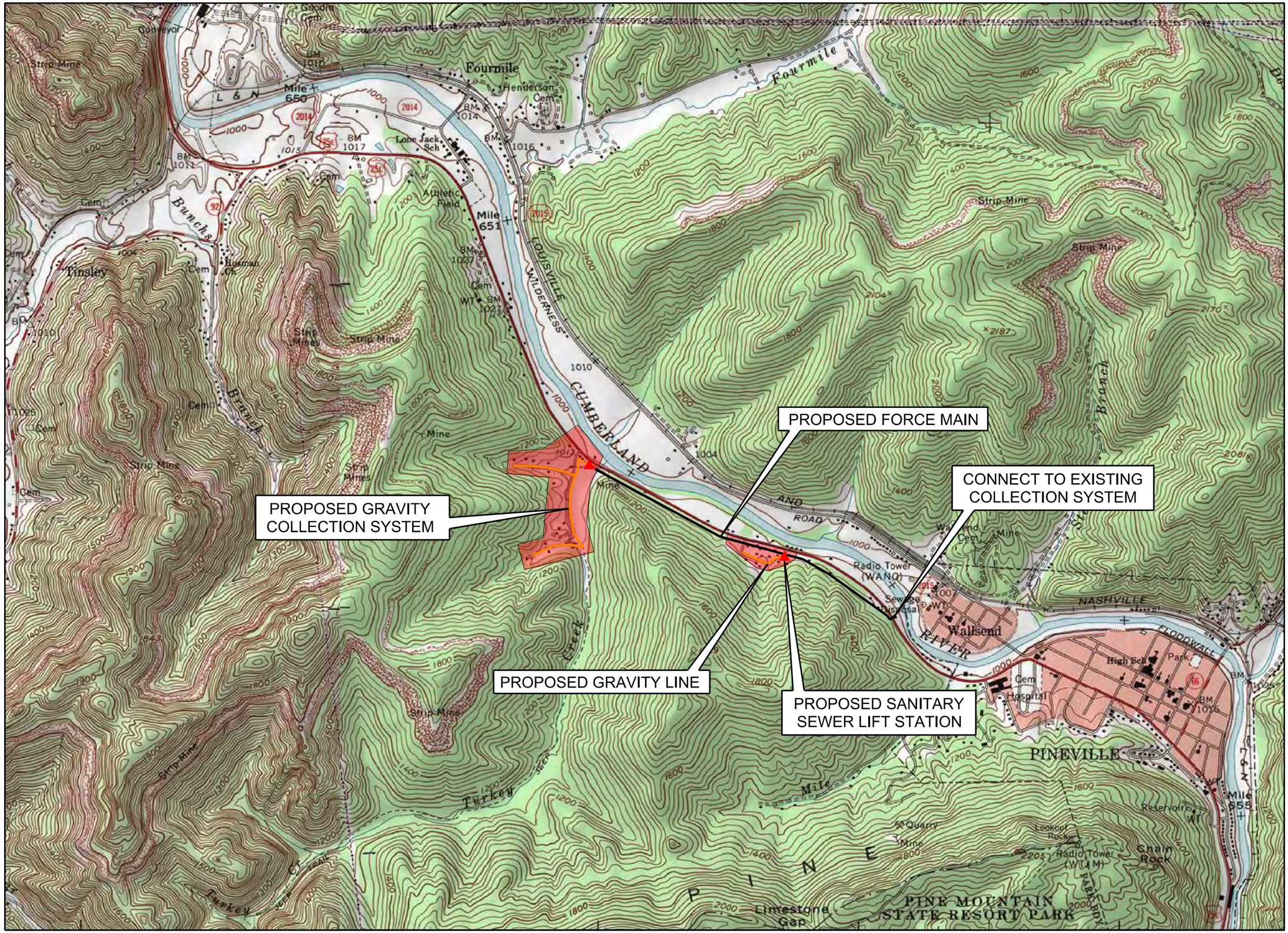

FIGURE 20 - TURKEY CREEK SEWER LINE EXTENSION
PROPOSED OPTION
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

SCALE: 1" = 2000'

LEGEND

- PROJECT AREA
- PROPOSED GRAVITY LINE
- PROPOSED FORCE MAIN
- PROPOSED LIFT STATION

Project Number: 11055-00
Date: AUGUST 2014

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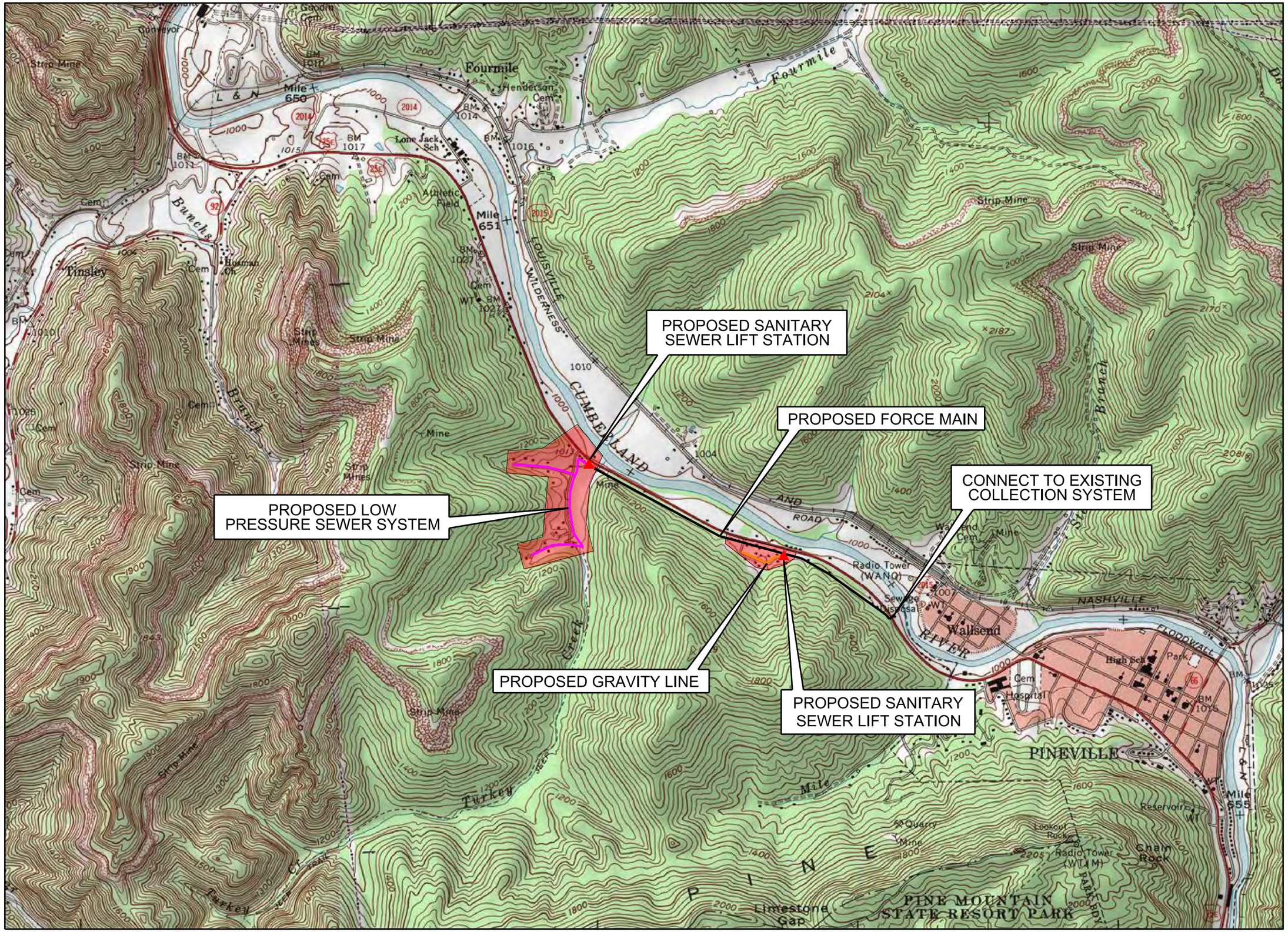

FIGURE 21 - TURKEY CREEK SEWER LINE EXTENSION ALTERNATIVE OPTION REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 2000'

LEGEND

- PROJECT AREA
- PROPOSED LOW PRESSURE LINE
- PROPOSED FORCE MAIN
- PROPOSED LIFT STATION

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will need to be evaluated and upgraded as necessary to handle the additional flow from Turkey Creek. For budgeting purposes, this project is scheduled for Phase 3.

b) <u>Ferndale Line Extension & Alternative:</u>

The Ferndale area is located approximately 5 miles south of Pineville just off US 25E. This area was included in the planning area of the previous 201 Facilities Plan that was prepared in 1977. Although there have been numerous line extensions since the previous 201 Plan, the Ferndale area is still un-served, and in dire need of sewage collection due to the high number of houses with failing septic systems and "straight pipes". The potential project (Figure 22) will provide sewage collection/treatment to approximately 28 residences, a nursing home, and a low-income housing facility with approximately 122 apartments, both of which are currently served by on-site package treatment units. Such a project will allow both of these existing package treatment units to be abandoned.

The proposed project will include approximately 7,000 feet of gravity collection lines, approximately 8,000 feet of force main, two (2) sewage lift stations, rehabilitation of the existing Bell High sewage lift station, approximately 50 manholes, and other associated appurtenances. The estimated construction cost for this project is $1,530,363. A detailed construction cost estimate is provided in Appendix B, Table B-7.

An alternative to this option would be to use a low pressure sewer system (Figure 23) instead of a gravity collection system, along with new sanitary sewer lift stations to pump the flow to the existing Bell High lift station, as previously described.

The construction cost estimate of this alternative is approximately $1,265,825. A detailed breakdown of this alternative is provided in Appendix B, Table B-8. Similarly, for

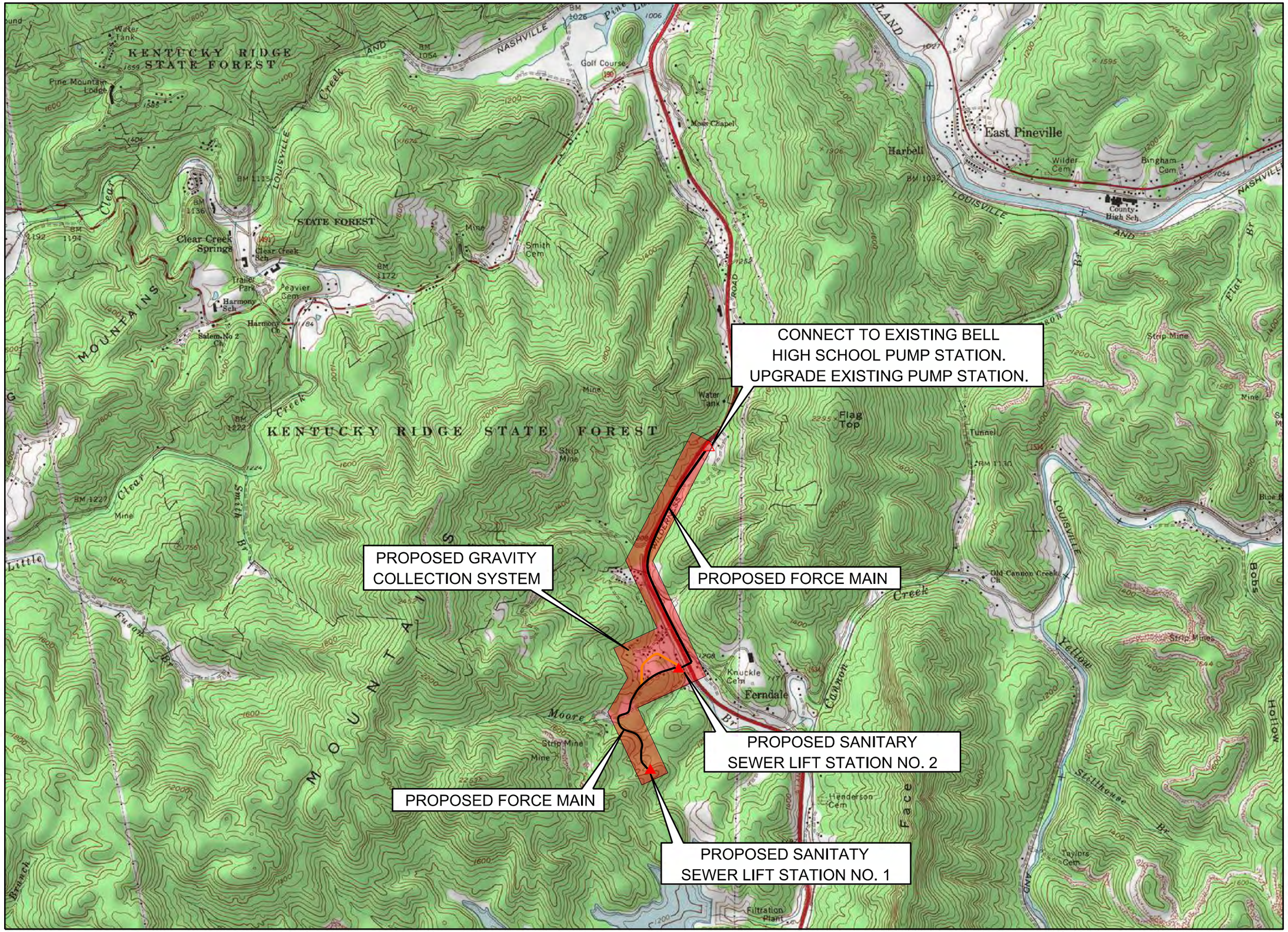

FIGURE 22 - FERNDALE SEWER LINE EXTENSION PROPOSED OPTION REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 2000'

LEGEND

- PROJECT AREA
- PROPOSED GRAVITY LINE
- PROPOSED FORCE MAIN
- PROPOSED PUMP STATION
- EXISTING PUMP STATION

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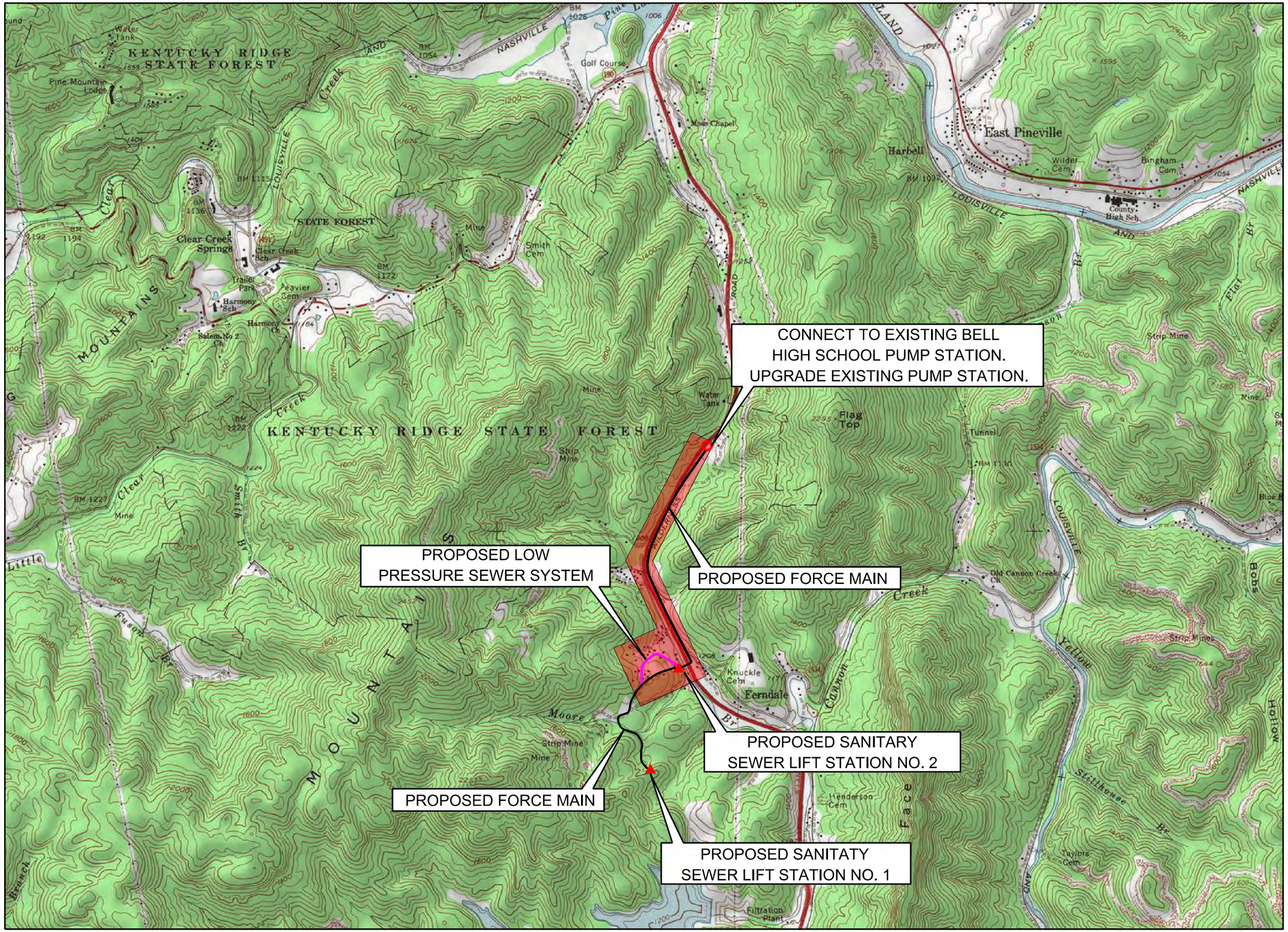

FIGURE 23 - FERNDALE SEWER LINE EXTENSION ALTERNATIVE OPTION REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 2000'

LEGEND

- PROJECT AREA
- PROPOSED LOW PRESSURE LINE
- PROPOSED FORCE MAIN
- PROPOSED LIFT STATION
- EXISTING LIFT STATION

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budgeting purposes, this project is scheduled for Phase 3 and it will be revisited at a later stage to re-evaluate the options available and update the costs accordingly.

c) <u>Pine Mountain Regional Industrial Park (PMRIA) Line Extension & Alternative:</u>

PMRIDA was created in 2000 with the intention of developing a regional industrial park in Bell County, Kentucky. Since their establishment, significant progress has been achieved. Acquisition of a roughly 500-acre tract of property was completed in February 2002. This future potential service area is located in mid-eastern Bell County near the community of Varilla, approximately 9 miles east of the City of Pineville and approximately 20 miles west of the City of Harlan. The property consists of reclaimed surface mine land, and is known locally as "Mountain Drive". It lies on the south side of the Cumberland River on Hances Ridge and contains 453-acres of property designated for industrial development.

In a recent study completed at the beginning of 2008, it was concluded that a direct connection to Pineville's Wastewater Collection System would be the most viable and cost effective solution for sewage disposal from the Industrial Park. The recommended option (Figure 24) consists of a transport/collection system from the Industrial Park property, west down Sam Low Branch toward Hances Creek (KY 1344), then along KY 1344, under the Cumberland River, and along State Highway 119 through a series of strategically located lift stations and force main. These lift stations will pump the sewage to the existing OTB Lift Station located adjacent to U.S. 25E. From there, the OTB Lift Station will pump the flow directly to the WWTP. A new force main from the OTB L.S. to the plant will need to be considered once the industrial park and future growth areas are fully developed.

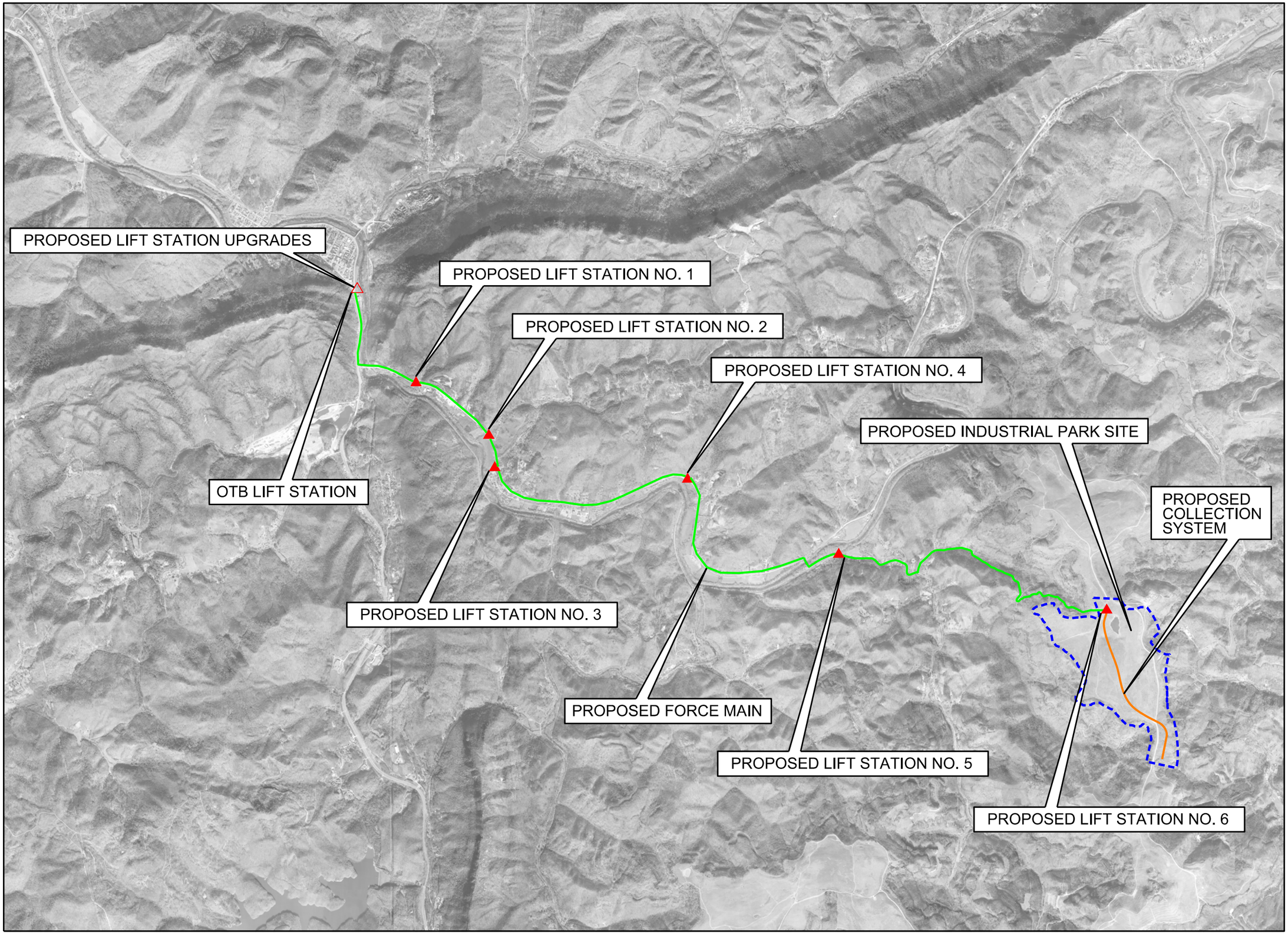

FIGURE 24 - PINE MTN REGIONAL INDUSTRIAL PARK PROPOSED OPTION REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 4000'

LEGEND

- PROPOSED FORCE MAIN
- PROPOSED GRAVITY LINE
- EXISTING LIFT STATION
- PROPOSED LIFT STATION

Project Number: 11055-00
Date: AUGUST 2014

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Odor control and corrosion protection will need to be provided to these proposed pump station sites and force mains due to the long distance the sewage has to travel. Standby generator sets may also be required depending on the nature of the industrial park customers, local preferences, and other such design guidelines.

This proposed project would lay the ground work for the following State Highway 119 Corridor Project that would provide public sewer to approximately another 200 additional residents along the Kentucky 119 corridor. For budgetary purposes, the sewage conveyance from the industrial park back into the existing collection system will be accomplished via approximately 6 new sanitary sewer pump stations, approximately 50,000 LF of force main, and approximately 10,000 LF of new 10" gravity sewer. The estimated construction cost of the proposed project is $5,623,500. A breakdown of the construction cost is attached in Appendix B, Table B-9.

An alternative to this option is to construct a new package WWTP in the Industrial Park area to treat the wastewater generated from this area (Figure 25). The estimated construction cost for this option is $5,675,250. The construction cost breakdown is provided in Appendix B, Table B-10. A new outfall line and a new NPDES Permit will be required under this alternative.

Similarly, for budgeting purposes, this project is scheduled for Phase 3. It will be revisited at a later time and as needed to re-evaluate the options available and to update the cost estimates.

d) <u>Walnut Lane Line Extension & Alternative:</u>

Walnut Lane is located within the existing sewerage area and boarders the Wasioto Winds Golf Course. Up to 12 potential new customers can be gained by extending sewer to this location. Due to the relatively flat topography, this system (Figure 26) would be served

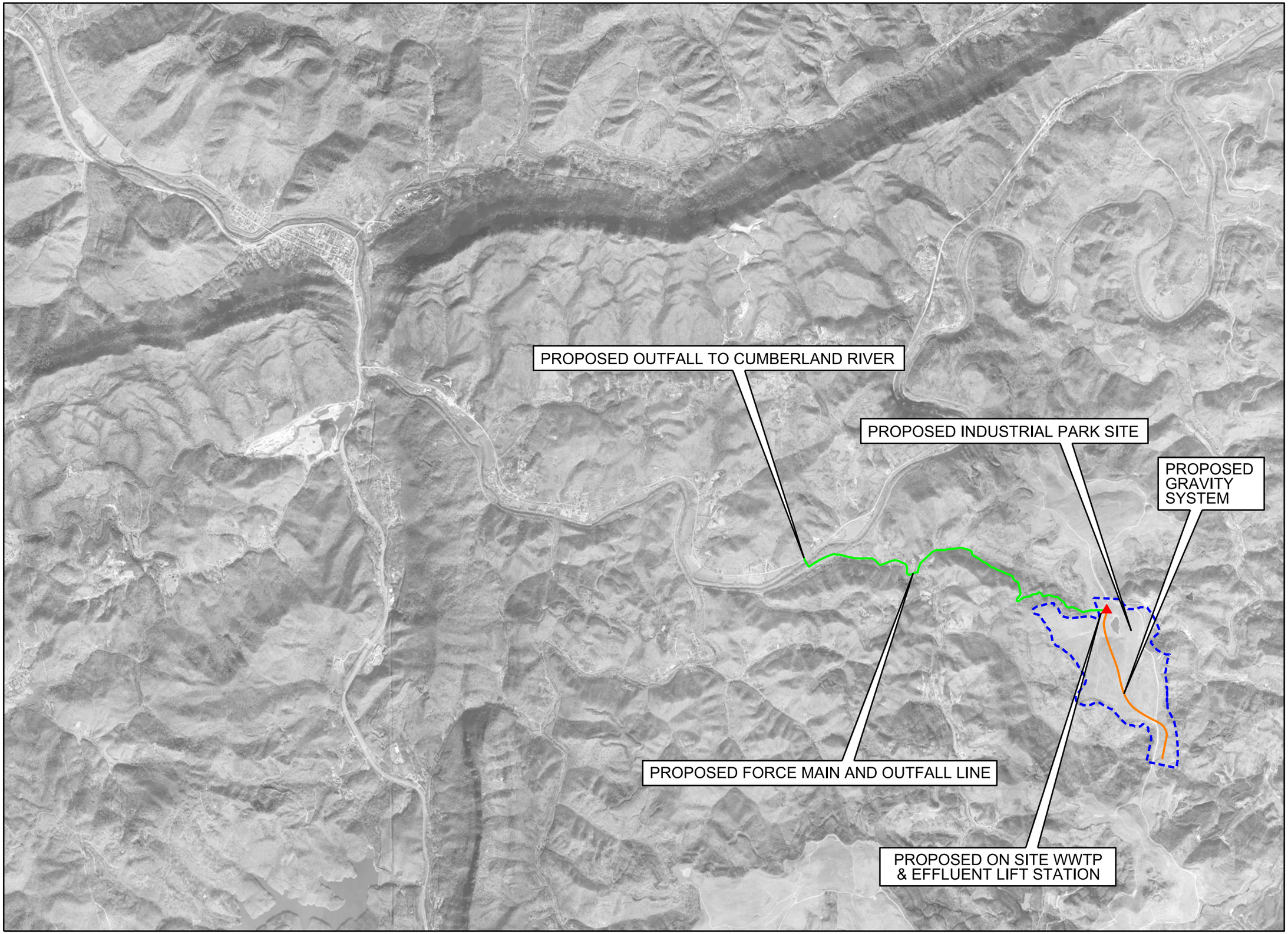

FIGURE 25 - PINE MTN REGIONAL INDUSTRIAL PARK
ALTERNATIVE OPTION
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 4000'

LEGEND

- PROPOSED FORCE MAIN
- PROPOSED GRAVITY LINE
- PROPOSED LIFT STATION

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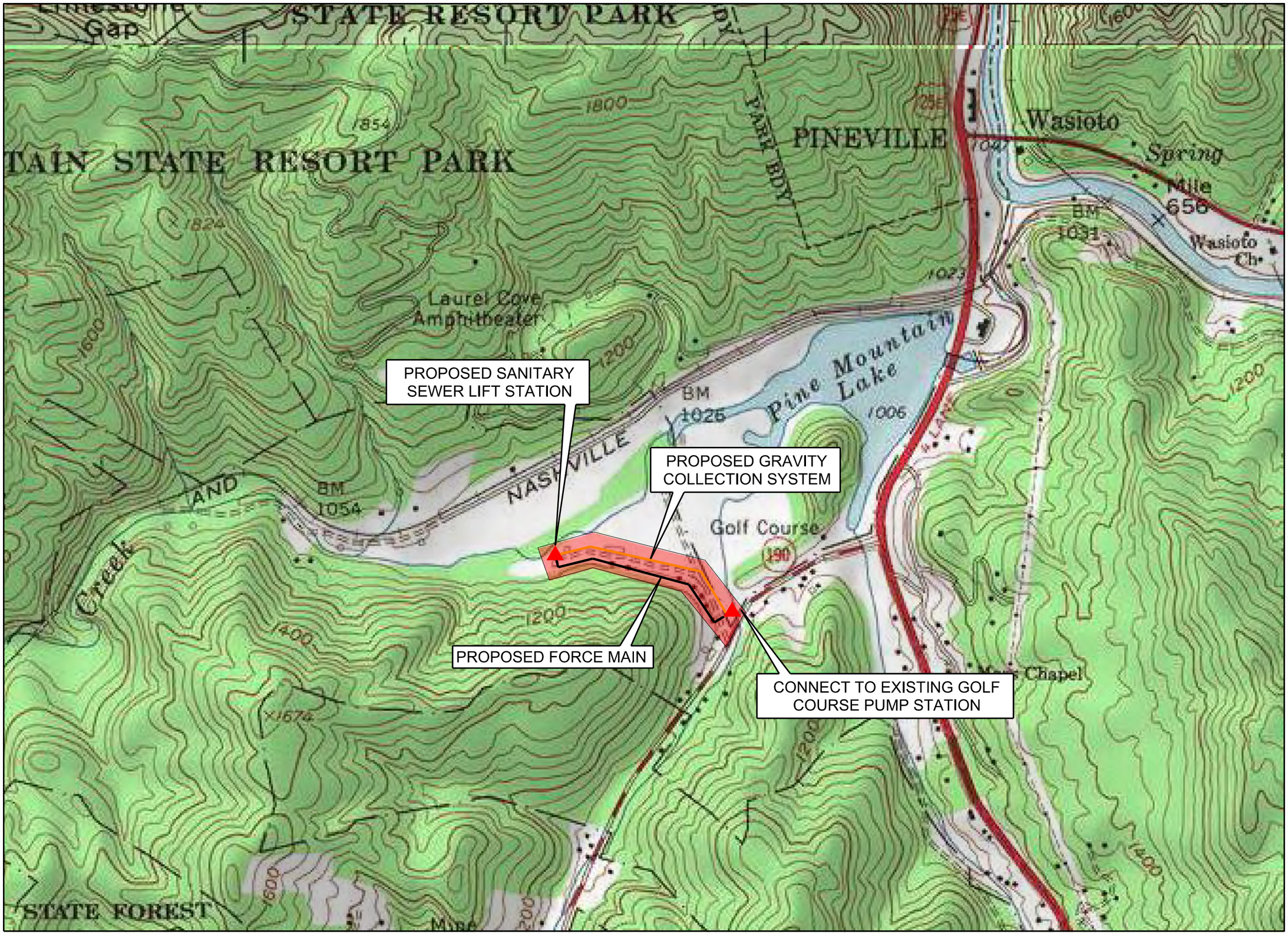

FIGURE 26 - WALNUT LANE SEWER LINE EXTENSION
PROPOSED OPTION
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 1000'

LEGEND

- PROJECT AREA
- PROPOSED GRAVITY LINE
- PROPOSED FORCE MAIN
- PROPOSED LIFT STATION

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by gravity lines. Sewage conveyance from this area back into the existing collection system will be accomplished via one sanitary sewer pump station and approximately 1,500 LF of PVC force main. Approximately 1,400 LF of new gravity sewer lines and approximately 6 manholes would be constructed during this project. Refer to Figure 29 for a detailed map. An estimated construction cost for this project is $503,700. Refer to Appendix B, Table B-11 for a detailed cost breakdown.

An alternative option (Figure 27) to serve these potential customers would be to use a low pressure sewer system, such as previously described. The project will involve approximately 12 low pressure residential pump stations, approximately 2,500 LF of PVC pressure line and a connection to the existing sewer system.

The estimated construction cost of this alternative project is $244,720. Refer to Appendix B, Table B-12 for a detailed cost breakdown.

For budgeting purposes, this project will be scheduled for Phase 3.

e) <u>State Highway 119 Corridor Line Extension & Alternative:</u>

Once the extension to the Pine Mountain Regional Industrial Park is in place, it opens various opportunities to serve additional communities along the State Highway 119 corridor and to potentially eliminate a 3rd package WWTP at Page Elementary School. Populated communities adjacent to the proposed route, such as Wasioto, East Pineville, Bird Branch, and possibly Laurel Hill, could potentially benefit from the already constructed lines. Several households within these populated areas are currently utilizing conventional septic systems with failing lateral fields or straight pipes disposing sanitary sewer directly into the local streams or river.

The proposed Highway 119 corridor project would be completed in multiple projects/stages. Stage 1 would provide service to the Wasioto area (Figure 28). This future

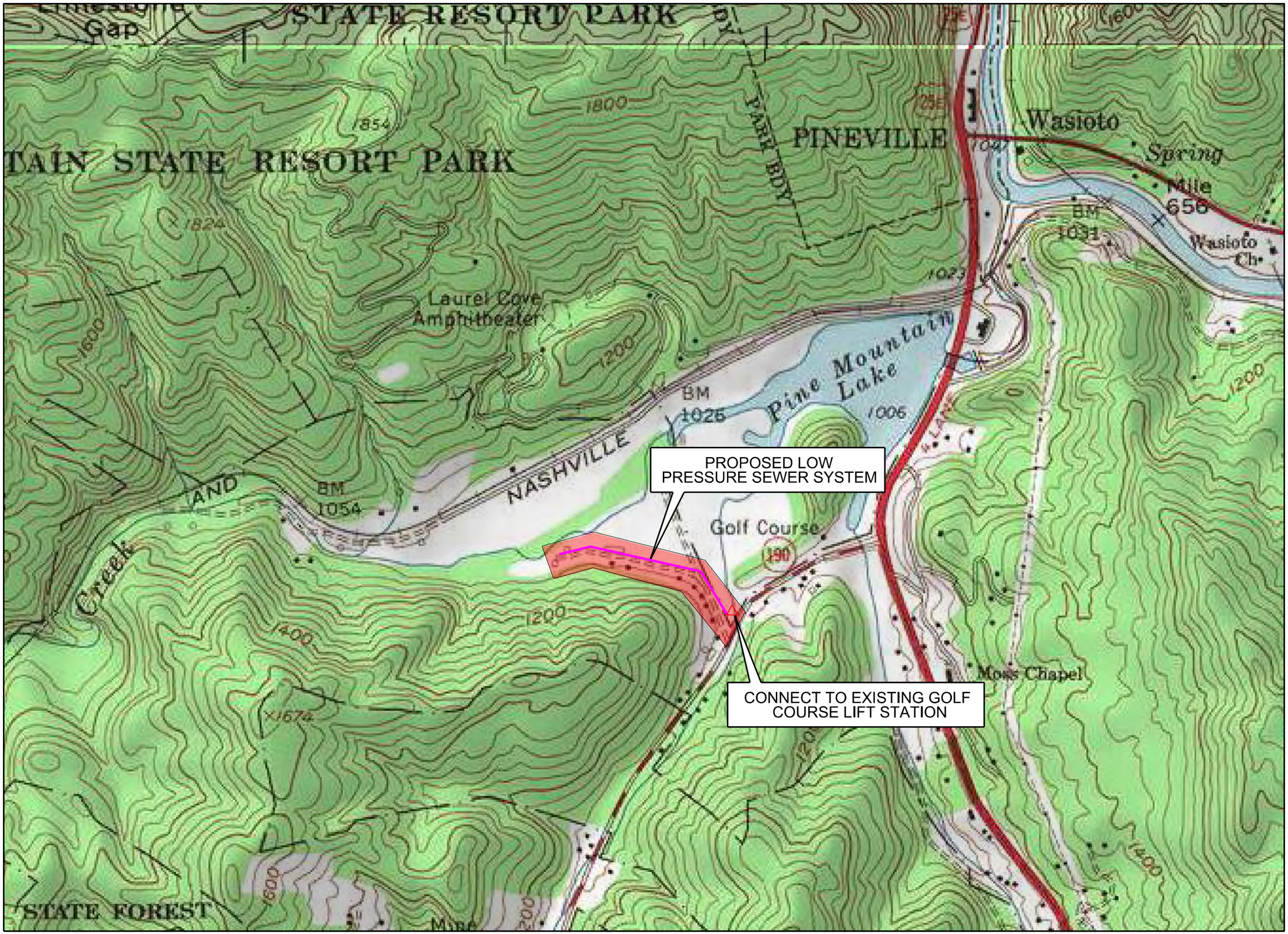

FIGURE 27 - WALNUT LANE SEWER LINE EXTENSION
ALTERNATIVE OPTION
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 1000'

LEGEND

- PROJECT AREA
- PROPOSED LOW PRESSURE LINE
- EXISTING LIFT STATION

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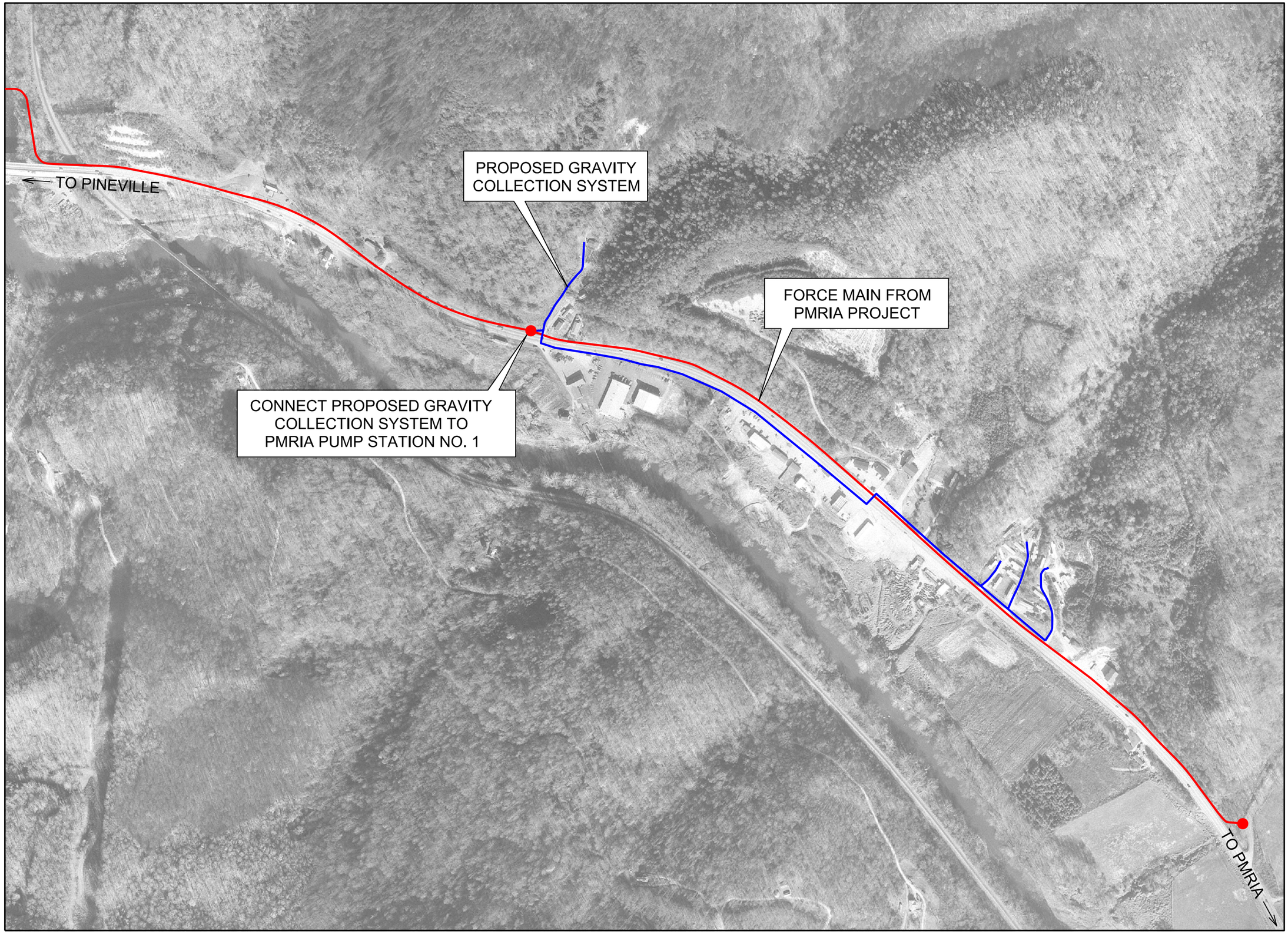

FIGURE 28 - HWY 119 CORRIDOR SEWER LINE EXTENSION PROPOSED OPTION - WASIOTO SECTION (STAGE 1)

REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 400'

LEGEND

- PROPOSED INDUSTRIAL SEWER LINE
- POSSIBLE FUTURE EXTENSION
- PROPOSED INDUSTRIAL LIFT STATION

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potential service area is located just east of the existing sewerage area. Up to 40 potential new customers could be gained by extending sewer to this location. The sewage collected would flow by gravity into one of the sanitary sewer pump stations that would be provided by the PMRIA project (Refer to Figure 24). Stage 1 would include approximately 4,500 LF of new gravity sewer lines along with approximately 20 manholes and other appurtenances. The estimated construction cost for this project is $449,075. A detailed construction cost estimate is provided in Appendix B, Table B-13.

Stage 2 would include service to the Bird Branch area (Figure 29). By extending sewer to this location, approximately 75 new residents could be served. Similarly, the sewage collected would flow by gravity into one of the sanitary sewer pump stations that would be provided by the PMRIA project. This project would include approximately 10,300 LF of new gravity sewer lines along with approximately 20 manholes and other such appurtenances. The estimated construction cost for this project is $786,025. A detailed construction cost estimate is provided in Appendix B, Table B-13. This project would be a prerequisite to serving the Laurel Hill area (future growth) which at this point, we believe would be outside this 20-year plan. The Page Elementary School package WWTP may be also eliminated due to service in this area.

Stage 3 project would include service to the East Pineville area (Figure 30). Extending sewer to this location could potentially serve approximately 85 new customers. The sewage collected would flow by gravity into one of the sanitary sewer pump stations that would be provided by the PMRIA project. This project would include approximately 13,800 LF of new gravity sewer lines, approximately 30 manholes, along with other sewer appurtenances. An estimated construction cost for this project is $1,060,156. A detailed construction cost estimate is provided in Appendix B, Table B-13.

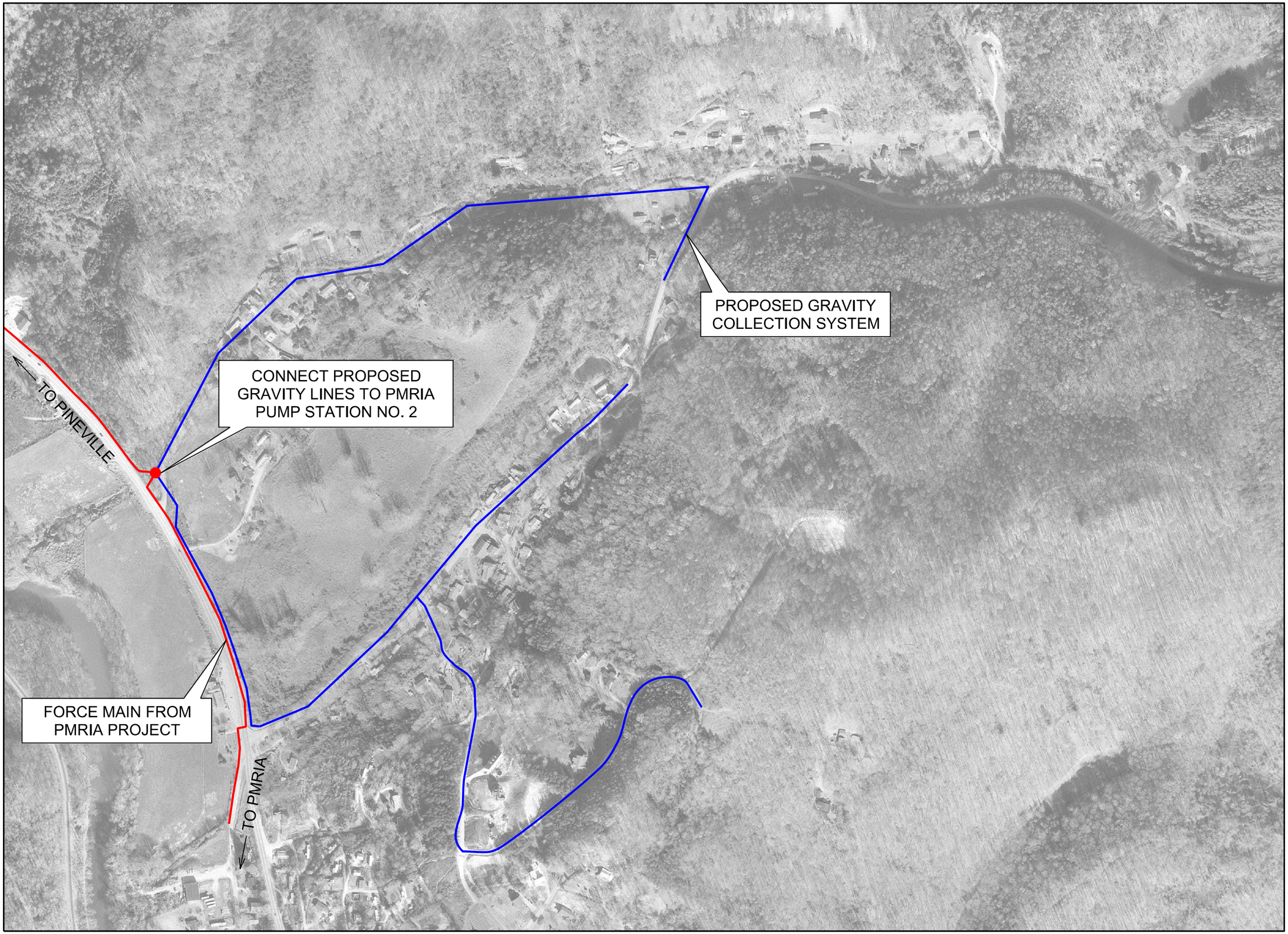

FIGURE 29 - HWY 119 CORRIDOR SEWER LINE EXTENSION PROPOSED OPTION - BIRD BRANCH SECTION (STAGE 2)

REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 400'

LEGEND

- PROPOSED INDUSTRIAL SEWER LINE
- POSSIBLE FUTURE EXTENSION
- PROPOSED INDUSTRIAL LIFT STATION

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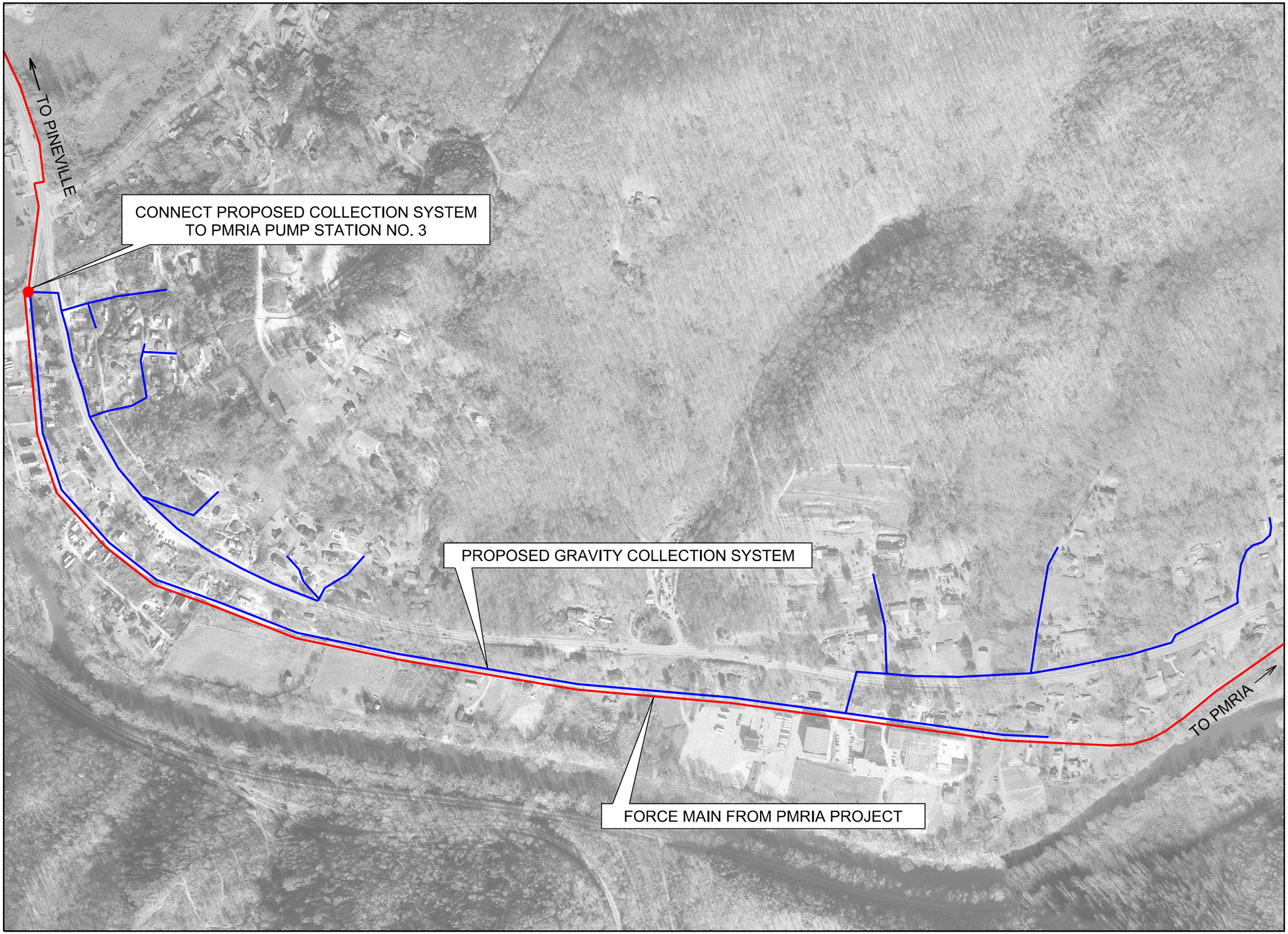

FIGURE 30 - HWY 119 CORRIDOR SEWER LINE EXTENSION
PROPOSED OPTION - EAST PINEVILLE SECTION (STAGE 3)
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 400'

LEGEND

- PROPOSED INDUSTRIAL SEWER LINE
- POSSIBLE FUTURE EXTENSION
- PROPOSED INDUSTRIAL LIFT STATION

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An alternative to provide sewer service would be to install low pressure sewer systems instead of gravity lines in these three (3) service areas (Figure 31). Sewer will be collected in a low pressure force main and discharged into one of the existing PMRIA pump stations as previously described. For budgeting purposes, the estimated construction costs for this alternative would be $391,575, $642,850, $778,981, respectively. The construction cost estimate breakdown for these alternatives is provided in Appendix B, Table B-14. Similarly, this project is scheduled for Phase 3. It will be later revisited to re-evaluate options available and update the costs accordingly.

B2.4 Economic Analysis and Evaluation:

The use of a gravity sewer system where topography allows it, along with new pump station(s) and force main to connect to the existing collection system would be the preferred alternative for any of the line extension projects. Avoiding the installation of another package WWTP, eliminating the associated operation and maintenance of a package WWTP, and reducing the overall capital and O&M costs of the sewer system are a few of the reasons for selecting the proposed action.

The low pressure systems, although slightly less expensive to construct, would normally keep the wastewater in the pipelines for a longer period (longer detention time) than in a gravity sewer system. Since most of these areas are quite far from the WWTP, handling of the sewage will provide challenges with regards to odor generation, corrosion inhibition, and stronger wastewater strength. The frequent maintenance of low pressure pumps is another concern and a deterrent to the Utility also.

A closer economic evaluation and analysis will be conducted in the future as some of these projects get closer to development. Since their timeframe is scheduled for Phase 3, no additional work will be conducted.

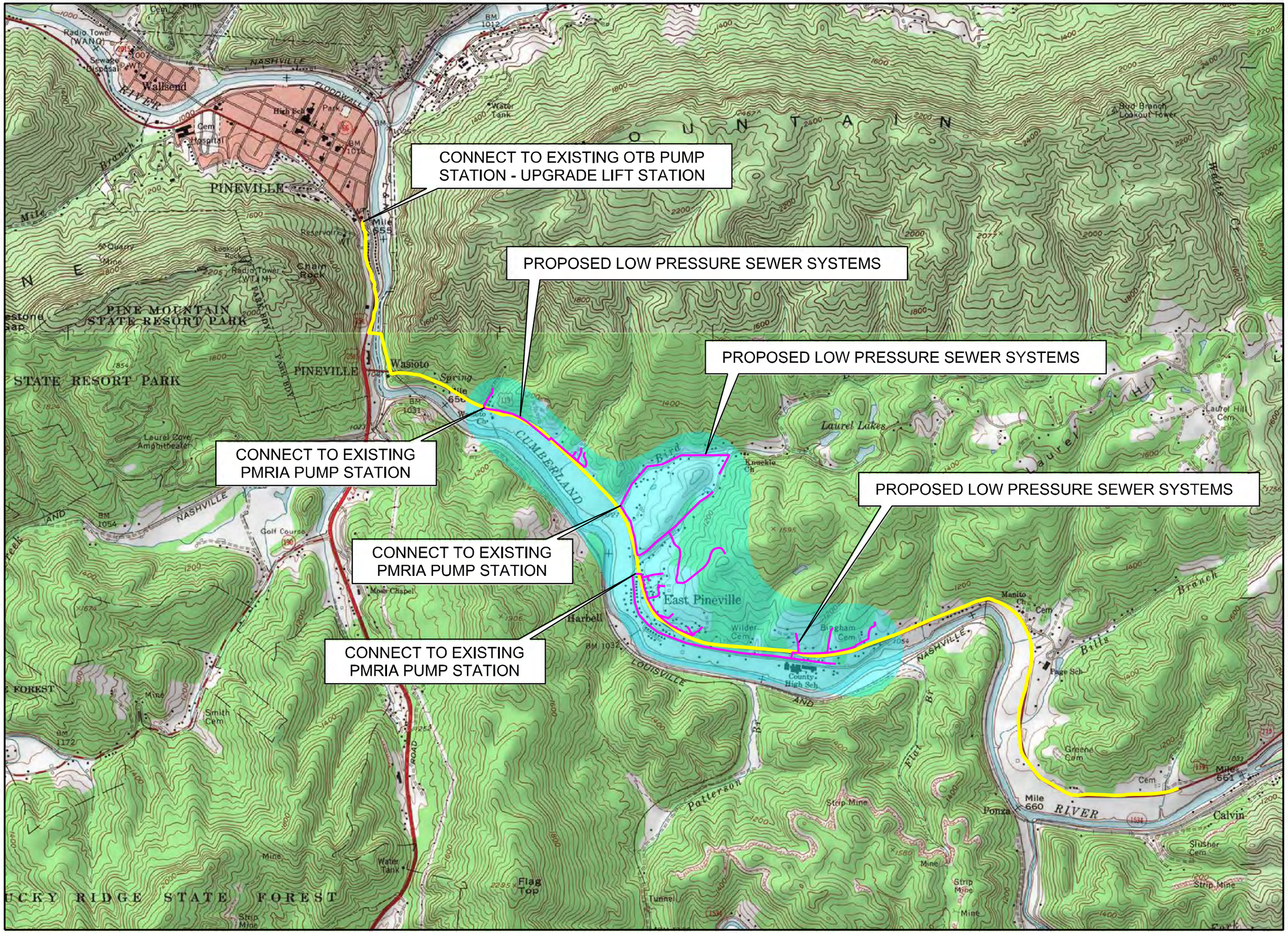

FIGURE 31 - HWY 119 CORRIDOR SEWER LINE EXTENSION ALTERNATIVE OPTION REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 2000'

LEGEND

- POSSIBLE AREA OF FUTURE SERVICE
- PROPOSED PARK SEWER LINE
- LOW PRESSURE SEWER

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Refer to Figure 32 for a summary and an illustration of the proposed sewer line extension projects.

B.3. Pump Station Upgrades/Replacement Projects & Alternatives:

Pump station equipment and related infrastructure come into contact with highly corrosive gases and liquids, therefore, it is hard to predict their life expectancy and maintenance cost. Based on the site visits and evaluation of the existing 13 pump stations, one can assume that the entire number of pump stations will be either replaced entirely, or somehow upgraded during the next 20 years. Pump station areas that will need immediate attention will be grouped into the first project phase (0-2 years), whereas everything else that is known to need attention will be assigned into the second project phase (3-10 years). Any remaining stations that will potentially require work in the near future will be accounted in Phase 3 (11-20 years).

B3.1 Phase 1(0-2 Years):

According to the findings of the pump station evaluation, the Ball Field Pump Station, the McDonalds/Mountain View Pump Station, the KFC Pump Station, the Lake Mistake Pump Station, the Clear Creek Daycare Pump Station, and the Bell High Pump Station need immediate attention. The Ball Field Pump Station and McDonalds (Mountain View) Pump Station are part of the upcoming stormwater project already in the planning phase, so their work will be described elsewhere in this report.

Due to the short timeframe available and the limited work involved with the remaining four (4) pump stations, we will assume that the Utility will combine all the work involved in one contract and try to immediately provide repairs to these stations utilizing one project. The list of repairs identified and the estimated construction cost for each site is summarized and reported in Table 8.7.

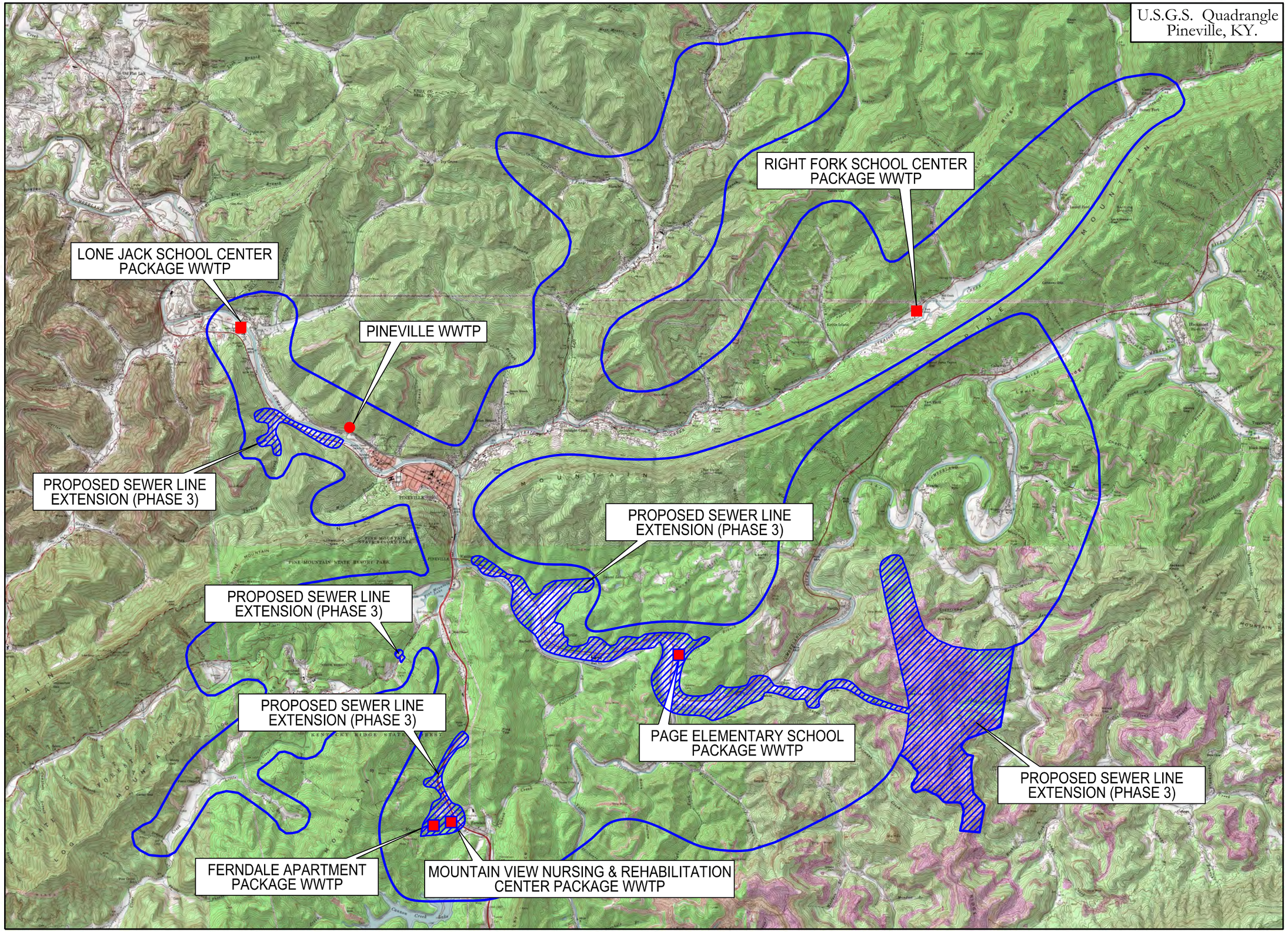

FIGURE 32 - PROPOSED SEWER LINE EXTENSION PROJECTS
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 6000'

LEGEND

- PLANNING AREA BOUNDARY
- PINEVILLE WWTP
- PACKAGE WASTE WATER TREATMENT PLANT
- PROPOSED SEWER LINE EXTENSION AREAS

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When all four (4) pump stations work is combined in one construction contract, the proposed construction cost estimate is $600,000.

TABLE 8.7 PUMP STATION PROJECTS PHASE 1			
Pump Station I.D.	**Work Description**	**Estimated Construction Amount**	**Reference Appendix B**
3 – KFC P.S.	Replace w/ New Pump Station	$200,000	Table B-15
7 – Lake Mistake P.S.	Miscellaneous Improvements & Additional Wet-Well	$100,000	Table B-16
9 – Clear Creek Daycare P.S.	New Pumps & Miscellaneous Improvements	$100,000	Table B-17
12 – Bell High P.S.	Rehabilitation of Station	$200,000	Table B-18
Total:		**$600,000**	

Alternative options to making repairs to existing pump stations, would be to try to eliminate one or more of these pump stations by sending the flow to a different location, or providing a new lift station to replace the old unit. Such options would be more costly in general, and likely would require additional design considerations. The options noted above, along with other available alternatives would be further considered during the preliminary phase of each of these projects. At such time, the pump station flows will be revisited, the need and project expectations will be identified, along with other pertinent design and/or operational criteria. Any proposed work will be accomplished within the confines of the existing property where possible.

B3.2 Phase 2(3-11 Years):

The pump station work scheduled for the second phase period involves work to the Clear Creek Lodge Pump Station, the Clear Creek Apartments Pump Station, the Golf Course Pump

Station, and work to the Main Pump Station. Based on the type of repairs identified in Table 6.1, and the expected growth during this second phase, the scheduled repair work will be done in two (2) separate projects. The first project will aim to upgrade the Main Lift Station so it can remain in proper order with the upgraded WWTP that is scheduled for the same period.

The second project will aim to address repairs and deficiencies in the remaining three (3) pump stations as noted earlier.

The estimated construction cost for these projects is summarized in Table 8.8.

TABLE 8.8 PUMP STATION PROJECTS PHASE 2		
Pump Station I.D.	**Work Description**	**Estimated Construction Amount**
8 – Clear Creek Lodge P.S.	New Fence	$6,500
10 – Clear Creek Apt. P.S.	New Pumps, Guiderails, Controls	$75,000
11 – Golf Course P.S.	New Pumps, Guiderails, Controls	$75,000
13 – Main P.S.	New VFDs, Guiderails, Controls, Standby Generator Set, Flowmeter	$264,000 Appendix B, Table B-19
Total:		**$420,500**

Alternative options for the pump station repairs and upgrades during Phase 2 would be similar to the alternative options noted earlier for the Phase 1 projects. Such alternative options would be considered more closely during the preliminary stage of each project.

B3.3 Phase 3(11-20 Years):

Similarly, the projects scheduled for Phase 3 include work to the OTB Pump Station, Dorton Branch Pump Station, and Newtown Pump Station. Work to the OTB pump station will be

included with the sewer line extension to the Industrial park, therefore no additional cost will be added here. We will assume that each of the remaining two projects will be handled separately by the Utility.

The estimated construction cost for each project is noted in Table 8.9.

Similarly, a new force main from the upgraded OTB station to the WWTP site will be required in order to carry the ultimate flow expected from the Industrial Park development, the Kentucky 119 Corridor growth, and the anticipated Ferndale connection.

A preliminary cost estimate for the proposed force main extension is $1,000,000 (Appendix B, Table 20).

TABLE 8.9
PUMP STATION PROJECTS
PHASE 3

Pump Station I.D.	Work Description	Estimated Construction Amount
Dorton Branch Pump Station	New Pumps, Guide Rails, Controls	$125,000
Newtown Pump Station	New Pumps, Guide Rails, Controls	$125,000
OTB Pump Station	New Pumps, Odor Control System, Standby Generator Set, Flowmeter	Append. B, Table B-20
Total:		**$250,000**

Since all of the above projects involve existing equipment and somewhat unique installations, alternative options are hard to define at this stage. The option to replace the entire station is available and it will be evaluated on a case by case scenario and as funding for the project allows. Options in materials selected, pump manufacturers and other related options will also be considered during the planning stages of these projects. Each pump station will be re-

evaluated during the preliminary engineering phase to revisit the alternatives available and update the costs.

A summary of the proposed list of pump station repairs and upgrades for each of the phases noted, is illustrated on Figure 33.

B3.4 Economic Analysis and Evaluation:

Due to the relatively large number (13) of pump stations included within the planning area, a close economic analysis and evaluation has not been conducted.

Such an analysis and evaluation will be scheduled to be performed later on for each project considered.

B.4. Stormwater Projects & Alternatives:

A recent study concluded that the most feasible approach to eliminate the two existing combined sewer overflow structures was to separate the entire sanitary/storm water collection systems within the downtown area.

This project includes separation of the entire downtown sanitary/storm sewer system, replacement of the Mountain View (McDonalds) and Ball Field lift stations, and replacement of the existing force mains serving the two (2) lift stations, along with other such sewer appurtenances. The separation of the downtown combined sewer system will replace several catch basins and storm inlets, rehabilitate part of the existing collection system to be used as the new "dedicated" storm sewer system, add new sanitary sewer system to replace part of the existing system, and eventually eliminate the two (2) CSO structures.

The proposed project will be accomplished in two (2) Stages.

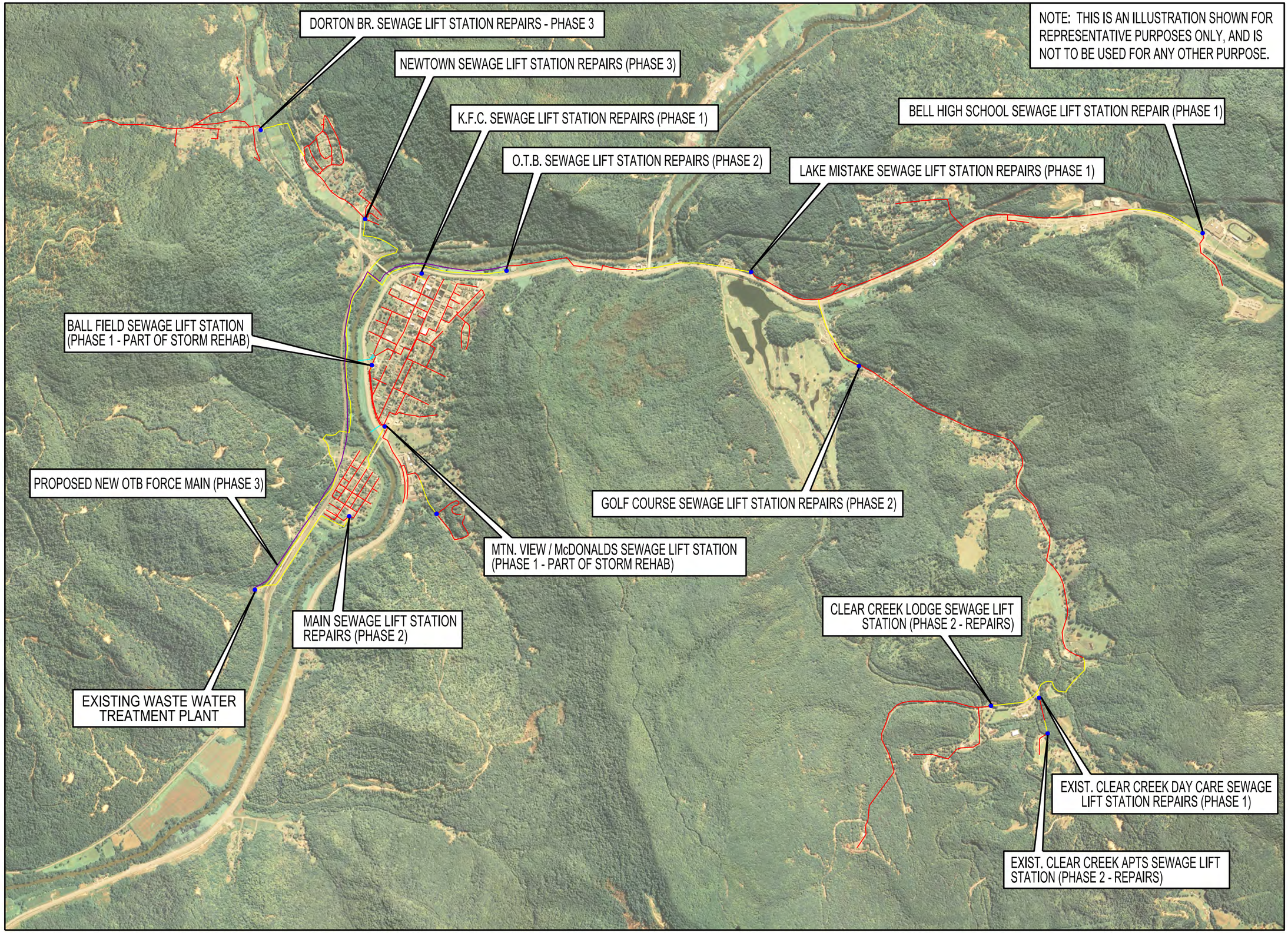

FIGURE 33 - PROPOSED PUMP STATION PROJECTS
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

SCALE: 1" = 2000'

LEGEND

- EXISTING GRAVITY LINE
- EXISTING FORCE MAIN
- EXISTING CSO STRUCTURE
- PROPOSED FORCE MAIN
- EXISTING LIFT STATION/WWTP

Project Number: 11055-00
Date: AUGUST 2014

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B4.1. Phase 1 (0-2 Years):

a) Downtown Stormwater – Project Stage 1:

This project (Figure 34) would replace the existing Ball Field and Mountain View Lift Stations, their associated force mains, and provide connections to the existing collection system. The project would also separate the existing combined sewer along Virginia Avenue from the Mountain View Avenue to the intersection of Holly Street, as well as along Holly Street and Prospect Avenue near the City Pool. Compliance with the consent judgement requirements, such a plan preparation and enforcement, would also be incorporated in this phase.

The estimated cost of construction for this project is $1,943,293. Refer to Appendix B, Table B-21 for a breakdown of the construction cost estimate.

B.4.2 Phase 2 (3-10 Years):

b) Downtown Stormwater Project Stage 2:

The work involved under this stage (Figure 35) will include:

Separate sewers along the rest of Virginia Ave and joining streets Laurel, Oak, Walnut, Pine and Cherry Street. Eliminate odor issue near Courthouse Square, especially corner of Pine Street and Virginia Avenue (First State Financial). Separate sewers along Tennessee and Park Ave and joining streets. Separate sewers along Spruce Street, Horseshoe Drive, and South of Tennessee Ave along Cedar and Catalpa Street. Eliminate CSO @ Ball Park Pump Station and eliminate CSO @ McDonalds (Mountain View) Pump Station. The estimated cost of construction for this project is $5,271,002. Refer to Appendix B, Table B-22 for a breakdown of the construction cost estimate.

B4.3 Phase 3(11-20 Years):

No work has been identified for this period.

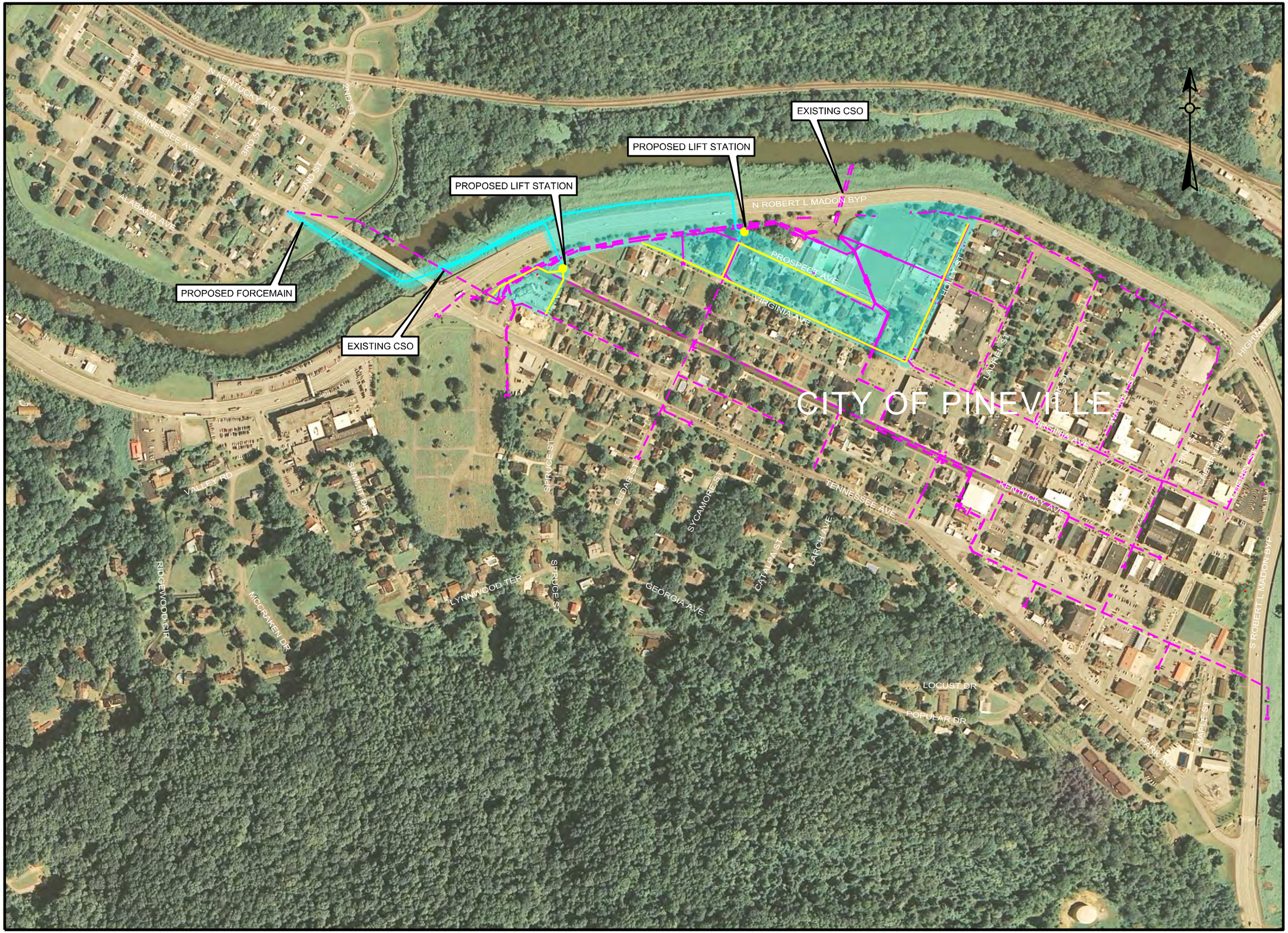

FIGURE 34 - DOWNTOWN STORMWATER PROJECT (STAGE 1)
PROPOSED OPTION
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

SCALE: 1" = 400'

LEGEND

- STAGE 1 AREA
- EXISTING FORCEMAIN
- EXISTING COMBINED SEWER TO BE CONVERTED TO STORM SEWER
- PROPOSED LIFT STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN

Project Number: 11055-00
Date: AUGUST 2014

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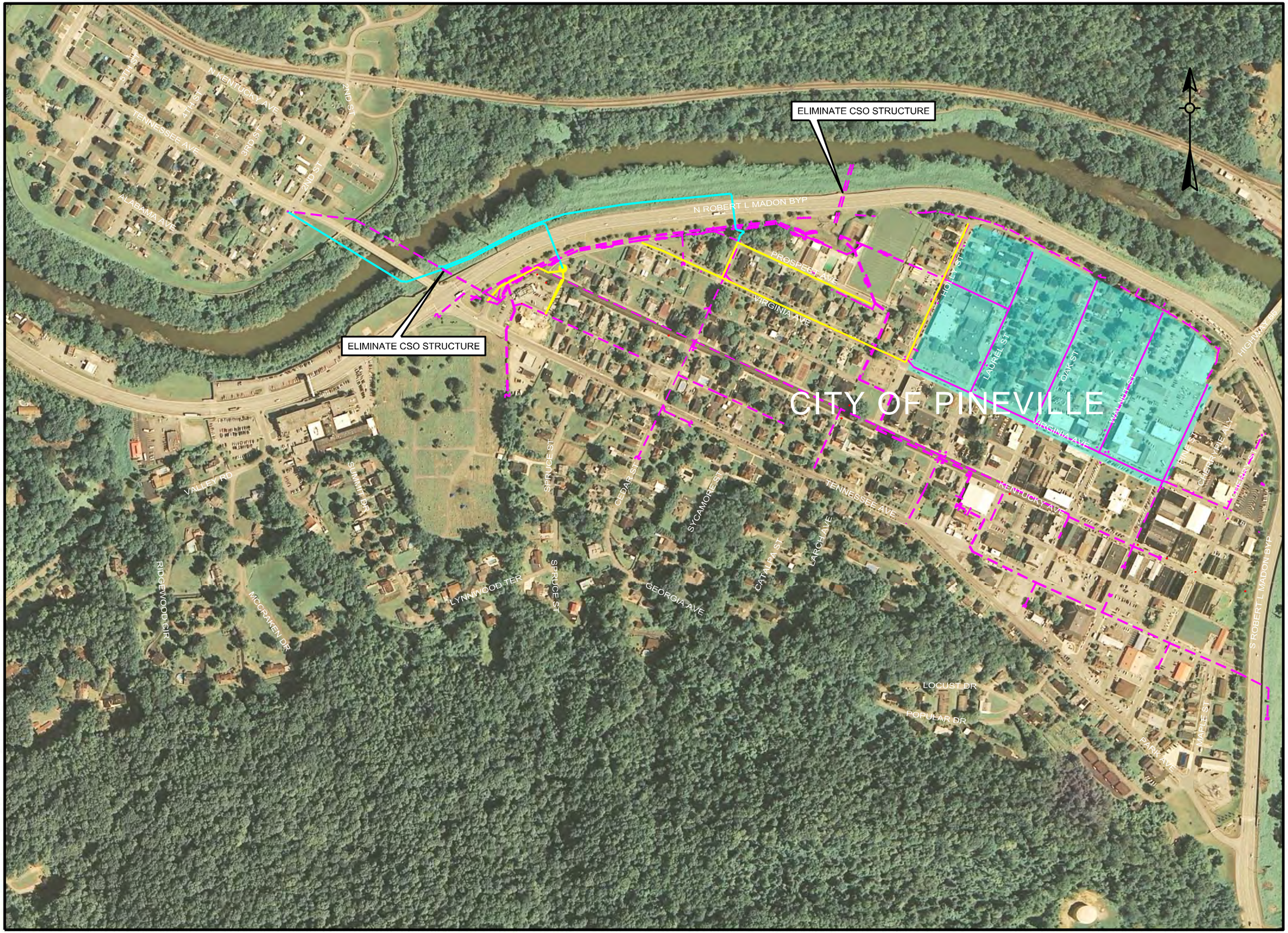

FIGURE 35 - DOWNTOWN STORMWATER PROJECT (STAGE 2)
PROPOSED OPTION
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 400'

LEGEND

- STAGE 2 AREA
- EXISTING FORCEMAIN
- EXISTING COMBINED SEWER TO BE CONVERTED TO STORM SEWER
- PROPOSED LIFT STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN

Project Number: 11055-00
Date: AUGUST 2014

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c) <u>Downtown Stormwater Project Alternative:</u>

An alternative to this approach (Figure 36) would be to eliminate the CSO structures directly/immediately, and upgrade the existing infrastructure to carry/treat all the combined flow. This will result/require larger size: pump stations, collection system, force mains, and additional capacity (than what was already proposed) to the WWTP. The two (2) existing pump stations Mountain View and Ball Field, will need to be upgraded to pump the entire flow to the new WWTP. If no flow control measures will be utilized within the collection system, the entire flow will need to be treated or handled at the WWTP site.

The design flows out of the two (2) drainage basins for this case will again be 350 GPM and 300 GPM for dry weather, and 10,000 GPM and 5,000 GPM respectively for the Ball Field and Mountain View areas. Based on preliminary calculations, the new flow to the WWTP can be handled by utilizing a 1.2 MGD ADF (4.5 MGD PDF) WWTP with a 2.5 million gallon surge tank.

With the existing WWTP site bound by steep ridges and the railroad, it does not leave room for a plant expansion of such magnitude. In order for Pineville to manage and treat such a flow, a new plant at a new location would need to be built. Work under this option would include: upgrading the Ball Field and Mountain View lift stations, constructing new force mains to send the flow to the new WWTP site, new line construction to re-direct the existing flows from the current WWTP to the new WWTP, along other miscellaneous system upgrades. The estimated construction cost estimate for this alternative would be $23,884,063. The breakdown of this construction cost estimate is shown in Appendix B, Table B-23.

B4.4 <u>Economic Analysis and Evaluation:</u>

The staged separation alternative is recommended because it provides the best means by which the City of Pineville can eliminate the existing combined sewer overflows with the least

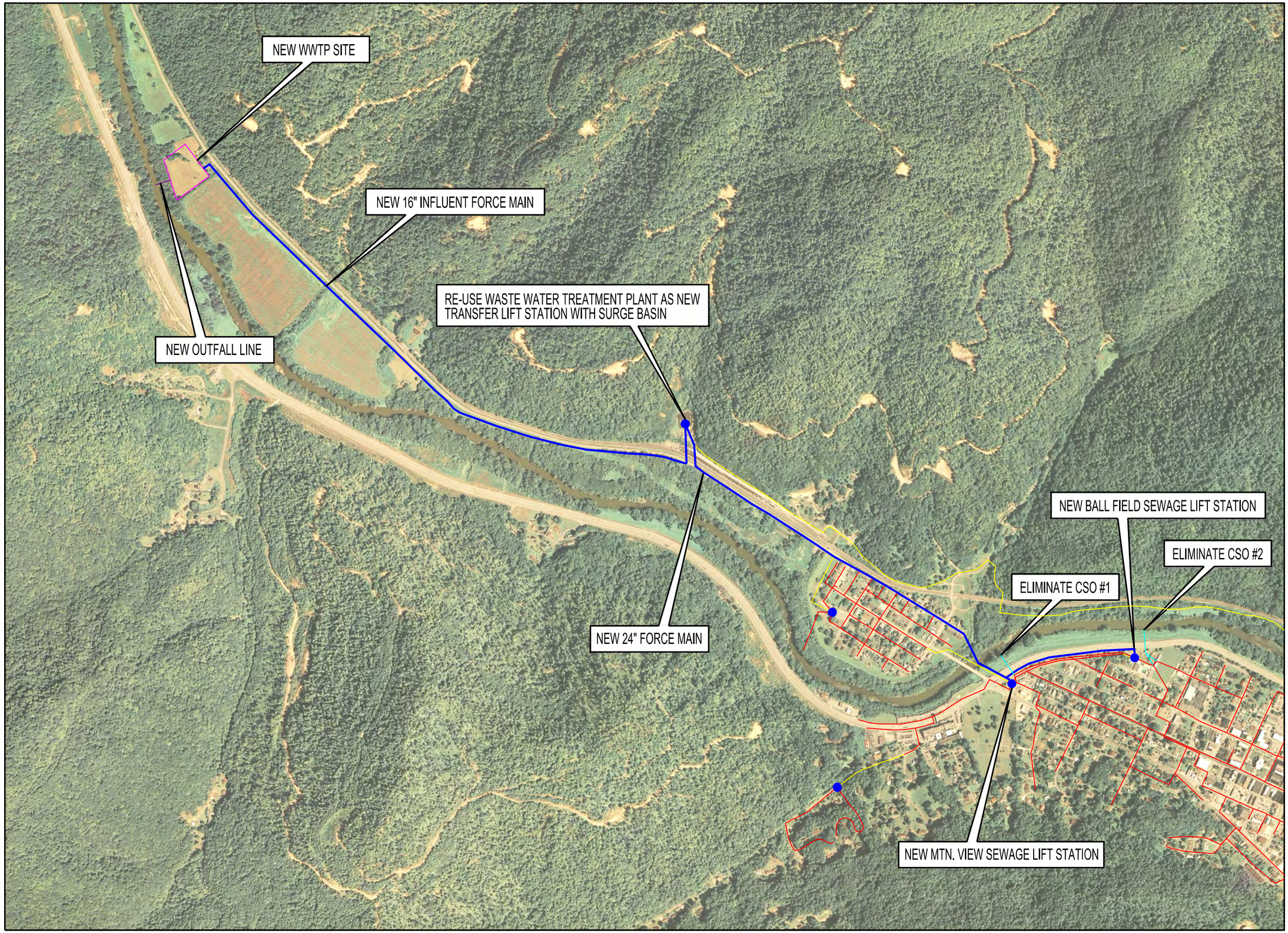

FIGURE 36 - DOWNTOWN STORMWATER PROJECTS
ALTERNATIVE OPTION
REGIONAL FACILITIES PLAN
PINEVILLE, KENTUCKY

N

SCALE: 1" = 1000'

LEGEND

- EXISTING GRAVITY LINE
- EXISTING FORCE MAIN
- EXISTING OVERFLOW
- PROPOSED OUTFALL
- PROPOSED FORCE MAIN
- EXISTING LIFT STATION/WWTP

Project Number: 11055-00
Date: AUGUST 2014

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associated cost of construction. It offers a better manageable operation and maintenance sequence, and offers a solution without over-sizing sewer infrastructure to carry stormwater contribution.

Refer to Figure 37 for a summary and an illustration of the proposed stormwater rehabilitation projects.

C. RECOMMENDED ALTERNATIVES:

C1. Wastewater Treatment Plant:

a) Project Description:

The projected flow requirements from the planning area will be met by expanding the existing WWTP facility from 0.72 MGD capacity to 1.2 MGD. Based on the evaluation of alternatives, expanding the current facility, and staying with the same biological treatment process was the best selection.

Benefits and advantages offered by this option include: least construction cost, compact footprint requirement, low O&M costs, familiarity with existing biological treatment process, maximum utilization of existing infrastructure, and ease of construction and expandability.

Under the proposed project, two (2) new mechanical fine screens will be added to the headworks along with improvements to the grit chamber system. Upgrades to the existing lagoon system will be made to include the addition of new diffused aeration tubing, new interior baffles, addition of anoxic mixers to the lagoon, use of internal recycle pumps, and additional blower capacity. Other additions include: two (2) new separately built secondary clarifiers, a U.V. disinfection system, a post-aeration basin, new sludge pumps (RAS and WAS), a new dewatering building and dewatering equipment, a new plant drain pump station, a new standby generator set, a new surge basin, new sludge holding basins, and miscellaneous other support facilities.

The plant expansion will meet Grade C Reliability Classification, will meet the WLA effluent limits imposed for a 1.2 MGD plant, and will continue to discharge to the Cumberland

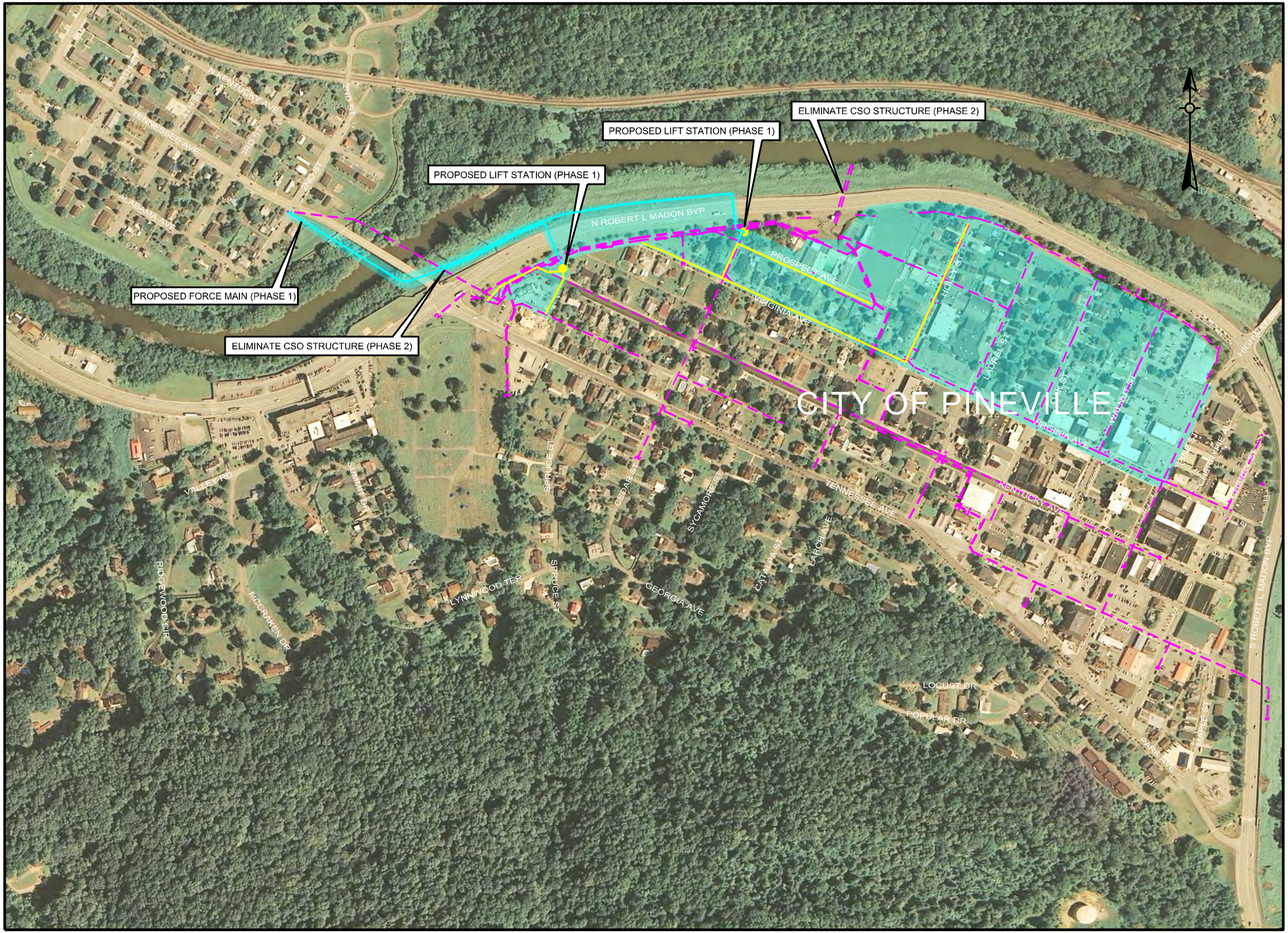

FIGURE 37 - PROPOSED STORMWATER PROJECTS REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 400'

LEGEND

- STAGE 1 AREA
- EXISTING FORCEMAIN
- EXISTING COMBINED SEWER TO BE CONVERTED TO STORM SEWER
- PROPOSED LIFT STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN

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River via the existing outfall line. A Class II certified operator will be needed by the newly expanded facility.

Refer to Figure 38 for a preliminary site layout plan.

The basis of design and other preliminary information are as follows:

i) Future Design Criteria:

Design life expectancy = 20 years

Average design flow = 1.2 MGD

Peak to average flow ratio = 3.7

Peak design flow = 3.7 x 1.2 = 4.5 MGD

Average design BOD influent = 350 mg/L

Average design TSS influent = 450 mg/L

Average design ammonia nitrogen influent = 40 mg/L

Desired effluent BOD conc. = 20 mg/L

Desired effluent TSS conc. = 20 mg/L

Desired effluent Ammonia conc. = 5 mg/L

Desired DO conc. = 3 mg/L

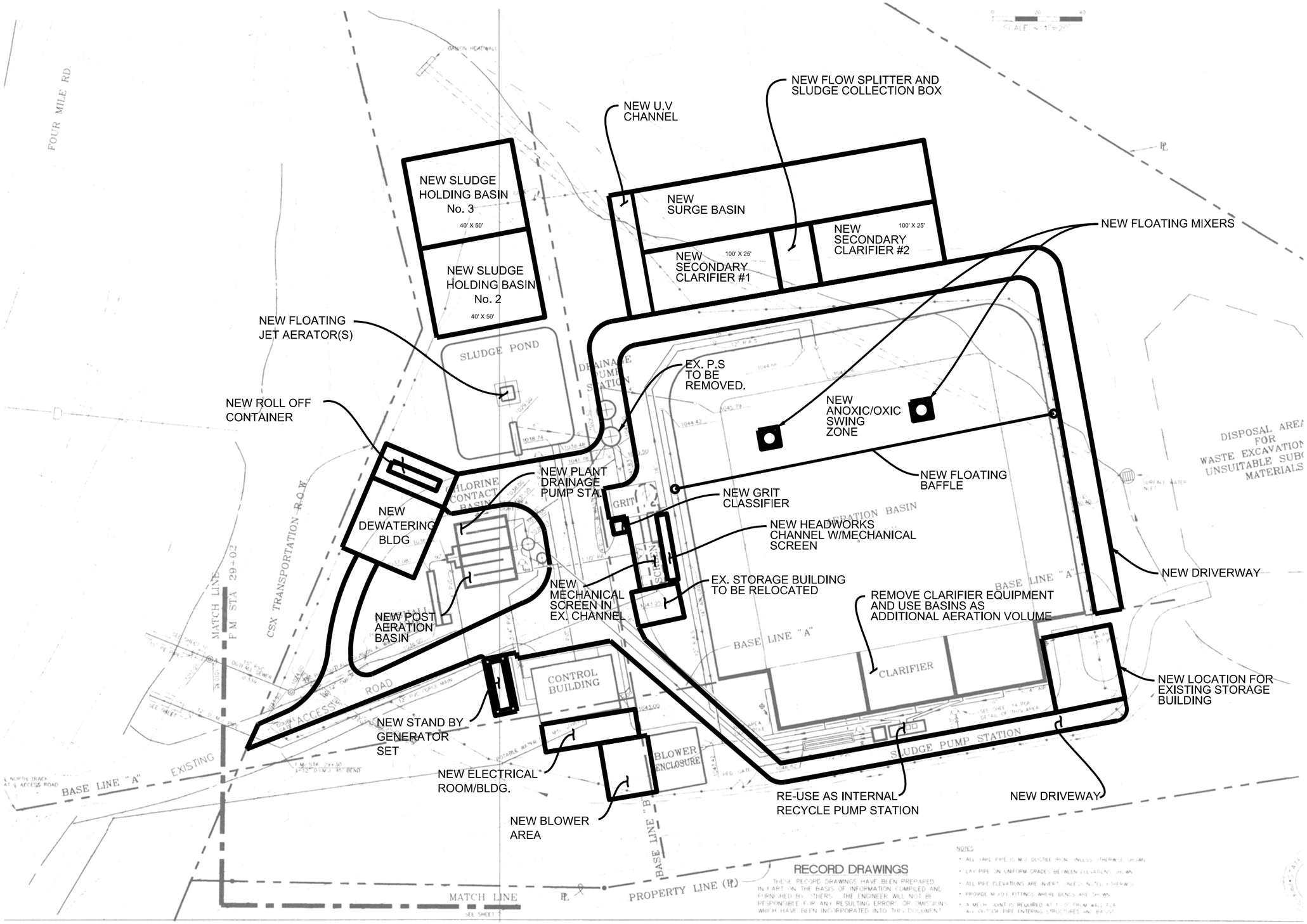
ii) Average Design Loading Rates:

BOD loading rate = 1.2 MGD x 350 mg/L x 8.34 = 3,502 lb/d

TSS loading rate = 1.2 MGD x 450 mg/L x 8.34 = 4,503 lb/d

NH_3-N loading rate = 1.2 MGD x 40 mg/L x 8.34 = 400 lb/d

Refer to Appendix M for Preliminary Design Calculations for a 1.2 MGD (average flow) WWTP and the basis of design summary listed below:



SITE LAYOUT PLAN

LAGOON TREATMENT SYSTEM (1.2 MGD ADF)

FIGURE 38 - PROPOSED TREATMENT SYSTEM REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

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iii) Design Summary:

Mechanical Screens:

Number of units: 2 (new)

Screen opening size = 6 mm

Capacity = 2,300 gpm each

Backup Unit: Manually cleaned coarse bar screen

Accessories: Screenings compactor and bagging device

Sludge Holding Basins:

Number of units: 3 basins (one existing, two new)

Capacity required = 384,060 gallons (total)

Capacity available = 60,000 gallons

New capacity provided = 324,060 gallons

Air required = 3,786 cfm

Aeration Zone:

Number of units: 1 cell (retrofit existing lagoon)

Aeration volume required = 169,924 Ft^3 or 1,271,031 gallons

Volume available = 1,400,000 gallons

Air required = 1500 CFM

Organic loading = 13.3 lbs of BOD/1,000 Ft^3 d

Hydraulic detention time = 1.0 days

Material of construction = earth basins with poly liner

Reactor SWD = 12 Ft

Anoxic Zone (New):

Number of units = 1 cell with compartments (in series with aeration cell)

Anoxic volume required = 56,239 Ft^3 or 420,667 gallons

Volume available = 450,000 gallons

Number of anoxic mixers = 2 units

Secondary Clarifiers:

Number of units: 2 (new)

Surface area per clarifier: 2,500 S.F.

Average surface overflow rate: 240 GPD/sq Ft per clarifier

Physical dimensions: 100' diameter x 25' wide x 12' SWD (each)

Detention time (no RAS flow): 8.9 hrs (avg), 2.4 hrs (peak)

Average solids loading rate per unit = 14 lbs/ft^2

Chemical feed system: Ferric chloride will be provided to both clarifiers for enhanced coagulation and phosphorous removal.

U.V. Disinfection System

Number of channels = one

No. of banks = 2

No. of lamps per bank = 112

Cleaning mechanism = automatic/mechanical

Channel dimensions = 30'L x 21"W x 54" deep

Dewatering Equipment:

Number of units = 1

Dewatering equipment = 48" dual rotary fan press

Capacity = 140 gpm

Accessories = progressive cavity pump and polymer feed

Wasted Sludge Pump Station (New):

Number of pumps: 2

Type of pumps: submersible, non-clog, single speed

Capacity: 400 GPM

Blowers:

Number of units available: 3

Number of new blowers: 3

New blower type: Positive displacement

New capacity = 1,000 CFM per unit

New horsepower = 40 HP per unit

Total capacity required = 5,471 CFM

Total available capacity = 6,000 CFM

Post-Aeration (New):

Volume required = 210 gallons

Basin dimensions = 10’ x 24’ x 5’ SWD

Volume provided = 8.976 gallons

Air requirements = 185 CFM

Diffuser type = Coarse bubble

RAS Pump Station (New):

Number of pumps: 2

Type: Submersible non-clog, variable speed

Capacity = 1,250 GPM/each

Internal Recycle Pump Station:

Number of pumps: 5 (3 existing, 2 new)

Type of pump: self-prime, single speed

Capacity = 300 GPM/each (existing)

Capacity = 800 GPM/each (new)

Total capacity = 2,500 GPM (300% recycle)

The estimated construction cost for the WWTP expansion is approximately $8.5 Million. Refer to Appendix B, Table B-1 for a cost breakdown.

b) Estimated Project Cost:

The estimated cost of the WWTP expansion project based on 2014 estimates:

1) Construction Cost (including Contingencies)	$8,500,000
2) Preliminary Engineering	$30,000
3) Design Fee @ 7% of Construction Cost	$595,000
4) Survey	$25,000
5) Other Miscellaneous Engineering (Permits, EA)	$35,000
6) Geotechnical Work	$35,000
7) Project Administration	$20,000
8) Legal & Land Acquisition Fees	$35,000
9) Construction Administration/Inspection	$200,000
10) WWTP O&M Manual	$25,000
Total Project Cost:	$9,500,000

The above project estimate does not include inflation costs and will need to be revisited and adjusted during the design phase of the project. Similarly, plant flows, design criteria and plant wastewater strength will need to be revisited and adjusted accordingly depending on the actual design period, and any other notable changes to the operation of the collection system.

Due to the tight space available and the steep topography of the site, the Owner may consider purchasing some additional land adjacent to the property for ease of construction and proper structure clearances and setbacks.

It is expected that construction will last approximately 16 months. The design phase will include provisions for a future plant expansion, beyond the 1.2 MGD. Such provisions will include flow splitter boxes, larger piping where feasibly allowable, larger buildings for future equipment installation, blind flanges and valve installations for future connections, etc.

The proposed site layout is general in nature and for planning purposes only. The proposed site layout will need to be revisited/revised during the design phase to accommodate site survey information, available property boundaries, topographical features, and accommodation of practical construction practices, while keeping the existing facility in operation.

Due to the immediate need to expand the current WWTP, it is recommended that the preliminary engineering work for this project begins in Phase 1 (0-2 Years). The design and construction of the project is scheduled for Phase 2 (3-10 Years).

For budgeting purposes, the majority of the project costs (as reported previously) will be assigned to Phase 2. A small portion (approximately $100,000) will be allocated for Phase 1 (0-2 Years) to cover miscellaneous preliminary engineering work costs. No other WWTP projects will be scheduled for Phase 3.

C 2. Collection System:

The proposed new infrastructure is illustrated on Figure 39.

The collection system recommended projects are summarized below:

a) Sewer Rehabilitation Projects:

i) Phase 1 (0–2 Years):

Sewer rehabilitation projects scheduled for this period will be included with the stormwater rehabilitation project described elsewhere in this report. No additional projects are anticipated during this period.

ii) Phase 2 (3-10 Years):

Based on the projects listed on Table 8.5, for the period of 2018 – 2026, the Utility will need to budget approximately $180,000 to complete this preliminary sewer rehabilitation work. This amount will cover approximately 24,000 LF of sewer line TV inspection, sewer line cleaning, and manhole inspections. The extent of any repair work is currently not available or cannot be predicted at this point, thus no monetary amount has been established for any corrective action.

iii) Phase 3 (11-20 Years):

The remaining part of the sewer system will be inspected and completed during Phase 3. It is estimated that another 56,100 LF (Table 8.6) of sewer lines will be inspected and another $350,000 will be spent in sewer rehabilitation preliminary work.

In summary, the total estimated project costs assigned for sewer rehabilitation for the next planning period would be $530,000.

b) Sewer Line Extension Projects:

i) Phase 1 (0-2 Years):

No major sewer line extensions will be scheduled during Phase 1 so the Utility can focus their attention and limited resources to the stormwater rehabilitation project and any necessary upgrades to the existing sewer pump

stations. Any minor sewer line extensions or sewer hook-ups during this period shall be limited and accomplished within the City Limits only.

ii) Phase 2 (3-10 Years):

Similarly, no additional sewer line extensions are listed/scheduled for this phase either. It is anticipated that the Utility will be working to complete the stormwater rehabilitation project, expanding the WWTP capacity, and making improvements to the existing sanitary pump stations before any new customers are added to the sewer system.

iii) Phase 3 (11-20 Years):

All areas identified to be served with new sewer services will be considered in the 3rd phase. The proposed projects and anticipated project budget is summarized below:

Turkey Creek Line Extension:

The project will serve approximately 40 new customers and will include a new pump station, approximately 11,000 LF of new force main, and approximately 6,000 LF of new gravity collection lines. The 2014 estimated project cost would be $1,259,960. Refer to Appendix B, Table B-24 for a breakdown of this project cost estimate.

Ferndale Line Extension:

The project will serve approximately 148 new customers and will include two (2) new pump stations, approximately 8,000 LF of new force main, and approximately 7,000 LF of new gravity collection lines. The 2014 estimated project cost would be $1,696,978. Refer to Appendix B, Table B-25 for a breakdown of this project cost estimate.

PMRIA Line Extension:

The project will serve a new 453-acre industrial park and will include approximately six (6) new pump stations, 50,000 LF of new force main, and 10,000 LF of new gravity collection lines. The 2014 estimated project cost would be $6,325,100. Refer to Appendix B, Table B-26 for a breakdown of this project cost estimate.

Walnut Lane Line Extension:

The project will serve approximately twelve (12) new customers and will include one (1) new pump station, 1,500 LF of new force main, and 1,400 LF of new gravity collection lines. The 2014 estimated project cost would be $624,360. Refer to Appendix B, Table B-27 for a breakdown of this project cost estimate.

State Highway 119 Corridor Line Extensions:

The project will serve approximately 200 new customers and will include approximately 29,000 LF of new gravity lines. The 2014 estimated project cost would be $2,699,968. Refer to Appendix B, Table B-28 for a breakdown of this project cost estimate.

In summary, the total estimated project costs assigned for sewer line extensions for the next planning period would be $10,909,388.

c) Pump Station Upgrade Projects:

i) Phase 1 (0-2 Years):

The first phase of the pump station work will address noted deficiencies within the sewer system. Upgrades will be made in areas where there is dire need or where finances allow it.

The areas identified to receive upgrades include the KFC Pump Station, Lake Mistake Pump Station, Clear Creek Day Care Pump Station, and the Bell High Pump Station.

The Phase 1 project costs for the pump station improvements are approximately $0.8 Million and is summarized below:

1) Construction Cost	$600,000
2) Preliminary Engineering	$10,000
3) Design Fee @ 7% of Construction Cost	$42,000
4) Survey	$40,000
5) Other Miscellaneous Engineering (Permits, EA)	$30,000
6) Project Administration	$10,000
7) Legal Fees	$5,000
8) Construction Administration/Inspection	$80,000
Total Project Cost:	$817,000

ii) Phase 2 (3-10 Years):

Additional pump station improvements to include Clear Creek Lodge Pump Station, Clear Creek Apartments Pump Station, Golf Course Pump Station, and Main Pump Station will be incorporated into Phase 2.

Due to the extent of repairs identified for this period, the proposed work will be accomplished in three (3) separate projects as previously noted. The estimated project costs for these three (3) projects is summarized below:

a) Estimated Project Cost (Main Pump Station):

1) Construction Cost	$264,000
2) Preliminary Engineering	$10,000
3) Design Fee @ 7% of Construction Cost	$19,000
4) Survey	$10,000
5) Other Miscellaneous Engineering (Permits, EA)	$10,000
6) Project Administration	$10,000
7) Legal Fees	$5,000
8) Construction Administration/Inspection	$50,000
Total Project Cost:	$378,000

b) Estimated Project Cost (Clear Creek Lodge Pump Station, Clear Creek Apartments Pump Station, Golf Course Pump Station):

The project cost for these 3 L.S. is expected to be very close to the estimated construction cost. Since the Owner will be replacing existing equipment with similar capacity units, there may be no need for engineering work associated with these projects. Therefore, the total project cost is expected to be at $156,500.

iii) Phase 3 (11-20 Years):

Upgrades to the OTB Pump Station, Dorton Branch Pump Station, and Newtown Pump Station, along with the new OTB force main installation, will be accomplished during the 3rd phase.

The project cost for the OTB L.S. upgrades will be incorporated into the line extensions of the industrial park, therefore it will not be included again here.

The Phase 3 estimated project cost for this work is approximately $1.5 Million, and is summarized below:

1) Construction Cost (Dorton & Newtown Pump Station)	$250,000
2) Construction Cost (OTB Force Main)	$1,000,000
3) Preliminary Engineering	$30,000
4) Design Fee @ 7% of Construction Cost	$87,500
5) Survey	$30,000
6) Other Miscellaneous Engineering (Permits, EA)	$50,000
7) Project Administration	$10,000
8) Legal Fees	$10,000
9) Construction Administration/Inspection	$100,000
Total Project Cost:	$1,567,500

In summary, the total estimated project costs assigned for the pump station upgrades for the next planning period would be $3,010,500.

d) Stormwater Projects:

iv) Phase 1 (0-2 Years):

One stormwater project has been identified in this period. This project is part of a series of storm and sewer rehabilitation projects aimed to separate the collection systems in the downtown Pineville areas. This first project will include upgrades to the Ball Field and Mountain View Pump Stations, separate sewer and storm piping along Virginia Avenue, Holly Street, and Prospect Avenue.

The estimated project cost for this work is approximately $2.3 Million. Refer to Appendix B, Table B-29 for a breakdown of this project cost estimate.

v) Phase 2 (3-10 Years):

The remaining portion of the stormwater and sewer rehabilitation project in the downtown Pineville area will be accomplished in this period. Such work will

include separating sewer and storm piping along Laurel, Oak, Walnut, Pine and Cherry Streets. Similarly, separate storm and sewer along Tennessee, Park Avenue, Spence Street, Horseshoe Drive, Cedar, Catalpa Streets, along with eliminating the two CSO structures.

The estimated project cost for this work is approximately $5.9 Million. Refer to Appendix B, Table B-30 for a breakdown of this project cost estimate.

vi) Phase 3 (11-20 Years):

No projects have been identified for this period.

In summary, the total estimated project costs assigned for stormwater system upgrades for the next planning period would be $9,000,000.

Refer to Figure 39 for the projected service area and summarized infrastructure illustration.

C 3. Conclusions and Recommendations:

The evaluation of the current infrastructure along with the projected area growth, has identified several conclusions and several areas of concern within the collection and wastewater treatment plant sectors. Conclusions drawn from such an evaluation include:

a) The plant influent flow and strength has increased dramatically and steadily over the last few years despite the relatively stationary number of sewer customers.

b) The WWTP plant, and several pump stations in the conveyance system, are operating near their full capacity.

c) Elimination of the two (2) combined sewer overflow structures cannot occur immediately without significant changes to the collection system and WWTP capacity.

d) Expanding the WWTP and collection system to the point that it can handle all the combined sewer inflow would be cost prohibitive. In addition, the expected combined

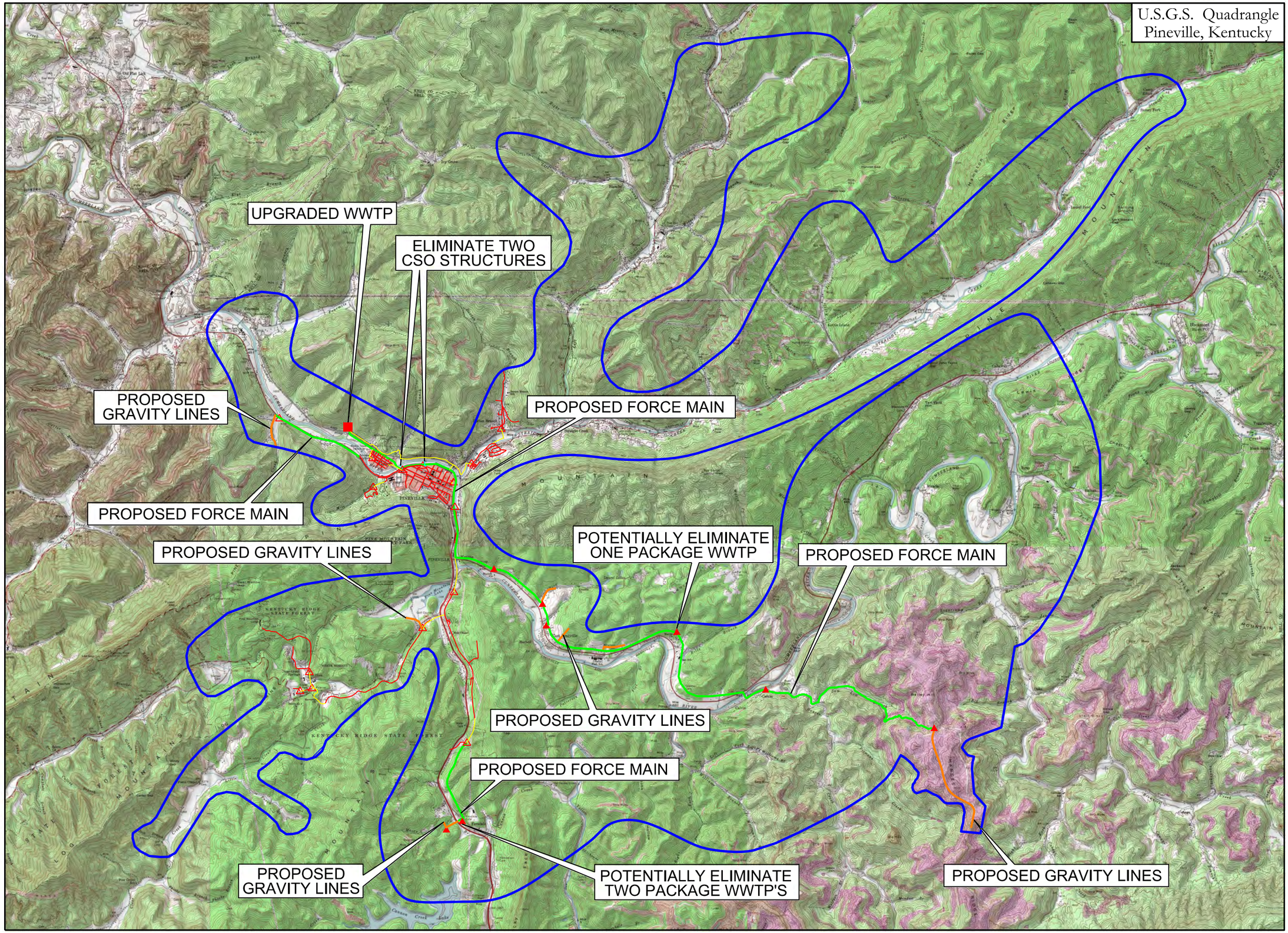

FIGURE 39 - PROJECTED SERVICE AREA & INFRASTRUCTURE REGIONAL FACILITIES PLAN PINEVILLE, KENTUCKY

N

SCALE: 1" = 6000'

LEGEND

- EXISTING GRAVITY LINE
- EXISTING FORCE MAIN
- EXISTING CSO STRUCTURES
- PROPOSED GRAVITY LINE
- PROPOSED FORCE MAIN
- EXISTING LIFT STATIONS
- PROPOSED LIFT STATION
- UPGRADED WWTP

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sewer flow cannot be accurately quantified based on the limited information currently available.

e) The ideal scenario would be to methodically work to separate the sewer and stormwater collection systems over a period of time. At such point, eliminate the two permitted combined sewer overflow structures. Be prepared (just in case) to operate the plant at or above its rated capacity while the above work is taking place. Such timeframe may be close to five years or more.

Similarly, areas of concern include:

a. How long will it take before the current plant starts not meeting its intended purpose, and violates effluent discharge standards?

b. How can the Utility keep up with all the proposed work based on limited resources?

c. Where is funding going to come from for the projects identified?

d. What is an acceptable project schedule, and what will be the equivalent sewer rate increase to cover such expenses?

Based on the allotted timeframe and financial constraints, the following plan of action is recommended:

The recommended approach to addressing collection system needs is as follows (in no chronological order):

a. During Phase 1, initiate stormwater and sewer line separation project in the downtown area, conduct additional rehabilitation inspection work in the downtown area, and address immediate pumping station needs.

b. Continue to perform additional sewer system evaluation surveys (SSES) of the major interceptors and major problem areas within the collection system, perform targeted rehabilitation projects in areas evaluated previously by the SSES work, and

address lower priority pumping station improvements needs. Conduct follow-up studies on completed sewer and stormwater separation projects to re-assess effectiveness of such projects. Incorporate such findings to the design work of future collection and WWTP infrastructure (Phase 2).

c. Properly maintain and keep in service, the existing combined sewer overflow structures until the second phase of the stormwater separation project is complete. At such point, disconnect and eliminate the two (2) permitted outfall structures.

d. Address future sewer line extensions to meet the projected 124,000 LF of new sewer lines to be constructed in the planning area (Phase 3). In doing so, eliminate some of the failing septic systems and straight pipes found in the rural sections of the planning area, along with the elimination of the Ferndale Apartments package WWTP, and the Mountain View Nursing Home package WWTP in Ferndale.

e. Submit the 201 Facilities Plan Update to the Kentucky Division of Water (DOW) for review and approval.

f. Initiate and secure funding for the collection (stormwater and pump stations) projects identified during Phase 2. Complete stormwater separation in the downtown areas as previously described during Phase 2.

g. Submit and obtain environmental clearances from the Kentucky State Clearinghouse, where applicable.

h. During the preliminary phase of each project, remember to revisit the scope of each project; revisit options available, and select best option based on the design criteria established at that moment. Update cost estimates and apply any necessary inflation cost indices.

i. Complete engineering design of all collection system projects, request engineering review and approval process, and secure permitting for each project identified.

j. Continue to re-assess and supplement the staff and equipment needs for the proper system maintenance, on a continuous basis. Establish and implement required maintenance plans noted in the consent judgement, or as otherwise recommended by the DOW.

Similarly, the recommended approach to addressing WWTP needs is as follows (in no chronological order):

a. Initiate preliminary engineering work and secure funding for this project. It will need to begin immediately, i.e. Phase 1.

b. Submit the 201 Facilities Plan Update to the Kentucky Division of Water (DOW) for review and approval.

c. Submit and obtain environmental clearances from the Kentucky State Clearinghouse.

d. During Phase 2, and before the design phase of the WWTP, re-assess the results of any ongoing sewer and stormwater rehabilitation work, update plant design flows and raw wastewater strength accordingly, revisit the list of needed work, and update the construction and project cost estimate based on the updated scope of work and any applicable inflation indices.

e. If plant flows are much higher than projected in this report, reconsider the option to build a new WWTP at a new plant site per Option 3C.

f. The plant operator will need to profile the raw wastewater characteristics and concentrations over an extended period of time in terms of raw TKN, TN, TP,

NH_3-N, DO, and any other such influent parameters. This step will assist the design engineer in sizing equipment and providing the appropriate level of treatment required.

g. Examine any correlation of inflow/infiltration with influent plant concentration of pollutants, to assess impact of "dilution effect" as described previously in this report.

h. Complete design of WWTP expansion. Submit plans and specifications to DOW for review and approval.

i. Submit KPDES permit application for approval. The step will assist the design engineer in sizing equipment and providing the appropriate level of treatment required.

j. Complete WWTP expansion within Phase 2 and supplement WWTP staffing needs as necessary.

Table 8.10 provides a cost versus timeframe breakdown of the projected needs as identified by this report.

Performing the much needed pump station upgrades, sewer line extensions, sewer rehabilitation, separating the downtown stormwater and sewer systems, along with increasing the capacity of the local WWTP, will potentially help the planning area decrease the various stream impairments, restore streams and surface waters to their original and intended uses, help safeguard public health and other natural resources, and last but not least, maintain growth and prosperity within the planning area. Up to 400 additional residential customers and several light industrial/commercial customers are expected to be gained over the next planning period.

TABLE 8.10 SUMMARY PROJECT COST			
	Phase 1 (0-2 Years)	**Phase 2 (3-10 Years)**	**Phase 3 (11-20 Years)**
WWTP Expansion	$100,000	$9,400,000	N/A
Sewer Rehabilitation	$0	$180,000	$350,000
Sewer Line Extensions	$0	$0	$10,909,388
Pump Station Upgrades	$817,000	$534,500	$1,567,500
Stormwater Rehabilitation	$2,300,000	$5,900,000	N/A
Total:	$3,217,000	$16,014,500	$12,826,888

Note: Above pricing is based on 2014 estimates and does not include inflation costs. Estimates are to be revisited and revised at time of consideration.

SECTION 9 – CROSS-CUTTER CORRESPONDENCE AND MITIGATION

A. ENVIRONMENTAL CLEARANCE

A notification for the preparation of the Facilities Plan has been submitted to the numerous environmental agencies within the state, to identify potential adverse impacts from the proposed projects identified by the study. These submittals were directed to the following agencies:

- U.S. Fish & Wildlife Services
- Kentucky Department of Fish & Wildlife Resources
- U.S. Army Corps of Engineers
- Natural Resources and Conservation Service
- Kentucky Heritage Council

Copies of the cover letters sent to these various agencies, along with any responses received are included in Appendix L.

B. MITIGATION

Mitigation for the Virginia Avenue Sanitary Sewer Separation Project, an immediate project, has already been completed. Following is the approach used as well as the specific mitigation measures implemented to obtain environmental clearance. That same approach will be used on all remaining future projects and each corresponding agency's concerns and requirements will be met.

a.) U.S. Fish & Wildlife Service (USFWS)

After notification of the proposed project, comments were received from the USFWS indicating the possible presence of the Indiana, Gray, and Northern Long-Eared bat species, the Cumberland elktoe mussel, the Blackside Dace, the Cumberland arrow darter, and the Icebox Cave beetle within the project area. The Virginia Ave

Project will not require the cutting or removal of any trees, which alleviates the possibility of disturbance to the roosting habitat of the listed bat species. If tree removal or cutting is required for any of the future proposed projects, seasonal accommodations, as allowed by the USFWS, can be made to schedule the work so as to avoid disturbance.

Similarly, the USFWS indicated numerous aquatic species located in the Virginia Avenue project area, specifically the Cumberland River. To avoid disturbance, crossing of the Cumberland River with the proposed sewer force main is proposed by directional boring. This alleviates any concern of detrimental impact to the listed species. Future projects will be handled in the same manner depending on the sensitivity of the stream in question. If no Federally listed species are known to exist in the stream, a trenched crossing will be proposed with appropriate clearance obtained from the U.S. Army Corps of Engineers and/or the Kentucky Division of Water.

The Icebox Cave Beetle will not be impacted due to its isolation to the Icebox Cave.

b.) Kentucky Department of Fish & Wildlife Resources (KDFWR)

A project notification letter (cross-cutter letter) was also submitted to the Kentucky Department of Fish and Wildlife Resources. KDFWR recognized that, due to the nature of the projects submitted and their locations, they did not anticipate negative impacts to any federally or state-listed species, or their associated critical habitat. Their only comment was to recommend contact with the US Army Corps of Engineers and the Kentucky Division of Water prior to any work within the waterways or wetland habitats of Kentucky.

All future projects will also be coordinated with KDFWR and possible mitigation measures for stream impact are as follows:

- Channel changes located within the project area should incorporate natural stream channel design.
- If culverts are used, the culvert should be designed to allow the passage of aquatic organisms.
- Culverts should be designed so that degradation upstream and downstream of the culvert does not occur.
- Development/excavation during low flow period to minimize disturbances.
- Proper placement of erosion control structures below highly disturbed areas to minimize entry of silt into area streams.
- Replanting of disturbed areas after construction, including stream banks, with native vegetation for soil stabilization and enhancement of fish and wildlife populations.
- Return all disturbed in stream habitat to a stable condition upon completion of construction in the area.
- Preservation of any tree canopy overhanging any streams

c.) U.S. Army Corps of Engineers (Corps)

The sewer force main crossing proposed as part of the Virginia Ave. Sanitary Sewer Separation Project was covered by the Corp's Nationwide Permit (NWP) # 12 Utility Line Activities, which became effective March 19, 2012. The proposed work requiring this permit consists of installation of a new 8 inch sewer force main by directional

boring at a minimum of 10 feet below the bottom of the Cumberland River channel. A Fracture Contingency Plan was developed in the event a fracture occurs during the proposed boring operations.

For all future project, the following factors will be consider when determining appropriate and practicable mitigation necessary to ensure that adverse effects on the aquatic environment are minimal. The activity will be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the U.S. to the maximum extent practicable at the project site. Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for the resource losses) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

d.) Natural Resources and Conservation Service (NRCS)

NRCS provides information on soils and/or impact to farmland according to the criteria set forth in the 1985 National Food Security Act Manual. According to the scope of the proposed projects submitted to NRCS found no concerns at that time. If in the future areas of prime farmland are found within a project area then it will be avoided during the design of the project.

e.) Kentucky Heritage Council (KHC)

The Kentucky Heritage Council helps protect archaeological and cultural resources within a project area. The projects described within this Facility Plan fall in areas of many previously documented historic properties and high potential of direct impacts to archaeological resources and indirect effects to historic structures.

In order to minimize the impact to archaeological and cultural resources within the Virginia Avenue Sanitary Sewer Separation Project area historic properties and areas with undisturbed soils, where the presence of archaeological resources were possible, were avoided. With proposed projects the same will be done, if in an instance an area of concern cannot be avoided a cultural resource consultant will be hired and guide lines from the Heritage Council will be followed.

SECTION 10 – EVALUATION OF RECOMMENDED REGIONAL FACILITY PLAN

A. LEGAL AUTHORITY AND CONCURRENCE

The Pineville Utility Commission has selected to continue with the stormwater rehabilitation project in the Downtown area in order to comply with the Consent Judgment as previously reported in Section 2. The majority of the proposed work is expected to occur within the confines of the existing collection system, therefore, no other utility companies or outside agencies may be involved. Concurrence with the Kentucky State Clearinghouse and the DOW requirements will be followed.

Similarly, the Pineville Utility Commission has acknowledged the need to proceed with the Wastewater Treatment Plant Expansion immediately in order to maintain and sustain future area growth. Since this project will likely take place within the confines of the existing facility (property boundary), no other jurisdiction (other than approval from DOW) may be involved in terms of environmental clearance requirements. Concurrence with the Kentucky State Clearinghouse, regarding environmental approval, has been initiated and review comments are underway.

B. FUNDING PLAN

The current sewer rate structure (as of March, 2015) from Pineville Utility Commission is summarized below:

SEWER RATES, March, 2015

Water Usage	Inside City Service Charge	Outside City Service Charge
First 1,000 Gallons	$ 8.22	$ 8.22
Next 9,000 Gallons	$ 5.84	$ 5.84
Next 20,000 Gallons	$ 5.55	$ 5.55
Over 30,000 Gallons	$ 5.22	$ 5.22

For example, if a residential customer inside the City limits uses an average of 5,000 gallons of water per month, the corresponding sewer bill will be:

$8.22, plus 4,000 gal/1,000 x $5.84
= $8.22 + $23.36 = $31.58 sewer bill

For planning and budgeting purposes, this report will use $32.00 as the current average sewer bill per customer.

i) <u>WWTP Expansion Project:</u>

Based on the findings of this report, the 1.2 MGD wastewater plant expansion project will cost approximately $9.5 million. It will probably start construction sometime in 2017 and be placed in service sometime at the end of the year, 2018. The mean O&M cost for the new facility will be in the range of $260,000 per year. This O&M cost does not include any employee on property expenses. Similarly, the 2014 O&M cost to run the current 0.72 MGD facility is estimated at $210,000. Therefore, the Utility will see an approximate increase of $50,000 in O&M costs during the first few years of operation. Funding for the project will likely be from the United States Department of Agriculture, Rural Development (USDA). Other options will also be considered. For the purpose of this report and budgeting purposes, a 25% grant and a 75% loan funding allocation will be assumed.

According to a typical USDA loan term of 38 years, a 2.75% interest rate, and all of the above referenced conditions, the expected monthly debt repayment for such a project (according to Table 10.0) will be approximately $16,345 per month. This debt amount includes costs for monthly O&M, and infrastructure depreciation. Assuming an average number of 900 customers during the life of the loan, the required rate increase is estimated to be $18.00 per customer per month.

The above calculations are preliminary in nature and do not differentiate between residential and commercial customers, nor do they include revenue from new sewer tap fees. A more detailed rate study would need to be performed during the loan closing period to reflect current conditions.

Therefore, the projected sewer rates for 2017 may be estimated as follows:

Water Usage	Inside City Service Charge	Outside City Service Charge
First 1,000 Gallons	$ 15.00	$ 15.00
Next 9,000 Gallons	$ 9.00	$ 9.00
Next 20,000 Gallons	$ 8.50	$ 8.50
Over 30,000 Gallons	$ 8.00	$ 8.00

ii) Stormwater Rehabilitation Project:

Funding for the stormwater rehabilitation project identified during Phase 1 (approximately $2.3 Million) has already been secured by the Commission, and the design work is already underway. For planning purposes, this report will assume that the City will pursue funding for the Phase 2 – Stormwater Project, soon after the Phase 1 project completion. Such a funding program may be similar to the WWTP expansion project, and with the same loan conditions. Based on these similar conditions, the anticipated rate increase is estimated to be very minimum (refer to Table 10.1). For planning purposes, a rate increase of $5.00 per customer per month, needs to be considered.

Therefore, the projected sewer rates for 2020 may be estimated as follows:

Water Usage	Inside City Service Charge	Outside City Service Charge
First 1,000 Gallons	$ 10.00	$ 10.00
Next 9,000 Gallons	$ 7.00	$ 7.00
Next 20,000 Gallons	$ 6.75	$ 6.75
Over 30,000 Gallons	$ 6.50	$ 6.50

iii) Other Projects:

Funding for the miscellaneous pump station upgrades identified during Phase 1, and any subsequent work for Phase 2 (except WWTP and Phase 2 Stormwater) and Phase 3, will be addressed at a later time by the Commission based on the financial status of the system and available sources of funding. Potential sources of funding may include the Rural Development program, CDBG or KIA programs, the SRF program, or the EDA program when it comes to the development of the industrial park and associated infrastructure needs. A combination of two or more funding programs may also be considered.

C. ENVIRONMENTAL IMPACTS:

i) WWTP Project:

The proposed facility will be constructed mostly within the boundaries of the existing property. Therefore, environmental impact studies may not be required at all, or if indeed required, will be anticipated to be at a lower level than normal.

All proposed unit operations will need to be constructed and remain operational during a 100-year flood occurrence. Noise and odor control mitigation practices will be incorporated into the design due to the proximity to nearby residences.

An anti-degradation study may be required by the DOW since the plant expansion will increase the discharge flow and load to Cumberland River.

a. Environmental Innovations:

The new facility will consider/use the following innovative technologies:

- U.V. disinfection to replace the use of gaseous chlorine.
- High efficiency/high transfer rate, fine pore diffused aeration equipment.

- Use of variable frequency drives, timers, soft-starts, etc. will be utilized to provide better power management, power cost savings, and turndown capability.
- Automation/instrumentation will be utilized where necessary to better control the various unit operations, stabilize the process control and effluent characteristics, and to provide instantaneous monitoring capability.
- Provide emergency standby generator to power equipment and to maintain/sustain effluent quality during power outage events.
- Provide sludge/solids dewatering equipment technology to reduce the volume of sludge/solids sent to the landfill.

ii) Stormwater Rehabilitation Project:

The majority of the proposed stormwater rehabilitation project will take place inside the new system and will not need to adhere to the 100-year flood elevation and associated flood protection requirements. The required environmental clearances will be obtained prior to any work.

Some temporary noise and traffic inconvenience may be experienced during the construction period in the downtown areas. Work will be scheduled to minimize travel or wait period, and to minimize interruption to domestic sewer service.

The impact to the Cumberland River water quality will be significant since no more untreated sewage can potentially be discharged via one of the existing CSO structures.

Other benefits from this project may include elimination of potential system overflows from manholes or catch basins associated with the combined sewer system.

a Environmental Innovations:

The new stormwater and sanitary sewer separation project will consider the use of the following innovative technologies:

- Use of VFDs and high efficiency motors for any new pump station construction or rehabilitation.
- Use of precast concrete structures and special coatings to prolong the life of components and prevent additional I/I contribution.

D. IMPLEMENTATION SCHEDULE:

i) WWTP Project:

A tentative project schedule for the WWTP expansion is provided below:

Task	Tentative Date
Preliminary Design Phase Start	October, 2015
Survey Work	November, 2015
Select Major WWTP Equipment	December, 2015
Secure Funding	December, 2015
Geotechnical Investigation	January, 2016
Design Phase Start	February, 2016
Complete Design	October, 2016
Submit Plans to Funding Agency/DOW	November, 2016
Advertise for Bids	February, 2017
Award Contract	April, 2017
Start Construction	July, 2017
Complete Construction	October, 2018
New Plant Goes On-Line	October, 2018

ii) Stormwater Rehabilitation Project (Phase 1):

A tentative project schedule for the stormwater rehabilitation/separation project for Phase 1 is provided below:

Task	Tentative Date
Complete Design Phase	May, 2015
Submit Plans to Funding Agency/DOW	June, 2015
Advertise for Bids	September, 2015
Award Contract	November, 2015
Start Construction	January, 2016
Complete Construction	January, 2017

iii) Stormwater Rehabilitation Project (Phase 2):

Similarly, the second phase of the stormwater project may begin after the Phase 1 project is complete, or may start as soon as funding is secured. For planning purposes, we will assume this project will start in 2018 and be completed around 2020.

SECTION 11 – DOCUMENTATION OF PUBLIC PARTICIPATION

A. PUBLIC HEARING AND NOTICE

A copy of the Public Hearing Notice, as advertised in the local newspaper, will be later included in Appendix M along with the hearing transcript and written comments.

SECTION 12

REGIONAL FACILITY PLAN COMPLETENESS

CHECKLIST AND FORMS

Section 12: Regional Facility Plan Completeness Checklist and Forms

Requirements: Two (2) hard copies, one certified by a professional engineer licensed in Kentucky and one (1) non-certified digital copy of the regional facility plan and the planning area shapefile on a Compact Disc (CD) shall be submitted to the Cabinet. This completeness checklist should be completed and submitted with each regional facility plan.

Regional Planning Agency Name: _____

Date: _____

		PAGE #
SECTION 1		
REGIONAL FACILITY PLAN SUMMARY- This section shall provide a brief summary of the information provided in the facility plan, including the following:		
1.	Purpose of the plan and major problems evaluated in the plan.	1
2.	Recommended alternative chosen to remediate or correct the problems and/or serve the area of need identified in the plan. Also, include any institutional arrangements necessary to implement the recommended alternative(s).	4, 5
3.	Estimated cost of implementing the proposed plan (including user fees) and the proposed funding method to be used.	6
4.	Planning agency commitments necessary to implement the plan.	7
5.	Schedule of implementation for projects.	4, 5
SECTION 2		
STATEMENT OF PURPOSE AND NEED- This section shall contain a brief description of the purpose and need for a submitting the facility plan.		8
SECTION 3		
PHYSICAL CHARACTERISTICS OF THE PLANNING AREA- This section shall delineate the planning area boundaries and describe key topographic, geographic and pertinent natural or man-made features of the area. Digital or electronic submission of the planning area boundary shapefile in a standard GIS format shall also be included. This section shall also include the following maps:		
1.	One (1) up-to-date map, suitable for photocopying, indicate the planning area boundary, service area boundary, watershed boundaries, county lines, populated places, cities and/or towns and project areas or proposed planning period phases.	Figure 1
2.	One (1) up-to-date map, suitable for photocopying, include locations of wastewater treatment facilities (including package treatment plants), discharge location(s), collection lines (gravity, force main, interceptors), pump stations, public drinking water intake points and groundwater supply areas [Source Water Area Protection Plans (SWAPP) and/or Wellhead Protection Areas (WHPA)].	Figure 2
3.	One (1) seven and one-half (7 ½) minute USGS topographic map including the location of wetlands, delineation of the 100-year floodplain, surface water(s), and topography.	Figure 4

4.	If available, a local planning and zoning land use map.	Figure 3
	SECTION 4	
SOCIOECONOMIC CHARACTERISTICS OF THE PLANNING AREA- The following characteristics of the planning area shall be discussed:		
1.	Historical, current, and projected population in the planning area including wastewater contributions from industrial and commercial sources.	24
2.	Current and projected population in the existing service area and unsewered parts of the planning area	25
3.	Economic or social benefit to the affected community	27
	SECTION 5	
EXISTING ENVIRONMENT IN THE PLANNING AREA- Describe existing physical, biological, cultural, and other resource features within the planning area with an emphasis on those that may be impacted by the proposed plan or projects, including the following:		
1.	Physical features such as surface and groundwater quality, water sources and supply, wetlands, lakes, streams, air pollution, floodplains, soils, geology, and topography	28
2.	Biological: Identify plant and animal communities in the planning area with an emphasis upon endangered and threatened species likely to be impacted	44
3.	Cultural: Describe archaeological and historical resources that may be affected by the proposed project	44
4.	Other Resource Features such as national and state parks, recreational areas, USDA Designated Important Farmland, and any other applicable environmentally sensitive areas	44
	SECTION 6	
EXISTING WASTEWATER SYSTEM- This section shall be prepared by a Professional Engineer licensed in Kentucky. A description of the existing facilities within the planning area shall include the following:		
1.	On-site systems in the planning area	60
2.	Physical condition of the existing wastewater treatment plant(s) including the type, age, design capacity, process units, peak and average wastewater flows, current discharge permit limits, schematic layout of treatment plant. Include a narrative description of the capacity of the treatment plant to meet reliability and redundancy requirements as outlined in regulation 401 KAR 5:005, Section 13.	45
3.	Existing collection and conveyance system and its condition	61
4.	Existing biosolids disposal method	54
5.	Existing operation, maintenance and compliance issues	68
	SECTION 7	
FORECASTS OF FLOWS AND WASTE LOADS IN THE PLANNING AREA- This section shall be prepared by a professional engineer licensed in Kentucky and shall include:		
1.	Current and projected commercial, industrial and residential growth for the proposed planning period	72
2.	A copy of the waste load allocation (WLA) issued by the DOW for new or expanded treatment plant projects	77

SECTION 8		
EVALUATION OF ALTERNATIVES- This section shall be prepared by a professional engineer licensed in Kentucky and include an assessment of alternatives to determine the appropriate facilities that will meet the wastewater needs of the planning area and provide benefits that are cost-effective and environmentally sound. The section shall include:		
1.	No-action alternative	80
2.	Optimization of existing facilities	83
3.	Regionalization	81
4.	Other alternatives	88, 93
5.	Detailed cost analysis along with 20 year present worth analysis for each alternative	101
6.	Recommended alternative	123
SECTION 9		
CROSS-CUTTER CORRESPONDENCE AND MITIGATION- Each facility plan shall include cross-cutter correspondences to and from each agency related to the following four environmental and cultural concerns:		
1.	Threatened and Endangered Species: The U.S. Fish and Wildlife Service- Kentucky Ecological Services Field Station and the Kentucky Department of Fish and Wildlife Resources	142
2.	Historical Resources: The Kentucky Heritage Council State Historic Preservation Office	142
3.	Aquatic Resources: The US. Army Corps of Engineers (Louisville, Nashville, or Huntington Districts).	142
4.	Agricultural Resources: The local office of the Natural Resources Conservation Service (NRCS) or USDA Service Center	142
SECTION 10		
EVAULATION OF RECOMMENDED REGIONAL FACILITY PLAN- This section of the facility plan shall summarize the critical components of the recommended plan.		
1.	Environmental impacts	146
2.	Institutional structure	143
3.	Funding plan	144
4.	Current and projected residential user charge rate based on 4,000 gallon usage per month	144
5.	Implementation schedule	148
SECTION 11		
DOCUMENTATION OF PUBLIC PARTICIPATION- The section shall include a copy of the newspaper advertisement/proof of publication, attendance sheet, and public comments.		150

Unit Process Design Criteria Form

Unit Process	Number of Units[1]	Flow per Unit (MGD)	Design Criteria[2]
Influent Pumping			
Screening			
Grit Removal			
Primary Clarification			
Biological Process			
Chemical Phosphorus Removal			
Final Clarification			
Disinfection			
RAS/WAS Pumping			
Sludge Treatment			
Sludge Dewatering			

1*The number of units shall be in accordance with the reliability/redundancy checklist
2*The design criteria shall be in accordance with 401 KAR 5:005 including Ten States Standards

Note: This is a suggested format only. The process listed here will not fit every project and will therefore need to be revised accordingly.

Refer to Section 8, pages 124 to 128.

Design Flow and Concentration Form

Design Flows and Organic Concentrations	Flows MGD	BOD_5 mg/l	BOD_5 lb/day	SS mg/l	SS lb/day	NH_3-N mg/l	NH_3-N lb/day	TKN mg/l	TKN lb/day	P mg/l	P lb/day
Average Daily											
Domestic Portion											
Industrial Portion											
Total											
Population Equivalent											
Peak Hourly											
Domestic Portion											
Industrial Portion											
Total											
Peak Daily											
Peak Instantaneous											

Refer to Section 7, pages 72-79