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ROLLA, MISSOURI

PRELIMINARY ENGINEERING REPORT:

HIGHWAY V EAST WASTEWATER REGIONALIZATION

JOB NO. 22141910-TO3

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PRELIMINARY ENGINEERING REPORT

HIGHWAY V EAST WASTEWATER REGIONALIZATION

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EXECUTIVE SUMMARY

The Phelps County Public Water Supply District (PWSD) No. 2 presently owns and operates numerous wastewater treatment facilities east of the City of Rolla. These treatment facilities predominantly consist of recirculating sand filters which have limited capacity to nitrify, especially when exposed to cold temperatures. Furthermore, many of the facilities are at or exceeding their design capacity. The PWSD No. 2 has approached the City of Rolla regarding the potential for regionalization of the facilities with the Rolla Southeast WWTP, which presently has 1.705 MGD reserve capacity.

The City of Rolla desires to determine the feasibility of providing wastewater services to the area southeast of the Interstate 44 – Highway V Interchange. The first priority would be to evaluate the extension of the City's wastewater collection system to connect/regionalize several small PWSD No. 2 owned WWTF's. By virtue of this collection system expansion, several undeveloped properties within the PWSD boundary would have potential for City sewer service. Further, the City and its economic partners have identified numerous areas located southeast of the Interstate 44 – Highway V / Hy Point Industrial Drive interchange which have potential for future commercial and/or industrial development.

Non-degrading and degrading alternatives were assessed for each service area. Non-degrading alternatives include land application wastewater and regionalization with the Rolla Southeast WWTP. Degrading alternatives include the construction of expanded or new treatment systems to meet the State of Missouri water quality standards but ultimately reduce the assimilative capacity of the facility's receiving stream.

Each development area was evaluated to identify potential improvements necessary to provide wastewater collection and treatment. Site soil conditions were investigated to ascertain the feasibility of onsite, non-discharging treatment. The development potential for each phase was also assessed to aide in the determination of probable wastewater production rates. Finally, improvement alternatives were conceived and assessed. A summary of findings for each development area is listed below.

Table ES-1 – Summary of PWSD No. 2 (Area I) and Development Site Evaluations

Description	Area I-PWSD No. 2 WWTFs	Area I-PWSD No. 2 Undeveloped Areas	Area II	Area III	Area IV
Site Soils	Restrictive(1)	Restrictive(1)	Restrictive (2)	Restrictive (2)	Restrictive (2)
Developable Area, Acres	--	1,220	51.0	583.0	745.0
Wastewater Production					
-Average Daily Flow, GPD	150,358	233,996	12,291	140,406	179,617
-Peak Flow, GPM	384.0	574.0	36.0	360.8	451.00

(1) Non-discharging onsite treatment alternative implementation will be limited, with site specific evaluation required.
(2) Non-discharging onsite treatment alternatives are not feasible.

Land application of wastewater generated by each PWSD No. 2 (Area I) treatment facility was assessed. The closest available land having potential suitability for wastewater treatment was identified. Costs associated with the purchase of land, construction of a storage basin and irrigation pump station, as well as development of center pivot sprinkler infrastructure were all considered in developing the opinion of probable project cost. Land application was considered for the Phase I, Phase II and Phase III developments; however, based on the assessment of in-situ soil conditions, it was quickly identified that land application of wastewater was not feasible.

Regionalization of the PWSD No. 2 Service area (Area 1) with the Rolla Southeast WWTP was considered. To facilitate regionalization, a regional pump station would be constructed southeast of the existing PWSD Summerfield Subd WWTF. This regional pump station would convey flows south and west to the Rolla Southeast WWTP for treatment. A new gravity sewer system would then be constructed to collect flow from the existing PWSD WWTPs to the regional pump station. A 3,000 FT, 10 IN SDR-35 PVC sewer main having 48-IN DIA manholes spaced at 300 FT intervals would be constructed north along the Dailey Branch watercourse to serve the Greenelefe, Country Club Terrace and Forrest Lakes WWTFs. A 20,481 FT, 8 IN SDR-35 PVC sewer main having 48-IN manholes spaced at 300 FT intervals would be constructed west and north along the Franz Branch water course to serve the Pines, College Hills East and College Hills North WWTFs. Each trunk main would be sized to accommodate flows from the facilities, in addition to providing capacity to accept future development that might occur adjacent and accessible to the sewer main alignment.

Numerous improvements were considered for Development Areas II, III and IV. Non-degrading, non-discharging land application of wastewater was considered and determined to be technically not feasible due to the observed site soil characteristics. Non-discharging alternatives (i.e. land application) were not considered feasible due to site soil restrictions. **Regionalization with the Rolla Southeast WWTP (MO-0050652) was considered as the only feasible non-degrading alternative**.

Table ES-2 – Alternatives Considered for Each Development Area

Description	Capital Cost	Notes
Non-degrading	Land Application	-Lagoon with center-pivot spray irrigation
	Regionalization	-Convey all wastewater to existing POTW in region
Degrading	Onsite Treatment	-Construct activated sludge or attached growth package plant at the site, discharge to a local waterbody / receiving stream.

For the Development Area II site, the regionalization option consisted of the construction of a pump station and force main which would discharge to existing force main infrastructure located near the intersection of County Road 3060 and the Hy Point Industrial Drive. For the Area III and Area IV regionalization alternatives, pump stations would be constructed at each development site which would discharge to a regional gravity sewer alignment. The regional gravity sewer would convey all flow to the regional pump station and gravity sewer system established for PWSD No. 2 regionalization effort. The regional pump station peak flow capacity can be increased to accommodate the additional flow via the transition of the pump station from a duplex to quadraplex configuration.

Degrading alternatives were also considered for each the Development Area III and Area IV sites. The primary degrading alternative considered consisted of a discharge onsite prefabricated treatment system (attached or suspended growth). A summary of the anticipated project costs is provided below in Table ES-2.

Table ES-3 – Summary of Probable Project Costs for Improvement Alternatives

Alternative	Opinion of Probable Project Cost
PWSD No. 2 Land Application	$11,560,822
PWSD Regionalization	$11,600,400
PWSD No. 2 Degrading Alternative	To be assessed via future evaluation
Area II Land Application	--
Area II Regionalization	$603,000
Area III and Area IV Land Application	--
Area III and Area IV Regionalization	$6,005,600
Area III and Area IV Degrading Alternative	$14,968,800

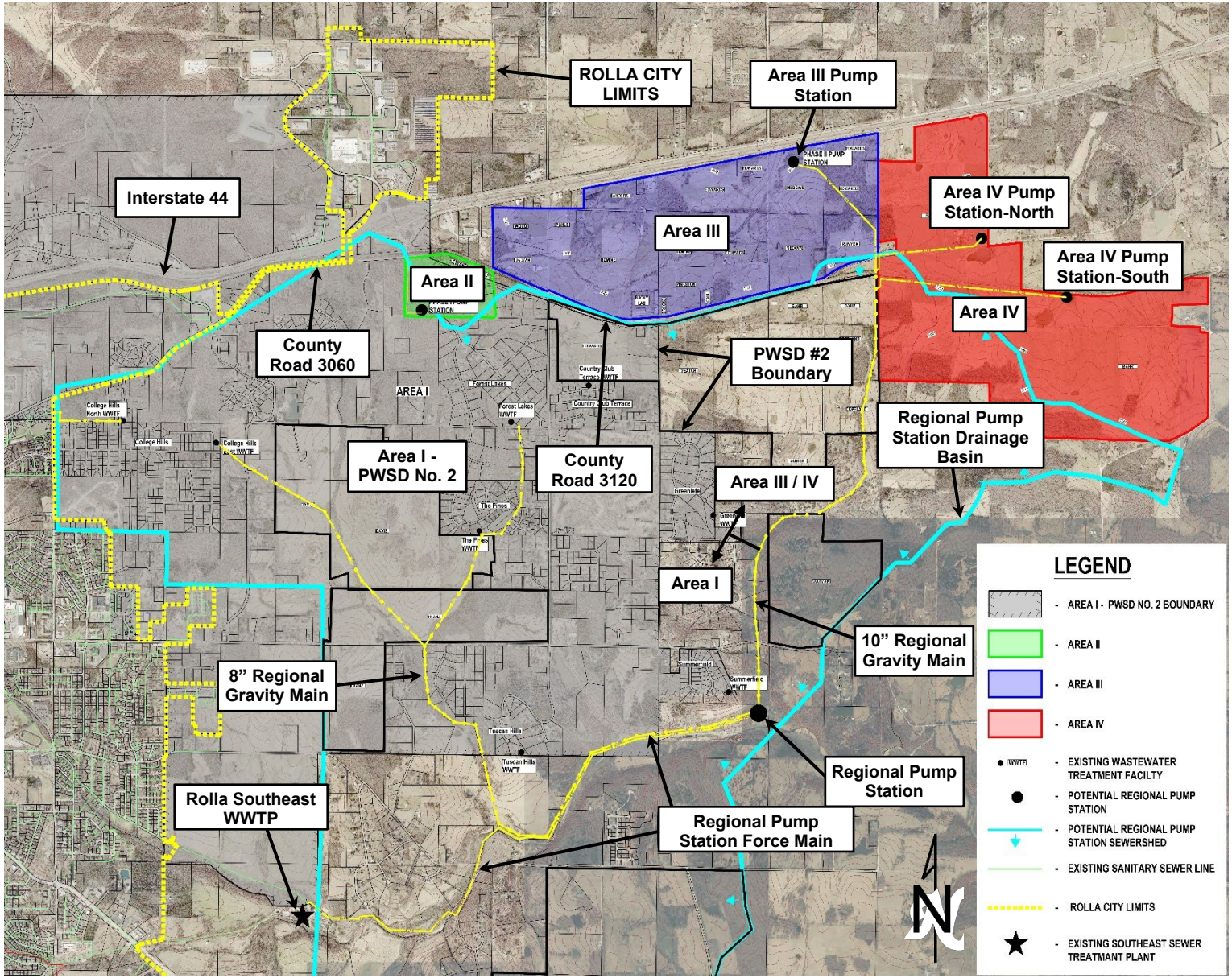


Figure ES-1 – Regionalization alternatives for the conveyance of Area I, II, III and IV wastewater to the Rolla Southeast WWTP.

1.1 SCOPE AND PURPOSE

The purpose of this engineering evaluation is multifaceted. First, the City of Rolla owns and operates the Rolla Southeast Wastewater Treatment Plan (MO-0050652) which has a permitted capacity of 4.765 MGD. Presently, the facility receives an average daily flow of 3.060 MGD, leaving a residual capacity of 1.705 MGD. Several existing wastewater treatment facilities service small residential subdivisions at the eastern extent of the City's limits. These facilities are generally recirculating sand filters which are owned and operated by the Phelps County Public Water Supply District (PWSD) No. 2. Many of these existing facilities have met or exceeded their permitted capacity. The Phelps County PWSD No. 2 has approached the City to explore the possibility of regionalization of wastewater collection and treatment with the City's existing system.

Secondly, numerous potential commercial and industrial development areas have been identified south and east of the intersection of Phelps County Road 3060 and Highway V / Hy Point Industrial Drive. These development areas currently lack wastewater collection and treatment infrastructure necessary to promote development.

This report shall strive to address the feasibility of the regionalization of PWSD No. 2 facilities with the Rolla Southeast WWTP. Furthermore, this report shall assess future improvements associated with the extension of the City's wastewater collection system to serve the identified commercial/industrial development areas.

This report shall include:

- A review of existing facility service area, site and infrastructure;
- A review of existing influent wastewater flow;
- A review of existing process capacity;
- Projections of future flow;
- Descriptions of proposed improvements;
- Estimation of improvement costs;
- Consideration of project financing.

2. EXISTING FACILITIES

This section shall review pertinent infrastructure associated with the City of Rolla collection and treatment system. Information regarding the treatment and collection system was largely drawn from the Final Preliminary Engineering Report: Southeast, Vichy Road and Southwest Wastewater Treatment Plants and Collection System, February 2018, by HDR Engineering, Inc. Information regarding the Phelps County PWSD No. 2 treatment facilities was acquired via the various National Pollutant Discharge Elimination System (NPDES) site specific permits issued by the State of Missouri for the facilities. The collection system configuration, to include sewer main diameter and slope, was provided by the City based on available geographical information system (GIS) mapping.

2.1 EXISTING FACILITIES AND SERVICE AREA

This section shall review the existing facilities associated critical infrastructure impacted by potential improvements. This section shall also assess existing conditions for future development of the Mule Holding Development and Woessner/Brink properties as well as the Phase I, Phase II and Phase III areas. Geological and hydrologic conditions for each area shall be reviewed and assessed. Considerations shall be given toward capacities of the facility to meet the current operational conditions. Finally existing wastewater flow characteristics shall be reviewed.

2.1.1 EXISTING SITE GEOLOGIC AND HYDROLOGIC CHARACTERIZATION

The existing soil and hydrologic characteristics for the Rolla Southeast WWTP were discussed in detail within the Final Preliminary Engineering Report: Southeast, Vichy Road and Southwest Wastewater Treatment Plants and Collection System, February 2018, by HDR Engineering, Inc., document. No development at the Rolla Southeast WWTP is anticipated within the scope of this project. No further consideration shall be given to onsite conditions.

Existing site soil conditions for the Area I-PWSD No. 2, Area II, Area III and Area IV development sites were elucidated utilizing the custom soil resource service available from the United States Department of Agriculture (USDA) National Resource Conservation Service Web Soil Survey. The development sites were selected as the area of interest for the site soil survey. A soils report was generated utilizing the USDA database which detailed the likely soil makeup for the area. Soil information is summarized in the design memoranda contained within Appendix C – Supporting Documents.

The Area I-PWSD No. 2, Area II, Area III and Area IV development sites consist of ridges dissected by watercourses such as the Daily Branch, Franz Branch, Little Dry Fork, unnamed tributary to the Burbuese River, etc. Based on current Federal Emergency Management Agency (FEMA) Flood Insurance Rate Mapping (FIRM), the Daily Branch, Franz Branch and Little Dry Fork watercourses have established approximate Zone A flood plain determinations where they cross the Area I-PWSD No. 2 region. The unnamed tributary to the Burbuese River similarly impacts the Area III development area. For all development adjacent to the watercourses in the aforementioned areas, site specific determinations of the base flood elevations should be made. Construction in flood prone areas must conform the National Floodplain Insurance Program (NFIP) and Missouri Department of Natural Resources (MDNR) requirements. Key infrastructure must be designed to:

- Withstand hydrostatic or buoyancy forces
- limit damage to integral materials of construction
- limit damage to utilities
- limit inflow and infiltration into sewer conveyance systems
- remain accessible during flooding events

2.1.2 EXISTING ROLLA SOUTHEAST WWTP

The Rolla Southeast WWTP is located in the southeastern extent of the City, approximately 0.67 miles east of Highway 72. The permitted capacity of the WWTP is 4.765 MGD. The facility straddles the Burgher Branch, close to its confluence with Dutro Carter Creek. Historically the facility consisted of two discrete treatment trains: the “east” plant and the “west” plant. The facility recently completed an upgrade in 2024 which resulted in the consolidation of the main liquid treatment train at the east plant.

The city’s wastewater collection system is divided into three discrete sewersheds which each drain to their own respective WWTP. The Southeast WWTP sewershed has an area of 7,267 acres and covers the majority of the area currently developed within the city limits. This area includes the downtown commercial district, industrial areas located in the norther extent of the City and the Missouri University of Science and Technology. Gravity pipe within the collection system ranges from 6 IN to 42 IN and the collection system materials include vitrified clay pipe (VCP), lined VCP, polyvinyl chloride (PVC) pipe, reinforced concrete pipe and others (ductile iron pipe, truss pipe, etc.). The collection system consists of approximately 20,780 FT of force main and 624,872 FT of gravity sewer.

Figure 2.1.2-1 – Rolla Southeast WWTP "East" Plant, November 2023

Flow from the wastewater collection system enters the facility at two locations. One trunk main parallels the Dutro Carter Creek and enters the western extent of the "west" plant. The second trunk main parallels the Burgher Branch and enters the "east" plant at its northern extent. Each trunk main consists of 36 IN reinforced concrete pipe. Flow from the "west" plant is transferred to the headworks at the east plant via gravity. The facility discharges to the Burgher Branch at Outfall No. 001. A flow diagram for the facility is shown in Figure 2.1.2-1

The 2024 facility upgrade to the liquid treatment train afforded the construction of a new headworks process, new oxidation ditch, new secondary clarifier, new intermediate pump station, modifications to the existing UV disinfection process to expand capacity, new post aeration process. Improvements to the wet weather treatment train provided for coarse screening, primary sedimentation and chlorine disinfection. The solids treatment train was enhanced via aerobic digester and sludge storage improvements.

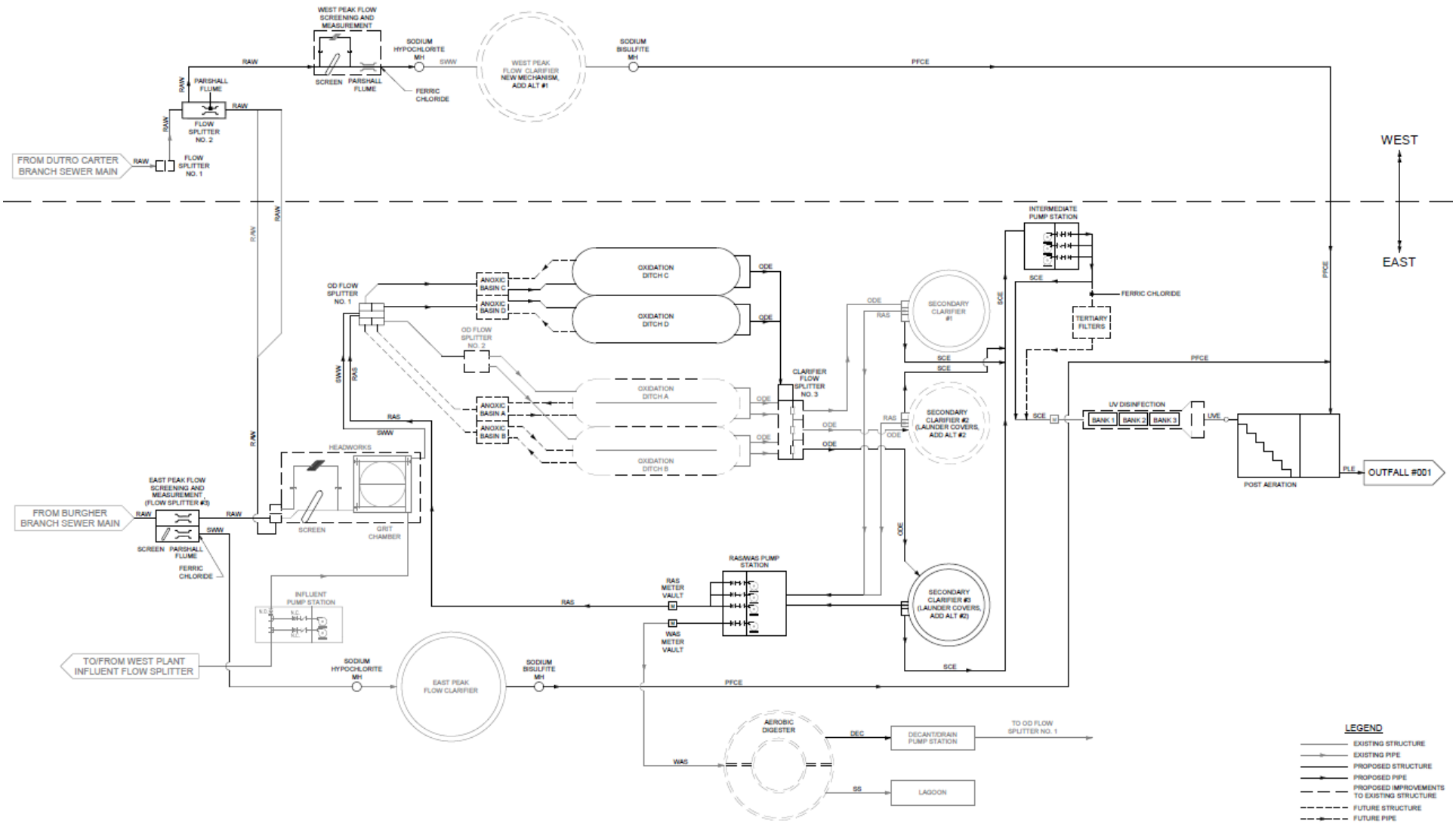


Figure 2.1.2-2 – Rolla Southeast WWTP Flow Diagram

2.1.3 AREA I-PHELPS COUNTY PWSD NO. 2

A number of unincorporated areas have been developed at the eastern extent of the Rolla city limits. As these predominantly residential developments have been constructed, centralized collection systems have been installed to convey wastewater to individual treatment facilities. The centralized collection systems generally consist of septic tank effluent pump (STEP) pressure systems. Wastewater generated by each residential dwelling is directed to a baffled septic tank. An effluent screen is placed in the downstream tank, within which an effluent pump is installed. Each effluent pump conveys the liquid contents of the tank to a centralized force main and on to the treatment facility. The treatment facilities consist of recirculating sand filters with chlorine or UV disinfection. Recirculating sand filters are generally designed to accommodate for biochemical oxygen demand (BOD) and total suspended solids (TSS) removal from the wastewater. However recirculating sand filters do not provide reliable nitrification capacity, especially during prolonged cold weather periods. With the Missouri Department of Natural Resources recent efforts to implement new, stringent ammonia-nitrogen criteria for point source discharges to receiving streams, it is likely that these facilities will be unable to adequately treat influent wastewater to the appropriate extent without significant improvements to the facilities. Each facility in the described unincorporated area is presently owned and operated by the Phelps County PWSD No. 2. Recently the PWSD No. 2 has approach the City regarding regionalization of the wastewater collection and treatment system with the City of Rolla. Table 2.1.3-1 provides a summary of of the wastewater treatment facilities located in the described developed unincorporated areas.

Table 2.1.3-1 – Summary of Wastewater Treatment Facilities in Unincorporated Areas

Facility Name	NPDES Permit No.	Design Flow, GPD	Collection System Configuration	Treatment Facility Configuration
PWSD#2-Forrest Lakes Subd. WWTP	MO-0125032	17,760	STEP	Recirculating Sand Filter Chlorine Disinfection Contract Sludge Hauling
PWSD#2-College Hills East WWTP	MO-0126730	24,975		
PWSD#2-Country Club Terrace WWTF	MO-0125059	14,708		
PWSD#2-Summerfield Subd WWTF	MO-0125482	11,100		
PWSD#2-College Hills North WWTF	MO-0126748	17,760		
PWSD#2-Greenlefe Subd. WWTP	MO-0125211	24,975	STEP	Recirculating Sand Filter UV Disinfection Contract Sludge Hauling
PWSD#2-The Pines WWTF	MO-0119121	34,400		
PWSD#2-Tuscan Hills Subd WWTF	MO-0135011	4,680		

STEP = Septic Tank Effluent Pump system

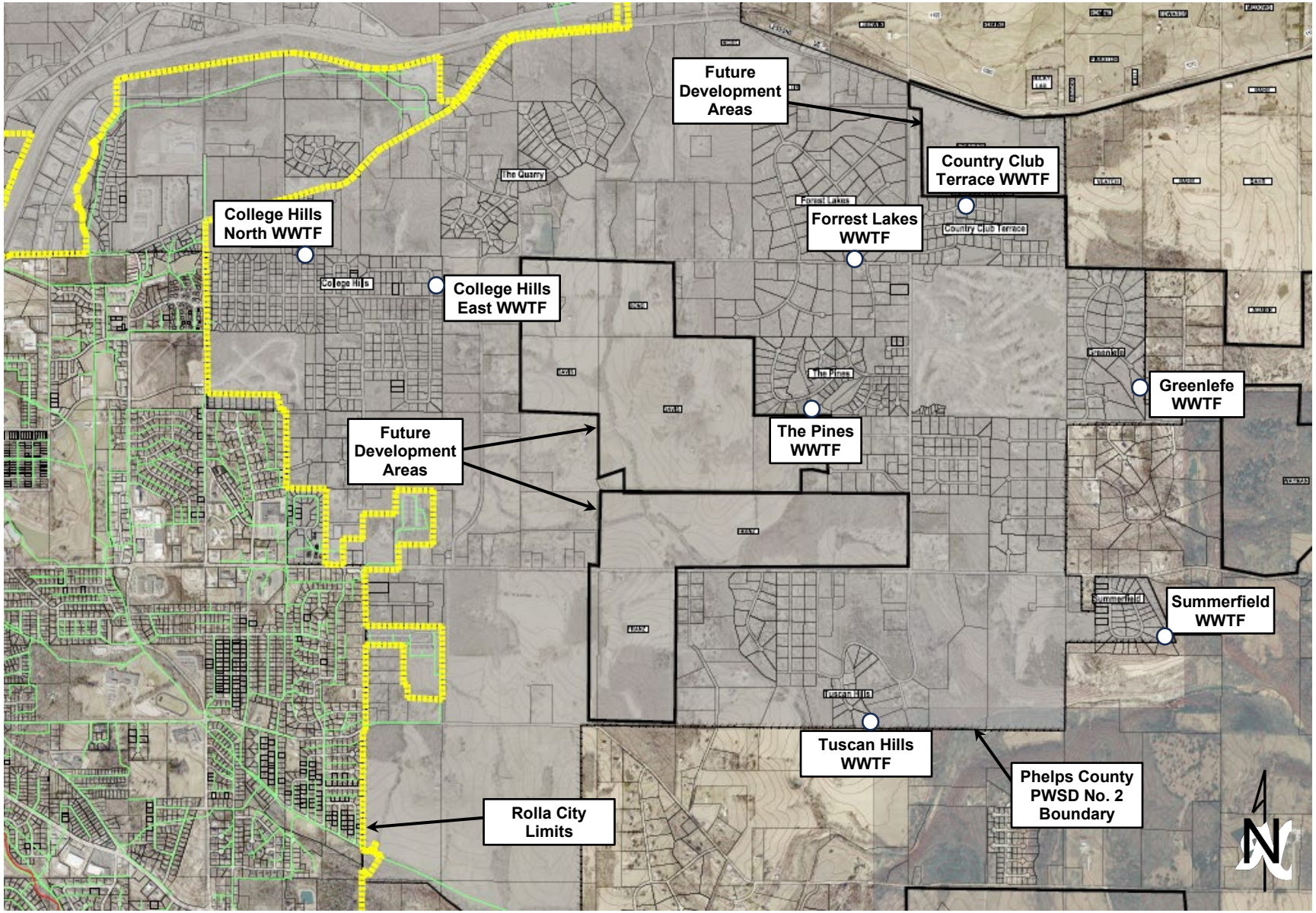


Figure 2.1.3-1 – Location map showing residential subdivisions and associated Area I-Phelps County PWSD No. 2 WWTPs

2.2 EXISTING WASTEWATER CHARACTERISTICS

The volumetric flows and mass loadings generated for each facility were assessed to aid in the design of potential improvements. Flow and loading data for the Rolla Southeast WWTP was based on the aforementioned preliminary engineering report, supplemented with more recent data collected during construction of the associated improvements. Flow and loading data for the PWSD No. 2 facilities is largely derived based on National Pollutant Discharge Elimination System (NDPES) permitting for the facilities, with supplemental data gathered from the USEPA Permit Compliance System-Integrated Compliance Information System (PCS-ICIS) platform.

2.2.1 ROLLA SOUTHEAST WWTP

Based on flow and loading data collected for the Rolla Southeast WWTP, it is observed that the average daily flow received at the facility is 3.06 MGD. This influent flow results in a residual capacity of 1.705 MGD. Table 2.2.1-1 summarizes existing flow and loading data for the facility.

Table 2.2.1-1 – Summary of Flow and Loading Data for the Rolla Southeast WWTP

Parameter	Ave Day	Max Month, Ave Day	Max Day	Peak Hour
Flow, MGD	3.06	7.58	21	41.8
BOD Conc, mg L^{-1} :	118.7	196.3	198.5	--
TSS Conc, mg L^{-1} :	117.3	173.1	199.4	--
NH3-N Conc, mg L^{-1} :	16.4	--	28.9	--
TKN Conc, mg L^{-1} :	32.7	--	57.9	--
TP Conc, mg L^{-1} :	3.69	--	6.41	--

2.2.2 AREA I-PHELPS COUNTY PWSD NO. 2

Wastewater production for unincorporated areas located east of Rolla were assessed. There are a number of subdivisions within the aforementioned unincorporated area which have wastewater treatment facilities operated by the Area I-Phelps County PWSD No. 2. A summary of these wastewater treatment facilities is provided below in Table No. 2.2.2-1. The currently available treatment capacity in the unincorporated region is 150,358 GPD. It should be noted that the facilities shown in Table 2.2.2-1 do not treat all wastewater produced within the unincorporated region. Onsite treatment is the typical method for wastewater treatment for those properties not connected to the facilities listed.

Table 2.2.2-1 – Summary of Wastewater Treatment Facilities in Area I

Facility Name	NPDES Permit No.	Design Flow, GPD	Actual Flow, GPD	Area Served, Acres	Areal Production, GPD/Acre
PWSD#2-Forrest Lakes Subd. WWTP	MO0125032	17,760	16,100	159.0	101.3
PWSD#2-College Hills East WWTP	MO-0126730	24,975	20,200	89.0	227.0
PWSD#2-Greenlefe Subd. WWTP	MO-0125211	24,975	23,600	151.0	156.3
PWSD#2-The Pines WWTF	MO-0119121	34,400	25,900	80.0	323.8
PWSD#2-College Hills North WWTF	MO-0126748	17,760	18,000	80.4	223.9
PWSD#2-Country Club Terrace WWTF	MO-0125059	14,708	13,800	53.7	257.0
PWSD#2-Tuscan Hills Subd WWTF	MO-0135011	4,680	--	11.6	403.4
PWSD#2-Summerfield Subd WWTF	MO-0125482	11,100	15,800	31.2	506.4
	Total	150,358	133,400		

2.2.3 AREA II, AREA III AND AREA IV

Area II, Area III and Area IV are presently undeveloped, being predominantly utilized for agricultural pursuits. A number of single family dwellings have been constructed in the areas, which are presently served via subsurface, onsite treatment systems. The current wastewater production associated with these areas is negligible.

The Mule Holdings and Brink properties presently have light commercial development. Each structure is served by its own onsite treatment system. It is fully expected that as these properties are redeveloped in the future, that the existing structures shall be demolished, affording the installation of new, more dense, commercial development.

The Woessner property is presently undeveloped and no wastewater is generated on the property.

3. BASIC PROJECT DEVELOPMENT

This section shall address the basic criteria utilized in the analysis of the existing system and the development of improvement alternatives.

3.1 PROJECT PLANNING PERIOD

Within the scope of this project, a planning period of 20 years was chosen. This time frame was deemed reasonable as it addresses several pertinent issues. First, it is reasonable to project population and volumetric flow growth over a 20-year period. Reasonable projections of population and volumetric flow over longer periods of time can be problematic, resulting in the improper design of critical process equipment. Furthermore, many pieces of process equipment have a projected lifespan of 20 years, if they are properly designed, installed and maintained. Finally, the 20 year planning period accommodates the typical term utilized by many public and private financing alternatives.

3.2 PROJECTIONS OF WASTEWATER VOLUMETRIC FLOW

3.2.1 ROLLA SOUTHEAST WWTP

Based on flow and loading data collected for the Rolla Southeast WWTP, it is observed that the average daily flow received at the facility is 3.06 MGD. This influent flow results in a residual capacity of 1.705 MGD. Table 2.2.1-1 summarizes existing flow and loading data for the facility. The current collection system conveying flow to the facility serves that portion of the City located south of Interstate 44 and east of the Interstate 44 Exit No. 184. The sewershed is generally fully developed and the City does not anticipate that any subsequent redevelopment might occur which will result in changes in the volumentric flow received at the facility. Expansion of the sewershed to accommodate unincorporated and undeveloped areas will drive any increases in flow and loading to the facility.

3.2.2 AREA I-PHELPS COUNTY PWSD NO. 2

Wastewater production for the developed residential subdivisions are summarized in Table 2.2.2-1. These subdivisions are fully developed, with no additional capacity for the construction of new residential dwellings or expansion of wastewater production. However, there are large swaths of undeveloped land that have reasonable potential for development within the service area for the Area I-Phelps County PWSD No. 2 during the project planning period. A total of 1,220 Acres were identified as potentially developable

land. It is assumed that only 70 percent of this potentially developable land could be fully developed, with the balance accounting for access infrastructure, drainage easements, setbacks, slope easements, etc. The average areal wastewater productions calculated for the existing PWSD No. 2 WWTFs. An average areal wastewater production rate of 274 GPD per acre was applied to the developable portion of the undeveloped lands. Based on this areal wastewater production rate, a total flow of 233,996 GPD might be expected in addition to 150,358 GPD potentially produced by the existing WWTFs.

3.2.3 AREA II, AREA III AND AREA IV

Area II, Area III and Area IV have been identified a prime for future commercial and industrial development. Presently these areas are undeveloped, being predominantly utilized for agricultural pursuits. In an effort to assess potential future wastewater production rates generated by development in these areas, the condition and nature of the Hy Point Industrial Park were assessed.

Current wastewater production for Hy Point Industrial Park was evaluated as a metric for future development in the designated development areas. The Hy Point Industrial Park was chosen as it is well developed and considered to be representative for sustainable commercial and industrial development that might occur within the region. As was identified in the Hy Point Lift Station Force Main Facility Plan, Archer-Eglin Engineering & Surveying., 2023, the wastewater production for the existing Hy Point Industrial Park is 55,000 GPD. The existing industrial park has a developed area of approximately 301.9 Acres, with 37.6 Acres undeveloped land area. Based on the assessment performed in 2023, an areal wastewater production rate of 162 GPD / Acre was estimated which accommodates for 11.4% undeveloped area within the industrial park.

Updated water usage records for all commercial and industrial facilities located in Hy Point industrial park were compiled. The water usage records were supplied by the Rolla Municipal Utilities for dates spanning January 2024 through June 2025. Table 1 shows a summary of the current water usage demand for Hy Point industrial park for each tenant. A reduction of 15% was used to account for the potable water demand that doesn't reach the sanitary sewer collection system.

Hartmann U.S., Inc. main water utility account no. 6332-2 was not utilized for in Table 3.2.3-1. Instead, wastewater production rates for Hartmann were collected and provided to the City of Rolla through the City's industrial pretreatment program. The wastewater production data provided by the City for Hartmann spanned from October 2019 through April 2025. When looking at Figure 2, Hartmann U.S., Inc. wastewater production at the facility increased significantly starting in October 2022 to 2025. The average

daily water demand for Hartmann U.S., Inc. in between October 1, 2022 and April 2025 was 68,394.4 GPD. Because this dataset is representative of wastewater production only, the average daily production was not modified as all flows produced are conveyed to the Rolla Southeast WWTP for ultimate treatment and disposal.

Table 3.2.3-1 –Summary of current water demands for Hy Point industrial park. Water utility account no. 6332-2, which belongs to Hartmann U.S., was not considered.

Business Name	Billing Location ID	GPD
Ozark Coca-Cola	6328.00	240.92
I-44 Truck Center	45356.00	30.65
TBA Investment LLC	6346-1	9.01
Schwan's Sales Enterprise Inc	6346-0	141.12
Public Water Supply	20466-1	93.00
Cunningham, Durwood Haley	43576-1	108.99
MS&T Physical Facility	6308-2	275.33
2nd Amendment Wholesale	31646-3	3.82
Brewer Science	6338-4	55.45
Brewer Science	26220.00	11,843.21
Phelps County Ind Solutions Inc	6336-0	258.13
Phelps County Ind Solutions Inc	6330-2	0.00
Pepsi Cola	26836.00	260.98
Mo-Sci Corporation	30136.00	1,674.95
Mo-Sci Corporation	47086.00	285.48
Fedex Ground Mail Unit #14	50616-2	531.55
Hartmann US Inc	6334-5	26.77
	Total (Before Reduction), GPD =	15,839.36
	Total, GPD =	13,463.45

Hartmann U.S., Inc. main water utility account no. 6332-2 was not utilized for in Table 3.2.3-1. Instead, wastewater production rates for Hartmann were collected and provided to the City of Rolla through the City's industrial pretreatment program. The wastewater production data provided by the City for Hartmann spanned from October 2019 through April 2025. When looking at Figure 3.2.3-1, Hartmann U.S., Inc. wastewater production at the facility increased significantly starting in October 2022 to 2025. The average daily water demand for Hartmann U.S., Inc. in between October 1, 2022 and April 2025 was 68,394.4 GPD. Because this dataset is representative of wastewater production only, the average daily production was not modified as all flows produced are conveyed to the Rolla Southeast WWTP for ultimate treatment and disposal.

Based on both the water usage records for the Hy Point Industrial Park, as well as the effluent flow measurements for the Hartmann U.S., Inc facility, it is anticipated that the average daily wastewater flow generated by the Hy Point Industrial Park is 81,857.9 GPD, a 48.8% increase from the 2023 evaluation described above. This wastewater production results in an areal wastewater production rate of 241 GPD / Acre.

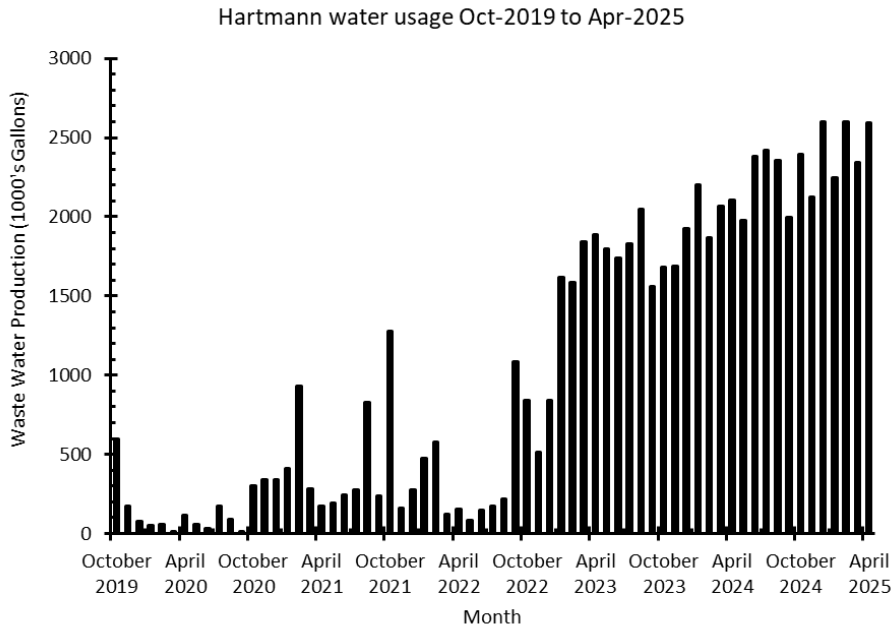


Figure 3.2.3-1 –Summary of Hartmann U.S., Inc. wastewater production from October 2019 to April 2025.

The areal wastewater production rates were then applied to each development phase based on the anticipated developable area for each phase. The developable area assessment accommodated for such factors as existing site slope and anticipated setback requirements from existing property lines, watercourses and transportation infrastructure. The areal wastewater production rate further accommodates for potential future transportation infrastructure, easements, etc., which will likely be required to accommodate site access. Peaking factors were determined based on an assessment of the population equivalent assuming 100 GPCD production and an application of the Fair & Geyer equation to establish the ratio of the peak hourly flow to the average daily flow. It should be noted that the Fair and Geyer peak flow determination is reasonable for municipal wastewater production with minimal influence of inflow and infiltration. This approach shall provide a reasonable estimate of the anticipated peak flows for each development phase; however, it is understood that every industrial process is different and each

potential discharge should be evaluated separately and regulated as required through the City's industrial pretreatment program to assure that peak flow discharges do not exceed the rated capacities of the wastewater infrastructure. A summary of wastewater production rates for each development phase has been provided below in Table 3.2.3-2.

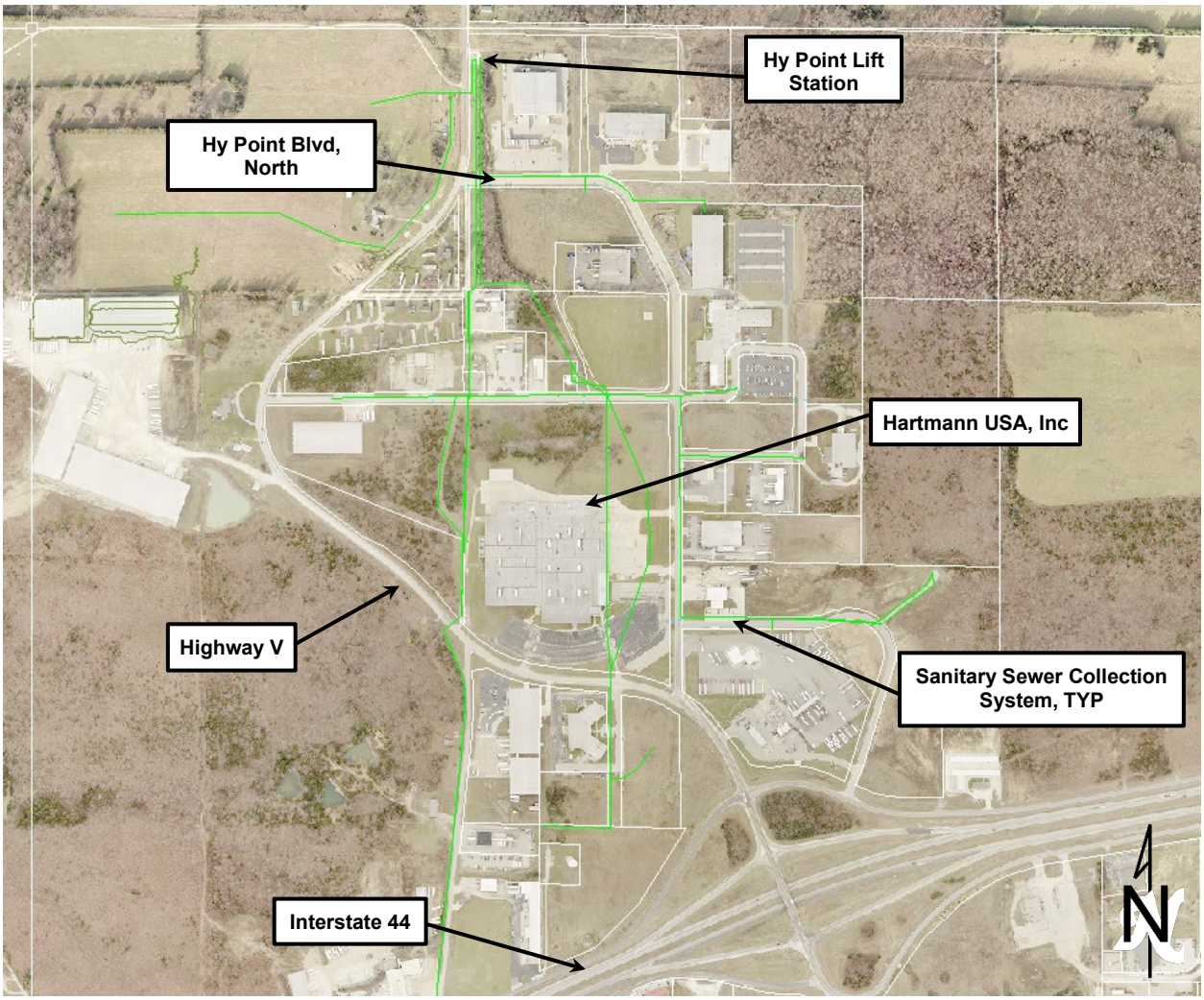


Figure 3.2.3-2 - Hy Point Industrial Park sanitary sewer collection system.

Table 3.2.3-2 – Summary of wastewater production rates for each development phase.

Development Phase	Development Area, Acres	Q_{adf}, GPD	P.E.	P_f	Q_{pf}, GPM
II	51.0	12,291	123	4.21	36.0
III	582.6	140,406	1,404	3.70	360.8
IV	745.0	179,617	1,796	3.62	451.7

Within the scope of the Rolla Hy Point Lift Station Force Main Improvements project, which is described in detail within the Hy Point Lift Station Force Main Facility Plan, Archer-Eglin Engineering & Surveying., 2023, a new 4 IN SDR-11 IPS HDPE force main was extended from the an existing force main highway/railroad bore east along County Road 3060 to a terminal point located due south of the Interstate 44 and Highway V / Hy Point Industrial Drive interchange. This force main was intended to serve properties located on the southern extent of the interchange. Specifically, the Mule Holdings, Woesner / Brink Property and the Phase I development area would be served by the force main. The force main would be configured as a system to which multiple discrete lift stations would connect for the conveyance of all wastewater to the Rolla Southeast WWTP for treatment. An assessment of the wastewater production for the Mule Holdings and Brinks Property was performed in the aforementioned study and a summary of that analysis is summarized in Table 3 below. The total flow conveyed by the proposed force main extension should pump stations for each development operate simultaneously will be approximately 100 GPM, well within the capacity force main.

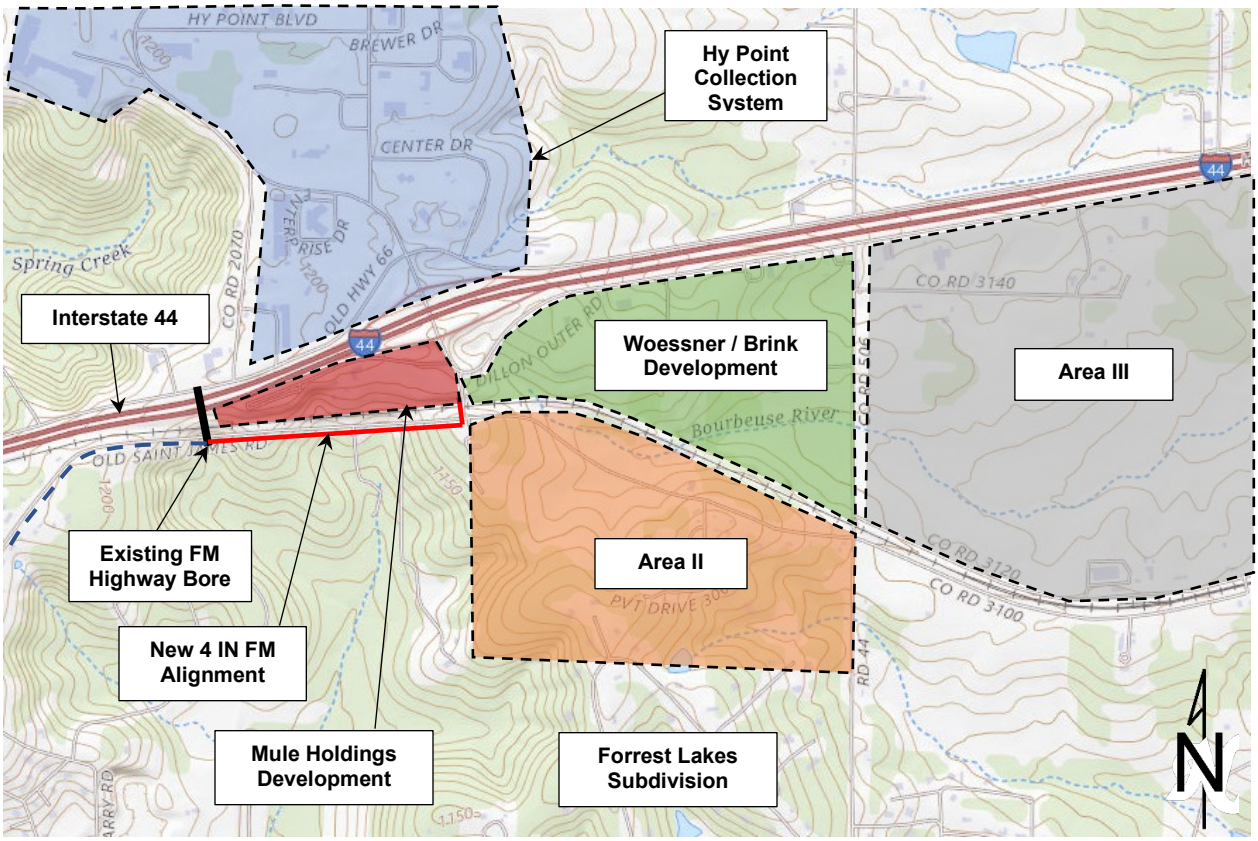


Figure 3.2.3-3 – Location map showing the Mule Holdings, Woessner / Brink, Forrest Lakes Subdivision and Area II and Area III development areas

Table No. 3.2.3-3 – Summary of Flows for Future Developments Requiring Sewer Service

Property	Area, ACRE	Areal Loading Rate, GPD/ACRE	Q_{adf}, GPD	P.E.	p_f	Q_{pf}, GPM
Mule Holdings	9.3 (1)	525	6,983	70	4.24	20.6
Woessner / Brink Development	28.7 (1)	525	15,068	151	4.19	43.8

(1) Reported area represents developable area, which accommodates for the 30 % of the total property area which cannot be developed.

3.3 DESCRIPTION OF NEED

The MDNR is presently working to integrate the USEPA Aquatic Life Ambient Water Quality Criteria for Ammonia-Freshwater, 2013 (EPA 822-R-18-002, April 2013) into the state's regulatory water quality standards. This new water quality standard shall result in stringent new ammonia-nitrogen effluent limitations at the majority of publicly owned treatment works (POTWs) across the state. The Phelps County PWSD No. 2 owns and operates numerous wastewater treatment facilities. These facilities are generally recirculating sand filters that are incapable of consistently meeting the stringent new limits without substantial improvement to each facility. Furthermore, many of these existing facilities have influent flows and loadings which are presently at or exceeding their permitted capacity. The PWSD has approached the City of Rolla regarding regionalization as an alternative to upgrade of each facility to provide the requisite nitrification capacity.

Furthermore, numerous properties have been identified as prime for development; however, they presently lack a means of wastewater collection and treatment. It is anticipated that once development of the property commences, wastewater collection and/or treatment infrastructure must be constructed at the site(s) impacting the overall cost of the development.

To address these specific concerns the following needs shall be addressed via the improvement alternatives. The specific needs that must be address by this report include, but are not limited to:

1. Evaluate PWSD No. 2 WWTF alternatives necessary to meet the stringent new effluent standards, with an emphasis on regionalization with the City of Rolla.

2. Evaluate improvements required to treat wastewater at each identified development site or provide for the expansion the City's collection system to serve identified development areas.

4. PROPOSED IMPROVEMENTS

This section shall detail potential improvements to address the needs identified in Sectoin 3.3. Improvements shall be grouped as non-degrading and degrading. Non-degrading alternatives are those for which a point source discharge of treatment wastewater shall occur. Generally non-degrading alternatives include: land application of wastewater; and regionalization. Degrading alternatives are those for which a unit process must be constructed to achieve a specific treatment goal. This treatment process shall discharge to the environment and will result in the utilization of the assimilative capacity of the receiving stream. Included with the discussions of each proposed improvement shall be a summary of pertinent design criteria as well an Engineers Opinion of Probable Project Cost.

4.1 LAND APPLICATION

This alternative shall evaluate the collection of point source discharges and/or wastewater flows and their application to a prepared land to afford subsurface treatment and vegetal uptake of nutrients. This evaluation shall address the Missouri 10 CSR 20-8.110(5)(E)3 requirement to consider no-discharge alternatives.

4.1.1 AREA I-PHELPS COUNTY PWSD NO. 2

This alternative includes the conversion of the existing Area I-Phelps County PWSD No. 2 facilities from point source discharges to non-discharging facilities. Effluent from each facility would be collected and stored for land application. Stored effluent would be pumped to the designated land application area were it would be spread directly on the land. Land application would consist of center-pivot style spray irrigation.

The land area immediately surrounding the each existing WWTP facility site consists of loamy/clayey soils having hydrologic soils group classifications of C or D. Many of the classified soil groups have restrictive features which limit the feasibility of land application for treatment. This is further compounded by steep grades and floodplains in close proximity to the existing facilities. Site specific evaluations of potential land application area must be performed to confirm suitability for land application. The closest contiguous properties potentially suitable for land application at each facility are identified in Table 4.1.1-1. A slow rate land application process would be required for each facility. Based on the EPA Process Design Manual: Land Treatment of Municipal Wastewater Effluents (EPA/625/R-06/016

September 2006), preliminarily estimates of land area required for each facility are listed in Table 4.1.1-1. These estimates include the required land application area and 3 months of effluent storage. The three months of storage capacity is a requirement of the MNDR Wastewater Guidelines and Standards Document, February 2019, (Section 11.5.3) to accommodate for those periods during which land application cannot be performed due to the frozen or excessively saturated fields. This land area estimate also incorporates an additional 30% buffer to accommodate for land that is unusable due to setback requirements, access, etc. It is estimated that contiguous parcels of land within a reasonable distance of the existing WWTP site could be purchased by the PWSD No. 2 at fee of $17,500 per acre.

Table 4.1.1-1 – Summary of Wastewater Treatment Facilities in Area I

Facility Name	Design Flow, GPD	Land Application Area, Acres	Storage Basin Area, Acres	Distance to Land Application Area, MI
PWSD#2-Forrest Lakes Subd. WWTP	17,760	7.0	1.4	> 0.40
PWSD#2-College Hills East WWTP	24,975	10.0	2.0	> 0.15
PWSD#2-Greenlefe Subd. WWTP	24,975	10.0	2.0	> 0.50
PWSD#2-The Pines WWTF	34,400	13.5	2.7	> 0.15
PWSD#2-College Hills North WWTF	17,760	7.0	1.4	> 0.15
PWSD#2-Country Club Terrace WWTF	14,708	6.0	1.2	> 0.15
PWSD#2-Tuscan Hills Subd WWTF	4,680	1.8	0.4	> 0.15
PWSD#2-Summerfield Subd WWTF	11,100	4.4	0.9	> 0.50
	150,358	59.7	12.0	

Numerous improvements must be made to the land application areas to prepare them to receive stored facility effluent. First the field must be prepared. Assuming that the proposed land area would consist of open field with some brush, it can be anticipated that the cost to prepare the area for land application would be approximately 5% or the land purchase price. Pumping facilities for land treatment must be constructed to convey stored effluent from the storage lagoon to the land application area. It can be anticipated that a pump stations sized to accommodate the anticipated design flow would cost $135,000 each. Storage basins must be constructed at each site. Based on the MDNR Wastewater Guidelines and Standards (Section 11.5.3), 90 days of storage capacity at the average daily design flow must be provided.

The basin must also provide supplemental volume to accommodate rainfall volume associated with a 10 year, 24 hour duration rainfall event. It is estimated that the total cost for construction of the basins shall be approximately $0.15 per gallon which accounts for subgrade preparation, construction of berms, installation of a liner system incorporating underdrains, riprap revetment, etc.

Slow rate land application will be performed using center pivot sprinklers. Multiple electrically driven, heavy-duty units will be installed to facility uniform distribution of stored facility effluent. Distribution piping would be buried at 3ft depth. Capital cots for center pivot sprinklers and operations and maintenance costs were evaluated based on the aforementioned EPA process design manual, adjusted for cost escalation between the document publication data and present day.

The total capital cost associated with the construction of a land application system is $11,560,822, which includes a contingency and engineering fees for the preliminary and final design, surveying and construction administration. The present worth value of value of annual replacement, operations and maintenance costs is $9,225,755. The total cost associated with this alternative is $20,786,577. Table 4.1.1-2 summarizes costs for each PWSD No. 2 facility.

4.1.2 AREA II, AREA III, AREA IV

The in-situ soil conditions at Area II, Area III and Area IV development sites limit the applicability of non-degrading onsite treatment and disposal methods for any wastewater (domestic, commercial and industrial) generated in the development area. The soil limitations include the presence of restrictive soil layers (shallow fragipan and lithic bedrock) as well as low saturated soil hydraulic conductivity. The implementation of land application at these facilities was not considered further. Onsite soil conditions for the aforementioned development phases is discussed further in Section 2 and the Appendix C.

4.1.3 MULE HOLDINGS, WOESSNER AND BRINKS PROPERTIES

The in-situ soil conditions and development potential associated with the Mule Holdings, Woessner and Brinks properties were discussed in the Hy Point Lift Station Force Main Facility Plan, Archer-Eglin Engineering & Surveying., 2023. Due to the locations of the site and its in-situ soil characteristics, land application was identified as not a feasible alternative for serving the abovementioned properties with wastewater collection and treatment.

Table 4.1.1-2 – Area I-Phelps County PWSD No. 2 Land Application Opinion of Probable Project Cost

ITEM	Forrest Lakes Subd. WWTP	College Hills East WWTP	Greenlefe Subd. WWTP	The Pines WWTF	College Hills North WWTF	Country Club Terrace WWTF	Tuscan Hills Subd WWTF	Summerfield Subd WWTF
Land Acquisition	$147,000	210,000	210,000	283,500	147,000	126,000	$38,500.00	$92,750.00
Land Preparation	$7,350	$10,500	$10,500	$14,175	$7,350	$6,300	$1,925	$4,638
Pump Station	$135,000	$135,000	$135,000	$135,000	$135,000	$135,000	$135,000	$135,000
Storage Basin	$239,760	$337,163	$337,163	$464,400.00	$239,760	$198,558	$63,180.00	$149,850.00
Sprinkler Equipment	$111,000	$111,000	$111,000	$111,000	$111,000	$111,000	$111,000	$111,000
Electrical	$128,022	$160,733	$160,733	$201,615	$128,022	$115,372	$69,921	$98,648
Site Piping	$96,017	$120,549	$120,549	$151,211	$96,017	$86,529	$52,441	$73,986
Site Civil	$64,011	$80,366	$80,366	$100,808	$64,011	$57,686	$34,961	$49,324
Contingency	$185,632	$233,062	$233,062	$292,342	$185,632	$167,289	$101,385	$143,039
Subtotal	$1,113,791	$1,398,373	$1,398,373	$1,754,051	$1,113,791	$1,003,733	$608,313	$858,233
Engineering, Surveying, Const. Admin	$278,448	$349,593	$349,593	$438,513	$278,448	$250,933	$152,078	$214,558
Opinion of Probable Project Cost:	$1,392,239	$1,747,966	$1,747,966	$2,192,563	$1,392,239	$1,254,666	$760,391	$1,072,792
Replacement, O & M Cost Present Worth:	$74,679	$106,685	$106,685	$144,025	$74,679	$64,011	$19,559	$47,119
Total Present Worth Cost:	**$2,473,081**	**$3,292,025**	**$3,292,025**	**$4,277,043**	**$2,473,081**	**$2,181,102**	**$1,043,468**	**$1,754,751**

TOTAL OPINION OF PROBABLE PROJECT COST: $11,560,822

TOTAL PRESENT WORTH COST: $20,786,577

4.2 REGIONALIZATION

Regionalization alternatives shall investigate the consolidation smaller, individual point source discharges with larger, regional, publicly owned treatment works (POTW). This analysis is intended to meet the requirements of Missouri 10 CSR 20-8.110(5)(E)4 to evaluate regionalization within this report. For the PWSD No. 2 service area, as well as Phase I, Phase II and Phase III development areas, regionalization with the Rolla Southeast WWTP shall be considered as it is the closest facility in proximity to the aforementioned development areas and has adequate residual capacity to accept and treat wastewater generated within each area.

4.2.1 AREA I-PHELPS COUNTY PWSD NO. 2

Regionalization of the Area I-Phelps County PWSD No. 2 would require several discrete improvements. First, a regional pump station must be constructed which would receive wastewater generated within the proposed PWSD No. 2 service area. This regional pump station was preliminarily located 1000 FT southeast of the PWSD No. 2 Summerfield Subd WWTP site and would convey flows up the Little Dry Fork watercourse to the Rolla Southeast WWTP.

Secondly, a gravity sewer would extend from the regional pump station into the PWSD No. 2 service area to collect wastewater and convey it to the regional pump station. Two sanitary sewer trunk mains would be constructed. First, a sewer extension should be construct from the proposed pump station north toward the Greenlefe WWTF. This extension shall consist of a 3,000 FT, 10” SDR-35 PVC trunk main would have capacity to convey PWSD No. 2 flows in addition to the Phase II and Phase III development area with a residual 50% capacity. This proposed extension would have and estimated (31)-48” Dia precast concrete manholes spaced at 300 ft intervals. A second sewer extension would be constructed parallel to the regional pump station force main west toward the Rolla Southeast WWTP. At the confluence of the Little Dry Fork with the Franz Branch, the gravity sewer shall turn north and travel toward State Highway BB. Immediately north of the Highway BB, the gravity sewer shall fork with one main paralleling the east fork of the Franz Branch toward The Pines WWTF. The second fork shall parallel the west fork of the Franz Branch towards the College Hills East WWTP. This new sewer main shall consist of 20,481 FT of 8” SDR-35 PVC pipe with approximately (78)-48” Dia precast concrete manholes spaced at 300 FT centers. This gravity sewer would be sized to accommodate established wastewater flows from the PWSD No. 2 services, as well as other unincorporated areas adjacent and accessible to the proposed alignment.

The total opinion of probable project cost associated with the implementation of the regionalization alternative for the Area I-PWSD No. 2 service area with the Rolla Southeast WWTP is $11,600,400.00.

Table 4.2.1-1 – Opinion of Probable Project Cost for Area I-PWSD No. 2 Regionalization-Gravity Sewer

Description	Extension Price
Excavation, Grading & Backfill	$96,962.40
Structures	$436,500.00
Process Equipment	--
Process Piping	$2,871,740.00
Subtotal	$3,405,202.00
Contingency (20%)	$681,040.00
Engineering, Surveying, Administration	$817,249.00
Opinion of Probable Project Cost	**$4,903,500.00**

The new regional pump station shall be constructed to serve the established flows from the Area I-PWSD No. 2 service area, as well as future flows from unincorporated areas northwest of the pump station site, to include the Area III and Area IV Development sites. The pump station would convey wastewater directly to the Rolla Southeast WWTP for treatment. The pump station should be a submersible non-clog centrifugal station having an initial duplex configuration. One firm pumps and one standby pump would be installed, each having a capacity of 1,250 GPM at 127 FT TDH. The pumps would be operated via variable frequency drive to afford turndown of the pump, with a minimum allowable volumetric discharge rate of 900 GPM to provide adequate scour velocity within the force main. The pump station would discharge to 14,290 LF, 14 IN SDR-11 DIPS HDPE force main which would convey collected flow west along the Little Dry Branch to headworks structure at the Rolla Southeast WWTP.

To accommodate for future growth, the lift station could be configured to accept a two additional pumps for quadreplex operations, with three (3) firm pumps and one (1) standby pump. With these modifications, the pump station can accommodate for an increase in flow capacity from 1,250 GPM to 1,800 GPM.

Table 4.2.1-2 – Area I-PWSD No. 2, Area III and Area IV Development – Regional Pump Station

Flow	
Required Pumping Capacity @ ADF, GPM	335.4
Required Pumping Capacity @ PF, GPM	1,225.5 (Current) 1,800.0 (Future)
Proposed Equipment Summary	
Pumps in Service	2 Duty 1 Standby
Single Pump Capacity @ 127 FT TDH, GPM	1,250.0
2 Parallel Pump Capacity @ 161 FT TDH, GPM	1,650.0
3 Parallel Pump Capacity @ 175 FT TDH, GPM	1,800.0
Pump Size, Max (HP)	84.5
Possible Pump Selections	

- Xylem Flygt NP3202 HT 3~ 466, 60.0 Hp, 480VAC, 3-ph, 60 Hz, 1,780 RPM
- Sulzer-ABS XFP106J-CH2 PE860/4, Performance Curve 330, 84.5 HP, 480VAC, 3-ph, 60 HZ, 1780 RPM

Table 4.2.1-3 – Opinion of Probable Project Cost for Area I-PWSD No. 2 - Regional Pump Station

Description	Extension Price
Excavation, Grading & Backfill	$356,730.00
Structures	$285,750.00
Process Equipment	$468,000.00
Process Piping	$2,211,383.50
Subtotal	$3,321,864
Electrical Improvements (20% of Subtotal)	$664,373.00
Site Piping (10% of Subtotal)	$332,186.00
Site Civil (10% of Subtotal)	$332,186.00
Subtotal	$4,650,609.00
Contingency (20%)	$930,122.00
Engineering, Surveying, Administration	$1,116,146.00
Opinion of Probable Project Cost	**$6,696,900.00**

4.2.2 AREA II, AREA III, AND AREA IV

Regionalization of the Area III site would require several discrete improvements. First, a regional pump station must be constructed, as described in Section 4.2.1, which would receive wastewater generated within the proposed development area as well as the surrounding community. Secondly, a gravity sewer would extend from the gravity sewer established for the PWSD No. 2 regionalization (refer to Section 4.2.1), approximately 9,906 FT north, to a terminal point off the north right of way for Burlington Northern Sante Fe (BNSF) railroad, approximately 300 FT south of County Road 3120. The gravity sewer would be sized to accommodate wastewater flows from the Area I-PWSD No. 2 as well as Area III and Area IV developments, and other unincorporated areas adjacent and accessible to the proposed alignment. Finally, a new pump station would be constructed at the northern extent of the Phase II development site to convey flows from the site across County Road 3120 and the BNSF railroad right of way.

The new sanitary sewer pump station would be constructed to serve the Area III Development site to convey wastewater to the gravity sewer and regional pump station for ultimate conveyance to the Rolla Southeast WWTP for treatment. The pump station should be a submersible non-clog centrifugal station having a duplex configuration. One firm pump and one standby pump would be installed, each having a capacity of 360 GPM at 117 FT TDH. The pump station would discharge to 4,830 LF, 8 IN SDR-11 IPS HDPE force main which would convey collected flow south along an existing drainage feature / watercourse, across County Road 3120 and BNSF right of way to its discharge at the abovementioned gravity sewer.

Table 4.2.2-1 – Area III Development Sanitary Pump Station – Regionalization Option

Flow	
Required Pumping Capacity @ ADF, GPM	98.0
Required Pumping Capacity @ PF, GPM	361.0
Proposed Equipment Summary	
Pumps in Service	1 Duty 1 Standby
Single Pump Capacity @ 117 FT TDH, GPM	360
Pump Size, Max (HP)	20.0
Possible Pump Selections	
- Xylem Flygt NP3102 3~ 461, 20.0 Hp, 480VAC, 3-ph, 60 Hz, 1,765 RPM	

Table 4.2.2-2 – Opinion of Probable Project Cost for Area III Development Sanitary Pump Station

Description	Extension Price
Excavation, Grading & Backfill	$85,775.00
Structures	$104,000.00
Process Equipment	$111,000.00
Process Piping	$426,931.75
Subtotal	$727,707.00
Electrical Improvements (20% of Subtotal)	$145,541.00
Site Piping (10% of Subtotal)	$72,771.00
Site Civil (10% of Subtotal)	$72,771.00
Subtotal	$1,018,789
Contingency (20%)	$203,758.00
Engineering, Surveying, Administration	$244,509.00
Opinion of Probable Project Cost	**$1,468,000.00**

The proposed gravity sewer to serve both Phase II and Phase III developments would consist of (31)-48 IN precast concrete manholes and 9,096 LF of 10 IN SDR-35 PVC pipe. The conveyance is sized to accommodate for the total anticipated flows from the Phase II and Phase III developments with 50% additional residual capacity. The conveyance would connect to the sewer main established for the Area I-PWSD No. 2 regionalization of the Greenlefe WWTP.

Table 4.2.2-3 – Opinion of Probable Project Cost for Area III and Area IV Development-Gravity Sewer

Description	Extension Price
Excavation, Grading & Backfill	$42,471.60
Structures	$139,500.00
Process Equipment	--
Process Piping	$1,219,080.00
Subtotal	$1,401,052.00
Contingency (20%)	$280,210.00
Engineering, Surveying, Administration	$336,252.00
Opinion of Probable Project Cost	**$2,017,600.00**

For the Area IV development, a new sanitary sewer pump stations constructed to serve the site shall be located north of County Road 3120 and the BNSF railroad and serve approximately 20 percent of the total developed site. The pump station should be a submersible non-clog centrifugal station having a duplex configuration. One firm pump and one standby pump would be installed, each having a capacity of 100 GPM at 120 FT TDH. The pump station would discharge to 2,984 LF, 4 IN SDR-11 IPS HDPE force main which would convey collected along the BNSF right of way to its discharge at the abovementioned gravity sewer.

A second new sanitary sewer pump station constructed to serve the Area IV Development site shall be located south of County Road 3120 and the BNSF railroad and serve the remaining 80 percent of the total developed site. The pump station should be a submersible non-clog centrifugal station having a duplex configuration. One firm pump and one standby pump would be installed, each having a capacity of 350 GPM at 150 FT TDH. The pump station would discharge to 4,836 LF, 6 IN SDR-11 IPS HDPE force main which would convey collected along the BNSF right of way to its discharge at the abovementioned gravity sewer.

Table 4.2.2-4 – Area IV Development Sanitary Pump Stations – Regionalization Option

Flow	South	North
Required Pumping Capacity @ ADF, GPM	124.7	25.0
Required Pumping Capacity @ PF, GPM	451.7	100.0
Proposed Equipment Summary		
Pumps in Service	1 Duty 1 Standby	1 Duty 1 Standby
Single Pump Capacity @ 108 FT TDH, GPM	350.0	100.0
Pump Size, Max (HP)	35.0	12.0
Possible Pump Selections		
-	Xylem Flygt NP3171 3~ 277, 35.0 Hp, 480VAC, 3-ph, 60 Hz, 3540 RPM	Xylem Flygt NP3127 3~ 279, 12.0 Hp, 480VAC, 3-ph, 60 Hz, 3540 RPM

Table 4.2.2-5 – Opinion of Probable Project Cost for Area IV Development Sanitary Pump Station

Description	Extension Price
Excavation, Grading & Backfill	$151,470.00
Structures	$115,000.00
Process Equipment	$178,000.00
Process Piping	$805,247.00
Subtotal	$1,249,717.00
Electrical Improvements (20% of Subtotal)	$249,943.00
Site Piping (10% of Subtotal)	$124,972.00
Site Civil (10% of Subtotal)	$124,972.00
Subtotal	$1,749,604.00
Contingency (20%)	$349,921.00
Engineering, Surveying, Administration	$419,905.00
Opinion of Probable Project Cost	**$2,520,000.00**

The total opinion of probable project cost associated with the implementation of this alternative for the regionalization of Area III and Area IV developments with the Rolla Southeast WWTP is $6,005,600.

Several regions of potential future commercial and industrial development exist south of Interstate 44 adjacent to the its intersection with Phelps County Highway V / Hy Point Boulevard. In the southwest quadrant of the Highway V interchange is the Mule Holdings property. This property and the lots to the west constitute 13.3 ACRES which is anticipated to be a highway commercial development. In the southeastern quadrant of the interchange, the Brinks property and adjacent lots consisting of approximately 41 ACRES will be a highway commercial development. The Rolla Regional Economic Commission has 60 ACRES due south of the interchange that is available for development as an Industrial zone. Figure 3.2.3-3 shows the locations of the various development sites relative to the existing sanitary sewer infrastructure.

Within the scope of the Hy Point Lift Station Force Main Improvements project, which was implemented in Spring/Summer 2025, a new 4 IN SDR-11 IPS HDPE force main was extended from an existing 6 IN SDR-21 PVC force main which crosses the Interstate 44 and BNSF right of ways approximately 2,500 FT southwest of the intersection of County Road 3060 and the Phelps County Highway V / Hy Point Boulevard. This new 4 IN force main extends east along County Road 3060 toward the aforementioned intersection where line termination assemblies have been established to afford future connection by the property developers to provide connection to the City's wastewater collection system infrastructure. An aerial crossing of the existing Phelps County roadway bridge over BNSF right of way was installed to afford access to those properties north of railroad. It is expected that as the Phase I development area and Mule

Holding, Woessner and Brink properties develop, the developers would bear the cost of onsite collection system and pump station construction necessary to connect to the City's established infrastructure.

For the regionalization of the Area II development area with the Rolla Southeast WWTP was considered for this site, a new sanitary sewer pump station must be constructed to convey wastewater to the existing force main. The pump station should be a submersible grinder pump station having a duplex configuration. One firm pump and one standby pump would be installed, each having a capacity of 72 GPM at 80 FT TDH. The pump station would discharge to 1,700 LF, 3 IN SDR-11 IPS HDPE force main which would convey collected flow around the perimeter of the property to a connection point with the existing 4 IN force main near the intersection of County Roald 3060 with Highway V / Hy Point Industrial Drive.

Table 4.2.2-6 – Area II Development Sanitary Pump Station – Regionalization Option

Flow	
Required Pumping Capacity @ ADF, GPM	9.0
Required Pumping Capacity @ PF, GPM	36.0
Proposed Equipment Summary	
Pumps in Service	1 Duty 1 Standby
Single Pump Capacity @ 80.0 FT TDH, GPM	76.0
Pump Size, Max (HP)	5.4
Possible Pump Selections	

- Xylem Flygt MP3102 1~ 267, 5.4 Hp, 240VAC, 1-ph, 60 Hz, 3490 RPM

Table 4.2.2-7 – Opinion of Probable Project Cost for Area II Development Sanitary Pump Station

Description	Extension Price
Excavation, Grading & Backfill	$41,170.00
Structures	$47,000.00
Process Equipment	$66,000.00
Process Piping	$144,727.50
Subtotal	$298,898.00
Electrical Improvements (20% of Subtotal)	$59,780.00
Site Piping (10% of Subtotal)	$29,890.00
Site Civil (10% of Subtotal)	$29,890.00
Subtotal	$418,457.00
Contingency (20%)	$83,691.00
Engineering, Surveying, Administration	$100,430.00
Opinion of Probable Project Cost	**$603,000.00**

4.3 DEGRADING ALTERNATIVES

Degrading alternatives shall be those that involve the establishment or expansion of existing point source discharges which have deleterious impacts to the assimilative capacity of the receiving water bodies. For example, a degrading alternative might include the construction of a new mechanical plant designed to meet water quality standards established by the State of Missouri for the particular receiving water body.

4.3.1 AREA I – PHELPS COUNTY PWSD NO. 2

Improvements to the existing PWSD No. 2 WWTPs identified in Table2.2.2-1 is presently outside the scope of this report. A thorough analysis of alternatives necessary to meet stringent new ammonia-nitrogen effluent requirements must be performed.

4.3.2 AREA III AND AREA IV

For the Area III Development Area, treatment of collected wastewater and its discharge to the unnamed tributary to the Buerbuese River was considered. For this alternative, various regulatory drivers were considered in the selection of the appropriate treatment methodology. Currently, the Missouri Department of Natural Resources is working to enact new stringent ammonia-nitrogen criterial based on the 2013 USEPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Fresh Water (EPA 822-R-18-002) guidance document. This new criteria will require the construction of more advanced, nitrifying treatment systems to assure compliance with the new regulations. As a consequence, once common treatment technologies, such as aerated lagoons, recirculating sand filters, etc., will no long be permitted within the state. Treatment by suspended growth or attached growth process capable of nitrification will be required. For this development site with the anticipated design volumetric flowrate of 150,000 GPD, an attached or suspended growth system would cost between $15 and $30 per gallon of wastewater treated. The operation of the onsite treatment system may be more complex than typically seen for normal municipal wastewater as industrial process wastewater can be lacking in key nutrients necessary to afford satisfactory performance.

Table 4.3.2-1 – Opinion of Probable Project Cost for Area III Development Onsite Treatment

Description	Extension Price
Subtotal	$3,375,000.00
Electrical Improvements (20% of Subtotal)	$675,000.00
Site Piping (10% of Subtotal)	$337,500.00
Site Civil (10% of Subtotal)	$337,500.00
Subtotal	$4,725,000.00
Contingency (20%)	$945,000.00
Engineering, Surveying, Administration	$1,134,000.00
Opinion of Probable Project Cost	**$6,804,000.00**

For the Area IV Development Area, treatment of collected wastewater and its discharge to the Dailey Branch tributary to the Little Dry Fork was considered. For this alternative, various regulatory drivers were considered in the selection of the appropriate treatment methodology. Currently, the Missouri Department of Natural Resources is working to enact new stringent ammonia-nitrogen criterial based on the 2013 USEPA Aquatic Life Ambient Water Quality Criteria for Ammonia – Fresh Water (EPA 822-R-18-002) guidance document. This new criteria will require the construction of more advanced, nitrifying treatment systems to assure compliance with the new regulations. As a consequence, once common treatment technologies, such as aerated lagoons, recirculating sand filter, etc., will no long be permitted within the state. Treatment by suspended growth or attached grown process capable of nitrification will be required. For this development site with the anticipated design volumetric flowrate of 180,000 GPD, an attached or suspended growth system would cost between $15 and $30 per gallon of wastewater treated. The operation of the onsite treatment system may be more complex than typically seen for normal municipal wastewater as industrial process wastewater can be lacking in key nutrients necessary to afford satisfactory performance.

Table 4.3.2-2 – Opinion of Probable Project Cost for Area IV Development Onsite Treatment

Description	Extension Price
Subtotal	$4,050,000.00
Electrical Improvements (20% of Subtotal)	$810,000.00
Site Piping (10% of Subtotal)	$405,000.00
Site Civil (10% of Subtotal)	$405,000.00
Subtotal	$5,670,000.00
Contingency (20%)	$1,134,000.00
Engineering, Surveying, Administration	$1,360,800.00
Opinion of Probable Project Cost	**$8,164,800.00**

The total opinion of probable project cost associated with the establishment of degrading onsite treatment systems at the Phase II and Phase III sites is $14,968,800.

This section shall summarize alternatives necessary to meet description of need identified in Section 3.3. A plan for the implementation of the proposed improvements shall be developed. Associated project cost shall be determined.

5.1 SUMMARY OF ALTERNATIVES

Numerous alternatives have been investigated within the scope of this engineering report. These alternatives are summarized in Table 5.1-1. Alternatives recommended for implementation within the scope of this project include:

- Regionalization of PWSD No. 2 with the Rolla Southeast WWTP
- Future implementation of Phase II and Phase III regionalization alternatives as these areas develop.

Table 5.1-1 – Summary of Improvement Alternatives

Alternative	Opinion of Probable Project Cost
Area I-PWSD No. 2 Land Application	$11,560,822
Area I-PWSD Regionalization	$11,600,400
Area IPWSD No. 2 Degrading Alternative	To be assess via future evaluation
Area II Land Application	--
Area II Regionalization	$603,000
Area III and Area IV Land Application	--
Area III and Area IV Regionalization	$6,005,600
Area III and Area IV Degrading Alternative	$14,968,800

For infrastructure improvements associated with the Area II, Area III and Area IV development areas, as well as the Mule Holdings, Woessner and Brink properties, a cooperative agreement should be executed between the City and local property owners which would afford a sharing of costs associated with the implementation and maintenance of the infrastructure.

5.2 PROJECT FINANCING

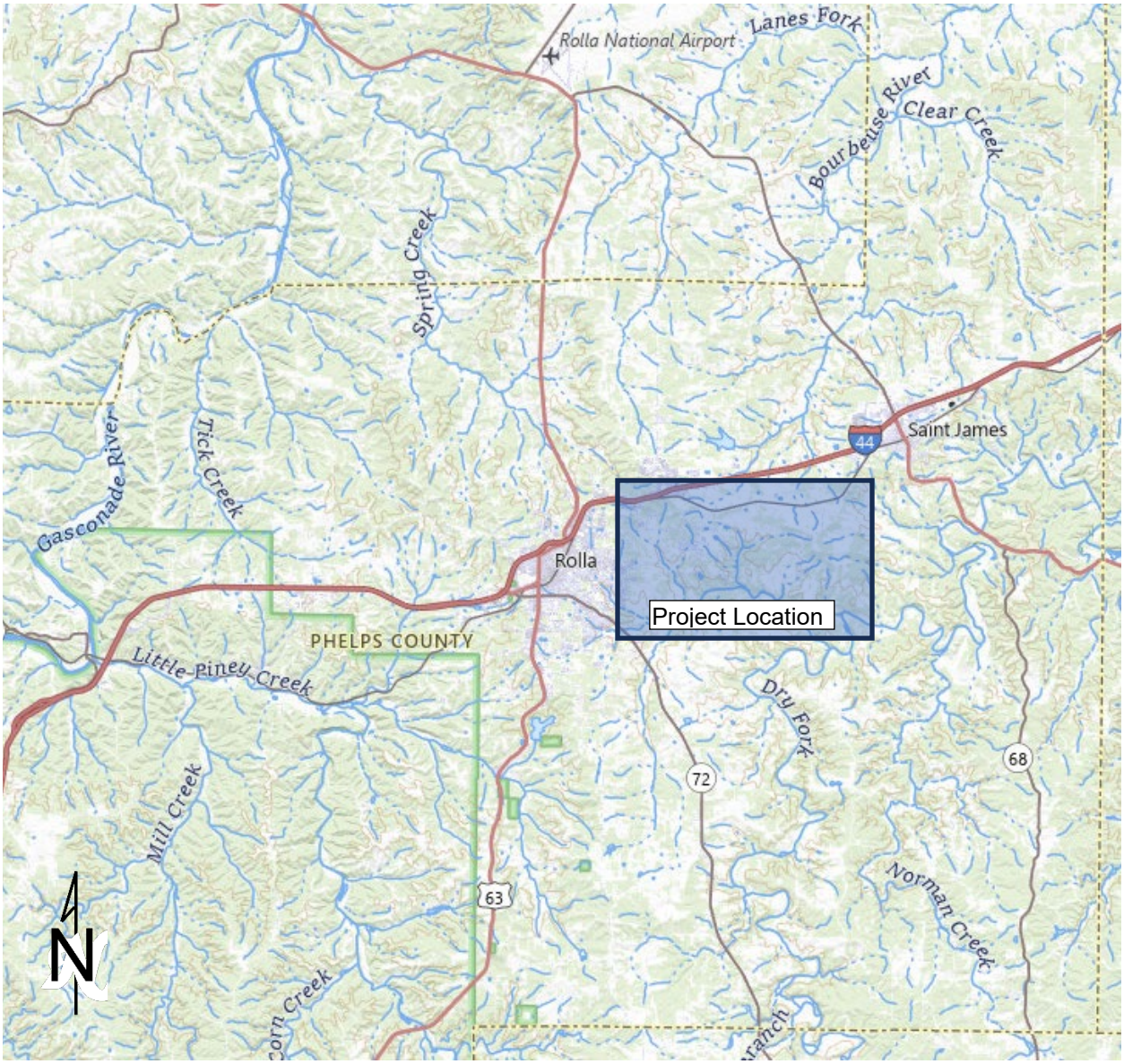
This project, which shall focus on the regionalization of the Area I-Phelps County PWSD No. 2 service area with the Rolla Southeast WWTP, should be funded via grant monies allocated by the State of Missouri for regionalization of wastewater collection systems. Eligible projects include those that afford connections of existing facilities or treatment systems with larger POTWs located within 5 miles of the City's collection system to the facility to be connected. This grant program will finance 100 percent of eligible costs, which include, but are not limited to:

- Planning, designing and constructing the sewer connection
- Legal costs associated with negotiation and execution of a service agreement
- Land acquisition or easements
- Decommissioning of POTWs

.

APPENDIX A

FIGURES AND DRAWINGS



DRAWING 1 – PROJECT LOCATION MAP

APPENDIX B

OPINIONS OF PROBABLE PROJECT COST

ARCHER-ELGIN
ENGINEERING | SURVEYING | ARCHITECTURE

Project: Rolla Highway V East Facility Plan
Client: City of Rolla, MO
By: KAC **Chk:**
Date: 11/24/2025 **Date:**

Opinion of Probable Project Cost

Area I-Phelps County PWSD No. 2 Regionalization - Gravity Sewer

Area I-PWSD No. 2 - Gravity Sewer: These improvements include the construction of a gravity sewer main from the Greenlefe WWTP, Forrest Lakes WWTP and College Hill WWTPs to a new regional pump station southeast of the Summerfield WWTP. The gravity sewer shall consist of 3,000 LF of 10" SDR-35 PVC main, 25944 LF SDR-35 PVC main and with (97)-48 IN Dia precast concrete manholes. This configuration assumes maximal spacing of manholes of 300 FT and 150% the conveyance capacity required for the Area III and Area IV developments.

Item No.	Description	Qty	Unit	Unit Price	Total
Excavation, Grading & Backfill					
1	Seed & Mulch	28944	LF	$0.85	$24,602.40
2	Easement Acquistion	28944	LF	$2.50	$72,360.00
				Sum =	**$96,962.40**
Structures					
3	4FT Dia Precast Concrete Wetwell, 6-8FT Depth	97.0	EA	$4,500.00	$436,500.00
				Sum =	**$436,500.00**
Process Equipment					
				Sum =	**$0.00**
Process Piping					
4	10" SDR-35 PVC Gravity Sewer	3000	LF	$105.00	$315,000.00
5	8" SDR-35 PVC Gravity Sewer	25944	LF	$85.00	$2,205,240.00
6	Connection to existing structure	1	EA	$1,500.00	$1,500.00
7	Steel Cased Highway Bore	140	EA	$2,500.00	$350,000.00
				Sum =	**$2,871,740.00**
				SubTotal =	$3,405,202
				Contingency =	$681,040
				Construction Total =	$4,086,243
				Engineering, Surveying, Admin =	$817,249
				Opinion of Probable Project Cost, P =	**$4,903,500**

ARCHER-ELGIN
ENGINEERING | SURVEYING | ARCHITECTURE

Project: Rolla Highway V East Facility Plan
Client: City of Rolla, MO
By: KAC **Chk:**
Date: 11/24/2025 **Date:**

Opinion of Probable Project Cost

Area I, Area III and Area IV Regional Pump Station

Area I-PWSD No. 2, Area III and Area IV Regional Pump Station: These improvements include the construction of a new duplex submersible non-clog centrifugal pump station to convey a peak wastewater generation of approximately 1,200 GPM (PH I = 360.8 GPM, PH III = 451.7 GPM, Other = 413 GPM) for ultimate treatment at the Rolla Southeast WWTP. The proposed pump station shall discharge to a new 14 IN SDR-11, DIPS, HDPE force main.

Item No.	Description	Qty	Unit	Unit Price	Total
Excavation, Grading & Backfill					
1	Soil Excavation	4800	CY	$20.00	$96,000.00
2	Dewatering	10%	% of Total		$9,600.00
3	Backfill, Aggregate	50	CY	$45.00	$2,250.00
4	Backfill, Soil	4750	CY	$20.00	$95,000.00
5	Granular Paving	900	SY	$45.00	$40,500.00
6	Full Depth Granular Fill	60	LF	$50.00	$3,000.00
7	Pavement Restoration	60	LF	$50.00	$3,000.00
8	Chain Link Fence	120	LF	$65.00	$7,800.00
9	Seed & Mulch	14800	LF	$0.85	$12,580.00
10a	Land Acquisition	1	LS	$50,000.00	$50,000.00
10b	Easement Acquistion	14800	LF	$2.50	$37,000.00
				Sum =	**$356,730.00**
Structures					
11	Cast-in-Place Concrete	195.0	EA	$1,250.00	$243,750.00
12	Combination Air Valve Vault	1.0	EA	$18,000.00	$18,000.00
13	3 FT x 3 FT Alum Access Hatch with Safety Grating	8.0	EA	$3,000.00	$24,000.00
				Sum =	**$285,750.00**
Process Equipment					
14	Pump Equipment Package, Including Controls	1	LS	$250,000.00	$250,000.00
15	Installation of Pump Equipment	20%	% of LS		$50,000.00
16	Combination Air Valve Assembly	4	EA	$2,000.00	$8,000.00
17	Odor Control Chemical Feed System	1	LS	$100,000.00	$100,000.00
18	Odor Control GAC Filtration	1	Ea	$40,000.00	$40,000.00
19	Davit Crane	1	LS	$20,000.00	$20,000.00
				Sum =	**$468,000.00**
Process Piping					
20	14" SDR-11 DIPS HDPE Force Main	14290	LF	$140.00	$2,000,600.00
21	14" MJ Plug Valve	4	EA	$17,200.00	$68,800.00
22	8" DIP, STC 53	75	LF	$700.00	$52,500.00
23	8" FLG 90 DEG Bend	2	EA	$770.00	$1,540.00
24	8" MJ 90 DEG Bend	1	EA	$1,250.00	$1,250.00
25	8" FLG TEE	1	EA	$1,350.00	$1,350.00
26	8" MJ TEE	1	EA	$1,850.00	$1,850.00
27	8" FLG Check Valve, Air-Cushioned	2	EA	$20,000.00	$40,000.00
28	8" FLG Plug Valve	2	EA	$6,400.00	$12,800.00
29	Connection to existing structure	1	EA	$3,200.00	$3,200.00
30	Process Piping Adder	15%	% of Subtotal		$27,493.50
				Sum =	**$2,211,383.50**
				SubTotal =	$3,321,864
				Electrical Improvements (20%) =	$664,373
				Site Piping (10%) =	$332,186
				Site Civil (10%) =	$332,186
				Subtotal =	$4,650,609
				Contingency =	$930,122
				Construction Total =	$5,580,731
				Engineering, Surveying, Admin =	$1,116,146
				Opinion of Probable Project Cost, P =	**$6,696,900**

ARCHER-ELGIN
ENGINEERING | SURVEYING | ARCHITECTURE

Project: Rolla Highway V East Facility Plan
Client: City of Rolla, MO
By: KAC **Chk:**
Date: 11/24/2025 **Date:**

Opinion of Probable Project Cost

Phase II-II Development Site Regionalization - Gravity Sewer

Phase II-III Development Site - Gravity Sewer: These improvements include the construction of a gravity sewer main from the Bahr property south to a new regional pump station. The gravity sewer shall consist of 9,096 LF of 10" SDR-35 PVC main and with (31)-48 IN Dia precast concrete manholes. This configuration assumes maximal spacing of manholes of 300 FT and 150% the conveyance capacity required for the Phase II and Phase III developments.

Item No.	Description	Qty	Unit	Unit Price	Total
Excavation, Grading & Backfill					
1	Full depth granular backfill	120	LF	$50.00	$6,000.00
2	Pavement Repair	120	LF	$50.00	$6,000.00
3	Seed & Mulch	9096	LF	$0.85	$7,731.60
4	Easement Acquistion	9096	LF	$2.50	$22,740.00
				Sum =	**$42,471.60**
Structures					
5	4FT Dia Precast Concrete Wetwell, 6-8FT Depth	31.0	EA	$4,500.00	$139,500.00
				Sum =	**$139,500.00**
Process Equipment					
				Sum =	**$0.00**
Process Piping					
6	10" SDR-35 PVC Gravity Sewer	9096	LF	$105.00	$955,080.00
7	Connection to existing structure	1	EA	$1,500.00	$1,500.00
8	Steel Cased Railroad Bore	105	EA	$2,500.00	$262,500.00
				Sum =	**$1,219,080.00**
				SubTotal =	$1,401,052
				Contingency =	$280,210
				Construction Total =	$1,681,262
				Engineering, Surveying, Admin =	$336,252
				Opinion of Probable Project Cost, P =	**$2,017,600**

ARCHER-ELGIN
ENGINEERING | SURVEYING | ARCHITECTURE

Project: Rolla Highway V East Facility Plan
Client: City of Rolla, MO
By: KAC **Chk:**
Date: 11/24/2025 **Date:**

Opinion of Probable Project Cost
Area III Development Site - Pump Station

Area III Development Site - Pump Station: These improvements include the construction of a new duplex submersible non-clog centrifugal pump station to convey a peak wastewater generation of 360 GPM from the development site to a new gravity sewer for ultimate treatment at the Rolla Southeast WWTP. The proposed pump station shall discharge to a new 8 IN SDR-11, IPS, HDPE force main.

Item No.	Description	Qty	Unit	Unit Price	Total
Excavation, Grading & Backfill					
1	Soil Excavation	725	CY	$20.00	$14,500.00
2	Dewatering	10%	% of Total		$1,450.00
3	Backfill, Aggregate	45	CY	$45.00	$2,025.00
4	Backfill, Soil	675	CY	$20.00	$13,500.00
5	Granular Paving	900	SY	$45.00	$40,500.00
6	Full Depth Granular Fill	60	LF	$50.00	$3,000.00
7	Pavement Restoration	60	LF	$50.00	$3,000.00
8	Chain Link Fence	120	LF	$65.00	$7,800.00
				Sum =	**$85,775.00**
Structures					
9	10FT Dia Precast Concrete Wetwell, 15FT Depth	1.0	EA	$50,000.00	$50,000.00
10	8FT DIA Precast Concrete Valve Vault, 7.5 FT Depth	1.0	EA	$26,000.00	$26,000.00
11	Combination Air Valve Vault	1.0	EA	$18,000.00	$18,000.00
12	2.5FT x 3 FT Alum Access Hatch with Safety Gratin	2.0	EA	$3,500.00	$7,000.00
13	3 FT x 3 FT Alum Access Hatch with Safety Gratin	1.0	EA	$3,000.00	$3,000.00
				Sum =	**$104,000.00**
Process Equipment					
14	Pump Equipment Package, Including Controls	1	LS	$75,000.00	$75,000.00
15	Installation of Pump Equipment	20%	% of LS		$15,000.00
16	Combination Air Valve Assembly	3	EA	$2,000.00	$6,000.00
17	Davit Crane	1	LS	$15,000.00	$15,000.00
				Sum =	**$111,000.00**
Process Piping					
18	6" DIP, STC 53	50	LF	$525.00	$26,250.00
19	6" FLG 90 DEG Bend	2	EA	$575.00	$1,150.00
20	6" MJ 90 DEG Bend	1	EA	$950.00	$950.00
21	6" FLG TEE	1	EA	$1,000.00	$1,000.00
22	6" MJ TEE	1	EA	$1,375.00	$1,375.00
23	6" FLG Check Valve, Air-Cushioned	2	EA	$14,785.00	$29,570.00
24	6" FLG Plug Valve	2	EA	$4,800.00	$9,600.00
25	8" MJ Plug Valve	4	EA	$9,800.00	$39,200.00
26	8" SDR-11, IPS, HDPE	3,474	LF	$75.00	$260,550.00
28	Connection to existing structure	1	EA	$1,600.00	$1,600.00
29	Process Piping Adder	15%	% of Subtotal		$55,686.75
				Sum =	**$426,931.75**
				SubTotal =	$727,707
				Electrical Improvements (20%) =	$145,541
				Site Piping (10%) =	$72,771
				Site Civil (10%) =	$72,771
				Subtotal =	$1,018,789
				Contingency =	$203,758
				Construction Total =	$1,222,547
				Engineering, Surveying, Admin =	$244,509
				Opinion of Probable Project Cost, P =	**$1,468,000**

ARCHER-ELGIN
ENGINEERING | SURVEYING | ARCHITECTURE

Project: Rolla Highway V East Facility Plan
Client: City of Rolla, MO
By: KAC **Chk:**
Date: 11/24/2025 **Date:**

Opinion of Probable Project Cost

Area IV Development Site - Pump Station

Area IVDevelopment Site - Pump Station: These improvements include the construction of a new duplex submersible non-clog centrifugal pump station to convey a peak wastewater generation of 451 GPM from the development site to a new gravity sewer for ultimate treatment at the Rolla Southeast WWTP. The proposed pump station shall discharge to a new 8 IN SDR-11, IPS, HDPE force main.

Item No.	Description	Qty	Unit	Unit Price	Total
Excavation, Grading & Backfill					
1	Soil Excavation	1110	CY	$20.00	$22,200.00
2	Dewatering	10%	% of Total		$2,220.00
3	Backfill, Aggregate	90	CY	$45.00	$4,050.00
4	Backfill, Soil	1020	CY	$20.00	$20,400.00
5	Granular Paving	1800	SY	$45.00	$81,000.00
6	Full Depth Granular Fill	60	LF	$50.00	$3,000.00
7	Pavement Restoration	60	LF	$50.00	$3,000.00
8	Chain Link Fence	240	LF	$65.00	$15,600.00
				Sum =	**$151,470.00**
Structures					
9	5FT Dia Precast Concrete Wetwell, 15FT Depth	1	EA	$15,000.00	$15,000.00
10	5FT DIA Precast Concrete Valve Vault, 7.5 FT Depth	1	EA	$7,500.00	$7,500.00
11	10FT Dia Precast Concrete Wetwell, 15FT Depth	1.0	EA	$50,000.00	$50,000.00
12	8FT DIA Precast Concrete Valve Vault, 7.5 FT Depth	1.0	EA	$26,000.00	$26,000.00
13	2.5FT x 3 FT Alum Access Hatch with Safety Grating	2.0	EA	$3,500.00	$7,000.00
14	3 FT x 3 FT Alum Access Hatch with Safety Grating	2.0	EA	$3,000.00	$6,000.00
15	4 FT x 3 FT Alum Access Hatch with Safety Grating	1	EA	$3,500.00	$3,500.00
				Sum =	**$115,000.00**
Process Equipment					
16	Pump Equipment Package, Including Controls-South	1	LS	$75,000.00	$75,000.00
17	Installation of Pump Equipment - South	20%	% of LS		$15,000.00
18	Pump Equipment Package, Including Controls - North	1	LS	$45,000.00	$45,000.00
19	Installation of Pump Equipment - North	20%	% of LS		$9,000.00
20	Combination Air Valve Assembly	2	EA	$2,000.00	$4,000.00
21	Davit Crane	2	LS	$15,000.00	$30,000.00
				Sum =	**$178,000.00**
Process Piping					
22	4" DIP, STC 53	50	LF	$350.00	$17,500.00
23	4" FLG 90 DEG Bend	2	EA	$385.00	$770.00
24	4" MJ 90 DEG Bend	1	EA	$720.00	$720.00
25	4" FLG TEE	1	EA	$670.00	$670.00
26	4" MJ TEE	1	EA	$920.00	$920.00
27	4" FLG Check Valve, Air-Cushioned	2	EA	$10,000.00	$20,000.00
28	4" FLG Plug Valve	2	EA	$3,200.00	$6,400.00
29	6" DIP, STC 53	50	LF	$525.00	$26,250.00
30	6" FLG 90 DEG Bend	2	EA	$575.00	$1,150.00
31	6" MJ 90 DEG Bend	1	EA	$950.00	$950.00
32	6" FLG TEE	1	EA	$1,000.00	$1,000.00
33	6" MJ TEE	1	EA	$1,375.00	$1,375.00
34	6" FLG Check Valve, Air-Cushioned	2	EA	$14,785.00	$29,570.00
35	6" FLG Plug Valve	2	EA	$4,800.00	$9,600.00
36	4" MJ Plug Valve, Burried Service	2	EA	$4,500.00	$9,000.00
37	4" SDR-11, IPS, HDPE	2,984	LF	$60.00	$179,040.00
38	6" MJ Plug Valve, Burried Service	4	EA	$7,350.00	$29,400.00
39	6" SDR-11, IPS, HDPE	4,836	LF	$75.00	$362,700.00
40	Connection to existing structure	2	EA	$1,600.00	$3,200.00
41	Process Piping Adder	15%	% of Subtotal		$105,032.25
				Sum =	**$805,247.25**
				SubTotal =	$1,249,717
				Electrical Improvements (20%) =	$249,943
				Site Piping (10%) =	$124,972
				Site Civil (10%) =	$124,972
				Subtotal =	$1,749,604
				Contingency =	$349,921
				Construction Total =	$2,099,525
				Engineering, Surveying, Admin =	$419,905
				Opinion of Probable Project Cost, P =	**$2,520,000**

APPENDIX C

SUPPORTING DOCUMENTS

ARCHER-ELGIN
ENGINEERING | SURVEYING | ARCHITECTURE

DESIGN MEMORANDUM

To:	File
From:	Ken Campbell, P.E.
Date:	August 26, 2025
Subject:	Rolla Hwy V East WW Facility Plan
	Site Soil Evaluation

.The Rolla Regional Economic Commission desires to determine the feasibility of providing wastewater services southeast of the Interstate 44 - Highway V / Hy Point Industrial Drive interchange for potential commercial and industrial development. This development is likely to occur in three phases. Phase I is located due south of Phelps County Road 3060, east of its intersection with Hy Point Industrial Drive. Phase II is east of the Phase I area, located between the Dillon Outer Road and County Road 3120, approximately 2,200 FT east of the intersection of County Road 3060 and the Hy Point Industrial Drive. The Phase III development site is located 12,200 FT east of the intersection of County Road 3060 and the Hy Point Industrial Drive on County Road 3120.

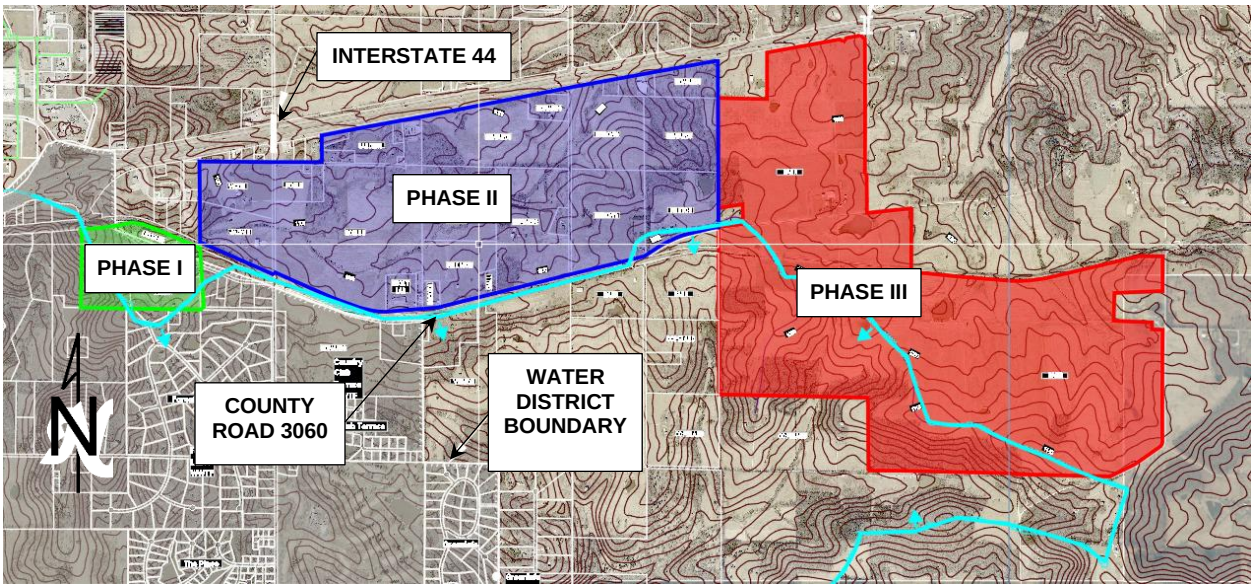


Figure 1 – Rolla Highway V East Development Areas

This memorandum shall summarize available data on in situ soils present within each development area. Furthermore, this memorandum shall preliminarily assess impacts of in situ soils on the site development, with a focus on wastewater collection and treatment. It must be noted that the soil mapping data was obtained from the United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS) web soil survey application which encapsulates county soil mapping efforts. This data is intended to provide a broad understanding of the soils in each area of interest; however, it is anticipated that intensive onsite soil investigations may yield differing results than those identified below. As

development in each phase progresses, onsite soils testing should be performed to further assess the suitability of onsite soils for the nature of development, to include onsite wastewater treatment.

Phase 1 Development Site

The Phase I development site is located off exit 189 on I-44, south of County Road 3060. The Phase I development area has a total area of 69.01 acres. A map of the Phase I development area and the surrounding region is shown below.

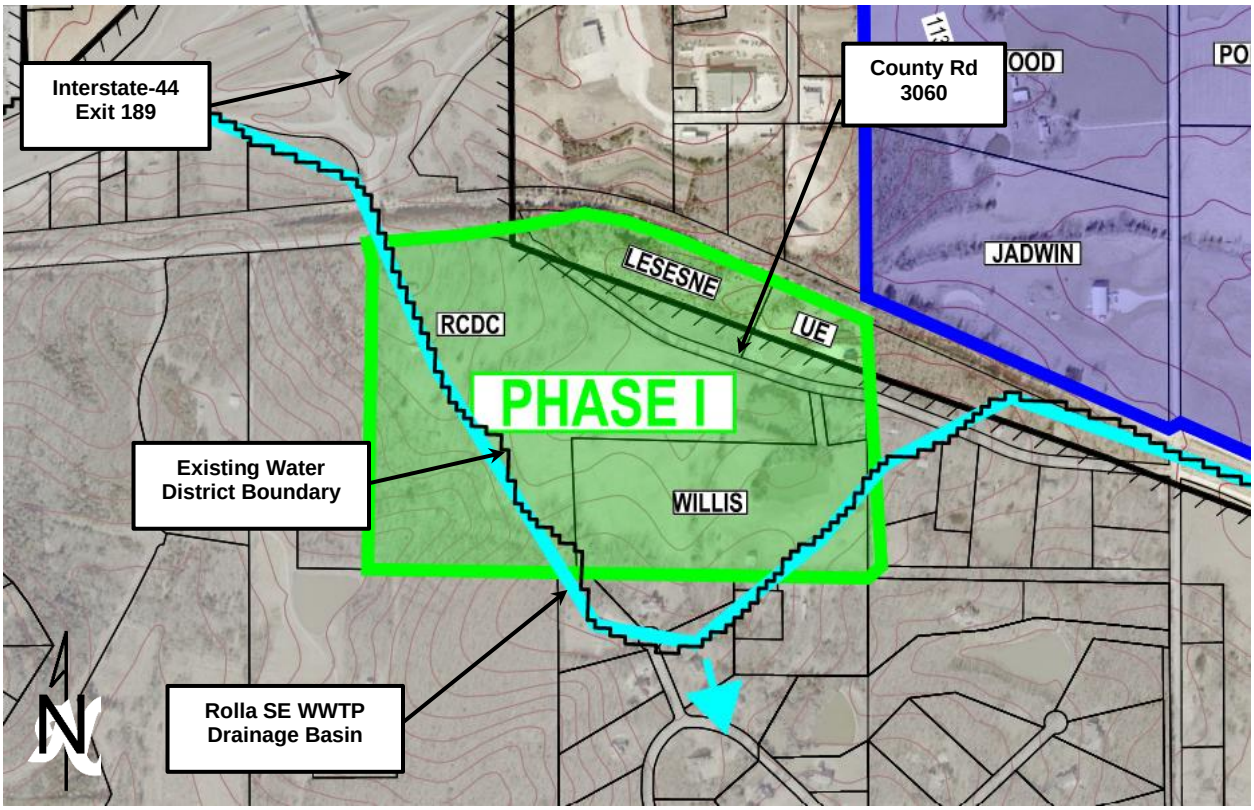


Figure 2 – Location map showing the extents of Phase I development site.

Figure 3 –Soils map for the land encompassing and surrounding Phase I.

Soil mapping data for the Phase I development site was obtained via the USDA NRCS web soil survey application. Figure 3 shows the soil map generated for the area encompassing the Phase I development area. Soils in the region are largely comprised of the Union Silt Loam (Map Unit 73135) and the Beemont-Gatewood Complex (Map Unit 73170).

The Union silt loam series (map unit 73135) comprises approximately 32.6% of the development area. It general exhibits 3 to 8 percent slopes with the following soil profile:

- Ap - 0 to 9 inches: silt loam
- Bt1 - 9 to 30 inches: silty clay loam
- 2Btx - 30 to 53 inches: extremely gravelly silt loam
- 3Bt2 - 53 to 79 inches: very gravelly clay

This soil generally has a hydrologic soil rating of C, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN; however a restrictive fragipan stratum exists between 14 and 35 IN. Finally, it has an average saturated hydraulic conductivity (K_{sat}) of 0.503 IN HR^{-1}, with the most restrictive layer having a very low K_{sat} = 0.00 to 0.06 IN HR^{-1}

The Beemont-Gatewood complex (Soil map unit 73170) is a stony soil series with 3 to 15 percent slopes. It comprises approximately 65.3% of the area in Phase I development area. This series typically contains the following soil profile:

- A - 0 to 3 inches: gravelly silt loam
- E - 3 to 11 inches: gravelly silt loam
- 2Bt - 11 to 59 inches: clay
- 2R - 59 to 79 inches: bedrock

Soil map unit 73170 has a hydrologic soil rating of D indicating a very slow infiltration rate with high runoff potential. The depth of lithic bedrock is expected to be 60 IN centimeters. Finally, it has an average saturated hydraulic conductivity of 0.264 IN HR^{-1}, with a limiting K_{sat} = 0.00 to 0.06 IN HR^{-1}

Both the Union silt loam and Beemont-Gatewood complex soil series have restrictive layers or bedrock within close proximity to the surficial layers. Furthermore, these soils exhibit slow to very slow infiltration capacities, resulting in greater runoff potential. These characteristics limit the applicability of non-degrading or less degrading onsite treatment and disposal methods for the onsite treatment and disposal of any wastewater (domestic, commercial, and/or industrial) generated at the site. Consequently, this development site would require a degrading treatment alternative (suspended or attached growth biological treatment process) or be regionalized with the location treatment facility for ultimate disposal of treated wastewater.

Phase II Development Site

The Phase II development site is located off Exit 189 on Interstate-44, north of County Road 3120 and to the east of the Phase I development area. The Phase II development area has a total area of 630.8 acres. A map of the Phase 2 development area and the surrounding region is shown below.

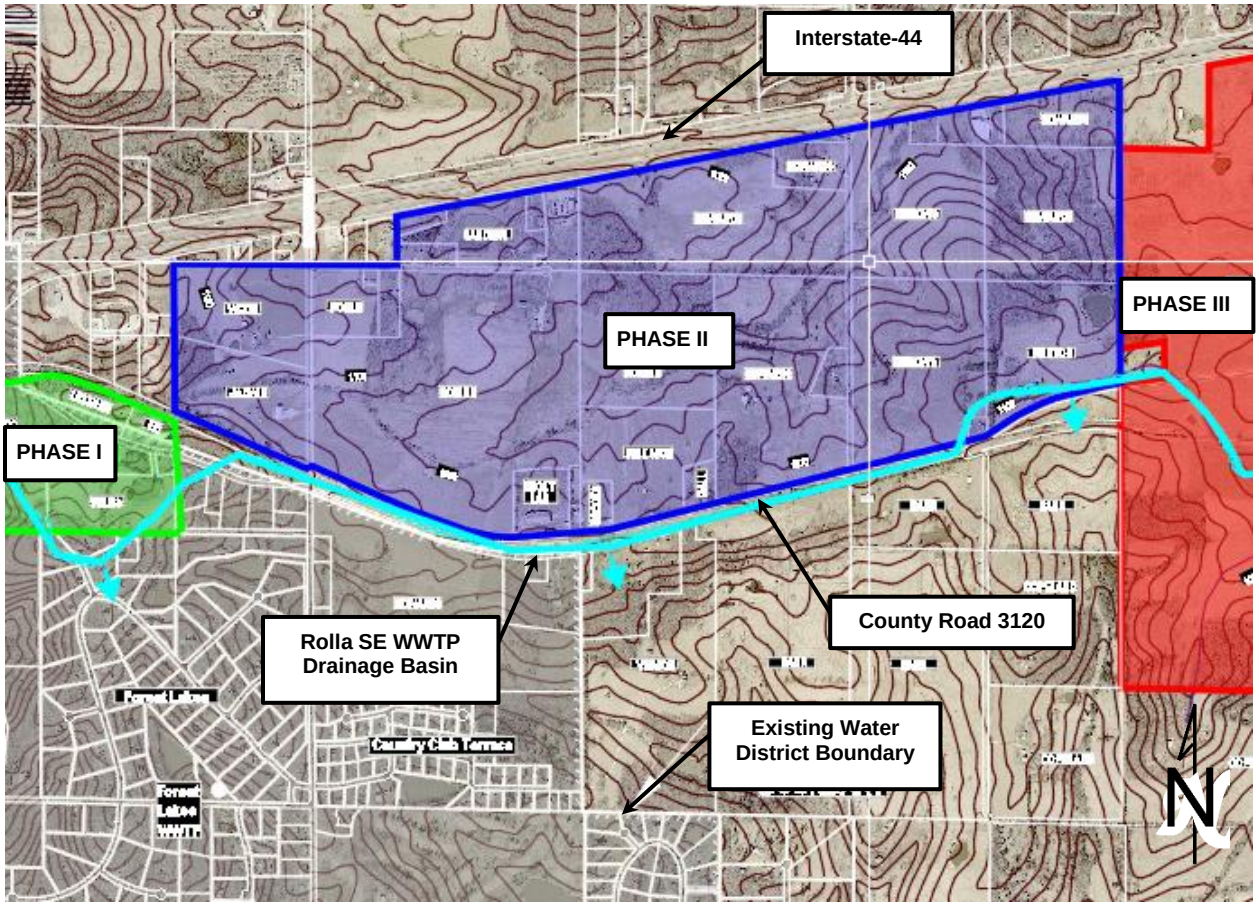


Figure 4 – Location map showing the extents of the Phase II development area.

Soil mapping data for the Phase II development site was obtained via the USDA NRCS web soil survey application. Figure 5 shows the soil map generated for the area encompassing the Phase II development area. Soils in the region are largely comprised of: Beemont-Gatewood complex (Soil map unit 73170; Cedargap gravelly silt loam series (soil map unit 76008); Hartville silt loam (Soil map unit 74634); Plato Silt lam (Map Unit 73098); Union Silt Loam (Map Unit 73135); and Viration-Wilderness complex (map unit 73179).

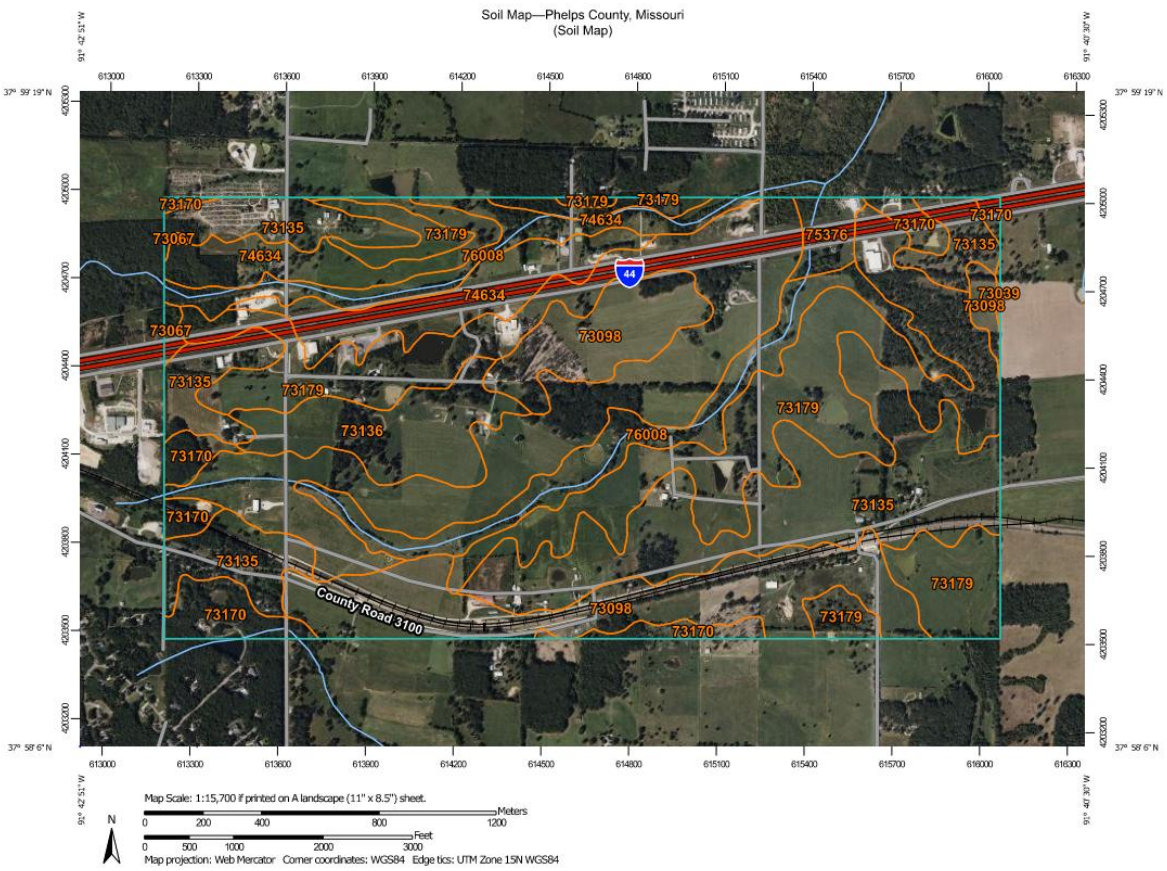


Figure 5 –Soils map for the land encompassing and surrounding Phase II development area.

The Plato silt loam soil series (Soil map unit 73098) comprises 88.9 acres or approximately 14.1% of the development area. It is generally located on convex hillcrests with slopes ranging between 1 to 3 percent slopes. A typical soil provide includes:

- Ap - 0 to 8 inches: silt loam
- Bt1 - 8 to 20 inches: silty clay
- 2Btx - 20 to 48 inches: extremely gravelly silt loam
- 3Bt2 - 48 to 79 inches: gravelly clay

The Plato silt loam soil series has a hydrologic soil group rating of D, indicating low infiltration and high runoff capacity. The depth of bedrock is expected to be greater than 80 IN; however, a restrictive fragipan layer typically exists at depths ranging from 16 to 39 IN. Finally, it has an average saturated hydraulic conductivity of 0.158 IN HR^{-1} with a limiting K_{sat} = 0.00 to 0.06 IN HR^{-1}.

The Union silt loam series (map unit 73135) comprises approximately 129.9 acres, or 20.6% of the development area. This soil series general exhibits 3 to 8 percent slopes with the following soil profile:

- Ap - 0 to 9 inches: silt loam

- Bt1 - 9 to 30 inches: silty clay loam
- 2Btx - 30 to 53 inches: extremely gravelly silt loam
- 3Bt2 - 53 to 79 inches: very gravelly clay

This soil generally has a hydrologic soil rating of C, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN; however a restrictive fragipan stratum exists between 14 and 35 IN. Finally, it has an average saturated hydraulic conductivity (ksat) of 0.503 IN HR^{-1} with the most restrictive layer having a K_{sat} = 0.00 to 0.06 IN HR^{-1}.

The Union silt loam (Soil map unit 73136) comprises 30.9 acres or approximately 4.9% of the area from development area. The soil series is generally located at convex ridge crests with 1 to 3 percent slopes. The typical soil profile incluses:

- Ap - 0 to 9 inches: silt loam
- Bt1 - 9 to 30 inches: silty clay loam
- 2Btx - 30 to 53 inches: extremely gravelly silt loam
- 3Bt2 - 53 to 79 inches: gravelly clay

The Union Silt Loam has a hydrologic soil rating of D indicating high runoff and low infiltration potential. The depth of bedrock is expected to be greater than 80 IN, with a restrictive fragipan layer located at 14 to 35 IN depth. Finally, it has an average saturated hydraulic conductivity of 0.203 IN HR^{-1} with the limiting K_{sat} = 0.00 to 0.06 IN HR^{-1}.

The Beemont-Gatewood complex (Soil map unit 73170) is a stony soil series with 3 to 15 percent slopes. It comprises approximately 27.8 acres or approximately 4.4% of the area in Phase II development area. This series typically contains the following soil profile:

- A - 0 to 3 inches: gravelly silt loam
- E - 3 to 11 inches: gravelly silt loam
- 2Bt - 11 to 59 inches: clay
- 2R - 59 to 79 inches: bedrock

Soil map unit 73170 has a hydrologic soil rating of D indicating a very slow infiltration rate with high runoff potential. The depth of lithic bedrock is expected to be 60 IN centimeters. Finally, it has an average saturated hydraulic conductivity of 0.264 IN HR^{-1} with the limiting K_{sat} = 0.00 to 0.06 IN HR^{-1}.

The Viration-Wilderness complex (map unit 73179) comprises approximately 36.9% (232.8 Acres) of the development area. The series is typically found on hillslopes and exhibits 3 to 8 percent slopes with the following soil profile:

- A - 0 to 3 inches: silt loam
- E - 3 to 7 inches: silty loam
- Bt1 – 7 to 23 inches: gravely silty clay loam
- 2Btx - 23 to 48 inches: extremely gravelly silt loam
- 3Bt2 - 48 to 79 inches: clay

This soil generally has a hydrologic soil rating of D, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN; however a restrictive fragipan stratum exists between 16 and 41 IN. Finally, it has a limiting saturated hydraulic conductivity (K_{sat}) of 0.02 to 0.04 IN HR^{-1}, with an average K_{sat} = 0.262 IN HR^{-1}.

The Hartville silt loam (Soil map unit 74634) comprises 53.0 acres or approximately 8.4% of the area. The series is typically found at the base of hillslopes and exhibits 3 to 8 percent slopes with the following soil profile:

- A - 0 to 7 inches: silt loam
- BE - 7 to 12 inches: silty loam
- Bt1 – 12 to 48 inches: silty clay loam
- 3Bt2 - 48 to 79 inches: silty clay loam

This soil generally has a hydrologic soil group rating of C/D, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN. Finally, it has a saturated hydraulic conductivity (ksat) of 0.320 IN HR^{-1} with the most restrictive layer having K_{sat} = 0.06 to 0.20 IN HR^{-1}.

The Cedargap gravelly silt loam series (soil map unit 76008) comprises 57.4 acres or approximately 9.1% of the area. It is generally found in low lying areas and flood plains, having 0 to 2 percent slopes. It typically contains the following profile:

- Ap - 0 to 9 inches: gravelly silt loam
- A - 9 to 18 inches: very gravelly loam
- Bw1 - 18 to 49 inches: very gravelly sandy clay loam
- 2Bw2 - 49 to 79 inches: gravelly clay

The Cedargap gravelly silt loam has a hydrologic soil rating of B for phase II with a depth of bedrock greater than 80 IN. Finally, it has an average saturated hydraulic conductivity of 0.839 IN HR^{-1}, with the most restrictive K_{sat} = 0.06 to 0.20 IN HR^{-1}.

The Plato silt loam, Union silt loam, Beemont-Gatewood complex, and Viration-Wilderness complex soil series all have shallow restrictive features that limit infiltration. This characteristic results in high to very high runoff potential. The Hartville silt loam and Cedargap gravely silt loam soil series have higher infiltration capacities; however are generally located within or adjacent to watercourses, which are excluded from the assessed developable area of the site. These characteristics limit the applicability of non-degrading onsite treatment and disposal methods for any wastewater (domestic, residential and industrial) generated at the development area. Implementation of degrading treatment alternatives (suspended or attached biological growth) or regionalization with local facility would be required.

Phase III Development Site

Phase III development area is located off Exit 189 on Interstate-44 ,along County Road 3120 to the east of the Phase II development area. The Phase III development site has a total area of 802.3 acres. A map of the Phase III development area is shown below.

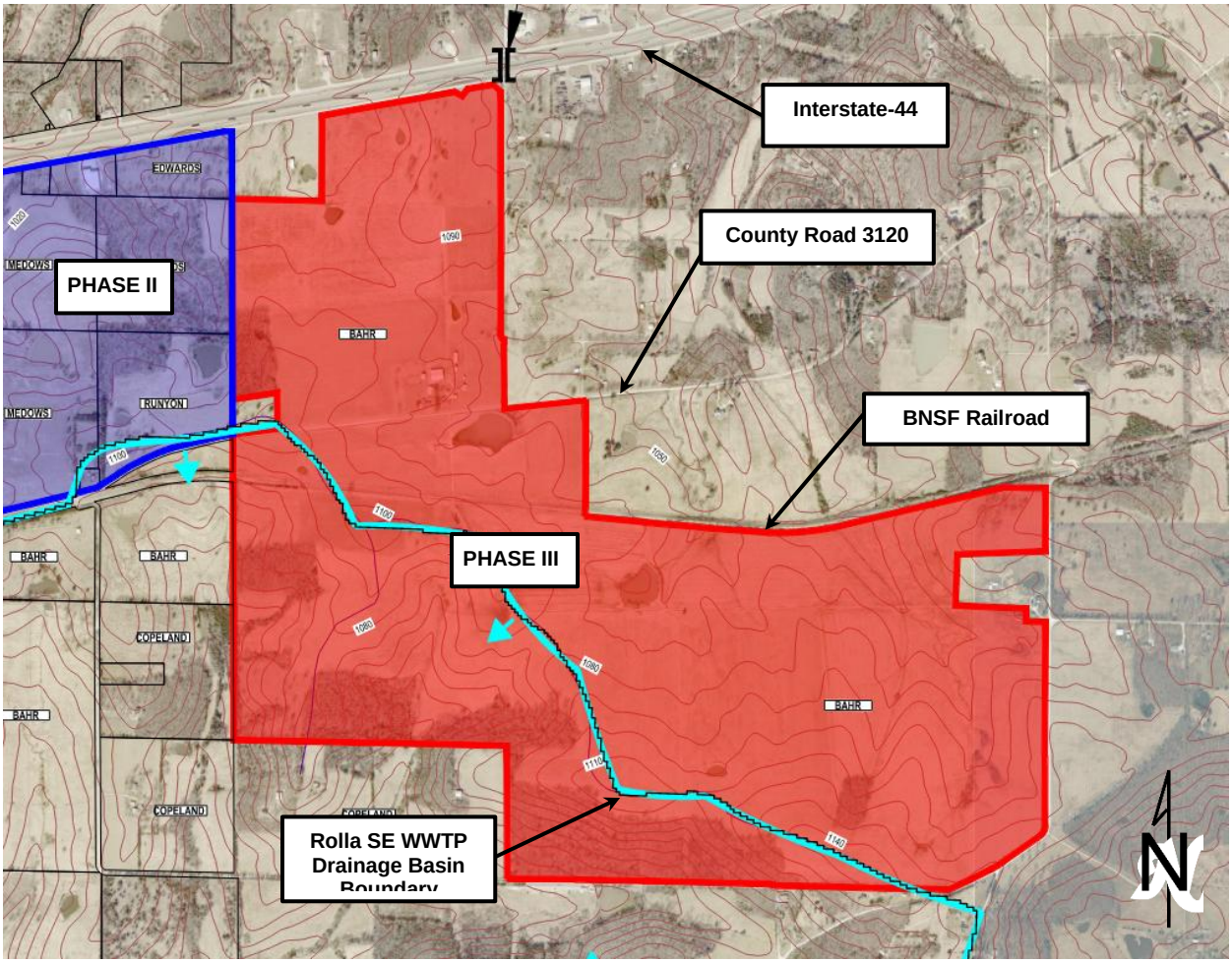


Figure 6 – Location map showing the extends of Phase III.

Soil mapping data for the Phase III development site was obtained via the United States Department of Agriculture National Resource Conservation Service web soil survey application. Figure 7 shows the soil map generated for the area encompassing the Phase III development area. Soils in the region are largely comprised of: Glensted silt loam (Soil map unit 73039); Plato Silt loam (Soil map unit 73098); Union Silt Loam (Map Units 73135 and 73136); Swiss gravelly silt loam (Soil map unit 73168); Rosati silt loam series (soil map unit 73168).

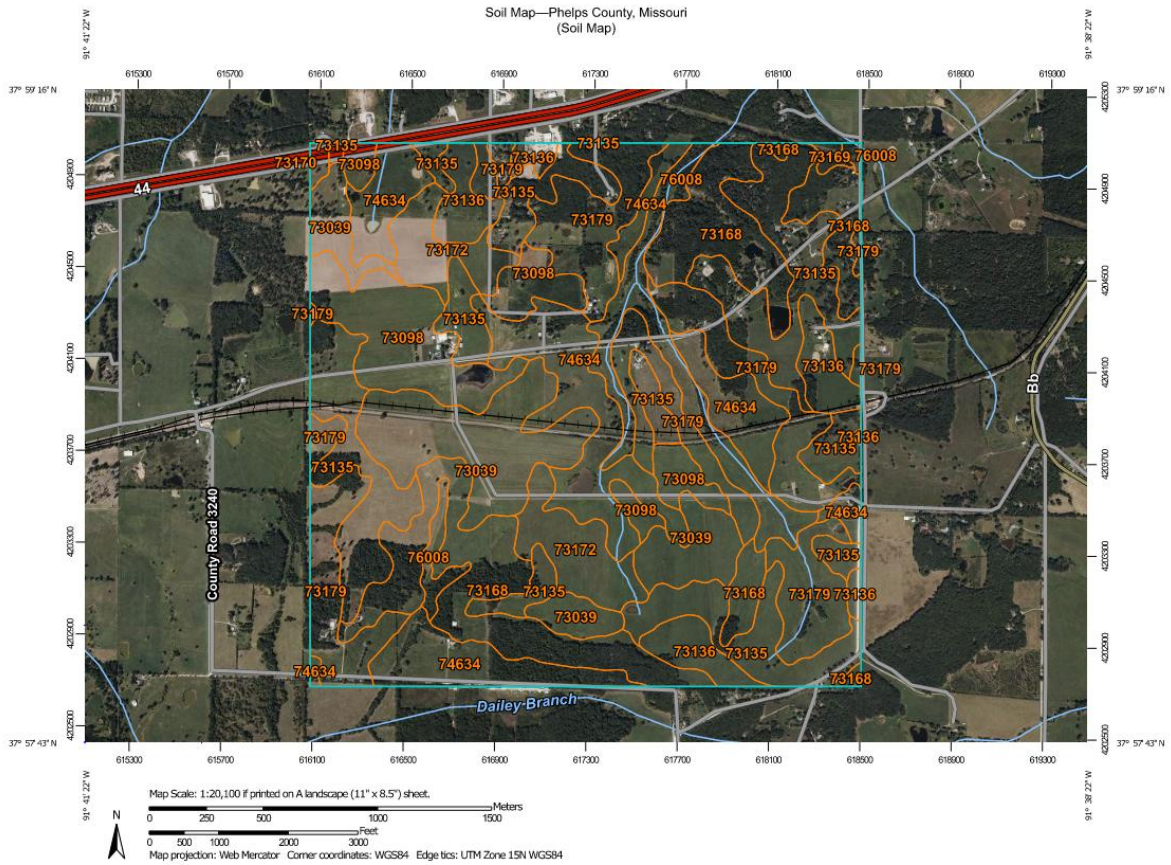


Figure 7 –Soils map for the land encompassing and surrounding Phase III.

The Glensted silt loam (Soil map unit 73039) comprises 87.5 acres or approximately 10.9% of the area in the Phase III development area. The series is typically found on interfluves and exhibits 1 to 3 percent slopes with the following soil profile:

- A - 0 to 9 inches: silt loam
- 2Btg1 - 9 to 14 inches: silty clay
- 2Btg2 – 14 to 33 inches: silty clay
- 2Cg - 33 to 79 inches: silty clay loam

This soil generally has a hydrologic soil group rating of C/D, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN; however a restrictive, abrupt textural change occurs in the soil series at between 16 and 32 IN depth. Finally, it has an average saturated hydraulic conductivity (K_{sat}) of 0.437 IN HR^{-1} with the most restrictive K_{sat} = 0.06 to 0.20 IN HR^{-1}.

The Plato silt loam soil series (Soil map unit 73098) comprises 67.4 acres or approximately 8.4% of the total development area. It is generally located on convex hillcrests with slopes ranging between 1 to 3 percent slopes. A typical soil provide includes:

- Ap - 0 to 8 inches: silt loam
- Bt1 - 8 to 20 inches: silty clay

- 2Btx - 20 to 48 inches: extremely gravelly silt loam
- 3Bt2 - 48 to 79 inches: gravelly clay

The Plato silt loam soil series has a hydrologic soil group rating of D, indicating low infiltration and high runoff capacity. The depth of bedrock is expected to be greater than 80 IN; however, a restrictive fragipan layer typically exists at depths ranging from 16 to 39 IN. Finally, it has a saturated hydraulic conductivity of 0.158 IN HR^{-1}.

The Union silt loam series (map unit 73135) comprises approximately 159.7 acres, or 19.9% of the development area. This soil series general exhibits 3 to 8 percent slopes with the following soil profile:

- Ap - 0 to 9 inches: silt loam
- Bt1 - 9 to 30 inches: silty clay loam
- 2Btx - 30 to 53 inches: extremely gravelly silt loam
- 3Bt2 - 53 to 79 inches: very gravelly clay

This soil generally has a hydrologic soil rating of C, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN; however a restrictive fragipan stratum exists between 14 and 35 IN. Finally, it has an average saturated hydraulic conductivity (K_{sat}) of 0.503 IN HR^{-1} with the most restrictive K_{sat} = 0.00 to 0.06 IN HR^{-1}.

The Union silt loam (Soil map unit 73136) comprises 38.5 acres or approximately 4.8% of the area from Phase II. The soil series is generally located at convex ridge crests with 1 to 3 percent slopes. The typical soil profile incluses:

- Ap - 0 to 9 inches: silt loam
- Bt1 - 9 to 30 inches: silty clay loam
- 2Btx - 30 to 53 inches: extremely gravelly silt loam
- 3Bt2 - 53 to 79 inches: gravelly clay

The Union Silt Loam has a hydrologic soil rating of D indicating high runoff and very low infiltration potential. The depth of bedrock is expected to be greater than 80 IN, with a restrictive fragipan layer located at 14 to 35 IN depth. Finally, it has an average saturated hydraulic conductivity of 0.203 IN HR^{-1} with the most restrictive Ksat = 0.00 to 0.06 IN HR^{-1}.

The Swiss gravelly silt loam soil series (Soil map unit 73168) comprises 117.9 acres or approximately 14.7% of the total Phase III development area. It is generally found on hillslopes, with slopes ranging between 3% to 15%. It has a generally stoney characteristic. It typically contains the following profile:

- A - 0 to 3 inches: gravelly silt loam
- E - 3 to 9 inches: gravelly silt loam
- 2Bt - 9 to 40 inches: clay
- 2Cd - 40 to 79 inches: clay loam

Soil map unit 73168 has a hydrologic soil rating of D, meaning that it has very slow infiltration capacity and high runoff potential. The depth of bedrock is expected to be greater than 80 IN; however, a restrictive densic material can be found at depths ranging between 18 to 79 IN. Finally, it has a very low to moderately low saturated hydraulic conductivity ranging between 0.00 to 0.06 IN HR^{-1} for the most restrictive layer, with an average K_{sat} = 0.177 IN HR^{-1}.

The Rosati Silt loam soil series (Soil map unit 73172) comprises 40.9 acres or approximately 5.1% of the Phase III development area. It is largely found on interfluves or ridgelines, having 1 to 5 percent slopes. It typically contains the following profile:

- Ap - 0 to 9 inches: silt loam
- Bt1 - 9 to 29 inches: silty clay
- 2Btx - 29 to 41 inches: silt loam
- 3Bt2 - 41 to 79 inches: silty clay loam

Soil map unit 73172 has a hydrologic soil rating of D, indicating very low infiltration capacity and high runoff potential. The depth of bedrock is expected to be greater than 80 IN with a depth to a restrictive fragipan layer ranging between 14 and 38 IN. Finally, this soil has a low saturated hydraulic conductivity ranging between 0.00 to 0.06 IN HR^{-1} , with an average K_{sat} = 0.364 IN HR^{-1}.

The Viration-Wilderness complex (map unit 73179) comprises approximately 16.2%, or 130.0 Acres of the development area. The series is typically found on hillslopes and exhibits 3 to 8 percent slopes with the following soil profile:

- A - 0 to 3 inches: silt loam
- E - 3 to 7 inches: silty loam
- Bt1 – 7 to 23 inches: gravely silty clay loam
- 2Btx - 23 to 48 inches: extremely gravelly silt loam
- 3Bt2 - 48 to 79 inches: clay

This soil generally has a hydrologic soil rating of D, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN; however a restrictive fragipan stratum exists between 16 and 41 IN. Finally, it has a saturated hydraulic conductivity (K_{sat}) of the most restrictive layer ranging between 0.02 to 0.06 IN HR^{-1}, with an average K_{sat} = 0.263 IN HR^{-1}

The Hartville silt loam (Soil map unit 74634) comprises 114.7 acres or approximately 14.3% of the area in Phase II. The series is typically found at the base of hillslopes and exhibits 3 to 8 percent slopes with the following soil profile:

- A - 0 to 7 inches: silt loam
- BE - 7 to 12 inches: silty loam
- Bt1 – 12 to 48 inches: silty clay loam
- 3Bt2 - 48 to 79 inches: silty clay loam

This soil generally has a hydrologic soil group rating of C/D, identifying a slow infiltration rate and moderate runoff potential. The depth of bedrock is expected to greater than 80 IN. Finally, it has a limiting saturated hydraulic conductivity (K_{sat}) of 0.06 to 0.200 IN HR^{-1}, with an average K_{sat} = 0.311 IN HR^{-1}

The Cedargap gravelly silt loam series (soil map unit 76008) comprises 41.7 acres or approximately 5.2% of the area. It is generally found in low lying areas and flood plains, having 0 to 2 percent slopes. It typically contains the following profile:

- Ap - 0 to 9 inches: gravelly silt loam
- A - 9 to 18 inches: very gravelly loam
- Bw1 - 18 to 49 inches: very gravelly sandy clay loam

- 2Bw2 - 49 to 79 inches: gravelly clay

The Cedargap gravelly silt loam has a hydrologic soil rating of B, indicating moderate infiltration capacity with moderate runoff potential. The soil series generally has a depth of bedrock greater than 80 IN. Finally, it has an average saturated hydraulic conductivity of 0.849 IN HR^{-1} with a limiting K_{sat} = 0.06 to 0.20 IN HR^{-1}.

The Glensted silt loam, Plato Silt loam, Union Silt Loam, Swiss gravelly silt loam, Rosati silt loam, Viration-Wilderness complex soil series constitute approximately 80 percent of the total development site. Each soil series has restrictive layers or bedrock within close proximity to the surficial layers. Furthermore, these soils exhibit slow to very slow infiltration capacities, resulting in greater runoff potential. Those soils having higher infiltration capacity are generally located along or adjacent to watercourses, and are as such, not developable. These characteristics limit the applicability of non-degrading or less degrading onsite treatment and disposal methods for the onsite treatment and disposal of any wastewater (domestic, commercial, and/or industrial) generated at the site. Consequently, this development site would require a degrading treatment alternative (suspended or attached growth biological treatment process) or be regionalized with the location treatment facility for ultimate disposal of treated wastewater.