Engineering Memorandum

Utility System Understanding for Persimmon Ridge

The Persimmon Ridge Utility System is made up of one service areas. This system provides wastewater service only within the service area.

Wastewater

The wastewater facility consists of a two cell wastewater lagoon. The lagoon cells each have partial aeration but does not appear to be a fully aerated system. The existing system also has chlorine disinfection followed by dichlorination. The collection system consists of all gravity sewer for 6 drainages which have a pump station at each drainage to pump wastewater to the lagoons for treatment.

The system is in need of upgrades to meet the current permit for ammonia, BOD, and E. coli. The improvements necessary will be the increasing the aeration at the facility and an ultraviolet disinfection unit.

Summary of system improvements

CONSTRUCTION ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
Wastewater Improvements				
Berm repairs	1	Lump Sum	$15,000	$15,000
Electrical improvements	1	Lump Sum	$5,000	$5,000
Replace surface aerator with Airmaster surface aerator	1	Lump Sum	$45,000	$45,000
New filter at lagoon effluent	1	Lump Sum	$50,000	$50,000
Address Inflow and infiltration in system	1	Lump Sum	$30,000	$30,000
Equipment Installation and Contractor O & P	1	Lump Sum	$35,000	$35,000
Alarm agents	7	Lump Sum	$5,000	$35,000
Ultraviolet disinfection	1	Lump Sum	$50,000	$50,000
Gravel road	1	Lump Sum	$5,000	$5,000
Flowmeter	1	Lump Sum	$3,500	$3,500
SUBTOTAL				**$273,500**
Contingency(10%)				$27,350
TOTAL				**$300,850**

Randview (Wastewater) – No discharge/No permit
Engineering Memorandum
Date: February 8, 2020

Wastewater Treatment Facility Understanding

The Randview wastewater treatment facility is located in western Kentucky on the west side of Mayfield. The plant services about 54 customers which is approximately 162 people. The facility consists of a no-discharge lagoon.

The facility does not have a discharge permit and has minimal oversight from permitting entities. The Kentucky Department of Environmental Protection governs wastewater permits with discharges but does not have any oversight on non-discharging systems such as this facility. The KDEP leaves management and oversight up to the local Health Departments. In speaking with head of the Health Department in this county, they will perform field inspections only when a complaint is filed. Therefore, we recommend investigation with the Health Department for quantity and relevance of complaints in the near future. Conversations with the head of the Health department made me believe they have construction plans for this system in their files. However, he didn't have time to research the files at the prior to drafting this memo.

During our visit to the lagoon, various site components were showing signs of failure and minimal maintenance. The system is setup oddly of two lagoon cells that are approximately 2,000 feet apart. A representative of the sewer system stated that one of the lagoons has a lift station at the effluent that pumps to the second lagoon cell. Investigation will be needed to determine capacity of the components to determine if the system can function as it is today. The two Lagoon cells have limited access due to minimal maintenance around the perimeters of each lagoon cell. Heavy vegetation berm cutting will be needed to avoid possible failure and/or leaking of the lagoons. From pictures, we were unable to evaluate the integrity of the berms. The perimeter fencing needs repairs at multiple locations.

We reviewed documents at the local Health Department whom provided original plans for construction. The plans showed a subsurface drain field. This field was wooded a few short years ago but recently was cleared by a local farmer and is now in crops. Probing was completed and it was found that the drain field indeed has farming operations over it and most likely is overly compacted and in a state of failure. During the same visit, the lagoon was overflowing the berm and into the crop fields. Most likely due to an overly compacted drain field. This area will need to be repaired and taken out of farming operation. Lastly, it was found that the overflow to the drain field had been broken off and floating in the lagoon. This will also need repaired immediately.

This facility does not have an operating permit. It also does not have any monitoring or testing limits imposed on the facility that need to be reported. Therefore, this system does not show up in the EPA's Echo website for evaluation.

Improvements: Remove all berm vegetation for further inspection and possible repair. The perimeter fence needs repair. Inspection of the lateral field and compare to any design plans that the Health Department. Repair lateral field and discharge pipe as needed. Repair inside berms where erosion is occurring.

Wastewater Collection System Understanding

The collection system flow gravity feeds to the lagoon from the Randview neighborhood. No other information regarding the collection system was provided to the Engineer for review to drafting this memo. However, we recommend researching the Health Department's files to see if they have construction plans for the collection system.

An inspection was made and we were able to find a second lift station. This second lift station is made of a corrugated metal pipe and wires and piping hanging from a fence post that was punched through the side of the pipe. This is a safety and reliability issue and needs replaced.

Improvements Required: Perform smoke testing, evaluate system and create GIS mapping for future maintenance needs. Research Health Department files.

Tree fallen on lift station 1

Unmaintained Lagoon

Lagoon Berm vegetation and sewage overflow

Lagoon Berm vegetation

Lagoon seepage and overflow into crop field

Non-standard/failing lift station 2

KY - Bluegrass

Randview

Eng Memo 20200208

CONSTRUCTION ITEM	QUANTITY	UNIT	UNIT PRICE	EXTENDED PRICE
Address Inflow and Infiltration	1	Lump Sum	$30,000	$30,000
Chainlink fence repair	1	Lump Sum	$30,000	$30,000
Repair damaged berms and varment damage on both lagoons	1	Lump Sum	$30,000	$30,000
Clear berm of unwanted vegetation	1	Lump Sum	$30,000	$30,000
Construction and trash debris cleanup	1	Lump Sum	$2,500	$2,500
Access road construction	1	Lump Sum	$20,000	$20,000
Cleanup and repair lift station 1	1	Lump Sum	$25,000	$25,000
Lift Station 2 cleanup and repair	1	Lump Sum	$45,000	$45,000
Repair effluent pipe	1	Lump Sum	$4,000	$4,000
Effluent drainage field repairs	1	Lump Sum	$40,000	$40,000
SUBTOTAL				**$256,500**
GIS				$5,000
Surveying				$15,000
Engineering				$22,500
Contingency(10%)				$25,650
TOTAL				**$324,650**

Sludge in lagoon shall be evaluated but a foot of sludge in the lagoons could cost:	**$150,000**

River Bluff (Wastewater) – KY0043150
Engineering Memorandum
Date: October 5, 2019

Wastewater Treatment Facility Understanding

The River Bluff wastewater treatment facility is located in River Bluff, KY approximately 10 miles northeast of Louisville and serves 180 customers which is approximately 540 people. During our visit to the plant, various site components were showing signs of failure and aging. The plant has had multiple effluent violations in the recent past, however most of them are not much higher than their respective limits.

The plant is an activated sludge system with grinding, activated sludge, chlorine disinfection, and dichlorination. The metal tanks holding the wastewater treatment components are showing various signs of aging, and all of them are developing severe amounts of rust. All the control panels on site seem to be in declining condition and will need electrical inspections to ensure they meet all safety requirements. Most will probably need to be either repaired or replaced. The system currently has two blowers installed, and both need to be inspected and either replaced or repaired if necessary. There is an influent lift station. An inspection should be completed after acquisition to determine shape of pumps as well as if they are the properly installed. The return, skimmer, influent, and effluent lines appear to be PVC. Some of the older returns are still in place but appear to have corroded to a level that would deem them inoperable. An inspection of each line should be completed upon startup and replaced as needed.

The facility's influent pipe appears to be laying across the chainlink fence and held down by the 3 strand barb wire. This is not a typical installation. The pipe should be properly buried to avoid freezing, sun damage of the PVC, and to protect the system from vandalism.

This facility is utilizing chlorine disinfection. If the amount of chemicals is properly controlled, it can continue to be a viable disinfection treatment system. However, if chemical usage and costs continue to rise, the owner may need to consider ultraviolet disinfection. This should be considered after operational control is assumed and an evaluation on true cost of chemicals. Additionally, not everyone is properly trained to use chlorine gas and this should be evaluated for safety reasons of future operations.

The estimated flow is about 66,000 gallons according to the effluent discharge permit. In evaluating the number of customers connected, I would anticipate existing flow being around 30,000 to 35,000 gpd. If the facility was constructed consistent with the capacity listed on the permit, the system should have excess capacity. Before selecting the blower and or pump replacements, a hydraulic analysis should be completed to select the proper equipment for the application.

It is evident that operations are struggling to maintain the plant. No remote monitoring is in place at the site which makes it difficult for the operators to know when the facility is failing. We recommend a mission remote monitoring system which will give information such as pump failure, blower failure, and high-level alarms. A generator quick connect should also be added to the plant to provide electricity during power outages which would ensure the plant can run 24/7.

A review was performed of EPAs ECHO compliance website which lists prior violations issued to the system. According to the ECHO report, it has multiple effluent violations in recent history, however, none of them are major, and the plant is doing a reasonable job of treating wastewater.

In the future, after operational control is taken by Central States Water Resources, I recommend pulling aerations and diffusers for an inspection. If an annual inspection program is put in place, diffuser replacement can be drastically reduced and overall system performance improved. Due to the low quality of preventative maintenance performed on the site equipment, it is estimated that many of the air diffusers will be needing a replacement.

Improvements: Due to the extent of the failure to maintain the systems by the previous owners, I recommend the improvements be staged. The first phase of improvements should include the inspection and replacement of blowers/service filters as needed, lift station pump inspection and repair/replacement, installation of Mission monitoring/generator quick connect/flow meter, inspection and replacement/repair of control panels, and inspection and replacement of diffusers that have failed. After a period of operation and facilities evaluations regarding capacity and permit limits, a second phase will be put into action to either expand or replace the current treatment facility in its entirety.

Wastewater Collection System Understanding

No mapping was provided for this collection system. While minimum flow equalization was observed at the facility, further evaluation of the collection will be necessary to minimize the amount of I and I entering the system. If this is minimally controlled, it will be difficult for the wastewater systems to meet limits.

Since no flow monitoring is installed, flow monitoring should be considered using a magnetic flow meter to evaluate whether I and I is currently a problem.

The system does have two lift stations. This lift station have been poorly maintained. Pumps should be pulled and inspected. A safety inspection should be completed on the control panels to ensure reliability.

With no current utility mapping available, the system should be evaluated to create mapping and develop a GIS site for future maintenance. System mapping at the fingertips of the operators will enhance the level of service and timing of responses to emergency and customer issues.

Improvements Required: Inspection lift stations for quality, performance and safety. Perform smoke testing, evaluate system and create GIS mapping for future maintenance needs.

APPENDIX

Treatment Tanks are rusting and have gone unmaintained

Influent PVC line is fastened to the top of the fence and should be properly buried.

Lift station control panels appear to be poorly wired and are a safety concern.

Springcrest Sewer – Springcrest Wastewater Disposal System
Kentucky
Engineering Memorandum
Date: September 11, 2020

Introduction

The Springcrest Sewer facility is located in Keene, Kentucky approximately 7 miles southwest of Lexington, Kentucky. According to the Rough Service Area map, this utility services 45 parcels. The system includes a low pressure sewer system and an irrigation disposal system.

In review of the original subdivision drawing, it seems that the subdivision was originally designed to serve 48 parcels, including parcels not shown on the current Rough Service Area map. The additional parcels that may be served are shown below. The occupancy of the existing subdivision is close to full capacity.

Wastewater Treatment

Each of the existing homes utilizes a septic tank for wastewater treatment and a low pressure pumping system to convey effluent to the low pressure main that conveys wastewater to the common disposal site. The pump pits are each 3' in diameter, have a 5' total depth, are constructed of FRP, and include 18" opening in the cover. The gray water conveyed through the low service lines are routed through a single 4" forcemain to the wastewater disposal facility.

The original drawings of the system indicate that the homeowners own and maintain their septic systems, but that the utility owns and maintains all of the low pressure pump stations and pressure main. The inspection of the system did not include an assessment of the individual pump stations.

It is recommended that CSWR review the existing tariff to confirm ownership and operations responsibilities and liabilities. It is also recommended that the low pressure pump stations be inspected to determine reliability of each of the 45-48 pumping system.

Wastewater Irrigation Disposal System

Flow from the single 4" force main enters the flow irrigation pump wet wells. There are 4, 6' diameter precast concrete wet wells and each is hydraulically connected with a 10" pipe that spans from wet well to wet well.

Electrical / Control Building and Irrigation Area in Background

Each of the 4 wet wells is equipped with a triplex pumping system to convey wastewater to a specific zone of the irrigation system (Zones 1-4). Each zone includes 2 subzones, and if 1 subzone is in service, one pump is required to operate to maintain pressure; if two zones are in service, two pumps are utilized. Each pump station includes a standby pump.

There is a single control panel for all four irrigation pumping systems located in a masonry building between the pump stations and the irrigation area. The pump stations, controls, electrical gear and masonry building internals all appear to be in good working order.

There is limited security at the facility. There is a gate to the site, but the utility has not historically been able to keep the gate locked because the electric utility has easement access rights through the gate to the high voltage electric service lines running adjacent to the sewer facility, and the access is frequently used. The building can be secured to protect the electrical and control facilities. However, the low pressure sewer pump stations throughout the system and the irrigation pump stations are currently accessible to those willing to trespass.

This application may not require the addition of fencing around the pump station sites for a couple of reasons: a) the site is remote; to enter the site, you have to drive off the paved streets and into a field through a gate that says no trespassing; and b) there are no tanks to fall in at this site and the hatches into each wet well have lockable hatches and padlocks. We recommend that security concerns be discussed with the electric utility and that locks on the entrance gate be maintained by both CSWR and the electric utility.

Over 5-acres are irrigated with the gray water. The irrigation network includes the following features:

Zone 1

- Over 1,475’ of 4”, 140’ of 3” and 115’ of 2” transmission main piping
- Zone 1A – 1,890 FT of 1-1/4” lateral lines with 5/32” orifices
- Zone 1B = 2,100 FT of 1-1/4” lateral lines with 5/32” orifices

Zone 2

- Over 800’ of 6”, 215’ of 3” and 100’ of 2” transmission main piping
- Zone 2A – 2,800 LF of 1-1/4” lateral lines with 5/32” orifices
- Zone 2B – 3,010 LF of 1-1/4” lateral lines with 5/32” orifices

Zone 3

- Over 344’ of 4”, 132’ of 3” and 134’ of 2” transmission main piping
- Zone 3A – 1,960 LF of 1-1/4” lateral lines with 5/32” orifices
- Zone 3B – 3,840 LF of 1-1/4” lateral lines with 5/32” orifices

Zone 4

- Over 1,367’ of 6”, 940’ of 4”, 283’ of 3”, and 137’ of 2” transmission main piping
- Zone 4A – 4,830 LF of 1-1/4” lateral lines with 5/32” orifices
- Zone 4B – 4,250 LF of 1-1/4” lateral lines with 5/32” orifices

Wastewater Collection System Recommended Improvements

- The system should be evaluated to create mapping and develop GIS shapefiles for future maintenance. System mapping at the fingertips of the operators will enhance the level of service and timing of responses to emergency and customer issues.
- Each low pressure system pump station should be inspected. It is assumed that 5 pumps will be replaced initially.
- Each irrigation pump station should be inspected. It is assumed that 3 pumps will be replaced initially.
- The pump vault hatches should be replaced with lockable hatches.
- An inventory of assets should be developed and spare pumps, controllers, and valves acquired to allow CSWR to maintain effective, timely service.

Total Project Cost Estimate

Opinion of Capital Cost Summary	
Springcrest, KY	
DESCRIPTION OF WORK	**2020 Cost**
Initial Improvements	**$47,000**
Install Mission monitoring - Plant	$15,000
Hatch replacement on 4 wet well covers	$8,000
Irrigation pump replacement and installation (3 pumps total)	$9,000
Low pressure pump and controls replacement (5 systems)	$15,000
Secondary Improvements	**$29,000**
Replace system valves	$5,000
Replace additional irrigation pumps (3 pumps total)	$9,000
Replace additional low pressure pumps/controls (5 systems)	$15,000
Total	**$76,000**

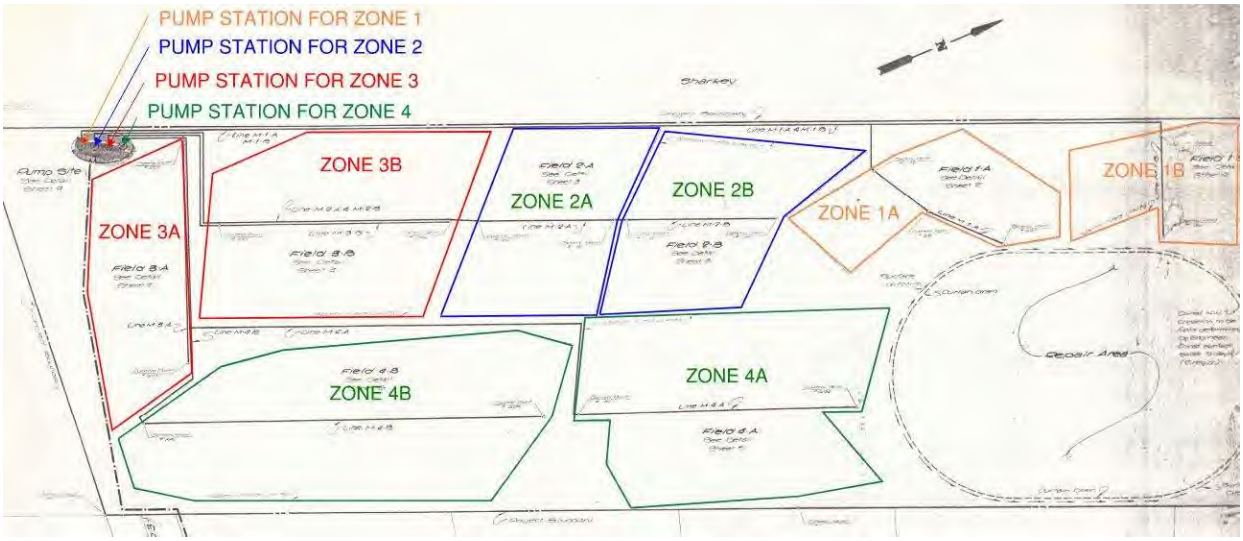
APPENDIX

Triplex Irrigation Pump Station No. 1

Triplex Irrigation Pump Station Nos. 3 & 4

Irrigation Pump Stations Control Panel

Irrigation Area



Map of Irrigation System

Irrigation Vicinity Map

Timberland (Wastewater) – KY0083755
Joann Estates, Inc.
Engineering Memorandum
Date: September 23, 2019

Wastewater Treatment Facility Understanding

The Timberland wastewater treatment facility is located in Heath, KY approximately 10 miles west of Paducah. The plant services about 70 customers which is approximately 210 people. During our visit to the plant, various site components were showing signs of failure and aging. The plant has been placed on significant noncompliance status for each of the last twelve quarters.

The plant consists of an extended aeration activated sludge system and an aerated lagoon. All blowers in the system will need to be inspected and either replaced or repaired, as well as all influent pumps in the lift station on site. There is a good chance that any working pumps could possibly be reaching the end of their useful life, so an inspection of each pump should be done to ensure it is operating on the performance curve in order to handle the demand required by the system. Any broken pumps will need to be either repaired if possible or replaced entirely. The return, skimmer, influent, and effluent lines are currently PVC and need to be replaced with steel to ensure longevity and reliability of the system. PVC has low durability and is prone to cracking when exposed to sunlight for extended periods of time. Consideration should be given to pumping excess flow to the southwestern lagoon if it has adequate flow capacity.

Structurally, the existing steel wastewater facility is severely rusted and will need a thorough inspection, painted and potentially patched if the tank remains in service. Additionally, the chlorine contact chamber was constructed out cinder blocks, has limited walls to maximize contact time, and is degrading.

The aeration volume provided by this system is about 16,288 gallons and the clarifier provides a volume of 2,672 gallons. According to design treatment calculations, all minimum standards for activated sludge treatment are met except for aeration volume and clarifier detention time for maximum permitted flow. The permitted flow at this facility is 25,000 gallons, but we estimate average daily flow at about 14,000 gallons based on 70 customers. This customer count was taken from the current service area map. The system also has a polishing lagoon after the treatment facility which has a volume of approximately 400,000 gallons, assuming a depth of three feet. The lagoon has some minimal aeration at best which also extends to the chlorine contact chamber, which has some aeration that is attempting to increase the dissolved oxygen prior to discharging.

As a part of this acquisition, Carriage Park will also be purchased under this ownership. Carriage Park is a no discharge lagoon system that is directly adjacent, and to the south of this facility. If Carriage Park

has capacity for additional flow, consideration should be given to pumping the Timberland flow to the Carriage Park and avoiding future maintenance and system upgrades.

It is evident that operations are struggling to maintain the plant, and currently no remote monitoring is in place at the site which makes it difficult for the operators to know when the facility is failing. We recommend remote monitoring by Mission which will give information such as pump failure, blower failure, and high-level alarms. A generator quick connect should also be added to the plant to provide electricity during power outages which would ensure the plant can run 24/7.

A review was performed of EPAs ECHO compliance website which lists prior violations issued to the system. According to the ECHO report, it has been placed on significant noncompliance status each of the past twelve quarters

This facility is utilizing chlorine disinfection after the lagoon, which will work better than ultraviolet disinfection due to level of turbidity currently in the system. However, once the system is running properly, consideration should be given to installing ultraviolet disinfection which would lower operational cost and be more consistent on disinfection.

In the future, after operational control is taken by Central States Water Resources, I recommend pulling the aeration and diffusers for an inspection. If an annual inspection program is put in place, diffuser replacement can be drastically reduced and overall system performance improved. Due to the low quality of preventative maintenance performed on the site equipment, it is estimated that many of the air diffusers will be needing a replacement.

Improvements: If Carriage Park has capacity to receive this facility's flow, we recommend shutting down the treatment system and overhauling the existing influent lift station to pump water to the Carriage Park facility. If Carriage Park doesn't have the excess capacity, I recommend the improvements be staged. The first phase of improvements should include the inspection and replacement of blowers/service filters as needed, lift station pump inspection and repair/replacement, installation of Mission monitoring/generator quick connect/flow meter, inspection and replacement/repair of control panels, replacement of all PVC, and inspection and replacement of diffusers that have failed. After a period of operation and facilities evaluations regarding capacity and permit limits, a second phase will be put into action to either expand or replace the current treatment facility in its entirety.

Wastewater Collection System Understanding

No mapping was provided for this collection system. While minimum flow equalization was observed at the facility, further evaluation of the collection will be necessary to minimize the amount of I and I entering the system. If this is minimally controlled, it will be difficult for the wastewater systems to meet limits.

Since no flow monitoring is installed, flow monitoring should be considered using a magnetic flow meter to evaluate whether I and I is currently a problem.

With no current utility mapping available, the system should be evaluated to create mapping and develop a GIS site for future maintenance. System mapping at the fingertips of the operators will enhance the level of service and timing of responses to emergency and customer issues.

Improvements Required: Perform smoke testing, evaluate system and create GIS mapping for future maintenance needs.

APPENDIX

Chlorination Contact Chamber not up to code

PVC lines need to be replaced

Activated Sludge – Extended Aeration tank beginning to rust/fail

Woodland Acres – Woodland Acres WWTP KY0096100
Kentucky
Engineering Memorandum
Date: September 11, 2020

Introduction

The Woodland Acres wastewater treatment facility is located in Shepherdsville, Kentucky approximately 17 miles south of Louisville, Kentucky. This facility services 121 parcels. The system operates under Kentucky DEP Permit number KY0096100 and Agency ID number 479.

Wastewater Treatment Facility Existing Conditions

The plant is authorized to discharge up to 25,000 gallons per day (gpd) by the KDEP per the operating permit.

A summary of the existing permit limits are described below:

- BOD5 – 10/15 mg/L (Monthly average/Maximum Weekly Average)
- TSS – 30/45 mg/L
- NH3-N – 4/6 mg/L in Summer
- NH3-N – 10/15 mg/L in Winter
- E-Coli – 130/240 mpn/100 ml
- Total Residual Chlorine – 0.011/0.019 mg/L
- Dissolved Oxygen – 7.0 mg/L minimum

The subdivision has 121 parcels and little additional buildout would seem possible. Based off of the number of possible connections and assuming 250 gpd of flow per customer, 30,000 gpd of average daily flow would be expected when the available lots are fully occupied.

A review was performed of EPAs Echo compliance website which lists violations of wastewater treatment plants across the country. The Woodland Acres wastewater treatment plant has exceeded permit limitations several times in recent months and years for E-Coli, BOD, and Ammonia.

The existing facility includes an extended aeration package plant including a mechanically cleaned bar rack screen, a single aeration basin, equalization basin with two influent pumps (one portable), aerobic digestion, rapid sand filter, and a chlorine contact tank. Dechlorination is utilized downstream of disinfection.

The packaged plant has aged and shows significant signs of wear and corrosion. The blowers and diffusers are in need of replacement, and one of the two RAS lines has broken off into the aeration basin. The basin appears to have been modified over time with changes to original structural components. The basin does not include handrail needed to protect operators or visitors from falling into the package plant.

Functionally, the system also has some limitations:

- The entire community is challenged by high ground water levels. The site visit was conducted during a moderate storm event that resulted in significant stormwater challenges in the streets and wastewater flow challenges at the plant. During the visit the blowers had been turned off to inventory solids, and both influent pumps were continuously pumping at what appeared to be a rate higher than the plant was capable of processing. When the blowers were turned on briefly, the noise was significant and the discharge pressure was likely excessive.
- According to operators, the all gravity collection system results in significant I&I, impacting system performance.
- The blower discharge pressure may be excessively high..
- The operator believes it is necessary to turn off aeration during wet weather events to minimize the loss of solids and to retain a healthy biomass.
- The tertiary treatment basin (rapid sand filter, contact tank and dechlorination tank) is highly corroded.
- There is no ideal place for chlorine tablet addition or dechlorination tablet addition.
- There is no flow monitoring at this time.
- The facility includes significant amounts of exposed wiring.

The fencing around most of the site is generally in relatively good condition, and there is significance footprint available for the addition of improvements.

Currently no remote monitoring is in place at the site. This makes it difficult for the operators to know when the facility is failing. Operational monitoring should be completed to monitor the quality of effluent, which should then be compared to the operating permit.

Wastewater Treatment Facility Recommended Improvements

- The condition of the tank calls for taking the facility off line for structural repair, at a minimum to include the addition of access bridge improvements, safety handrail, welding repairs, and the addition of a new RAS line from one of the hopper bottomed clarifiers to the front end of the plant. Because of this, it makes sense to take advantage of the down time to upgrade the

system to an MBBR treatment system to simplify operations and improve performance during wet weather events. The conversion from extended aeration activated sludge to MBBR will include the addition of baffle walls, new diffusers, new blowers, media, and media retention sieves.

- The smaller footprint MBBR will allow a fraction of the existing tank to be used for digestion. The new system will generate significantly less sludge than the existing extended aeration system as well, so sludge handling needs will significantly decrease.
- The 10' foot deep clarifier is adequate for a fixed film type system, and will function much better in this application than with the existing activated sludge system.
- The effluent from the three stage MBBR will be evenly distributed into and through the clarifier, and the level control in the clarifier will be maintained with the addition of a weir trough and weir.
- A flow meter will be installed in the clarifier effluent piping, in route to the contact tank.
- Peroxyacetic acid will be introduced directly into the contact tank in lieu of attempting to install chlorination and dechlorination tablet feeders in the limited hydraulic profile. The PAA chemical requires less contact time, and will more consistently achieve the necessary disinfection objectives.
- Alum will be introduced into the clarifier to improve settleability when required to consistently achieve solids reduction and in turn, BOD effluent limit compliance.
- The existing chlorine contact tank will be equipped with diffusers to help in meeting the dissolved oxygen effluent limit.
- Three blowers will replace the existing two blowers. One will serve the aeration tank needs, air lift needs, and post-aeration needs; one will serve the digester needs; and one will serve as standby for both applications.

Wastewater Collection System Understanding

While no mapping was provided, the collection system consists of only gravity collection.

According to the operator, the collection system consists of 8" and 10" gravity sewers, and the high groundwater table results in significant peak flow events at the facility. Wastewater enters the wastewater treatment plant through a gravity sewer.

Wastewater Collection System Recommended Improvements

- The system should be evaluated to create mapping and develop GIS shapefiles for future maintenance. System mapping at the fingertips of the operators will enhance the level of service and timing of responses to emergency and customer issues.
- Perform smoke testing, perform video inspection at selected locations, evaluate systems and create GIS based maintenance priority list.

REVISED CAPITAL ESTIMATE - NOV. 5, 2021

NARUC - Wastewater - Woodland Acres (25,000 GPD)

Item	NARUC Category	EXPENSES	FIXED ASSETS	TOTAL
Blowers and Blower Control Rplcmnt. for New System (3, 7.5 HP)	Sewer - Treatment and Disposal	$0	$55,000	$55,000
Installation of Blowers	Sewer - Treatment and Disposal	$0	$19,300	$19,300
Blower Pad	Sewer - Treatment and Disposal	$0	$1,500	$1,500
Blower Discharge Header Piping, Valves, Etc. (Installed)	Sewer - Treatment and Disposal	$0	$10,000	$10,000
Package Plant Diffusers & Diffuser Piping Replacement	Sewer - Treatment and Disposal	$0	$8,500	$8,500
Cages w/Diffusers (36) and MBBR Media (11 Cubic Meters)(3, 4'x6'x11')	Sewer - Treatment and Disposal	$0	$0	$0
Cage Materials (w/Shipping, Tax)	Sewer - Treatment and Disposal	$0	$12,000	$12,000
Cage Fabrication	Sewer - Treatment and Disposal	$0	$27,500	$27,500
Painting for Carbon Steel	Sewer - Treatment and Disposal	$0	$4,100	$4,100
Media	Sewer - Treatment and Disposal	$0	$13,300	$13,300
Diffusers & Diffuser Piping	Sewer - Treatment and Disposal	$0	$11,000	$11,000
Installation of Cages	Sewer - Treatment and Disposal	$0	$30,600	$30,600
PAA Equipment	Sewer - Treatment and Disposal	$0	$12,000	$12,000
PAA Pad Addition	Sewer - Treatment and Disposal	$0	$1,250	$1,250
PAA Equipment Installation	Sewer - Treatment and Disposal	$0	$4,000	$4,000
Wet Weather Tank	Sewer - Treatment and Disposal	$0	$15,200	$15,200
Wet Weather Valves, Grinder FM Piping, Return Piping	Sewer - Treatment and Disposal	$0	$15,000	$15,000
Wet Weathe Tank Pad	Sewer - Treatment and Disposal	$0	$1,500	$1,500
Wet Weather Diffusers Installed	Sewer - Treatment and Disposal	$0	$6,000	$6,000
Wet Weather Tank Pad	Sewer - Treatment and Disposal	$0	$1,250	$1,250
Wet Weather Blower and Blower Pad	Sewer - Treatment and Disposal	$0	$10,000	$10,000
Wet Weatehr Air Piping Addition	Sewer - Treatment and Disposal	$0	$3,000	$3,000
Wet Weather Grinder Pump and Conrol Panel Replacment	Sewer - Treatment and Disposal	$0	$5,000	$5,000
Add/Upgrade Mission Monitoring System	Sewer - Treatment and Disposal	$0	$7,000	$7,000
Electrical Wiring Improvements for Safety for Package Plant	Sewer - General Plant	$0	$10,000	$10,000
Electrical Distribution for New Ext. Aer. / MBBR Blowers	Sewer - General Plant	$0	$20,000	$20,000
Electrical Distribution for PAA, Wet Weather, and Grinder Pump	Sewer - General Plant	$0	$20,000	$20,000
Gravel Access Road Improvements (185 ft Gravel)	Sewer - General Plant	$0	$5,000	$5,000
Fence Replacement (Minor)	Sewer - General Plant	$0	$2,000	$2,000
TOTAL		**$0**	**$331,000**	**$331,000**

APPENDIX

Blowers, EQ Basin, and Electrical Cables

Electrical Boxes and Electrical Cabling

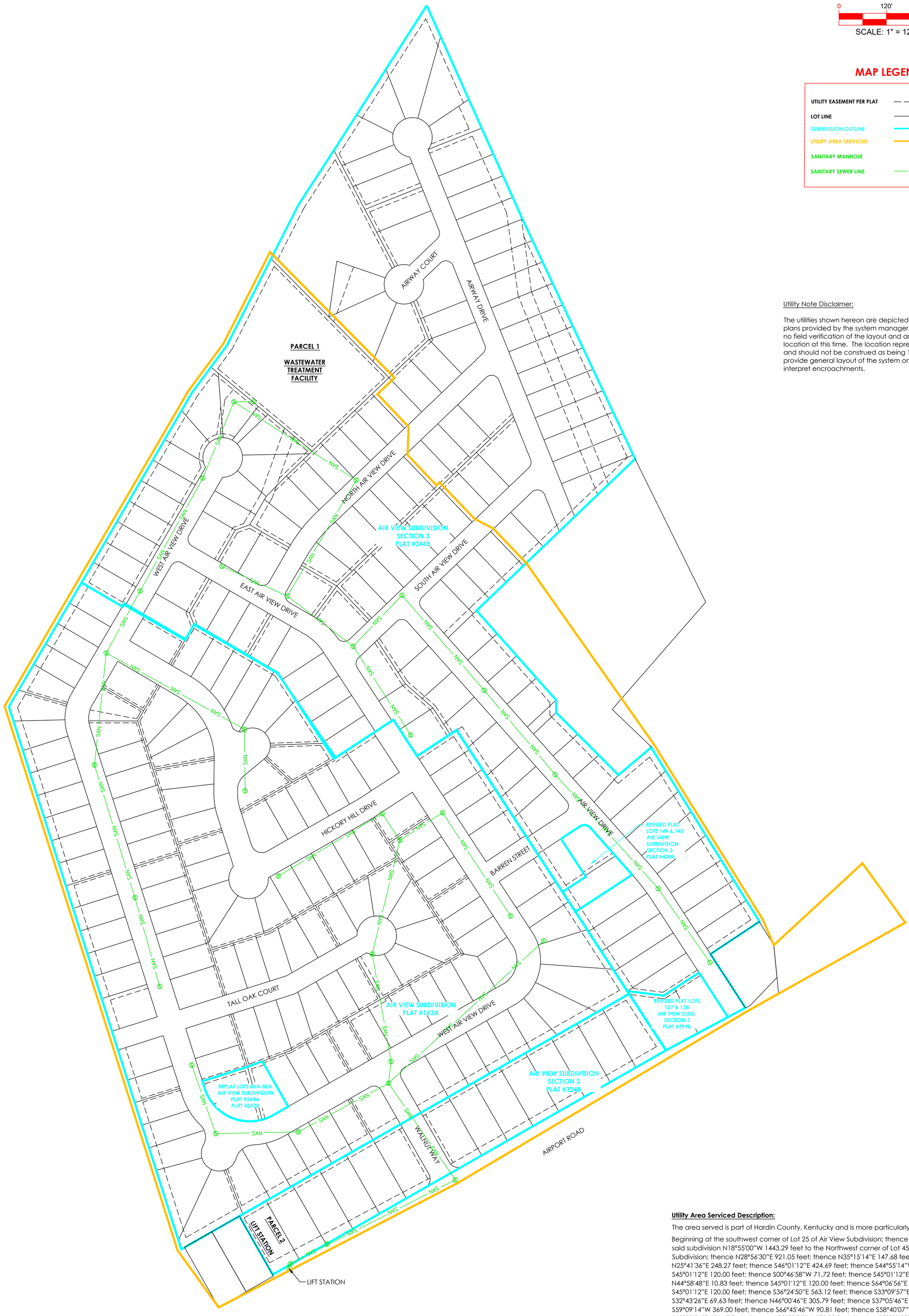
**EQ Basin, Portable Pump Discharge,
Digester, Miscellaneous Electrical Cables**

**Clarifier Performance During Wet Weather
(and No Aeration in Aeration Tank)**

Chlor/Dechlor Structure

WWTP Electrical Meter

FINAL SERVICE AREA MAP
FOR AIR VIEW



N
W 21 E
S

0 120' 240'

SCALE: 1" = 120'

MAP LEGEND

- UTILITY EASEMENT PER PLAT
- LOT LINE
- SUBDIVISION OUTLINE
- UTILITY AREA SERVICED
- SANITARY MANHOLE
- SANITARY SEWER LINE — SAN —

Utility Note Disclaimer:

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

Utility Area Serviced Description:

The area served is part of Hardin County, Kentucky and is more particularly described as follows:

Beginning at the southwest corner of Lot 25 of Air View Subdivision; thence along the west line of said subdivision N18°55'00"W 1443.29 feet to the Northwest corner of Lot 45 of Air View Subdivision; thence N28°56'30"E 921.05 feet; thence N35°15'14"E 147.68 feet; thence N25°41'36"E 248.27 feet; thence S46°01'12"E 424.69 feet; thence S44°55'14"W 60.00 feet; thence S45°01'12"E 120.00 feet; thence S00°46'58"W 71.72 feet; thence S45°01'12"E 120.00 feet; thence N44°58'48"E 10.83 feet; thence S45°01'12"E 120.00 feet; thence S64°06'56"E 52.91 feet; thence S45°01'12"E 120.00 feet; thence S36°24'50"E 563.12 feet; thence S33°09'57"E 520.05 feet; thence S32°43'26"E 69.63 feet; thence N46°00'46"E 305.79 feet; thence S37°05'46"E 185.50 feet; thence S59°09'14"W 369.00 feet; thence S66°45'46"W 90.81 feet; thence S58°40'07"W 855.46 feet; thence S62°30'54"E 681.47 feet; thence N30°59'00"W 175.00 feet; thence S59°01'00"W 9.32 feet to the point of beginning.

DATE:	9/11/19
PROJECT NO:	0542-18
DRAWN BY:	J.P.P.
SCALE:	1"=120'
SHEET NAME:	SERVICE AREA MAP

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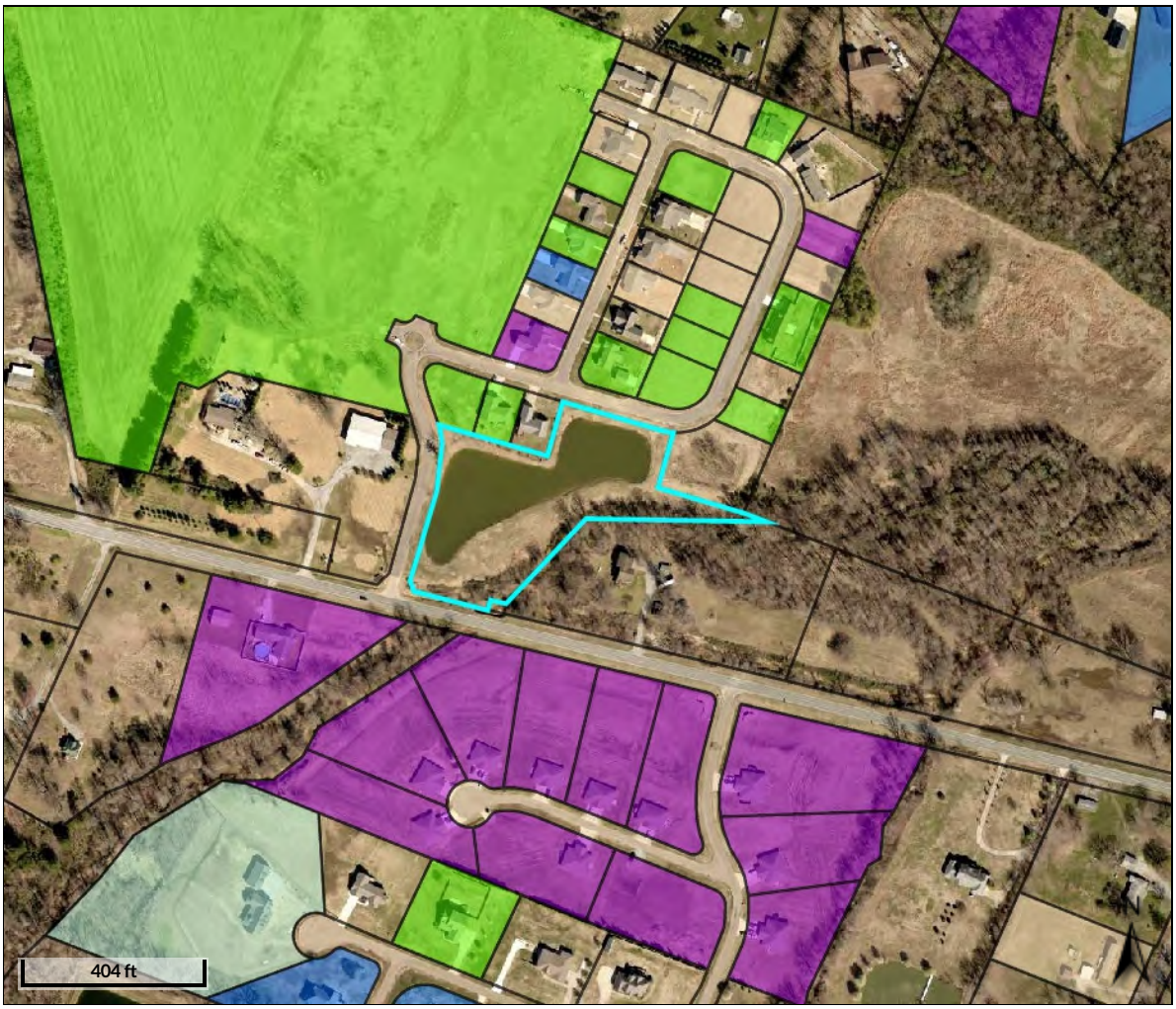
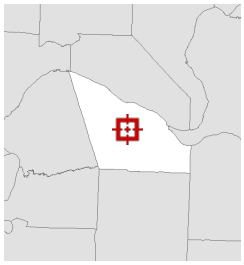
qPublic.net™ McCracken County, KY PVA



Overview



Legend

Parcels
- <all other values>
- Exempt

Yearly Sales
- 2014
- 2015
- 2016
- 2017
- 2018

Parcel ID	066-00-00-041.04	**Alternate ID**	n/a	**Owner Address**	n/a
Sec/Twp/Rng	n/a	**Class**	n/a		
Property Address		**Acreage**	n/a		
District	n/a				
Brief Tax Description	n/a				
	(Note: Not to be used on legal documents)				

Date created: 5/2/2019
Last Data Uploaded: 5/1/2019 8:49:22 PM

Developed by Schneider GEOSPATIAL