CITY OF PECULIAR, MISSOURI

EAST CREEK WASTEWATER SYSTEM

ENGINEERING REPORT

FINAL
January 2016

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CITY OF PECULIAR, MISSOURI

EAST CREEK WASTEWATER SYSTEM

ENGINEERING REPORT

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1.0 INTRODUCTION

1.1 Project Purpose

The City of Peculiar, Missouri (City) is located south of Kansas City, Missouri, in northwestern Cass County along Interstate 49 as shown in Figure 1.1. The current developed areas of the City are generally located within the Grand River watershed, and are serviced by the City's England Facility wastewater treatment plant (WWTP) located at the southeast edge of the City limit.

FIGURE 1.1 – CITY OF PECULIAR LOCATION MAP
EAST CREEK WASTEWATER SYSTEM ENGINEERING REPORT
CITY OF PECULIAR, MISSOURI

In recent years, the City has experienced considerable population growth and is planning for additional growth and development in the northwest portion of the City, on the west side of I-49. The undeveloped area, designated as East Creek Basin, is currently zoned for mostly industrial and some residential uses. Proposed land use map for the City is shown on Figure 1.2. This undeveloped area is located within the East Creek watershed that slopes more toward the south and west, - which is opposite the direction of the existing WWTP.

The purpose of this project is to prepare an engineering report to evaluate alternatives to extend sewer service to the East Creek Basin study area of the City. This study will evaluate phasing of the recommended improvements to meet the City's growth and development needs as they arise.

Alternatives to provide sewer service to this area have been investigated. This investigation included:

- Projection of future wastewater generated in the study area, including estimated average and peak flows, and probable wastewater characteristics.
- Determination of logical alternatives that satisfy local and state regulatory requirements regarding pumping, conveyance, and treatment of wastewater generated in the study area.
- Selection and summary of the recommended alternative, including preliminary estimates of probable construction costs; and construction financing and phasing recommendations.

The scope of work for this engineering report includes evaluating projected wastewater flows, identifying alternatives for conveying and treating the projected flows, and recommending the most feasible conveyance and treatment alternative, as well as the best solutions to achieve and maintain technical, managerial, and financial capacity throughout development of the recommended facilities. The impact of the recommended alternative will also be reviewed to confirm compliance with regulatory requirements.

1.2 Existing Facilities Description

The existing sanitary sewer collection system consists of approximately 195,000 lineal feet of gravity sewer, over 850 manholes, 9 pumping stations, and nearly 23,000 feet of force main piping, across two watersheds. This sewer and pumping system conveys flows to the City's England Facility WWTP, located just east of I-49 at the southeast edge of the City. The existing WWTP (Permit No. MO-0089443) has a permitted capacity of 0.75 mgd, and reported hydraulic (peak) capacity of 3.0 mgd. The WWTP treats an average of 0.35 mgd,

and discharges into a tributary to the East Fork of the East Branch of the South Grand River.

The WWTP is an activated sludge treatment facility, and includes two (2) grinders for preliminary treatment; a Schreiber sequencing reactor aeration basin and two (2) clarifiers for secondary treatment; and an aerobic digester and sludge pumping station for solids handling. Digested solids are hauled offsite to the City of Harrisonville WWTP Facility in nearby Harrisonville, Missouri for disposal.

The WWTP also has a peak flow clarifier with a design capacity of 20,000 gallons. Flows in excess of this capacity are stored in a 2.0 MG Extraneous Flow Holding Basin.

1.3 Service Area Description

As previously mentioned, the East Creek Basin study area is located in northwest Peculiar, bordered by E. 203rd Street to the north, State Route YY to the south, and extends in the east/west direction between I-49 and east of Mullen Rd on the north half and to S. Martha Rd on the south half. Two additional areas, designated as Tract 1 and Tract 2, were added to the overall study area for additional development. Tract 1 begins at the west boundary of the north half of the study area, and extends west to Mullen Rd. Tract 2 begins at the west edge of the southern half of the study area, and extends east to State Route Y.

As shown in Figure 1.2, the East Creek Basin, including the additional tracts, has been designated for the following land use types:

- High Density Residential (HDR)
- Medium Density Residential (MDR)
- Low Density Residential (LDR)
- Commercial (COM)
- Heavy Industrial (HI)
- Light Industrial (LI)
- Public/Quasi-Public (PQP)

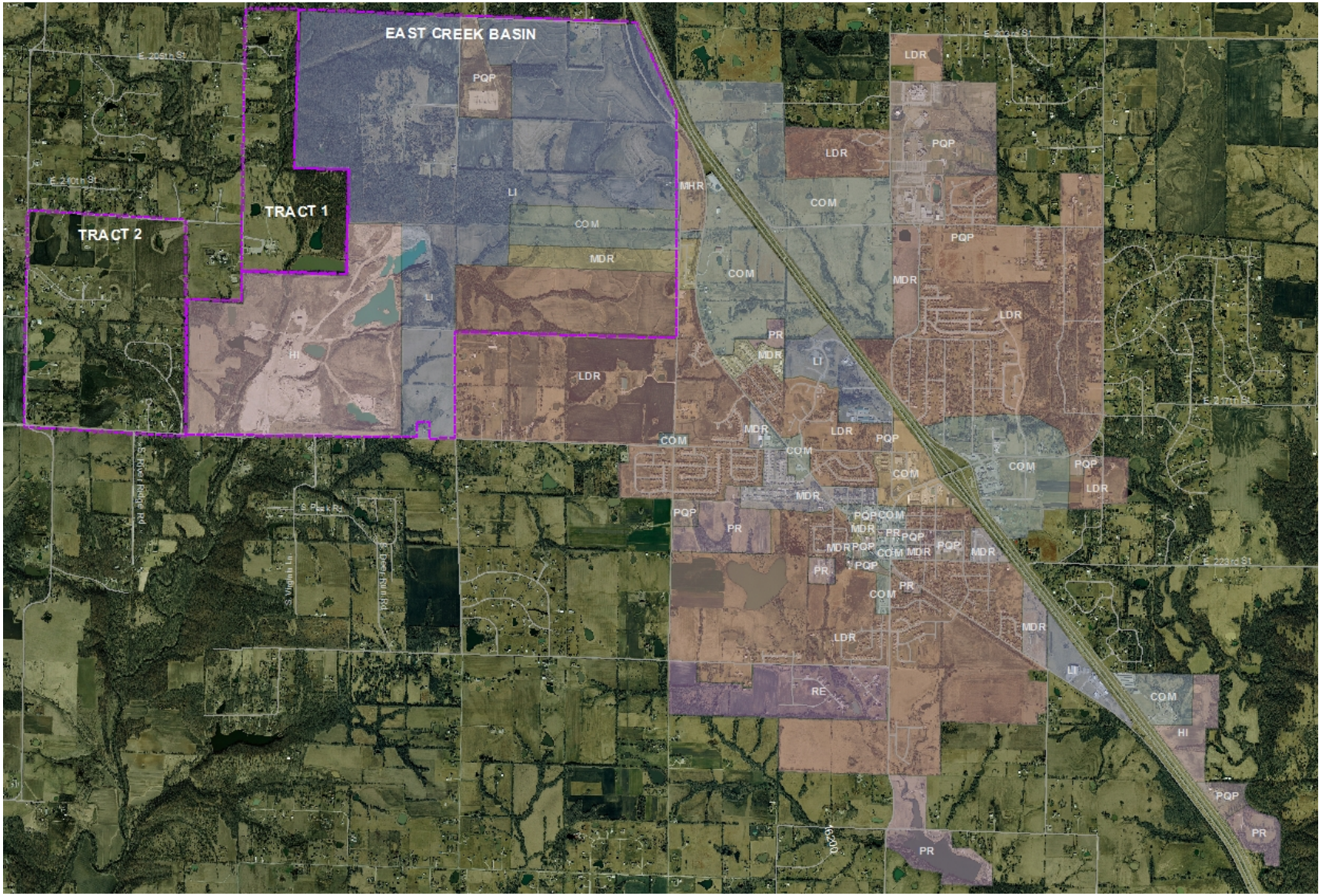

FIGURE 1.2 – PROPOSED LAND USE MAP
EAST CREEK WASTEWATER SYSTEM ENGINEERING REPORT
CITY OF PECULIAR, MISSOURI

1.3.1 Contributory Sub-Basins

For the purpose of preliminary hydraulic modeling and alternative alignment evaluations, the East Creek Basin was divided into several sub-basins. The study area is located in the East Creek watershed, and has been divided into thirteen (13) major contributory sub-basins. The sub-basins were delineated based on the preliminary sewer alignment, discussed in a later section of this report. The sub-basins were further divided into smaller tributary sub-basins for each inflow into the proposed system. Figure 1.3 illustrates these sub-basins.

The area of each sub-basins was calculated using the City's ten-foot contour intervals data with an automated ArcView GIS computer model. Table 1.1, below, lists the names of each sub-basin, number of sub-basins within that boundary, and the associated tributary area is within each designated basin boundary.

Table 1.1 Contributory Sewer Sub-Basins
East Creek Wastewater Engineering Report
City of Peculiar, Missouri

Basin	# of Sub-Basins	Total Tributary Area (ac)
Sub-Basin 1	4	259.66
Sub-Basin 2	14	387.45
Sub-Basin 3	14	610.97
Sub-Basin 4	8	425.25
Sub-Basin 5	2	68.97
Sub-Basin 6	1	132.01
Sub-Basin 7	3	47.39
Sub-Basin 8	2	97.74
Sub-Basin 9	7	216.80
Sub-Basin 10	6	257.79
Sub-Basin 11	3	143.76
Sub-Basin A	1	15.15
Sub-Basin B	1	42.17
Unaccounted(1)	5	86.66
	TOTAL:	**2791.77**

Notes:

(1) The grade elevation of the "unaccounted" sub-basins does not make them conducive to natural flow by gravity into the nearby basin area, and are not included in the evaluation.

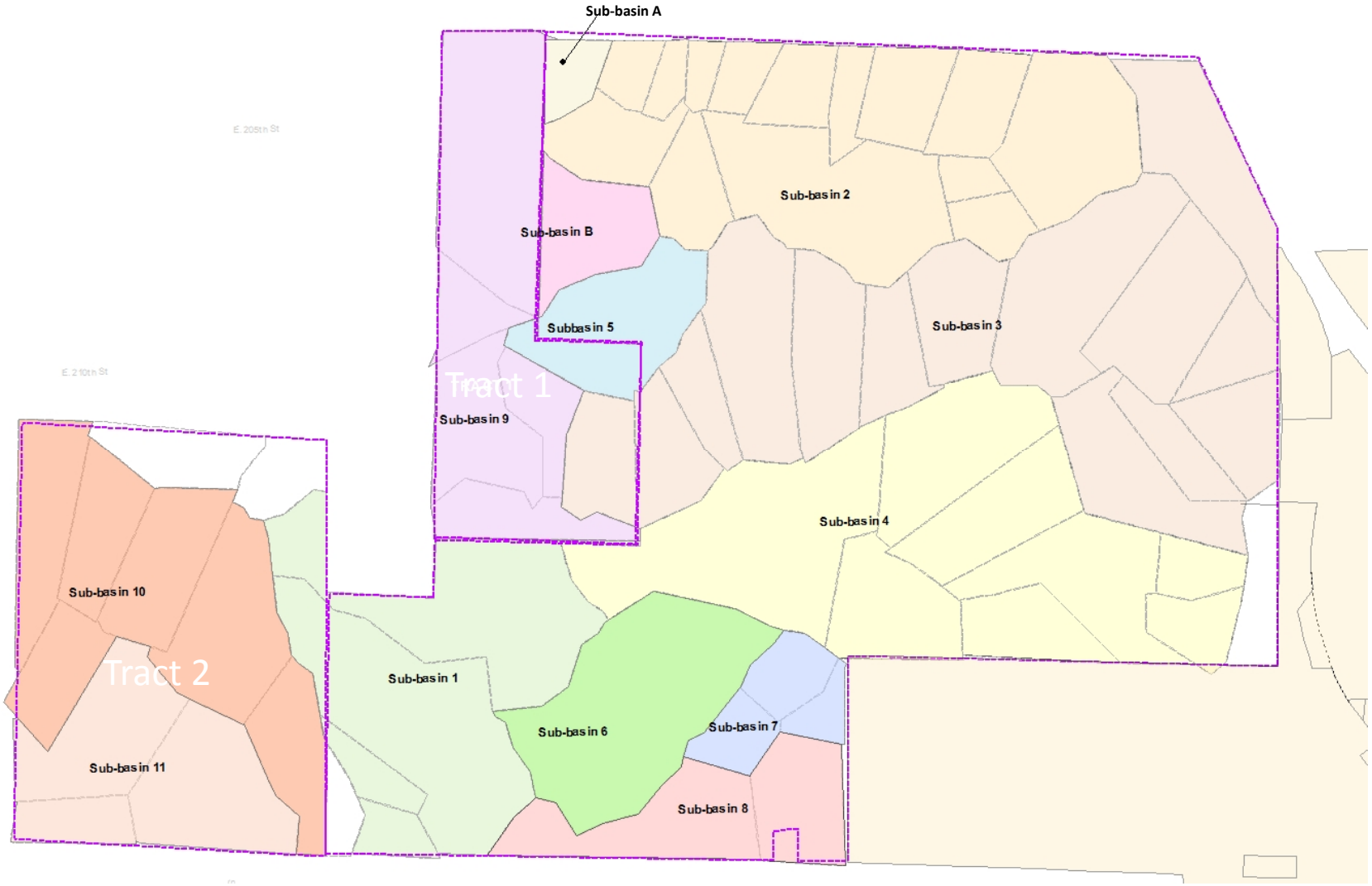

FIGURE 1.3 – CONTRIBUTORY SUB-BASINS
EAST CREEK WASTEWATER SYSTEM ENGINEERING REPORT
CITY OF PECULIAR, MISSOURI

1.4 Study Area Flows

Different methods are available for estimating base sanitary flow. Two such methods that can be used to develop projected flows are the application of flow-per-acre factors, and use of per capita flow factors. The per capita flow approach is generally based on population projections and sanitary flow generation rate per person, whereas the flow-per-acre approach is based on area for each land use type and determined flow factors for each land use type. Because population projection factors were provided by the City for each land use type, the per capita flow approach was used to estimate projected wastewater flows for this evaluation.

1.4.1 Study Area Flow Projections

As provided in the City's 2015 Comprehensive Plan (*Gould Evans*), a population density factor (persons/acre) was assigned to each land use type based on existing land use and population data. These factors were applied to the calculated area for each land use type within its respective sub-basins to determine an estimated population. For sub-basins with more than one land use type designation, the dominant land use type was used for this evaluation.

With establishment of the population projections, wastewater flow projections were estimated by multiplying the projected population by a per capita flow rate, or flow contribution per person. Per capita flow values were taken from the Missouri Department of Natural Resources (MoDNR) design guides (10 CSR 20-8) for minimum design values for specific types of establishments. Table 1.2 presents the population density and per capita flow rates used for each land use type, and Table 1.3 summarizes the population, per capita flow rates, and estimated flow values for each land use type. Acreage, population, and flow values for each sub-basin are presented in tabular format in App A.

Table 1.2 Population Density and Per Capita Flow Rate by Land Use Type
East Creek Wastewater Engineering Report
City of Peculiar, Missouri

Land Use Type	Population Density (ac/100 persons)	Unit Flow	Notes[1]
Commercial	3.5	200 gal/1,000 sf	Value for shopping centers
High Density Residential	1.3	100 gal/p/d	High-end of single family dwellings/apartments
Heavy Industrial	16.7	15 gal/p/d	Value for employee sanitary waste
Low Density Residential	25.5	100 gal/p/d	High-end of single family dwellings/apartments
Light Industrial	2.3	15 gal/p/d	Value for employee sanitary waste
Medium Density Residential	25.5	100 gal/p/d	High-end of single family dwellings/apartments
Public/Quasi-Public	8.1	5 gal/p/d	Value for public parks

Notes:
(1) Describes rationale for per capita flow values selected from MoDNR guidelines.

Table 1.3 Project Area Flow Contribution by Land Use Type
East Creek Wastewater Engineering Report
City of Peculiar, Missouri

Land Use Type	Total Area (ac)	Population	Avg Flow (cfs)	Peak Flow (cfs)(2)
Commercial	170.3	4,870	2.295	6.88
High Density Residential	0.0	0	0.000	0.00
Heavy Industrial	529.0	3,200	0.074	0.22
Low Density Residential	851.0	3,450	0.534	1.60
Light Industrial	1050.4	45,820	1.063	3.19
Medium Density Residential	56.0	220	0.034	0.10
Public/Quasi-Public	13.1	170	0.001	0.00
TOTAL	**2670**	**57,730**	**4.0**	**12.0**

Notes:

(1) These land use types were not used in the evaluation of estimated flows because they were within a sub-basin with a second, more dominant land use type that was used for the flow calculation.

(2) Peak flow based on a peak-to-average ratio of 3:1.

The MoDNR guidelines also provide guidance on the minimum peak design flow on which to base the sewer design. The recommended peaking factor can be determined from the following equation:

$$\text{Peaking Factor} = \frac{18+\sqrt{P}}{4+\sqrt{P}} \quad \text{where P = population in thousands}$$

Based on an estimated population of 57,730 for the new service area, the calculated peaking factor is 2.2. For a conservative estimate, the peaking factor was rounded up to 3.0 and used to estimate peak flows for the sewer system design.

1.4.2 Wastewater Characteristics

One factor characterizing wastewater strength is its five-day biochemical oxygen demand, or BOD_5. BOD_5 is described as the amount of oxygen required over a five-day period at 20°C by bacteria while stabilizing decomposable organic matter under aerobic conditions.

As illustrated by the land use maps and land use data in Table 1.3, a majority of the study area is designated for light to heavy industrial use, though the majority of the waste flow contribution will be from commercial and light industry. The strength of the wastewater from industrial users is generally not as strong, - in terms of BOD_5 as that of commercial and residential users. The MoDNR guidelines provide minimum per capita BOD loading rates for each land use type. The minimum loading rates for each land use type are listed in Table 1.4. Based on estimated average flow and BOD loading rates for each land use type, BOD_5 concentrations were calculated. The average of these will be used to characterize the waste flow from the study area.

Table 1.4 BOD_5 Contribution by Land Use Type
East Creek Wastewater Engineering Report
City of Peculiar, Missouri

Land Use Type	Population	Per Capita Loading Rate (lbs BOD/p/day)	BOD_5 loading (lbs/d)	BOD_5 conc (mg/L)
Commercial	4,870	0.34	2521.8	203.8
High Density Residential	0	0.17	--	--
Heavy Industrial	3,200	0.05	160.0	399.7
Low Density Residential	3,450	0.17	586.5	203.8
Light Industrial	45,820	0.05	2291.0	399.7
Medium Density Residential	220	0.17	37.4	203.8
Public/Quasi-Public	170	0.02	--	--
AVERAGE			**1,119.3**	**282.2**

Notes:
(1) These land use types were not used in the evaluation of estimated flows because they were within a sub-basin with another, more dominant land use type that was used for the flow calculation.
(2) Peak flow based on a peak-to-average ratio of 3:1.

2.0 WASTEWATER SYSTEM EVALUATION

The City currently operates and maintains 9 pumping stations to convey sanitary sewer to their WWTP facility located at the southeast end of Peculiar. The limited capacity of the existing treatment facilities, and its location relative to the project study area, make it a more expensive alternative for handling additional flows from development of the study area.

The City of Belton, Missouri also has a Wastewater Treatment Facility (WWTF) located just outside of their city limits, and just west of the Peculiar project study area. The Belton WWTF currently has adequate capacity and has recently incorporated or is planning treatment facility upgrades. The location and available capacity at Belton's facility presented an alternative to the City for handling flows from this new study area. City of Belton Staff approached the Peculiar City Staff, and they were in agreement to accept waste flows from the project study area for treatment at their WWTF.

2.1 Collection System Alignment Analysis

To aid in the selection of a preferred alignment for the sewer system to serve the project study area, two distinct tasks were performed. The first task was an alignment analysis. This analysis was completed using GIS data of the service area, provided by the City, including 10-foot contours. The second task was the preliminary hydraulic modeling of the basin. The main purpose of hydraulic modeling was to select the preliminary pipe sizes and sewer inverts to convey the wastewater from the sub-basin areas to the main trunk sewers.

The pipe lengths and associated construction quantities used in this evaluation are based on the City’s aerial mapping and ten-foot contours. The actual length of piping runs and construction quantities will be refined after the actual alignment is selected by the City and a more detailed survey and design has been performed.

2.1.1 Alignment Analysis

In review of the contour data available in the City's GIS database, preliminary tributary and trunk sewer alignments were laid out in close alignment with the natural flow line and grade of the project study area, as illustrated in Figure 2.1. Based on the natural grade of the service area, a major trunk sewer was routed north/south just outside the west project area boundary. Tributary sewers collecting wastewater from the sub basins will tie into this trunk for conveyance to the discharge point.

Six (6) major sub basins (Sub basin Nos. 2 - 5, and A and B) were delineated in the northeast portion of the project study area, where each were further divided into smaller tributary basins based on the natural route of drainage for the respective area. The sub basin area at the south end of the trunk sewer has been designated as Sub basin No. 1. Three (3) more sub basins (Sub basins Nos. 6 - 8) were also identified in the southeast

portion of the study area. However, the natural grade of the southern-most sub basin does not flow to the west, toward the major trunk sewer. For this reason, this sub basin would not be able to flow by gravity to the trunk sewer or sewer discharge location, and will likely require a small lift station to convey these flows to the discharge point.

As illustrated in the sub basin Figure 2.1, if Tract No. 1 is included as part of the sewer service area, Sub basin No. 9 would be included, which mainly incorporates flows directly into the trunk sewer. Sub basins delineated within Tract No. 2 (Sub basins Nos. 10 and 11) would flow into a separate trunk sewer to the discharge point.

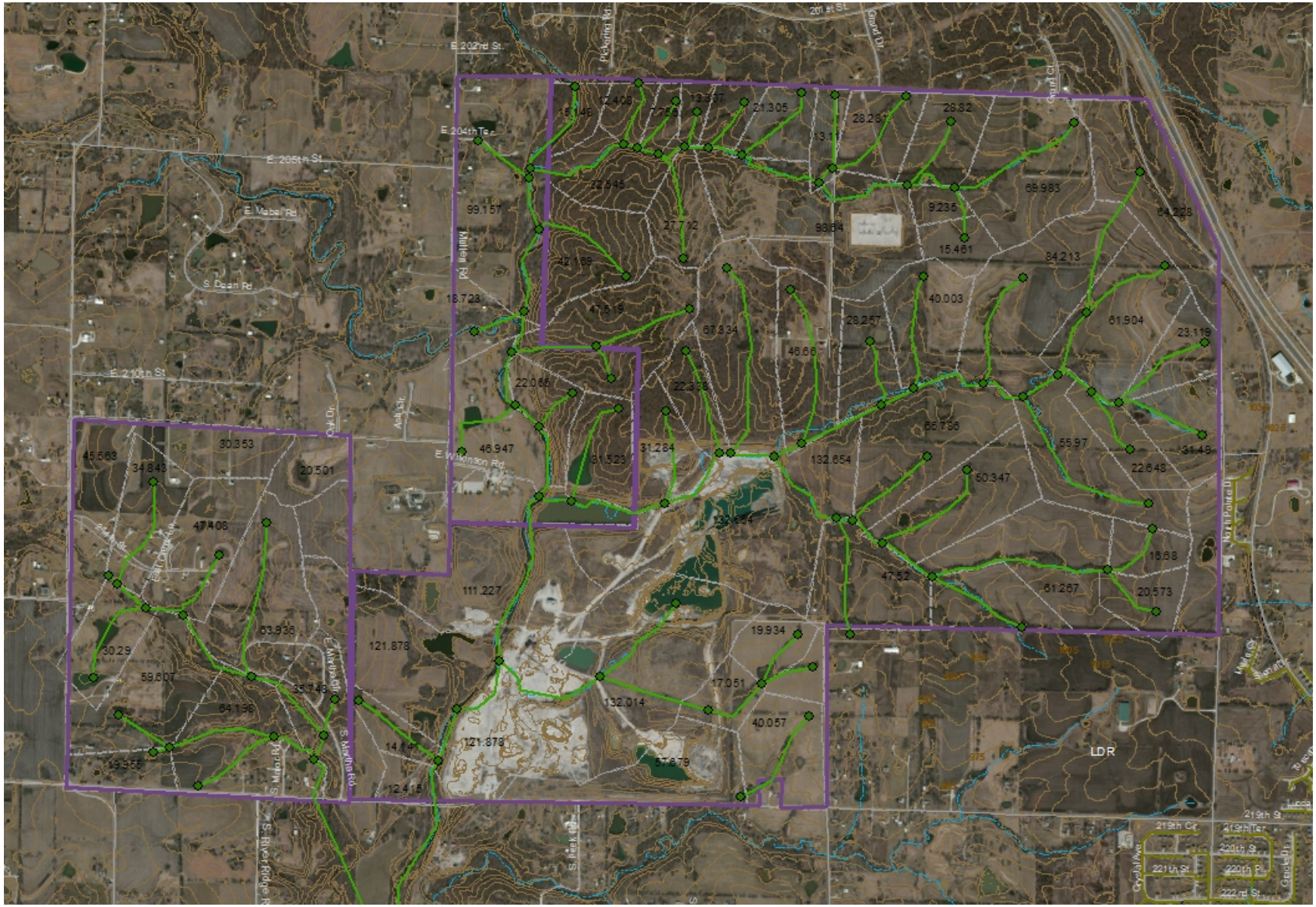

FIGURE 2.1 – PROPOSED SEWER SYSTEM
EAST CREEK WASTEWATER SYSTEM ENGINEERING REPORT
CITY OF PECULIAR, MISSOURI

2.2 Hydraulic Modeling

The purpose of preliminary modeling is to establish the preliminary size of the sewer system for the project study area that will be required to convey the estimated flows to the Belton WWTF. The worst-case scenario, - assuming all flows in the pipeline concurrently, was modeled to provide the City with the information needed to select and cost out tributary and trunk sewers that will provide capacity for development of the project study area. In addition, preliminary slopes, depth of flow, velocities, and locations of manhole structures, where inflow would be introduced into each sewer pipe, were identified.

XP SWMM computer model was used for the hydraulic analysis and modeling efforts. XP SWMM, marketed by XP-software, is a dynamic-state analysis tool and is an extremely powerful program for the design and analysis of flows in pipe networks.

It should be noted that the preliminary modeling should not be used as the method for final selection of the preferred alignment. The selection of the preferred alignment will be completed after the basic decisions relating to the area to be served have been confirmed. Once the preferred alignment has been selected, additional field reconnaissance will be required prior to final design. This reconnaissance will include field survey to verify stream flow lines, locating major utilities and collecting other physical data. It is recommended that the model be revisited during final design to reflect any changes made.

The following sub-sections discuss the basics of the hydraulic modeling used to evaluate the preliminary sewer system for the project study area.

2.2.1 <u>Manning's Equation</u>

The Manning's Equation is the most commonly used resistance formula for the analysis of open channel and gravity flow pipe systems. The equation modified to English Units is shown below.

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

Where:

V = Average velocity (ft/sec)

R = Hydraulic radius (ft)

S = Slope of the Energy Grade Line (ft/ft)

'n' = Roughness coefficient

The roughness coefficient varies depending on the type of material. For example, glass may have an 'n' value of 0.010, while earthen channels may have an 'n' value of 0.020. There has been much debate about the use of the appropriate 'n' value for different piping

materials in sanitary sewer systems. To complicate the debate, the slime layer that thrives on the wetted portions of sanitary piping can also contribute to and affect the actual value of 'n'.

Due to the unknowns at this time, such as the actual type of the pipe to be installed, the number of joints in the piping system, and the affect that the slime layer will have on the 'n' value, a conservative value of 0.013 has been adopted for this project, which is the most commonly used 'n' value for the evaluation and design of sanitary sewer systems.

2.2.2 Depth of Flow (d/D)

The design flow rate in pipes 36 inches in diameter and smaller was limited by a depth ratio (d/D) of 0.75. Based on the estimated flows for this area, pipes larger than 36 inches in diameter are not anticipated.

The gravity flow of wastewater in pipelines is an inherently transient process. Transient waves are created at flow input locations and where the pipelines change direction. These transient waves have been observed to effect the downstream as well as the upstream flow regime. The magnitude of the transient waves depends on many parameters including the distance from the initial wave source, invert, slope, and pipe size. Therefore, even pipelines with a relatively constant slope and pipe size may experience varying velocities, d/D, and q/Q values in the same reach of sewer both upstream and downstream from the initial source of the transient wave. To evaluate the phenomena, the fully dynamic wave model has been utilized to simulate the transient waves in the project study area sewer analysis, and to solve the associated time-dependent flow equations.

2.2.3 Pipeline Velocity

For this project the minimum design velocity in the trunk sewer was set at 2 ft/sec during full flow conditions. Likewise, the maximum design velocity in the trunk sewer system was designed not to exceed 10 ft/sec during full flow conditions. (If desired, a maximum velocity of 15 ft/sec could also be set during final design. An increase in the allowable velocity could decrease pipe sizes from the current evaluation, however, limiting maximum velocities to 10 ft/sec provides a level of conservatism for conceptual design.)

A velocity range of 2 to 10 fps was selected to encourage self-cleaning of the pipe through scouring and limit head losses during peak flows.

2.2.4 Pipe Size

For the preliminary modeling effort, the trunk and sub basin sewers were sized for pipe diameters down to and including 8 inches in diameter. Smaller pipe diameters are generally not recommended for collection systems.

As previously stated, the maximum pipe size estimated for the project study area is 36-inch diameter.

2.2.5 Location of Manholes and Junction Structures

It is the design intent that flows from the sub basins are introduced into the trunk sewers at junction structures and/or manholes that can accommodate the connection points. Modifying the trunk sewer in the future by installing new connections is discouraged. Such modifications can minimize nearby smaller service connections, and can also compromise the structural integrity and water tightness of the original installation. For the preliminary size of piping and preliminary number of pipes to be connected at a single point, manholes may be acceptable at all the connection points for this system. However, the use of manholes versus junction structures should be more thoroughly investigated during final design to determine the feasibility of one over the other.

The previously presented Figure 2.1 shows approximate locations of manholes along the sewer system. These locations are for estimating and modeling purposes only. It is strongly recommended that during the design phase(s) of the project(s) that the actual location of manholes (or junction structures) be jointly located with City staff, including Sewer Maintenance personnel. In addition to the location of manholes and structures, City staff should also be involved with the location of stub-outs, as necessary, provided at the connection points to allow connections from future developments without the need to cut into the trunk sewer or its engineered manholes.

2.3 Model Development

2.3.1 Model Input Parameters

The basic information used to preliminarily size the sewers using the XP SWMM Program included:

- Ground surface elevation.
- Minimum and maximum cover over the pipe (3-3.5 and 20 ft, respectively).
- Minimum and maximum allowed pipeline velocities.
- Manning's ‘n’.
- Flow input data for each sub basin.
- Physical sewer manhole (nodes) locations (located using Cartesian Coordinates). For final design, manhole spacing should be limited to 400-ft.

The minimum cover, minimum and maximum velocities, and Manning’s n were defined as modeling constraints as shown in Table 2.1 below. In general, the design constraints attempt to minimize excavation and pipe size while maximizing capacity.

Table 2.1 Modeling Input Constraints East Creek Wastewater System Engineering Report City of Peculiar, Missouri	
Constraint	**Value**
Manning's ‘n’	0.013
Minimum allowable velocity at design conditions	2 ft/sec
Maximum allowable velocity at design condition	10 ft/sec
Minimum cover	3 - 3.5 ft

2.3.2 Sub basin Inflows

Peak flows, as previously discussed, were evaluated from each delineated sub basin, and input at its respective node.

Each sub basin has one wastewater flow input point where flow is introduced into the sewer model. As discussed previously, sub basin areas were used along with land use type, the City’s population density values, and per capita flow rates and peaking factor from the MoDNR guidelines, to determine the flow from each sub basin. Inflow to the trunk sewer was determined using the total tributary flows to the trunk sewer at each junction structure location. The inflows are determined such that as additional sub basin flows enter the trunk sewer, flows from the contributing sub basins are combined.

Average and peak flows estimated for each sub basin are detailed in the table in Appendix A. A summary of flows within each basin are listed in Table 2.2 below.

Table 2.2	Sewer Sub-Basin Flows East Creek Wastewater Engineering Report City of Peculiar, Missouri	
Sub-Basin	**Average Flow (cfs)**	**Peak Flow (cfs)**
Sub-Basin 1	0.035	0.104
Sub-Basin 2	0.380	1.141
Sub-Basin 3	1.270	3.811
Sub-Basin 4	1.695	5.085
Sub-Basin 5	0.062	0.186
Sub-Basin 6	0.019	0.056
Sub-Basin 7	0.033	0.100
Sub-Basin 8	0.041	0.122
Sub-Basin 9*	0.135	0.404
Sub-Basin 10**	0.161	0.483
Sub-Basin 11**	0.023	0.070
Sub-Basin A	0.015	0.046
Sub-Basin B	0.043	0.128
Total	**3.91**	**11.73**

** included in Tract 1*
*** included in Tract 2*

Flows from the project study area will be conveyed to the Belton WWTF for treatment and ultimate disposal; however, based on the grade of the area, the wastewater is not capable of flowing by gravity from the study area to the WWTF. A lift station, located at the downstream end of the proposed sewer system, is recommended to collect wastewater by gravity from the project study area for pumping to the Belton WWTF. Based on this preliminary evaluation, the service area lift station, herein referred to as the Northwest Lift Station (NWLS), would be located in the area south of 219th St, between S. River Ridge Rd and S. Virginia Ln, and would receive flows from the entire service area for the project study area.

For this preliminary study, the NWLS was sized to accommodate both average and ultimate peak flows from the study area. Including flow from Tracts 1 and 2, average and ultimate peak flows are estimated to range from 4.0 to 12.0 cfs (2.6 to 7.8 mgd). Without the addition of flow from these additional tracts, the pump station capacity would need to be capable of handling a similar flow range of 2.3 to 7.0 mgd.

To handle the flow range with the additional tracts, 4 (3+1) pumps, with one as standby, rated at 2.6 mgd each are recommended for the NWLS. With this arrangement, a single

pump could handle average flows, and three pumps in service could accommodate the ultimate peak flow projected. A variable frequency drive (VFD) is recommended on at least one of the pumps to handle minimum flows below 2.6 mgd. (If the variation in the range of flows, - between minimum and maximum, is great, including VFDs on all of the pumps may not prove beneficial. This should be further evaluated during final design.)

At the flow capacity estimated without the additional tracts, it is recommended that the pump station be designed for 4 (3+1) pumps, rated at 2.33 mgd each. It is recommended that a VFD be installed with at least one of these pumps as well.

As previously indicated, a small, intermediate lift station will be required to convey waste flows from Sub-basin No. 8 to the NWLS. As shown in Table 2.2, peak flows from this sub basin area are estimated to be 0.12 cfs (or 54 gpm). A small, packaged lift station with 1+1 pumps sized to handle this small flow is recommended.

2.4 Force Main Routing

To handle the ultimate peak flow of 7.8 mgd (including the additional tracts), and limiting force main velocities to 15 fps, the NWLS force main is preliminarily sized at 12-inch diameter, minimum.

The route of the force main will be generally north towards the Belton WWTF, for an approximate length of 7,900 LF. Figure 2.2 illustrates the approximate location and route of the new lift station and force main.

Estimated project costs for both lift station and force main, and gravity sewer evaluations are shown in Table 2.3 below. The costs presented in Table 2.3 below also include the costs incurred by the City of Belton to increase the capacity of their preliminary treatment facilities to accommodate the additional flow from Peculiar.

Costs are presented in a dollar per acreage amount in consideration of development costs.

A more detailed cost analysis for the gravity piping, lift station, and force main is included in Appendix B.

FIGURE 2.2 – PROPOSED LIFT STATION AND FORCE MAIN ALIGNMENT
EAST CREEK WASTEWATER SYSTEM ENGINEERING REPORT
CITY OF PECULIAR, MISSOURI

Table 2.3	**Conceptual Project & Construction Costs East Creek Wastewater System Engineering Report City of Peculiar, Missouri**
Scenario 1 - All Service Areas included	**Value**
7.8-mgd Lift Station & 12" Force Main, 7,900 LF	$2,972,000
Gravity Sewer Piping, 120,000 LF	$32,425,000
Belton WWTF Headworks Expansion	$350,000
Total Project & Construction Cost:	**$35,747,000**
Service Area, ac	2,670
Total Project & Construction Cost/Acre	**$13,388**
Scenario 2 - No Add'l Tracts	
7.0 -mgd Lift Station & 12" Force Main, 7,900 LF	$2,581,000
Gravity Sewer Piping, 95,000 LF	$26,450,000
Belton WWTF Headworks Expansion	$350,000
Total Project & Construction Cost:	**$29,381,000**
Service Area, ac	2,068
Total Project & Construction Cost/Acre	**$14,207**

2.5 Total Project Costs

The Probable Opinion of the Estimated Project Costs for the two lift station options for the proposed East Creek Basin sewer system, as presented in Table 2.3 above, incorporate the following allowances:

- Fifty (50) percent estimating contingency.
- Twenty (20) percent for engineering and administrative fees.
- Ten (10) percent for general conditions (i.e. mobilization, demobilization, temporary facilities, testing, and commission).

Due to the conceptual level of detail at this point in the project, these allowances are higher than those that will be used in subsequent analyses.

Estimated costs for the gravity piping include the following allowances:

- 50-ft Permanent Easement at $1.00/SF.
- 50-ft Temporary Construction Easement at $0.50/SF.
- Ten (10) percent for estimating contingency for unforeseen construction conditions.

The estimated costs do not include any allowance for the identification or mitigation of hazardous materials, or the costs associated with the discovery and remediation/preservation of historical or cultural items.

2.6 Additional Improvements

As part of this evaluation, the City expressed an interest in possibly diverting some additional flows from their existing sewer system to the NWLS. The City is interested in eliminating the existing North Pointe Lift Station, which serves a small sub-division just outside of the east project study area boundary. Based on its location just outside of the project area boundary, and the depth of the influent sewer at the lift station, it is likely possible that a gravity sewer could be routed from the North Pointe Lift Station to a manhole/junction structure in Sub basin 4 to flow by gravity to the NWLS. This would allow the City to eliminate the maintenance of this existing lift station.

The City is also interested in reviewing the option to completely eliminate their current wastewater treatment facility and send all wastewater flows to the Belton WWTF for treatment as a regional treatment facility. Based on a general overview of the existing treatment facilities, it is proposed that a preliminary treatment facility for screenings and grit removal, followed by a large lift station be installed at the existing Peculiar WWTP site for initial receipt of waste flows prior to conveying to the Belton WWTF. It is recommended that the pumping facilities be sized to handle up to the maximum month average day (MMAD)

flows anticipated for the system, and that supplemental peak flow storage basins be used for flow attenuation during peak flow events. However, the preliminary treatment facilities would need to be sized to handle the peak flows so that flow can be screened and inorganics removed from the waste stream prior to storage.

Estimated conceptual costs to incorporate these additional improvements, include approximate costs to expand the treatment capacity at the Belton WWTF, is $24.1M. (Refer to Project Costs in Appendix B, pg. 41.)

3.0 RECOMMENDED PROJECT AND PHASING

3.1 Recommended Design Project

Once plans for development in the area have begun, it is recommended that a Facility Plan be developed in accordance with the MoDNR Design Guides. The Facility Plan will serve to present more refined design criteria for design of the sewer system; examine alternate sewer alignments based on actual grade and site conditions; determine project phasing plan; refine financing methods and anticipated user fees; review organizational and staffing needs; and outline official actions and procedures to successfully implement the project.

Alternative alignment evaluation criteria for development of the facility plan should be developed with input from City Staff, in accordance with regulatory requirements. Some examples of criteria that should be considered in the evaluation of the preferred sewer alignment are as follows:

Ease of Construction - Items such as topographic features (hills, stream crossings, etc.) are considered in this category.

Accessibility for Maintenance - Accessibility to critical locations such as junction structures, lift stations, manholes and other appurtenances is very important. These locations require sewer maintenance and operating staff to access the sewer for cleaning and inspection. Sewer cleaning equipment is very large and is generally mounted on trucks. Locating these special structures near roads or other areas that allow vehicular access, during all weather conditions is very important.

Conflicts with Existing or Planned Utilities - Once preliminary alternative alignments are generated, existing or proposed utilities should be consulted for identification of the potential location of major utilities including electrical transmission lines, major water distribution lines, fiber optic cable, and high-pressure gas transmission lines.

Environmental Factors - Effort should be made to locate the alignments in such a manner to avoid areas that may be identified as having environmental significance. Such areas include: wetlands, declared parks, areas of remnant vegetation, and areas of botanical and zoological significance, riparian setbacks, and grasslands.

Stream Geomorphology - The effects that the project has on the bank stability of nearby streams and their tributaries should be included in the evaluation.

Impact on Potential Development - This factor relates to future land planning and zoning, and what effect the location of the trunk sewer will have on future development.

Traffic Disruption/Inconvenience to Public - Alignments that minimize construction inconvenience are more desirable than those alignments that will cause additional traffic disruption and inconvenience to the public.

Easement Acquisition - The cost of right of way acquisition will need to be assessed and included in estimated project costs.

Geotechnical Factors - A geotechnical investigation will be required in each area of construction to determine the general subsurface profile of the area. Geotechnical findings are critical in assessing the constructability of the sewer system.

Estimated Overall Project Costs - Estimated costs should also be a factor in selecting the best alignments for the proposed system.

Following successful completion, and review and approval of the Facility Plan by MoDNR, final design plans and specifications can be developed for the first phase of the identified projects.

3.2 Project Phasing

To provide a balance between service demand (i.e. population growth) requirements and project funding, a phased expansion approach is recommended for the proposed sewer system. A phased approach will add to the sewer system in increments as growth in the area develops. At this stage, plans for development in the area are still conceptual in nature. The actual implementation phasing plan will need to be developed once plans for development have been identified.

3.3 Project Financing

3.3.1 Review of Financing Methods

Most municipal capital improvements are funded by the issuance of debt in the form of bonds. The two main forms of municipal bonds are general obligation and revenue. These two types are distinguished according to whether they are secured or unsecured.

General obligation bonds (GO Bonds) are unsecured municipal bonds that finance municipal operations. They have maturities of 10 years or greater. The creditworthiness of the issuing city is the only “guarantee” they provide. GO bonds generally finance projects that do not produce revenue. The municipal issuer repays the bonds with funds raised by fees or property taxes.

The revenues generated by the projects they fund secure the revenue bonds. Such revenues can include fees and lease payments. Revenue bonds involve a higher risk than GO bonds because of the possibility that the projects financed may not bring in enough revenue to pay bondholders. However, these bonds also pay higher yields than GO bonds.

3.3.2 Effect of State and Federal Assistance

Since the late 1980's, State and Federal funding for wastewater system improvements has been used to reduce the effective interest rates paid by municipalities on revenue bonds. This methodology of assistance replaced the grant programs created in the early 1970's.

Currently, the financial assistance provided to municipalities who participate in the State Revolving Fund (SRF) program amount to a 70 percent subsidy of "market" interest rates. Including the administration fee imposed by the State, the effective revenue bond interest rate for a municipality participating in the SRF program is approximately 2.1 percent.

3.3.3 Project Financing

The City may choose to finance the proposed projects by revenue bonds and to participate in the SRF program to reduce project financing costs.

A cost of service study will need to be prepared by or on behalf of the City toward the establishment of user rates. The rate determination process should include, at a minimum, the following principal components:

- Asset depreciation.
- Expenses, which are based on the current year's budget.
- Future expenses, increased at a rate of 3% (or more) per year.
- The Repair and Replacement fund value, - fluctuates annually to stabilize volumetric rates (minor fluctuations occur in base rate). Rates increase in years when improvements are completed.
- Existing debt, retired by user fees and is included in the usage rate structure.
- Future debt service, based on SRF participation (2% interest, 20- or 30-year term).
- Annualized winter average water usage, number of connections and tap fees, based on population growth projections.
- Collection system construction projects which are phased to match population growth.
- Collection system construction projects costs which are increased 3% per annum from the current year for inflation.

3.4 Regulatory and Other Legislative Considerations

If participation in the SRF program is desired, several ordinances and statutory requirements must be met. The SRF Loan Program application and participation procedure includes, at a minimum, the following requirements:

- SRF Application
- Facility Plan, which should also be followed by or accompanied with an Environmental Review and Clearance Letters from several state agencies.
- Public Participation, including, at a minimum, a public meeting to discuss alternative engineering solutions, and a public hearing to discuss the estimated user charge rates. An environmental impact public hearing may also be required.
- Governing body resolution.
- Engineering Contract.
- Plans and specifications.
- User Charge Ordinance.
- Sewer Use Ordinance.
- Project Schedule.
- Certification of easements and real property acquisition.
- Inter-municipal agreements.

A copy of the document submittal checklist for Clean Water SRF Project assistance is included for reference in the appendices.

APPENDIX A – SUB-BASIN AREA AND FLOW DATA

Appendix A - Sub-Basin Inflows

Sub-Basin	MH_ID	LU Type	Area (ac)	GSE	Ac/100 persons	No. of Persons	Per Capita Flow (gal/p/d)	Estimated Flow (gpd)	Estimated Flow (cfs)	Peak Flow (cfs)
Sub-basin 1	A02-002	HI	14.141	925	16.7	90	15	1350	0.002	0.006
Sub-basin 1	A02-001	HI	111.227	885	16.7	670	15	10050	0.016	0.047
Sub-basin 1	A02-008	HI	121.878	875	16.7	730	15	10950	0.017	0.051
Sub-basin 2	B01-006	LI	7.756	945	2.3	340	15	5100	0.008	0.024
Sub-basin 2	B01-005	LI	8.887	945	2.3	390	15	5850	0.009	0.027
Sub-basin 2	B01-021	LI	9.235	970	2.3	410	15	6150	0.010	0.029
Sub-basin 2	B01-004	LI	12.408	945	2.3	540	15	8100	0.013	0.038
Sub-basin 2	B01-014	PQP	13.11	985	8.1	170	5	850	0.001	0.004
Sub-basin 2	B01-010	LI	13.307	945	2.3	580	15	8700	0.013	0.040
Sub-basin 2	B01-020	LI	15.461	985	2.3	680	15	10200	0.016	0.047
Sub-basin 2	B01-012	LI	21.305	975	2.3	930	15	13950	0.022	0.065
Sub-basin 2	B01-008	LI	27.712	985	2.3	1210	15	18150	0.028	0.084
Sub-basin 2	B01-017	LI	28.281	985	2.3	1230	15	18450	0.029	0.086
Sub-basin 2	B01-018	LI	28.82	985	2.3	1260	15	18900	0.029	0.088
Sub-basin 2	B01-001	LI	32.545	915	2.3	1420	15	21300	0.033	0.099
Sub-basin 2	B01-022	LI	69.983	1005	2.3	3050	15	45750	0.071	0.212
Sub-basin 2	B01-011	LI	98.64	925	2.3	4290	15	64350	0.100	0.299
Sub-basin 3	C01-005	LI	22.338	965	2.3	980	15	14700	0.023	0.068
Sub-basin 3	C02-001	COM	22.648	1005	3.5	650	200	197309	0.305	0.916
Sub-basin 3	C02-006	LI	23.119	1035	2.3	1010	15	15150	0.023	0.070
Sub-basin 3	C01-012	LI	28.257	965	2.3	1230	15	18450	0.029	0.086
Sub-basin 3	C01-004	LI	31.284	965	2.3	1370	15	20441	0.032	0.095
Sub-basin 3	C02-008	COM	31.49	1010	3.5	900	200	274341	0.424	1.273
Sub-basin 3	C01-001	LI	31.523	955	2.3	1380	15	20700	0.032	0.096
Sub-basin 3	C01-014	LI	40.003	985	2.3	1740	15	26100	0.040	0.121
Sub-basin 3	C01-009	LI	46.66	975	2.3	2030	15	30450	0.047	0.141
Sub-basin 3	C01-018	MDR	55.97	1015	25.5	220	100	22000	0.034	0.102
Sub-basin 3	C02-004	LI	61.904	1025	2.3	2700	15	40500	0.063	0.188
Sub-basin 3	C02-005	LI	64.228	1005	2.3	2800	15	42000	0.065	0.195
Sub-basin 3	C01-007	LI	67.334	985	2.3	2930	15	43950	0.068	0.204
Sub-basin 3	C01-016	LI	84.213	985	2.3	3670	15	55050	0.085	0.255
Sub-basin 4	C03-001	LDR	15.68	1015	25.5	70	100	7000	0.011	0.032
Sub-basin 4	C03-003	LDR	20.573	1015	25.5	90	100	9000	0.014	0.042
Sub-basin 4	C03-004	LDR	30.427	985	25.5	120	100	12000	0.019	0.056
Sub-basin 4	C03-010	LDR	47.52	985	25.5	190	100	19000	0.029	0.088
Sub-basin 4	C03-006	COM	50.347	985	3.5	1440	200	438623	0.679	2.036
Sub-basin 4	C03-005	LDR	61.267	955	25.5	250	100	25000	0.039	0.116
Sub-basin 4	C03-008	COM	65.786	975	3.5	1880	200	573128	0.887	2.660
Sub-basin 4	C01-003	HI	132.654	905	16.7	800	15	12000	0.019	0.056
Sub-basin 5	A01-009	LDR	21.447	955	25.5	90	100	9000	0.014	0.042
Sub-basin 5	A01-007	LI	47.519	975	2.3	2070	15	31050	0.048	0.144
Sub-basin 6	D01-006	HI	132.014	885	16.7	800	15	12000	0.019	0.056
Sub-basin 7	D01-001	LI	10.401	975	2.3	460	15	6900	0.011	0.032
Sub-basin 7	D01-004	HI	17.051	945	16.7	110	15	1650	0.003	0.008
Sub-basin 7	D01-003	LI	19.934	975	2.3	870	15	13050	0.020	0.061
Sub-basin 8	F01-001	LI	40.057	975	2.3	1750	15	26250	0.041	0.122
Sub-basin 9	A01-012	LDR	18.723	895	25.5	80	100	8000	0.012	0.037
Sub-basin 9	A01-015	LDR	22.065	955	25.5	90	100	9000	0.014	0.042
Sub-basin 9	A01-017	LDR	29.907	885	25.5	120	100	12000	0.019	0.056
Sub-basin 9	A01-014	LDR	46.947	925	25.5	190	100	19000	0.029	0.088
Sub-basin 9	A01-003	LDR	99.157	925	25.5	390	100	39000	0.060	0.181
Sub-basin 10	E01-010	LDR	30.29	955	25.5	120	100	12000	0.019	0.056
Sub-basin 10	E01-012	LDR	34.843	965	25.5	140	100	14000	0.022	0.065
Sub-basin 10	E01-014	LDR	35.748	935	25.5	150	100	15000	0.023	0.070
Sub-basin 10	E01-013	LDR	45.563	915	25.5	180	100	18000	0.028	0.084
Sub-basin 10	E01-008	LDR	47.408	955	25.5	190	100	19000	0.029	0.088
Sub-basin 10	E01-006	LDR	63.936	965	25.5	260	100	26000	0.040	0.121
Subbasin 11	E01-001	LDR	35.748	895	25.5	150	100	15000	0.023	0.070
Sub-basin 11	E01-003	LDR	19.955	935	25.5	80	100	8000	0.012	0.037
Sub-basin 11	E01-004	LDR	59.607	945	25.5	240	100	24000	0.037	0.111
Sub-basin 11	E01-017	LDR	64.198	945	25.5	260	100	26000	0.040	0.121
Sub-basin A	A01-002	LI	15.148	905	2.3	660	15	9900	0.015	0.046
Sub-basin B	A01-005	LI	42.169	965	2.3	1840	15	27600	0.043	0.128

Total Service Area: **2669.76 ac** **Total Population:** **57730**

Avg Flow: **4.0 cfs**
Peak Factor: **3.0**
Peak Flow: **12.0 cfs**

**For Commercial landuse (COM), per capita flow was determined on a gal/day/1000 SF basis.*

APPENDIX B – PROJECT COSTS

Appendix B - Scenario 1 Gravity Sewer Conceptual Cost Estimate									
INCL All Area					UNIT COSTS			Constructability Factors Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
Pipe Name	Pipe Flow (cfs)	Upstream MH	Dstream MH	Total Length (ft)	New Conduit Diameter (in)	No. of Barrels	Base Cost (2015 dollars)	Additional Constructability Factor	Construction Cost (2015 dollars)
P2	11.227	A02-003	A02-006	3019	24	1	$ 1,313,265	1.10	$ 1,445,000
P5	0.006	A02-002	A02-003	1422	12	1	$ 362,610	1.10	$ 399,000
P7	0.074	F01-001	LS1	1563	15	1	$ 468,900	1.10	$ 516,000
P8	0.032	D01-001	D01-002	752	8	1	$ 146,685	1.10	$ 161,000
P9	0.109	D01-004	D01-005	1570	8	1	$ 306,244	1.10	$ 337,000
P10	0.158	D01-005	A02-001	1737	18	1	$ 599,265	1.10	$ 659,000
P11	2.279	C03-008	C03-009	1392	8	1	$ 271,524	1.10	$ 299,000
P12	1.959	C03-006	C03-007	1745	8	1	$ 340,380	1.10	$ 374,000
P13	0.078	C03-003	C03-002	950	8	1	$ 185,307	1.10	$ 204,000
P14	0.048	C03-001	C03-002	949	8	1	$ 185,112	1.10	$ 204,000
P15	0.097	C03-004	C03-005	1458	12	1	$ 371,790	1.10	$ 409,000
P16	0.473	C03-002	C03-005	2561	8	1	$ 499,549	1.10	$ 550,000
P17	1.265	C01-004	C01-003	1356	12	1	$ 345,780	1.10	$ 380,000
P18	0.088	c01-005	C01-006	1562	12	1	$ 398,310	1.10	$ 438,000
P19	0.204	C01-007	C01-008	2839	10	1	$ 638,605	1.10	$ 702,000
P20	0.141	C01-009	C01-010	2330	8	1	$ 454,490	1.10	$ 500,000
P21	0.111	C01-012	C01-013	974	8	1	$ 189,988	1.10	$ 209,000
P22	0.132	C01-014	C01-015	1659	8	1	$ 323,605	1.10	$ 356,000
P23	0.255	C01-016	C01-017	1750	8	1	$ 341,355	1.10	$ 375,000
P24	0.102	C01-018	C01-019	2537	8	1	$ 494,867	1.10	$ 544,000
P25	0.916	C02-001	C02-002	1020	8	1	$ 198,961	1.10	$ 219,000
P26	0.07	C02-006	C02-007	1539	8	1	$ 300,197	1.10	$ 330,000
P27	0.296	C02-004	C02-003	1359	8	1	$ 265,087	1.10	$ 292,000
P28	1.273	C02-008	C02-007	1291	8	1	$ 251,822	1.10	$ 277,000
P29	0.076	C01-001	C01-002	1602	12	1	$ 408,510	1.10	$ 449,000

INCL All Area					UNIT COSTS			Constructability Factors Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
					New				
	Pipe			Total	Conduit		Base	Additional	Construction
Pipe	Flow	Upstream	Dstream	Length	Diameter	No. of	Cost	Constructability	Cost
Name	(cfs)	MH	MH	(ft)	(in)	Barrels	(2015 dollars)	Factor	(2015 dollars)
P30	0.154	A01-007	A01-008	1406	8	1	$ 274,254	1.10	$ 302,000
P31	0.099	A01-005	A01-006	1537	8	1	$ 299,807	1.10	$ 330,000
P32	0.023	B01-004	B01-001	952	8	1	$ 185,697	1.10	$ 204,000
P33	0.028	B01-005	B01-002	857	8	1	$ 167,166	1.10	$ 184,000
P34	0.024	B01-006	B01-007	536	8	1	$ 104,552	1.10	$ 115,000
P35	0.04	B01-010	B01-011	821	8	1	$ 160,144	1.10	$ 176,000
P36	0.076	B01-012	B01-013	1288	8	1	$ 251,237	1.10	$ 276,000
P37	0.04	B01-014	B01-015	1055	8	1	$ 205,788	1.10	$ 226,000
P38	0.07	B01-017	B01-015	1537	8	1	$ 299,807	1.10	$ 330,000
P39	0.066	B01-018	B01-019	1118	8	1	$ 218,077	1.10	$ 240,000
P40	0.047	B01-020	B01-021	758	8	1	$ 147,855	1.10	$ 163,000
P41	1.062	B01-001	A01-001	1502	15	1	$ 450,600	1.10	$ 496,000
P42	10.966	A01-017	A02-001	2568	24	1	$ 1,117,080	1.10	$ 1,229,000
P43	0.823	E01-001	A02-006	3121	18	1	$ 1,076,745	1.10	$ 1,184,000
P44	0.121	E01-004	E01-002	860	8	1	$ 167,752	1.10	$ 185,000
P45	0.148	E01-002	E01-016	1525	8	1	$ 297,467	1.10	$ 327,000
P46	0.294	E01-007	E01-005	1395	8	1	$ 272,109	1.10	$ 299,000
P47	0.127	B01-008	B01-003	1602	8	1	$ 312,486	1.10	$ 344,000
P48	0.144	C03-010	C03-011	1714	8	1	$ 334,333	1.10	$ 368,000
P49	0.126	E01-006	E01-005	2298	8	1	$ 448,248	1.10	$ 493,000
P50	0.117	E01-008	E01-007	1052	8	1	$ 205,203	1.10	$ 226,000
P51	0.056	E01-010	E01-009	1456	8	1	$ 284,007	1.10	$ 312,000
P52	0.087	E01-012	E01-011	1635	8	1	$ 318,923	1.10	$ 351,000
P53	0.044	A01-012	A01-011	744	8	1	$ 145,125	1.10	$ 160,000
P54	0.201	A01-003	A01-004	964	10	1	$ 216,842	1.10	$ 239,000
P55	0.108	A01-014	A01-013	1268	10	1	$ 285,224	1.10	$ 314,000
P56	0.05	A01-015	A01-016	683	8	1	$ 133,226	1.10	$ 147,000
P57	0.044	A01-009	A01-008	513	8	1	$ 100,066	1.10	$ 110,000

INCL All Area					UNIT COSTS			Constructability Factors Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
					New				
	Pipe			Total	Conduit		Base	Additional	Construction
Pipe	Flow	Upstream	Dstream	Length	Diameter	No. of	Cost	Constructability	Cost
Name	(cfs)	MH	MH	(ft)	(in)	Barrels	(2015 dollars)	Factor	(2015 dollars)
P58	0.195	C02-005	C02-003	2206	8	1	$ 430,302	1.10	$ 473,000
P59	0.212	B01-022	B01-021	1994	8	1	$ 388,950	1.10	$ 428,000
P60	0.29	B01-021	B01-019	839	15	1	$ 251,700	1.10	$ 277,000
P61	0.344	B01-019	B01-016	1436	15	1	$ 430,800	1.10	$ 474,000
P62	0.44	B01-016	B01-013	1291	15	1	$ 387,300	1.10	$ 426,000
P63	0.505	B01-013	B01-011	486	15	1	$ 145,800	1.10	$ 160,000
P64	0.844	B01-011	B01-007	329	15	1	$ 98,700	1.10	$ 109,000
P65	0.868	B01-007	B01-003	436	15	1	$ 130,800	1.10	$ 144,000
P66	0.952	B01-003	B01-002	303	15	1	$ 90,900	1.10	$ 100,000
P67	0.979	B01-002	B01-001	213	15	1	$ 63,900	1.10	$ 70,000
P68	0.028	A01-002	A01-001	1445	8	1	$ 281,862	1.10	$ 310,000
P69	1.09	A01-001	A01-004	138	18	1	$ 47,610	1.10	$ 52,000
P70	1.271	A01-004	A01-006	761	18	1	$ 262,545	1.10	$ 289,000
P71	1.35	A01-006	A01-011	1283	18	1	$ 442,635	1.10	$ 487,000
P72	1.387	A01-011	A01-010	611	18	1	$ 210,795	1.10	$ 232,000
P73	0.213	A01-008	A01-010	1190	10	1	$ 267,679	1.10	$ 294,000
P74	1.573	A01-010	A01-013	872	18	1	$ 300,840	1.10	$ 331,000
P75	1.661	A01-013	A01-016	450	18	1	$ 155,250	1.10	$ 171,000
P76	1.703	A01-016	A01-017	1106	24	1	$ 481,110	1.10	$ 529,000
P77	9.209	C01-002	A01-017	496	21	1	$ 193,440	1.10	$ 213,000
P78	9.149	C01-003	C01-002	1429	18	1	$ 493,005	1.10	$ 542,000
P79	7.828	C01-006	C01-003	1130	15	1	$ 339,000	1.10	$ 373,000
P80	7.813	C01-008	C01-006	162	15	1	$ 48,600	1.10	$ 53,000
P81	2.542	C01-013	C01-010	1237	15	1	$ 371,100	1.10	$ 408,000
P82	2.456	C01-015	C01-013	514	15	1	$ 154,200	1.10	$ 170,000
P83	2.335	C01-017	C01-015	1081	15	1	$ 324,300	1.10	$ 357,000
P84	2.08	C01-019	C01-017	687	15	1	$ 206,100	1.10	$ 227,000
P85	1.978	C01-020	C01-019	571	15	1	$ 171,300	1.10	$ 188,000

INCL All Area					UNIT COSTS			Constructability Factors Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
					New				
Pipe Name	Pipe Flow (cfs)	Upstream MH	Dstream MH	Total Length (ft)	Conduit Diameter (in)	No. of Barrels	Base Cost (2015 dollars)	Additional Constructability Factor	Construction Cost (2015 dollars)
P86	1.595	C02-002	C01-020	590	8	1	$ 115,085	1.10	$ 127,000
P87	1.343	C02-007	C02-002	459	8	1	$ 89,533	1.10	$ 98,000
P88	4.882	C03-011	C01-011	1370	12	1	$ 349,350	1.10	$ 384,000
P89	4.731	C03-009	C03-011	225	12	1	$ 57,375	1.10	$ 63,000
P90	2.691	C03-007	C03-009	581	12	1	$ 148,155	1.10	$ 163,000
P91	0.752	C03-005	C03-007	804	12	1	$ 205,020	1.10	$ 226,000
P93	0.062	D01-006	D01-005	1520	8	1	$ 296,491	1.10	$ 326,000
P94	0.074	D01-003	D01-002	884	8	1	$ 172,433	1.10	$ 190,000
P95	0.102	D01-002	D01-004	974	8	1	$ 189,988	1.10	$ 209,000
P96	11.17	A02-001	A02-008	1058	24	1	$ 460,230	1.10	$ 506,000
P99	0.043	E01-003	E01-002	247	8	1	$ 48,180	1.10	$ 53,000
P101	0.207	E01-009	E01-007	564	8	1	$ 110,014	1.10	$ 121,000
P102	0.093	E01-013	E01-011	168	8	1	$ 32,770	1.10	$ 36,000
P103	0.159	E01-011	E01-009	522	8	1	$ 101,821	1.10	$ 112,000
P104	0.112	B01-015	B01-016	298	8	1	$ 58,110	1.10	$ 64,000
P105	0.383	C02-003	C01-020	1013	8	1	$ 197,596	1.10	$ 217,000
P106	2.75	C01-011	C01-008	436	15	1	$ 130,800	1.10	$ 144,000
P107	7.635	C01-011	C01-008	593	15	1	$ 177,900	1.10	$ 196,000
P108	11.225	A02-008	A02-003	790	24	1	$ 343,650	1.10	$ 378,000
P109	0.127	E01-017	E01-016	1311	8	1	$ 255,724	1.10	$ 281,000
P110	0.083	E01-014	E01-015	537	8	1	$ 104,715	1.10	$ 115,000
P111	0.484	E01-015	E01-001	386	15	1	$ 115,800	1.10	$ 127,000
P100	0.414	E01-005	E01-015	1369	8	1	$ 267,037	1.10	$ 294,000
P4	0.278	E01-016	E01-001	697	8	1	$ 135,957	1.10	$ 150,000

INCL All Area					UNIT COSTS			Constructability Factors Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
					New				
	Pipe			Total	Conduit		Base	Additional	Construction
Pipe	Flow	Upstream	Dstream	Length	Diameter	No. of	Cost	Constructability	Cost
Name	(cfs)	MH	MH	(ft)	(in)	Barrels	(2015 dollars)	Factor	(2015 dollars)
TOTAL				119,793	LF				$ 32,425,000
New Lift Station - 7.8 MGD & 12" Force Main (7900 LF)									$ 2,972,000
Belton WWTF Hdwks Ext.									$ 350,000
								Total:	$ 35,747,000
Acreage served, all areas				2,670	AC			Pipe Cost per Acre:	$12,144
								Total Project Cost per Acre:	$13,388

Appendix B - Scenario 2 Gravity Sewer Conceptual Cost Estimate									
NO Tracts 1 & 2					UNIT COSTS			Constructability Factors Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
Pipe Name	Pipe Flow (cfs)	Upstream MH	Dstream MH	Total Length (ft)	New Conduit Diameter (in)	No. of Barrels	Base Cost (2015 dollars)	Additional Constructability Factor	Construction Cost (2015 dollars)
P2	11.227	A02-003	A02-006	3019	24	1	$ 1,313,265	1.10	$ 1,445,000
P5	0.006	A02-002	A02-003	1422	12	1	$ 362,610	1.10	$ 399,000
P7	0.074	F01-001	LS1	1563	15	1	$ 468,900	1.10	$ 516,000
P8	0.032	D01-001	D01-002	752	8	1	$ 146,685	1.10	$ 161,000
P9	0.109	D01-004	D01-005	1570	8	1	$ 306,244	1.10	$ 337,000
P10	0.158	D01-005	A02-001	1737	18	1	$ 599,265	1.10	$ 659,000
P11	2.279	C03-008	C03-009	1392	8	1	$ 271,524	1.10	$ 299,000
P12	1.959	C03-006	C03-007	1745	8	1	$ 340,380	1.10	$ 374,000
P13	0.078	C03-003	C03-002	950	8	1	$ 185,307	1.10	$ 204,000
P14	0.048	C03-001	C03-002	949	8	1	$ 185,112	1.10	$ 204,000
P15	0.097	C03-004	C03-005	1458	12	1	$ 371,790	1.10	$ 409,000
P16	0.473	C03-002	C03-005	2561	8	1	$ 499,549	1.10	$ 550,000
P17	1.265	C01-004	C01-003	1356	12	1	$ 345,780	1.10	$ 380,000
P18	0.088	c01-005	C01-006	1562	12	1	$ 398,310	1.10	$ 438,000
P19	0.204	C01-007	C01-008	2839	10	1	$ 638,605	1.10	$ 702,000
P20	0.141	C01-009	C01-010	2330	8	1	$ 454,490	1.10	$ 500,000
P21	0.111	C01-012	C01-013	974	8	1	$ 189,988	1.10	$ 209,000
P22	0.132	C01-014	C01-015	1659	8	1	$ 323,605	1.10	$ 356,000
P23	0.255	C01-016	C01-017	1750	8	1	$ 341,355	1.10	$ 375,000
P24	0.102	C01-018	C01-019	2537	8	1	$ 494,867	1.10	$ 544,000
P25	0.916	C02-001	C02-002	1020	8	1	$ 198,961	1.10	$ 219,000
P26	0.07	C02-006	C02-007	1539	8	1	$ 300,197	1.10	$ 330,000
P27	0.296	C02-004	C02-003	1359	8	1	$ 265,087	1.10	$ 292,000
P28	1.273	C02-008	C02-007	1291	8	1	$ 251,822	1.10	$ 277,000
P30	0.154	A01-007	A01-008	1406	8	1	$ 274,254	1.10	$ 302,000
P31	0.099	A01-005	A01-006	1537	8	1	$ 299,807	1.10	$ 330,000

NO Tracts 1 & 2					UNIT COSTS			Constructability Factors	
								Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
					New				
	Pipe			Total	Conduit		Base	Additional	Construction
Pipe	Flow	Upstream	Dstream	Length	Diameter	No. of	Cost	Constructability	Cost
Name	(cfs)	MH	MH	(ft)	(in)	Barrels	(2015 dollars)	Factor	(2015 dollars)
P32	0.023	B01-004	B01-001	952	8	1	$ 185,697	1.10	$ 204,000
P33	0.028	B01-005	B01-002	857	8	1	$ 167,166	1.10	$ 184,000
P34	0.024	B01-006	B01-007	536	8	1	$ 104,552	1.10	$ 115,000
P35	0.04	B01-010	B01-011	821	8	1	$ 160,144	1.10	$ 176,000
P36	0.076	B01-012	B01-013	1288	8	1	$ 251,237	1.10	$ 276,000
P37	0.04	B01-014	B01-015	1055	8	1	$ 205,788	1.10	$ 226,000
P38	0.07	B01-017	B01-015	1537	8	1	$ 299,807	1.10	$ 330,000
P39	0.066	B01-018	B01-019	1118	8	1	$ 218,077	1.10	$ 240,000
P40	0.047	B01-020	B01-021	758	8	1	$ 147,855	1.10	$ 163,000
P41	1.062	B01-001	A01-001	1502	15	1	$ 450,600	1.10	$ 496,000
P42	10.966	A01-017	A02-001	2568	24	1	$ 1,117,080	1.10	$ 1,229,000
P47	0.127	B01-008	B01-003	1602	8	1	$ 312,486	1.10	$ 344,000
P48	0.144	C03-010	C03-011	1714	8	1	$ 334,333	1.10	$ 368,000
P57	0.044	A01-009	A01-008	513	8	1	$ 100,066	1.10	$ 110,000
P58	0.195	C02-005	C02-003	2206	8	1	$ 430,302	1.10	$ 473,000
P59	0.212	B01-022	B01-021	1994	8	1	$ 388,950	1.10	$ 428,000
P60	0.29	B01-021	B01-019	839	15	1	$ 251,700	1.10	$ 277,000
P61	0.344	B01-019	B01-016	1436	15	1	$ 430,800	1.10	$ 474,000
P62	0.44	B01-016	B01-013	1291	15	1	$ 387,300	1.10	$ 426,000
P63	0.505	B01-013	B01-011	486	15	1	$ 145,800	1.10	$ 160,000
P64	0.844	B01-011	B01-007	329	15	1	$ 98,700	1.10	$ 109,000
P65	0.868	B01-007	B01-003	436	15	1	$ 130,800	1.10	$ 144,000
P66	0.952	B01-003	B01-002	303	15	1	$ 90,900	1.10	$ 100,000
P67	0.979	B01-002	B01-001	213	15	1	$ 63,900	1.10	$ 70,000
P68	0.028	A01-002	A01-001	1445	8	1	$ 281,862	1.10	$ 310,000
P69	1.09	A01-001	A01-004	138	18	1	$ 47,610	1.10	$ 52,000
P70	1.271	A01-004	A01-006	761	18	1	$ 262,545	1.10	$ 289,000
P71	1.35	A01-006	A01-011	1283	18	1	$ 442,635	1.10	$ 487,000
P72	1.387	A01-011	A01-010	611	18	1	$ 210,795	1.10	$ 232,000

NO Tracts 1 & 2					UNIT COSTS			Constructability Factors Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
Pipe Name	Pipe Flow (cfs)	Upstream MH	Dstream MH	Total Length (ft)	New Conduit Diameter (in)	No. of Barrels	Base Cost (2015 dollars)	Additional Constructability Factor	Construction Cost (2015 dollars)
P73	0.213	A01-008	A01-010	1190	10	1	$ 267,679	1.10	$ 294,000
P74	1.573	A01-010	A01-013	872	18	1	$ 300,840	1.10	$ 331,000
P75	1.661	A01-013	A01-016	450	18	1	$ 155,250	1.10	$ 171,000
P76	1.703	A01-016	A01-017	1106	24	1	$ 481,110	1.10	$ 529,000
P77	9.209	C01-002	A01-017	496	21	1	$ 193,440	1.10	$ 213,000
P78	9.149	C01-003	C01-002	1429	18	1	$ 493,005	1.10	$ 542,000
P79	7.828	C01-006	C01-003	1130	15	1	$ 339,000	1.10	$ 373,000
P80	7.813	C01-008	C01-006	162	15	1	$ 48,600	1.10	$ 53,000
P81	2.542	C01-013	C01-010	1237	15	1	$ 371,100	1.10	$ 408,000
P82	2.456	C01-015	C01-013	514	15	1	$ 154,200	1.10	$ 170,000
P83	2.335	C01-017	C01-015	1081	15	1	$ 324,300	1.10	$ 357,000
P84	2.08	C01-019	C01-017	687	15	1	$ 206,100	1.10	$ 227,000
P85	1.978	C01-020	C01-019	571	15	1	$ 171,300	1.10	$ 188,000
P86	1.595	C02-002	C01-020	590	8	1	$ 115,085	1.10	$ 127,000
P87	1.343	C02-007	C02-002	459	8	1	$ 89,533	1.10	$ 98,000
P88	4.882	C03-011	C01-011	1370	12	1	$ 349,350	1.10	$ 384,000
P89	4.731	C03-009	C03-011	225	12	1	$ 57,375	1.10	$ 63,000
P90	2.691	C03-007	C03-009	581	12	1	$ 148,155	1.10	$ 163,000
P91	0.752	C03-005	C03-007	804	12	1	$ 205,020	1.10	$ 226,000
P93	0.062	D01-006	D01-005	1520	8	1	$ 296,491	1.10	$ 326,000
P94	0.074	D01-003	D01-002	884	8	1	$ 172,433	1.10	$ 190,000
P95	0.102	D01-002	D01-004	974	8	1	$ 189,988	1.10	$ 209,000
P96	11.17	A02-001	A02-008	1058	24	1	$ 460,230	1.10	$ 506,000
P104	0.112	B01-015	B01-016	298	8	1	$ 58,110	1.10	$ 64,000
P105	0.383	C02-003	C01-020	1013	8	1	$ 197,596	1.10	$ 217,000
P106	2.75	C01-011	C01-008	436	15	1	$ 130,800	1.10	$ 144,000
P107	7.635	C01-011	C01-008	593	15	1	$ 177,900	1.10	$ 196,000
P108	11.225	A02-008	A02-003	790	24	1	$ 343,650	1.10	$ 378,000

NO Tracts 1 & 2					UNIT COSTS			Constructability Factors	
								Extensions	
City of Peculiar Proposed Sewer System					Standard Pipeline (per inch diam per ft) =		$ 15.00	1.10	
				50-ft width	Temporary Easement (per SF) =		$ 0.50		
				50-ft width	Permanent Easement (per SF) =		$ 1.00		
					New				
	Pipe			Total	Conduit		Base	Additional	Construction
Pipe	Flow	Upstream	Dstream	Length	Diameter	No. of	Cost	Constructability	Cost
Name	(cfs)	MH	MH	(ft)	(in)	Barrels	(2015 dollars)	Factor	(2015 dollars)
TOTAL PIPE COSTS				95,389	LF				$ 26,450,000
New Lift Station - 7.0 MGD & 12" Force Main (7900 LF)									$ 2,581,000
Belton WWTF Hdwks Ext.									$ 350,000
								Total:	$ 29,381,000
Acreage served, no tracts				2,068	AC			Pipe Cost per Acre:	$12,790
								Total Project Cost per Acre:	$14,207

Appendix B - Additional Flow Transfer Scenario									
Transfer of Existing Facilities				UNIT COSTS (per inch diam per ft)				Constructability Factors Extensions	Constructability Factors Capacity Improvements
City of Peculiar Proposed Sewer System				Standard Pipeline (Y) =			$ 15.00	1.10	2.00
Pipe Name	Inflow (cfs)	Upstream MH	Dstream MH	Total Length (ft)	New Conduit Diameter (in)	No. of Barrels	Base Cost (2015 dollars)	Additional Constructability Factor	Construction Cost (2015 dollars)
Force Main	6.188			15804	12	1	$ 2,844,720	1.10	$ 3,129,000
Gravity Sewer	6.188			10044	15	1	$ 2,259,900	1.10	$ 2,486,000
LS Xfr	0.3565062			2021	8	1	$ 242,520	1.10	$ 267,000
TOTAL PIPE COSTS				**27,869**	**LF**				**$ 5,882,000**
New England Facility WWTP Prelim Trmt & Transfer Lift Station Facilities									**$ 9,259,000**
Belton WWTF Expansion (4.0 mgd)									**$ 9,000,000**
								Total:	$ 24,141,000

carollo

PROJECT : Peculiar WW Engineering Report
City of Peculiar, MO
JOB # : 9751A00

ESTIMATE CLASS: Conceptual Level

DATE : 16-Dec-15
BY : MJT

ELEMENT : **Scenario 1: New Northwest Lift Station, Add'l tracts - 7.8 MGD**

REVIEWED:

Description	Units	Quantity	Unit Cost	Cost
PROJECT COSTS				
New Submersible Pump Station (20' x 15' x 20', 18' deep)				
Land Acquisition	AC	1	$10,000	$10,000
Excavation	cu yd	2,116	$20	$42,311
Hauling	cu yd	278	$8	$2,222
Backfill	cu yd	1,893	$25	$47,333
Concrete	cu yd	370	$650	$240,500
Sluice Gate, 36"	EA	2	$10,000	$20,000
Jib Crane	EA	1	$20,000	$20,000
Miscellaneous Metals (stairs, grating, hacthes, etc.)	LS	2	$25,000	$50,000
Influent Pumps, 2.6 mgd	EA	4	$80,000	$320,000
Generator	LS	1	$75,000	$75,000
Generator Concrete Pad	CY	22	$650	$14,444
12" HDPE Force Main	LF	7,900	$35	$276,500
Discharge Valves & Fittings	EA	16	$6,000	$96,000
Misc. Equipment	LS	1	$17,500	$17,500
New Lift Station Station				$1,232,000
LS Elec Bldg (15' x 10' x 12', 2' D)				
Excavation	cu yd	30	$15	$1,000
Hauling	cu yd	38	$5	$1,000
Backfill	cu yd	24	$20	$1,000
Concrete	cu yd	34	$750	$25,167
Masonry	sq ft	600	$75	$45,000
Miscellaneous Metals (stairs, grating, etc.)	LS	1	$20,000	$20,000
Roofing	sf	150	$50	$7,500
Architectural (Doors, windows, etc.)	LS	1	$8,000	$8,000
HVAC Equipment	LS	1	$40,000	$40,000
Misc. Equipment	LS	1	$30,000	$30,000
Structure (including HVAC)				$179,000
New Lift Station				**$1,411,000**
Subtotal 1				**$1,411,000**
Paving/Grading/Sitework	3.0%			$42,000
Coatings	1.0%			$14,000
Misc. Electrical	8%			$113,000
Misc. Instrumentation	5%			$71,000
Subtotal 2				**$1,651,000**
General Conditions 10%				$165,000
Estimating Contingency 50%				$826,000
Engineering (17%), Legal (2%), Adminstration (1%)				$330,000
Total Project Costs				**$2,972,000**

carollo

ESTIMATE CLASS: Conceptual Level

PROJECT : Peculiar WW Engineering Report
City of Peculiar, MO
JOB # : 9751A00

DATE : 8-Jan-16
BY : MJT

ELEMENT : **Scenario 2: New Northwest Lift Station, No tracts - 7.0 MGD**

REVIEWED: PMM

Description	Units	Quantity	Unit Cost	Cost
PROJECT COSTS				
New Submersible Pump Station (15' x 15' x 20', 18' deep)				
Land Acquisition	AC	1	$10,000	$10,000
Excavation	cu yd	1,927	$20	$38,533
Hauling	cu yd	208	$8	$1,667
Backfill	cu yd	1,760	$25	$44,000
Concrete	cu yd	345	$650	$224,250
Sluice Gate, 36"	EA	1	$10,000	$10,000
Jib Crane	EA	1	$20,000	$20,000
Miscellaneous Metals (stairs, grating, hacthes, etc.)	LS	1	$25,000	$25,000
Influent Pumps, 2.3 mgd	EA	3	$75,000	$225,000
Generator	LS	1	$75,000	$75,000
Generator Concrete Pad	CY	22	$650	$14,444
12" HDPE Force Main	LF	7,900	$35	$276,500
Discharge Valves & Fittings	EA	12	$6,000	$72,000
Misc. Equipment	LS	1	$10,000	$10,000
New Lift Station Station				$1,047,000
LS Elec Bldg (15' x 10' x 12', 2' D)				
Excavation	cu yd	30	$15	$1,000
Hauling	cu yd	38	$5	$1,000
Backfill	cu yd	24	$20	$1,000
Concrete	cu yd	34	$750	$25,167
Masonry	sq ft	600	$75	$45,000
Miscellaneous Metals (stairs, grating, etc.)	LS	1	$20,000	$20,000
Roofing	sf	150	$50	$7,500
Architectural (Doors, windows, etc.)	LS	1	$8,000	$8,000
HVAC Equipment	LS	1	$40,000	$40,000
Misc. Equipment	LS	1	$30,000	$30,000
Structure (including HVAC)				$179,000
New Lift Station				**$1,226,000**
Subtotal 1				**$1,226,000**
Paving/Grading/Sitework	3.0%			$37,000
Coatings	1.0%			$12,000
Misc. Electrical	8%			$98,000
Misc. Instrumentation	5%			$61,000
Subtotal 2				**$1,434,000**
General Conditions 10%				$143,000
Estimating Contingency 50%				$717,000
Engineering (17%), Legal (2%), Adminstration (1%)				$287,000
Total Project Costs				**$2,581,000**

carollo

ESTIMATE CLASS: Conceptual Level

PROJECT : Peculiar WW Engineering Report
City of Peculiar, MO
JOB # : 9751A00

DATE : 8-Jan-16
BY : MJT

ELEMENT : **New England Facility WWTP Lift Station w/Preliminary Treatment & Peak Flow S**

REVIEWED: PMM

Description	Units	Quantity	Unit Cost	Cost
PROJECT COSTS				
Peak Flow Holding Basin (2:1, L:W)				
Width	ft	**130**		
Length	ft	**260**		
Depth	ft	**8**		
Volume	gallons	2,100,000		
Excavation	cu yd	15,300	$20	$306,000
Hauling	cu yd	19,125	$8	$153,000
Backfill	cu yd	6,700	$25	$168,000
Pond Liner	SF	34,000	$2	$68,000
Miscellaneous Materials	LS	1	$15,000	$15,000
Piping	LS	1	$25,000	$25,000
Misc. Equipment	LS	1	$10,000	$10,000
Sump Pump (1+1)	LS	1	$15,000	$15,000
Peak Flow Holding Basin				$760,000
New Submersible Pump Station (15' x 15' x 20', 18' deep)				
Excavation	cu yd	1,927	$20	$38,533
Hauling	cu yd	208	$8	$1,667
Backfill	cu yd	1,760	$25	$44,000
Concrete	cu yd	345	$650	$224,250
Sluice Gate, 36"	EA	1	$10,000	$10,000
Jib Crane	EA	1	$20,000	$20,000
Miscellaneous Metals (stairs, grating, hacthes, etc.)	LS	1	$25,000	$25,000
Influent Pumps, 2.0 mgd	EA	3	$70,000	$210,000
Generator	LS	1	$75,000	$75,000
Generator Concrete Pad	CY	22	$650	$14,444
In-Plant Discharge Piping	LF	90	$120	$10,800
Discharge Valves & Fittings	EA	12	$6,000	$72,000
Misc. Equipment	LS	1	$10,000	$10,000
New WWTP Xfr Pump Station				$756,000
LS Bldg (55' x 70' x 20' D for Prelim Trmt)				
Excavation	cu yd	5,772	$15	$87,000
Hauling	cu yd	7,215	$5	$37,000
Backfill	cu yd	3,650	$20	$74,000
Concrete	cu yd	1,037	$750	$777,544
Masonry	sq ft	3,000	$75	$225,000
Miscellaneous Metals (stairs, grating, etc.)	LS	1	$75,000	$75,000
Roofing	sf	3,850	$50	$192,500
Architectural (Doors, windows, etc.)	LS	1	$10,000	$10,000
HVAC Equipment	LS	1	$90,000	$90,000
Odor Control System	LS	1	$300,000	$300,000
Misc. Equipment	LS	1	$30,000	$30,000
Structure (including HVAC)				$1,899,000
Screening Equipment				
Screens & Washer Compactor	EA	2	$230,000	$460,000

carollo

ESTIMATE CLASS: Conceptual Level

PROJECT : Peculiar WW Engineering Report
City of Peculiar, MO
JOB # : 9751A00

DATE : 8-Jan-16
BY : MJT

ELEMENT : **New England Facility WWTP Lift Station w/Preliminary Treatment & Peak Flow S**

REVIEWED: PMM

Description	Units	Quantity	Unit Cost	Cost
Slide Gates	EA	4	$12,000	$48,000
Misc. Equipment	LS	1	$25,000	$25,000
Screening Equipment				$533,000
Grit Removal Equipment				
Grit Removal Unit with Pump & Classifier	EA	1	$270,000	$270,000
Slide Gates - 60" x 36"	EA	3	$14,000	$42,000
Grit Piping and valves	LS	1	$75,000	$75,000
Misc. Equipment	LS	1	$25,000	$25,000
Grit Removal Equipment				$412,000
New Lift Station & Headworks Facility				**$4,359,000**
Subtotal 1				**$4,359,000**
Paving/Grading/Sitework	1.5%			$65,000
Coatings	0.5%			$22,000
Misc. Electrical	5%			$218,000
Misc. Instrumentation	3%			$131,000
Demolition (existing facilities)	8%			$349,000
Subtotal 2				**$5,144,000**
General Conditions 10%				$514,000
Estimating Contingency 50%				$2,572,000
Engineering (17%), Legal (2%), Adminstration (1%)				$1,029,000
Total Project Costs				**$9,259,000**

APPENDIX C – SRF DOCUMENT GUIDANCE CHECKLIST

MISSOURI DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
FINANCIAL ASSISTANCE CENTER

Clean Water SRF Project Pre-Closing Document Submittal Checklist

This checklist is intended to assist the SRF loan applicant during the period prior to the closing of the loan pool and is not required to be submitted to the department.

CHECKLIST ITEM	DATE SUBMITTED
SRF Application (Postmarked by November 15)	
Governing Body Resolution for Authorized Representative	
Draft Ballot Language	
Ballot language and Canvass of Votes	
EPA Form 4700-4 (Compliance Review Report)	
Facility Plan (with Clean Water Facility Plan Submittal Checklist attached)	
Water Quality Review Sheet (if required):	
Request Received by DNR	
Final WQRS Determination Issued	
Facility Plan Public Hearing	
Environmental Clearance Letters:	
Division of State Parks	
Division of State Parks, Historic Preservation	
U.S. Dept. of Interior, Fish & Wildlife	
Corps of Engineers District Office	
A-95 Clearinghouse	
Division of Geology and Land Survey (DGLS)	
Missouri Department of Conservation	
Location Outside 100 Year Floodplain	
Facility Plan Approved by MDNR	
Project Schedule	
Plans & Specifications w/ Construction Permit Application & Fee	
Contract 1 –	
Contract 2 –	
Contract 3 –	
Project Schedule (Revised)	
A/E Agreements:	
Planning Phase Services	
Design Phase Services	
Construction Phase Services (Draft)	
User Charge Ordinance	
User Charge Public Hearing	
Sewer Use Ordinance	
Easement Acquisition:	
Assurance with Respect to Real Property Acquisition Form	
Uniform Relocation Act Certificate of Title to Site	
EPA Form 5700-49 (Recipient Certification regarding Debarment & Suspension)	
Assurance of Local Share	
Intermunicipal Agreement(s)	
EIERA Application	