Regionalization Feasibility Study

City of Belton

Wastewater Treatment Regionalization Feasibility Study
Project No. 133840

Revision 1
5/9/2022

Regionalization Feasibility Study

prepared for

City of Belton
Wastewater Treatment Regionalization Feasibility Study
Belton, Missouri

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Revision 1
5/9/2022

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

INDEX AND CERTIFICATION

City of Belton
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Certification

I hereby certify, as a Professional Engineer in the state of Missouri, that the information in this document was assembled under my direct personal charge. This report is not intended or represented to be suitable for reuse by the City of Belton or others without specific verification or adaptation by the Engineer.

Rachelle Lynn Lowe , P.E. MO, 2010019568

Date: 5/9/2022

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
A2O	Anaerobic-Anoxic-Oxic
ARPA	American Rescue Plan Act
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CIP	Capital Improvement Project
CIPP	Cured In Place Pipe
SRF	Clean Water State Revolving Fund
FPS	Feet Per Second
GPCD	Gallons Per Capita Per Day
GPD	Gallons Per Day
HRT	Hydraulic Retention Time
I/I	Inflow and Infiltration
IPS	Influent Pump Station
IUP	Intended Use Plan
JCW	Johnson County Wastewater
LBVSD	Little Blue Valley Sewer District
LS	Lift Station
MARC	Mid-America Regional Council
MBCH	Missouri Baptist Children's Home
MDNR	Missouri Department of Natural Resources
MG	Million Gallons
MGD	Million Gallons Per Day

Abbreviation	Term/Phrase/Name
MMAD	Maximum Month Average Day
PF	Peaking Factor
PH	Peak Hour
PVC	Polyvinyl Chloride
RAS	Return Activated Sludge
UV	Ultraviolet
WAS	Waste Activated Sludge
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant (refers to the Regional WWTP)

1.0 EXECUTIVE SUMMARY

Burns & McDonnell evaluated the feasibility of expanding the existing Belton, Missouri Wastewater Treatment Facility (WWTF) into a regional treatment plant to treat wastewater flows from the areas of Belton, Raymore, and Peculiar, as well as smaller, private communities. The idea of regionalization was introduced to the City of Belton by the Missouri Department of Natural Resources (MDNR). MDNR proposed that Olson Acres, a private community with a failing wastewater lagoon, connect to the City of Belton's collection system. The City initiated a feasibility study with Burns & McDonnell to understand the opportunities associated with a regional wastewater treatment plant (WWTP) with multiple contributors. The feasibility study, summarized in this report, includes watershed analyses of the proposed contributors, a capacity review of the Belton collection system and treatment facility, a conceptual treatment area with proposed connections and pipeline improvements, a phased approach to collection system and plant improvements, an engineer's opinion of probable cost, and funding opportunities.

1.1 Watershed Analysis

A watershed analysis was completed to determine how communities surrounding the City of Belton handle sewer treatment needs. Several communities were evaluated to determine if their proximity to the City of Belton made them good candidates for regionalization.

The southern half of the City of Belton, the southwest area of the City of Raymore, the undeveloped northwest corner of the City of Peculiar, along with the private communities of Crown Trailer Sales, Oasis Mobile Home Park, Olson Acres, and Pickering Place are located in the East Creek Subwatershed. This subwatershed is one of three located within the South Grand Watershed. Since the City of Belton's existing WWTF is located in the same subwatershed, all these contributors could connect to the Belton collection system and gravity flow to the existing treatment facility.

The northern sections of Raymore and Belton are located in an adjacent watershed and pump their wastewater flows north to the Little Blue Valley Sewer District (LBVSD). Loch Lloyd Village, located northwest of Belton, sends flow via gravity to Johnson County Wastewater (JCW) for treatment. Peculiar, located in an adjacent subwatershed, operates two lift stations and pumps their wastewater flows to their own WWTF. See Figure 2-1 for an overall map of the watersheds analyzed. In order for communities located outside of East Creek Subwatershed to participate in wastewater regionalization, they would be required to pump their flows into the East Creek Subwatershed to the Belton WWTF or collection system. It is significantly more feasible for contributors located within the East Creek Subwatershed to be included in the regionalization than contributors located in adjacent subwatersheds.

1.2 Collection System and WWTF Capacity Review

The available capacity of the wastewater treatment facility and collection system was evaluated to determine if additional contributors could be accommodated within the existing system. Belton's trunk sewers, which are 24-inch diameter or larger, were evaluated along with additional smaller sewer mains critical to a regional collection and treatment system. Roughly half of the pipelines that were evaluated had capacity to convey existing average flows, but did not have the capacity for existing peak flows.

The Belton WWTF's influent pump station (IPS) is located approximately half a mile north of the treatment facility and has a total rated pumping capacity of 9.84 million gallons per day (MGD). A 20-inch force main conveys flow to the headworks building of the WWTF. According to their MDNR permit, the Belton WWTF is designed for a flow of 2.26 MGD. Based on flow data collected at the WWTF from January 2019 to July 2020, the average daily flow is 1.9 MGD and the average maximum daily flow in a month during the same period is 4.2 MGD. The City of Belton reported that peaks as large as 7.0 MGD are experienced at the WWTF from the IPS. Since the current population of Belton has surpassed the permitted design population of 22,600 and peak flows frequently exceed the permitted design capacity, immediate improvements are needed to increase capacity at the WWTF.

1.3 Coordination with Potential Contributors

For a community to be eligible for the Regionalization Incentive Grant, MDNR requires them to be located within a 5-mile radius of the facility to which they are connecting. Seven private communities, currently operating their own treatment facilities, were considered as possible contributors to a regional WWTP. Ultimately, only four of these private communities were selected to be included in the conceptual treatment area. Crown Trailer Sales, Oasis Mobile Home Park, and Olson Acres are in close proximity to existing collection system infrastructure and would flow by gravity. Pickering Place would tie into the new gravity line from Raymore when they connect.

1.4 Conceptual Treatment Area

The conceptual treatment area for the wastewater regionalization includes contributions from the cities of Belton, Peculiar, and Raymore, and the four private communities of Olson Acres, Oasis Mobile Home Park, Crown Trailer Sales, and Pickering Place. Raymore and the private communities will connect to Belton's collection system by gravity lines. To treat flow from the City of Peculiar, a system of lift stations and force mains are required to pump flow to the East Creek Subwatershed. Therefore, only northwest Peculiar, located in the East Creek Subwatershed, will contribute wastewater flows to the regional Belton WWTP once it is developed. To accommodate the potential development area in northwest Belton and Loch Lloyd Village, a system of lift stations and force mains are required. It is

anticipated that wastewater from these areas will be directed to the existing LBVSD service area for treatment.

1.5 Priority Regionalization Improvements

A regional wastewater solution for Belton, Raymore, Peculiar, and smaller private communities can be achieved through several priority improvement projects. The list of projects, described below, include plans to bring on neighboring communities, upsize necessary sewer collection systems, and make incremental upgrades to the existing treatment facility. The connection of either Raymore and Pickering Place or northwest Peculiar can occur interchangeably and would require the existing Belton WWTF to expand from 2.26 MGD to 7.0 MGD. The WWTF would then be considered a regional WWTP due to contributions from multiple communities. Ultimately, the plant would have to undergo a second expansion from 7.0 MGD to 12 MGD in order to treat flows from both Raymore and northwest Peculiar.

The list of priority regionalization projects is as follows:

- A new system of lift stations and force mains to convey wastewater flow from northwest Belton and the Village of Loch Lloyd north to LBVSD for treatment.
- An increase in the capacity of the West Fork trunk sewer, Belton WWTF IPS and force main, and the construction of a wet weather holding basin to handle peak flows.
- Connection of Raymore and Pickering Place to Belton's collection system via a new 24-inch gravity trunk main to connect to the existing trunk main, which would have to be upsized to accommodate the additional flow.
- Expansion of the 2.26 MGD Belton WWWTF to a 7 MGD regional WWTP.
- Connection of northwest Peculiar to Belton's collection system via an 18-inch gravity main.
- Connection of small, private communities to Belton's collection system via 8-inch gravity mains.
- Expansion of the regional WWTP from 7 MGD to 12 MGD.

1.6 Costs and Funding

The engineer's opinion of probable cost (OPC) for the wastewater regionalization including collection system improvements and plant expansion costs are shown in Table 1-1. Descriptions and costs for each phase by contributor are shown below. There are multiple funding opportunities that should be pursued

by the City of Belton for collection system and WWTF improvements. Private communities tying into the collection system could be fully funded by MDNR's Regionalization Incentive Grant. Plant improvements could be partially funded from MDNR grants and partially funded through loans from Missouri's State Revolving Loan Fund. summarizes the recommended project work by phase and the associated OPC.

Table 1-1 Recommended Improvements and Opinions of Probable Cost

Project Description	Cost
Belton	
CIP B1: West Fork Trunk Sewer Improvements	$ 5,100,000
CIP B2: Influent Pump Station and Force main Improvements	$ 13,000,000
CIP B3: Wet Weather Holding Basin	$ 11,000,000
Belton Total	**$ 29,100,000**
Northwest Belton	
CIP N1: Fairway Ridge LS	$ 640,000
CIP N2: Loch Lloyd Tie-in to Fairway Ridge LS	$ 3,100,000
CIP N3: New Holmes Road LS	$ 460,000
CIP N4: Gravity Main/Force main to Fairway Ridge LS	$ 1,200,000
CIP N5: New 58 Highway LS	$ 200,000
CIP N6: Force main from 58 Highway LS to Fairway Ridge LS	$ 1,600,000
CIP N7: New Effertz Farm LS	$ 480,000
CIP N8: Force main across Effertz Farm	$ 1,900,000
CIP N9: Force main from Prospect & Markey to Markey Park LS	$ 800,000
CIP N10: New Markey Park LS	$ 480,000
CIP N11: Force main from Markey Park LS to 155th Street	$ 1,500,000
CIP N12: Force main from 155th Street to LBVSD	$ 1,000,000
Northwest Belton Total	**$ 13,360,000**
Raymore	
CIP R1: East Creek Interceptor Improvements	$ 5,400,000
CIP R2: Raymore tie-in from Owen Good Pump Station	$ 5,800,000
CIP R3: Pickering Place tie-in	$ 1,100,000
CIP R4: Belton WWTP Expansion	$ 72,000,000
Raymore Total	**$ 84,300,000**
Private Communities	
CIP C1: Olson Acres tie-in to Belton collection system	$ 2,700,000
CIP C2: Oasis tie-in to Belton collection system	$ 700,000
CIP C3: Crown Trailer Sales tie-in to Belton collection system	$ 1,600,000
Private Communities Total	**$ 5,000,000**
Peculiar	
CIP P1: Northwest Peculiar Trunk Sewer to Belton IPS	$ 3,600,000
CIP P2: Belton WWTP Expansion	$ 72,000,000
Peculiar Total	**$ 75,600,000**

2.0 WATERSHED ANALYSES

The cities of Belton, Raymore, and Peculiar, along with the smaller adjacent communities considered for this regionalization feasibility study, are all located within Cass County, Missouri. Although Cass County is located primarily in the South Grand Watershed and Big Creek Watershed, some parts are located in the Little Blue River Watershed and Blue River Watershed. The South Grand Watershed includes several smaller subwatersheds including East Creek, Headwaters East Branch South Grand River, and Massey Creek. The Blue River Watershed includes the largely undeveloped northwest part of Belton and Loch Lloyd Village. The Little Blue River Watershed includes northern parts of Belton and Raymore. Wastewater from these areas is currently treated by the LBVSD. The wastewater from the southern portion of Raymore, located in South Grand Watershed, is pumped north to LBVSD for treatment. A detailed map of the Cass County watersheds is shown in Figure 2-1.

2.1 South Grand Watershed

2.1.1 East Creek Subwatershed Analysis

The South Grand Watershed includes several smaller subwatersheds. East Creek Subwatershed includes the southern half of the City of Belton, the southwest part of the City of Raymore, and the undeveloped northwest corner of the City of Peculiar. The smaller private communities of Crown Trailer Sales, Oasis Mobile Home Park, Olson Acres, and Pickering Place currently operate their own WWTFs in the subwatershed. See Figure 2-2 for a detailed map showing the locations of the communities within the subwatershed.

Belton's collection system is on the northwest ridge of the East Creek Subwatershed, with half of the flow directed north to be treated by LBVSD and the rest directed south to the Belton WWTF. Two main sanitary sewers in the East Creek Subwatershed carry wastewater from the southern city limits to the Belton WWTF. A trunk sewer is a gravity sewer line that is 24-inches in diameter or greater. The West Fork trunk sewer is the west sanitary sewer line that carries a cumulative peak base flow of 1.0 MGD. It starts at 24-inch diameter within city limits and then increases to 27-inch diameter halfway to the WWTF. The east sewer line, East Creek sewer line, is 15-inch diameter and carries a cumulative peak base flow of 0.5 MGD from the southeast corner of Belton to the WWTF. The two sanitary sewer lines combine as a 36-inch diameter trunk sewer flowing to the WWTF.

Raymore's collection system is on the northeast ridge of the East Creek Subwatershed. Raymore's wastewater flow in the East Creek Subwatershed is currently conveyed to two main locations, Owen Good Pump Station and Whitetail Run Pump Station. Whitetail Run Pump Station pumps to Owen Good

Pump Station. Owen Good Pump Station pumps an average daily flow of 2.0 MGD north through a 30-inch force main, a sanitary line under pressure, discharging into the LBVSD collection system.

Based on the review of the East Creek Subwatershed, feasible opportunities exist for portions of Belton, Raymore, private communities, and the undeveloped area of northwest Peculiar to be conveyed via a gravity sewer collection system to the existing Belton WWTF.

2.1.2 Headwaters East Branch South Grand River Subwatershed Analysis

The Headwaters East Branch South Grand River Subwatershed is located directly east of the East Creek Subwatershed within the South Grand Watershed. The developed portion of the City of Peculiar, including East Lift Station and C Highway Lift Station, the Peculiar WWTF, and the Missouri Baptist Children's Home (MBCH) Byrne Campus WWTF are located within this watershed. The two lift stations pump wastewater southeast to the Peculiar WWTF. East Lift Station and C Highway Lift Station pump an average daily flow of 0.41 MGD and 0.02 MGD, respectively. Figure 2-3 shows a detailed map of the communities and facilities located within the subwatershed.

Based on the review of the Headwaters East Branch South Grand River Subwatershed, no feasible opportunities exist to convey flow via gravity to a regional WWTP. The only opportunity to consolidate wastewater flows from Peculiar is to pump flows to the East Creek Subwatershed for treatment. Therefore, only the area of northwest Peculiar located within the East Creek Subwatershed will be considered for future regionalization.

2.1.3 Massey Creek Subwatershed Analysis

The Massey Creek Subwatershed is directly west of the East Creek Subwatershed within the South Grand Watershed and includes the Cleveland WWTF and the RK Collision Repair Center WWTF. See Figure 2-4 for a detailed map showing the locations of the communities and facilities within the subwatershed. Based on the review of the Massey Creek Subwatershed, no feasible opportunities exist to convey flow via gravity to a regional WWTP. The only opportunity to consolidate wastewater flows from Cleveland WWTF and the RK Collision Repair Center WWTF is to construct lift stations and force mains to convey flows to the East Creek Subwatershed for treatment.

2.2 Blue River Watershed Analysis

The Blue River Watershed is northwest of the South Grand River Watershed. This watershed spans the state line of Missouri and Kansas and includes the largely undeveloped northwest part of Belton and Loch Lloyd Village. The City of Belton reported that this area is anticipated to experience significant growth in the future. The Blue River Watershed contains the Fairway Ridge Lift Station, which is owned and

operated by the City of Belton. Fairway Ridge Lift Station currently pumps wastewater to LBVSD for treatment. Loch Lloyd Village, located northwest of Belton, currently sends flow via gravity to Johnson County Wastewater for treatment. Refer to Figure 2-5 for a detailed map showing the locations of the communities and facilities within the watershed.

Based on the review of the Blue River Watershed, no feasible opportunities exist to convey flows from northwest Belton or Loch Lloyd Village via gravity to a regional WWTP. The only opportunities to consolidate wastewater flows from these areas to a regional WWTP is to pump flows to the East Creek Subwatershed or north to LBVSD for treatment.

2.3 Little Blue River Watershed Analysis

The Little Blue River Watershed is east of the Blue River Watershed. This watershed includes northern parts of Belton and Raymore which currently pump wastewater flows to LBVSD for treatment. Flows will continue to be treated by LBVSD and will not be considered as part of the Belton regionalization.

Figure 2-1 Cass County Watersheds

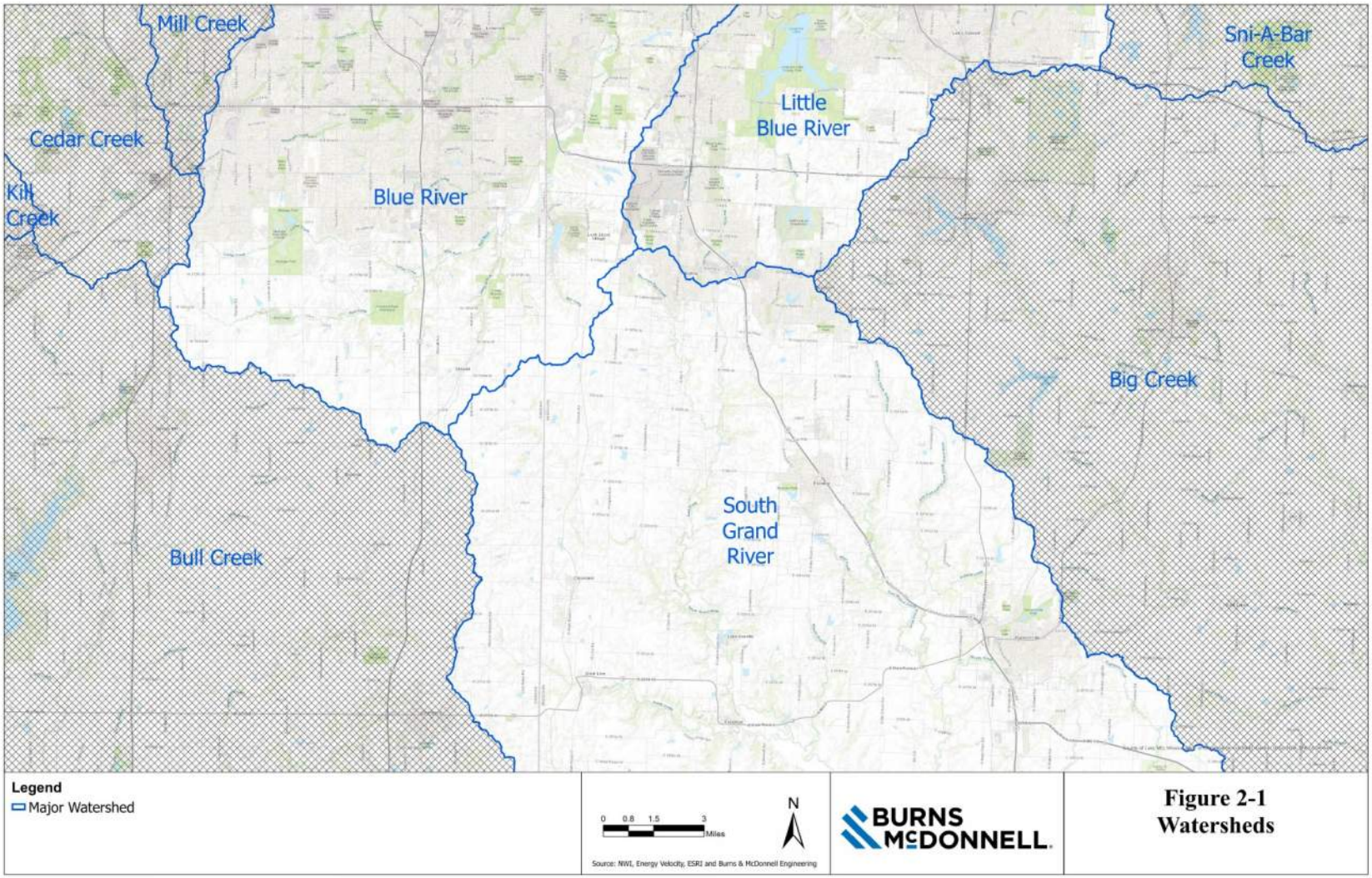


Figure 2-2 East Creek Subwatershed

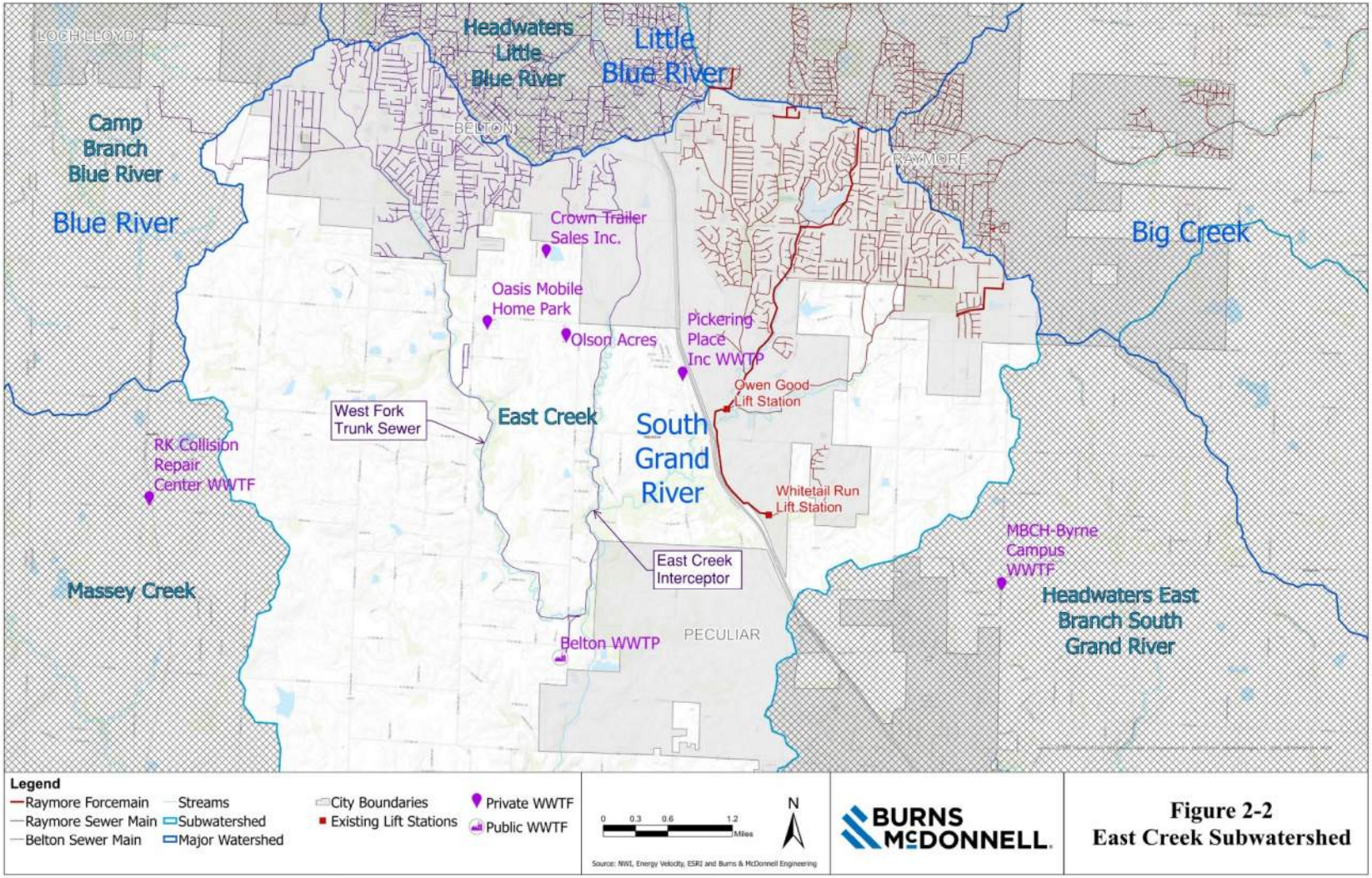


Figure 2-3 Headwaters East Branch South Grand River Subwatershed

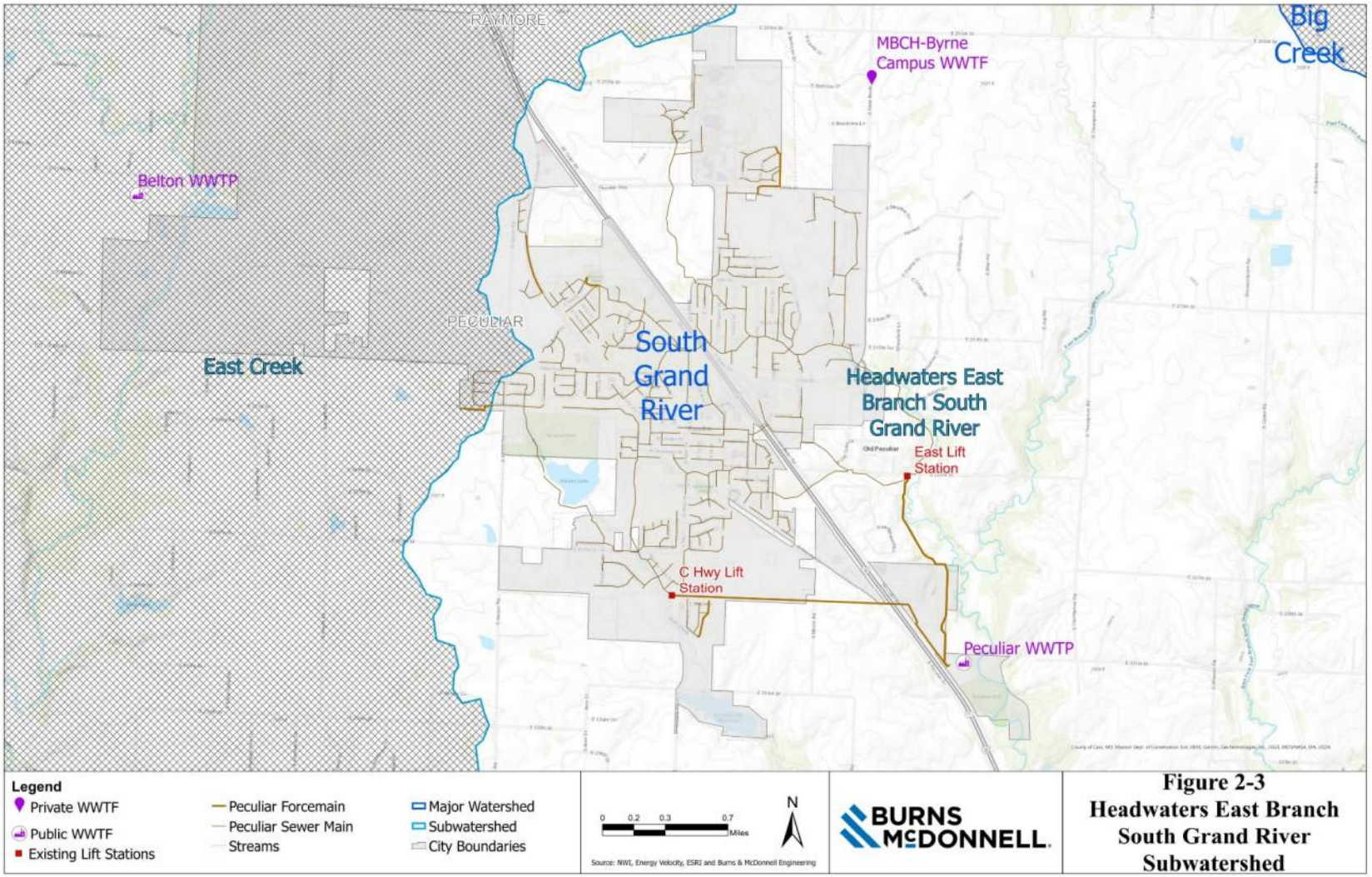


Figure 2-4 Massey Creek Subwatershed

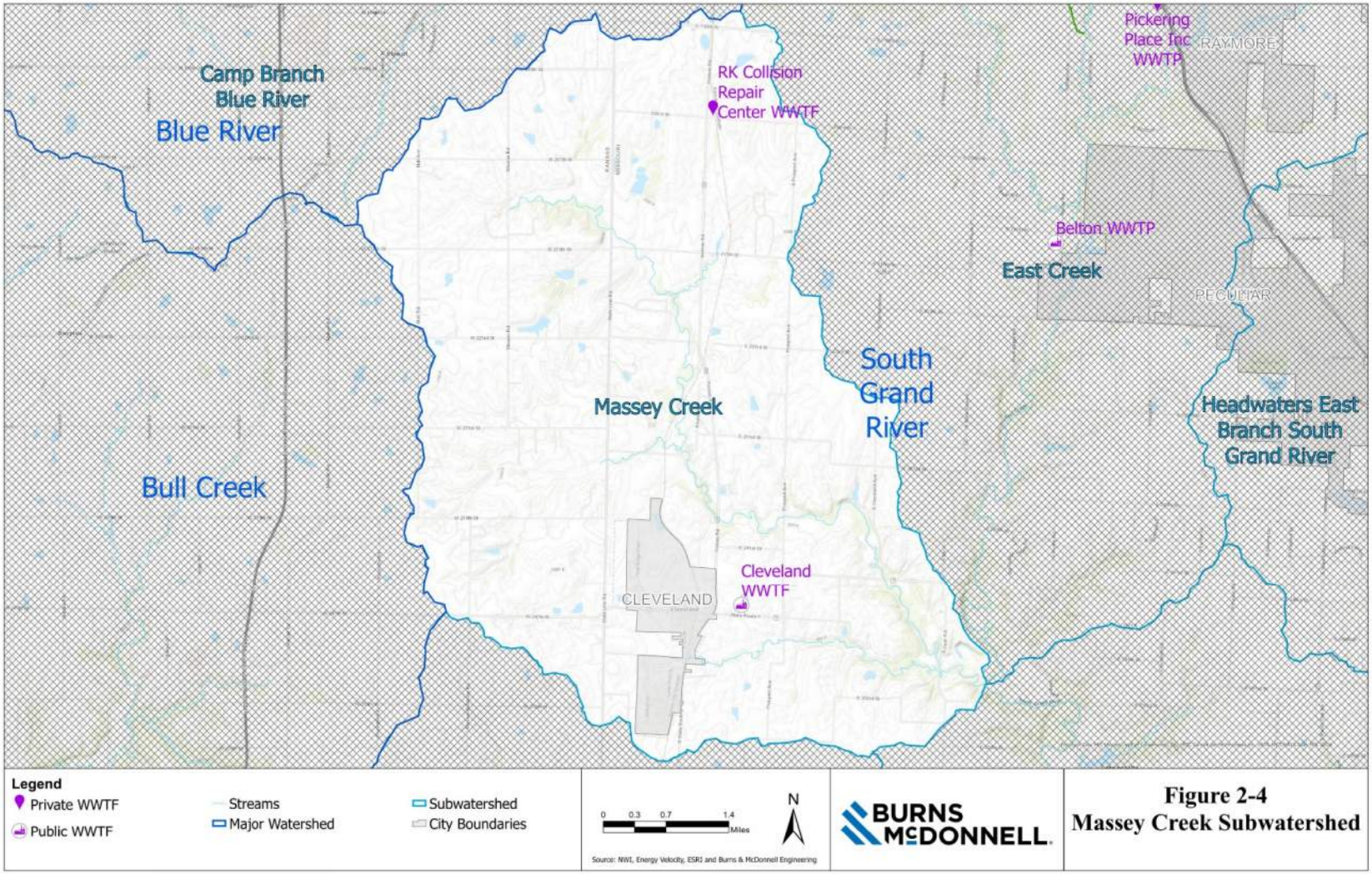
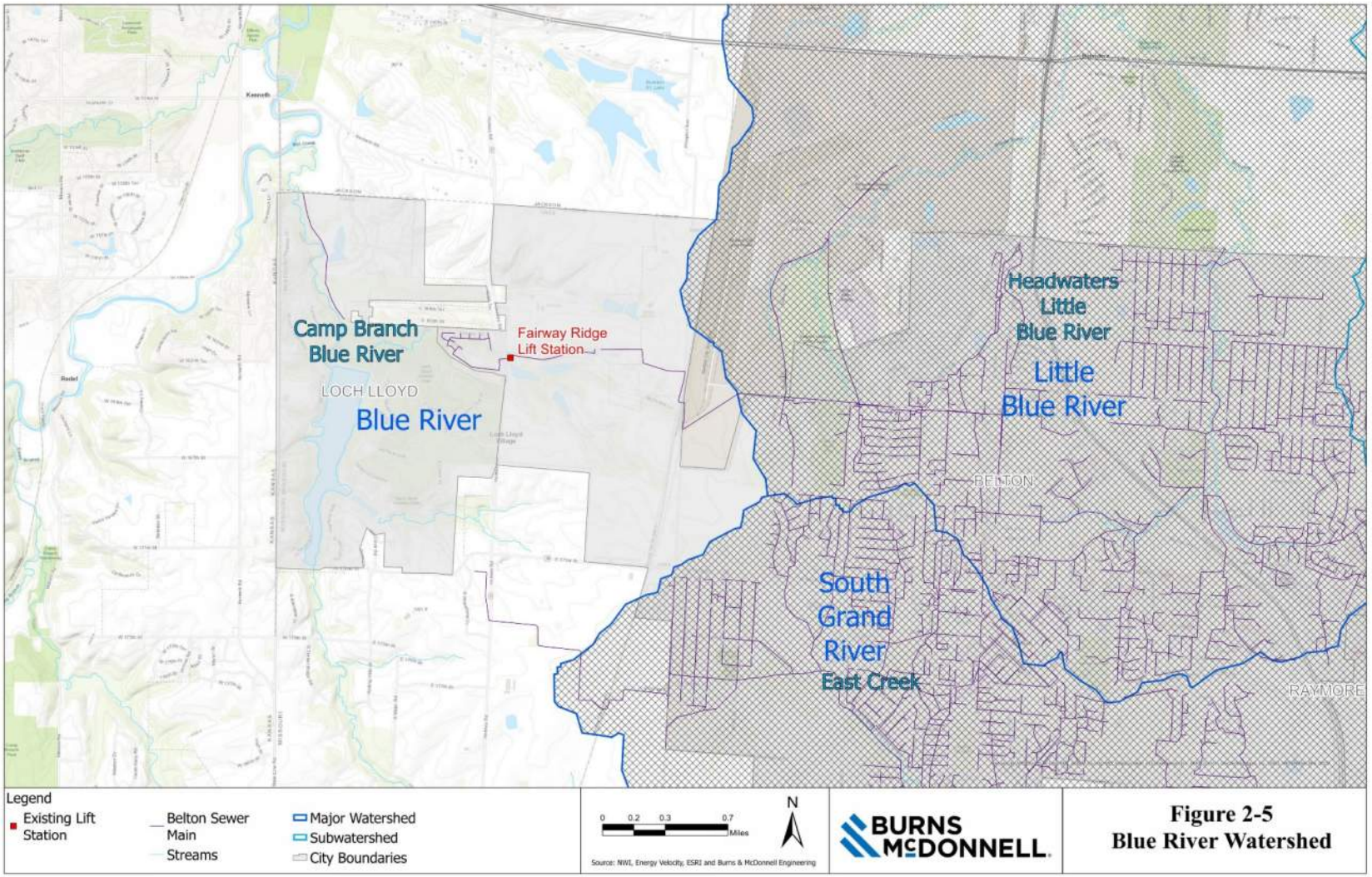


Figure 2-5 Blue River Watershed



3.0 CAPACITY REVIEWS

3.1 Collection System Capacity Review

The collection system for the City of Belton covers 14,500 acres and serves a population of approximately 24,000. The collection system consists of 125 miles of sewer lines, 2,647 manholes, 8 lift stations, and 8 force mains. Burns & McDonnell reviewed the capacity of Belton's trunk sewers and additional sewer lines that would be important to a regional system.

The collection system capacity review was conducted by comparing existing flow data from the *2020 Wastewater Collection System Master Plan Update* (2020 Master Plan) to the average and peak design capacity. Manning's Equation was used to calculate design capacity using slope values from GIS files provided by the City of Belton. According to the City of Belton's GIS, a Manning's roughness coefficient of 0.01 was assumed for cured in place pipe (CIPP) lined sewer lines, which has similar roughness to polyvinyl chloride (PVC). A full capacity scenario occurs when the flows are equivalent to 0.8 of the full pipe volume. Roughly half of the pipes that were evaluated did not have the capacity for the peak flows listed in the 2020 Master Plan but had enough capacity to handle the existing average daily flows. Tables evaluating each pipe segment are included in Appendix A. Pipe segments highlighted in yellow in Figure 3-1 are under capacity for existing peak flow estimates. Pipe segments highlighted in red are under capacity for existing average flow estimates.

3.2 Collection System Contributors

Potential locations where adjacent communities could tie into the existing Belton collection system and the respective downstream trunk sewers and sewer lines were reviewed to determine if the existing trunk sewers and sewer lines had enough capacity to accommodate additional flows from those communities. The available capacity of the trunk sewers was found by subtracting the average flows in the pipes from the calculated design capacity and then comparing the available capacity to the flow data collected from the adjacent communities.

The West Fork trunk sewer has enough available capacity to handle additional average daily flows from connecting the Oasis Mobile Home Park. The East Creek trunk sewer has enough available capacity to handle additional average daily flows from Olson Acres and Crown Trailer Sales. The capacity review indicates that the East Creek trunk sewer is under capacity for existing peak flows, and four segments have been identified as surcharged during average flows. Before Raymore can connect to the East Creek trunk sewer, the capacity would need to be increased to handle anticipated average and peak flows. The pipe segment from where West Fork trunk sewer and East Creek trunk sewer combine to the IPS does not

have enough available capacity to handle additional peak flows, but can handle the average flows from the adjacent communities. Tables evaluating each pipe segment are shown in Appendix B. Pipe segments designated with an asterisk are under sized and over capacity during peak flows. Pipe segments designated with two asterisks are under sized and over capacity during average flows. Color-coded pipe segments are shown in Figure 3-1 and Figure 3-2. Pipe segments highlighted in yellow are under capacity for peak flows, and pipe segments highlighted in red are under capacity for average flow.

3.3 WWTF Capacity Review

The Belton WWTF is located south of the City of Belton on 20 acres of land near the intersection of South Mullen Road and East 211th Street. Wastewater flows by gravity from the current treatment area to the Belton WWTF IPS. The IPS is located approximately one-half a mile north of the treatment facility and houses six submersible pumps with a total capacity of 9.84 MGD and a firm capacity of 8.18 MGD. A 20-inch force main conveys the flow to the headworks building of the WWTF. Force mains are typically designed for velocities of 2-8 feet per second (fps). At a maximum design velocity of 8 fps, the maximum capacity of the force main is 11.3 MGD. However, peak flows to the WWTF have exceeded the rated capacity of the IPS. According to the *2012 WWTF Facility Plan Update* by Carollo, during peak flow events, the water level in the IPS wet well increases above the design level which decreases the pump static head and the head that pumps operate against. A decrease in total dynamic head allows the pumps to pump at a higher flow to the WWTF. Flows to the WWTF exceed the capacity of both the IPS and the force main.

The existing plant facilities include preliminary treatment, secondary treatment, disinfection, and solids handling. Preliminary treatment consists of screening through a manually cleaned bar rack and a grit settling chamber. Secondary treatment is an activated sludge process designed for nutrient removal and consists of an aeration basin followed by three clarifiers. The final treatment step is ultraviolet (UV) disinfection prior to discharge into East Creek. Sludge treatment consists of aerobic digestion, dewatering via belt filter press, and disposal at a landfill. Return activated sludge (RAS) collected from the clarifiers is returned to the aeration basin. Waste activated sludge (WAS) from the aeration basin is periodically pumped to aerated sludge holding tanks. Solids in the sludge holding tanks are allowed to settle and are then dewatered by belt filter presses before they are sent to a landfill for disposal.

In 2020, Carollo performed a capacity analysis and listed the estimated capacities of each unit process in their *Wastewater Treatment Facility Capacity Evaluation* memorandum (2020 WWTF Capacity Evaluation). The unit process that limits plant capacity is the aeration basin. The capacity of the aeration basin is 3.25 MGD based on the minimum hydraulic retention time (HRT) of 18 hours recommended in

MDNR's *Wastewater Guidelines and Standards Document*. The capacities of major unit processes are summarized in Table 3-1.

Table 3-1 Existing Treatment Process Capacities

Existing Facilities	Estimated Capacity (MGD)	
Unit Process	**Average Conditions**	**Peak Conditions**
Influent Pump Station	--	7.5
Screenings Removal	--	20
Grit Removal	16	17
Influent Flume	--	21
Aeration Basin	3.25	--
Secondary Clarifier	4.62	11.55
Effluent Flume	--	27
UV Disinfection	4.5	16
Sludge Holding Tanks	4.56	--

According to Missouri State Operating Permit No. MO-0117412, the Belton WWTF is designed for a population of 22,600 and a design flow of 2.26 MGD. U.S. Census data indicates the population of Belton in 2020 was 23,953. Based on flow data collected at the WWTF from January 2019 to July 2020, the average daily flow is 1.9 MGD and the average maximum daily flow in a month during the same period is 4.2 MGD. This data was not correlated to rainfall. It is recommended that detailed analysis of rainfall and measured flow at the WWTF be performed during future facility planning. The City of Belton reported that peaks of approximately 7.0 MGD are experienced at the WWTF. Since Belton has exceed both its permitted design population and flow capacity, immediate improvements are needed to increase the capacity at the WWTF. With additional capacity, the WWTF could facilitate wastewater regionalization by accepting flows from adjacent communities.

Figure 3-1 Existing Collection System Capacity Review

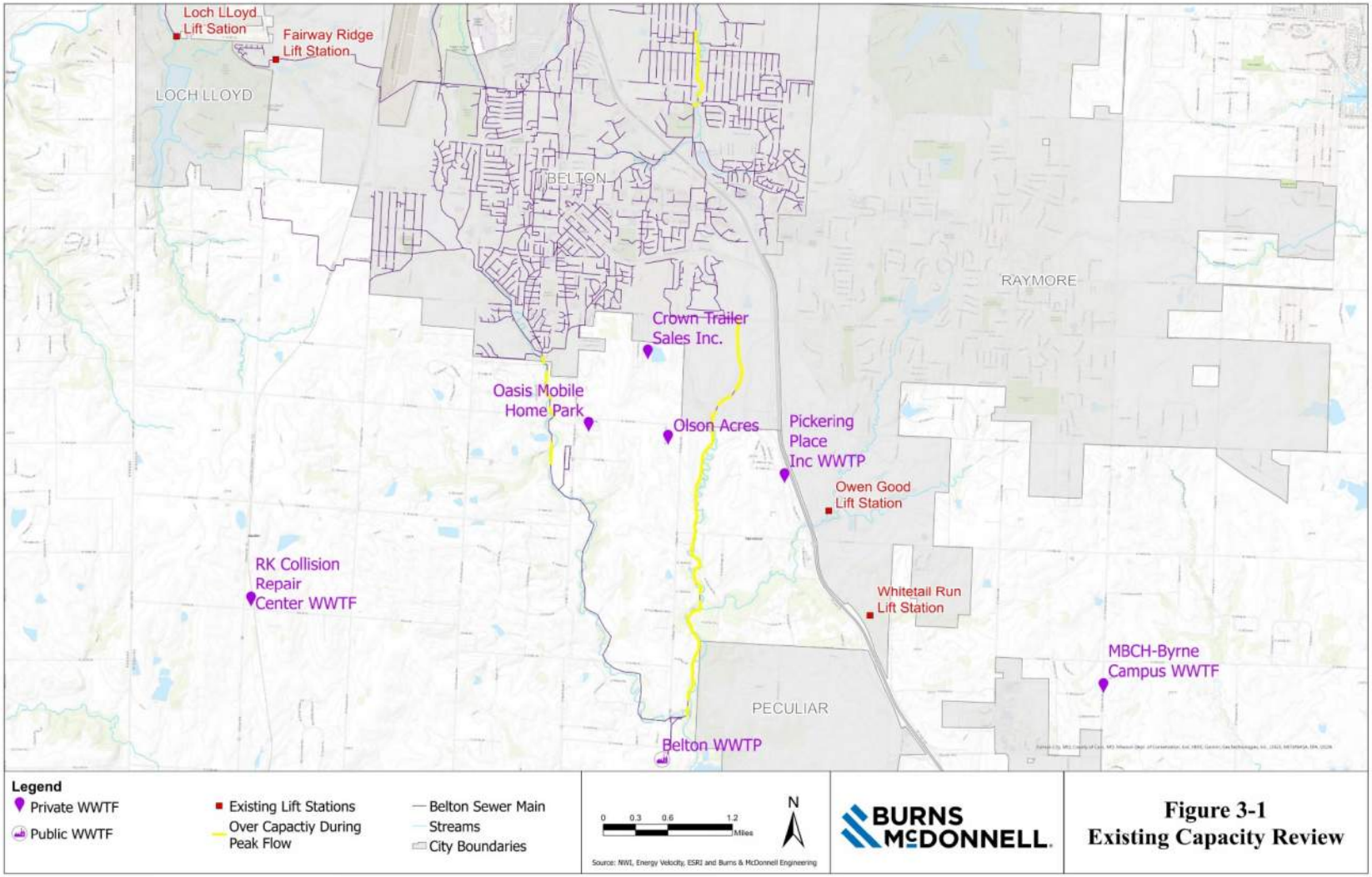
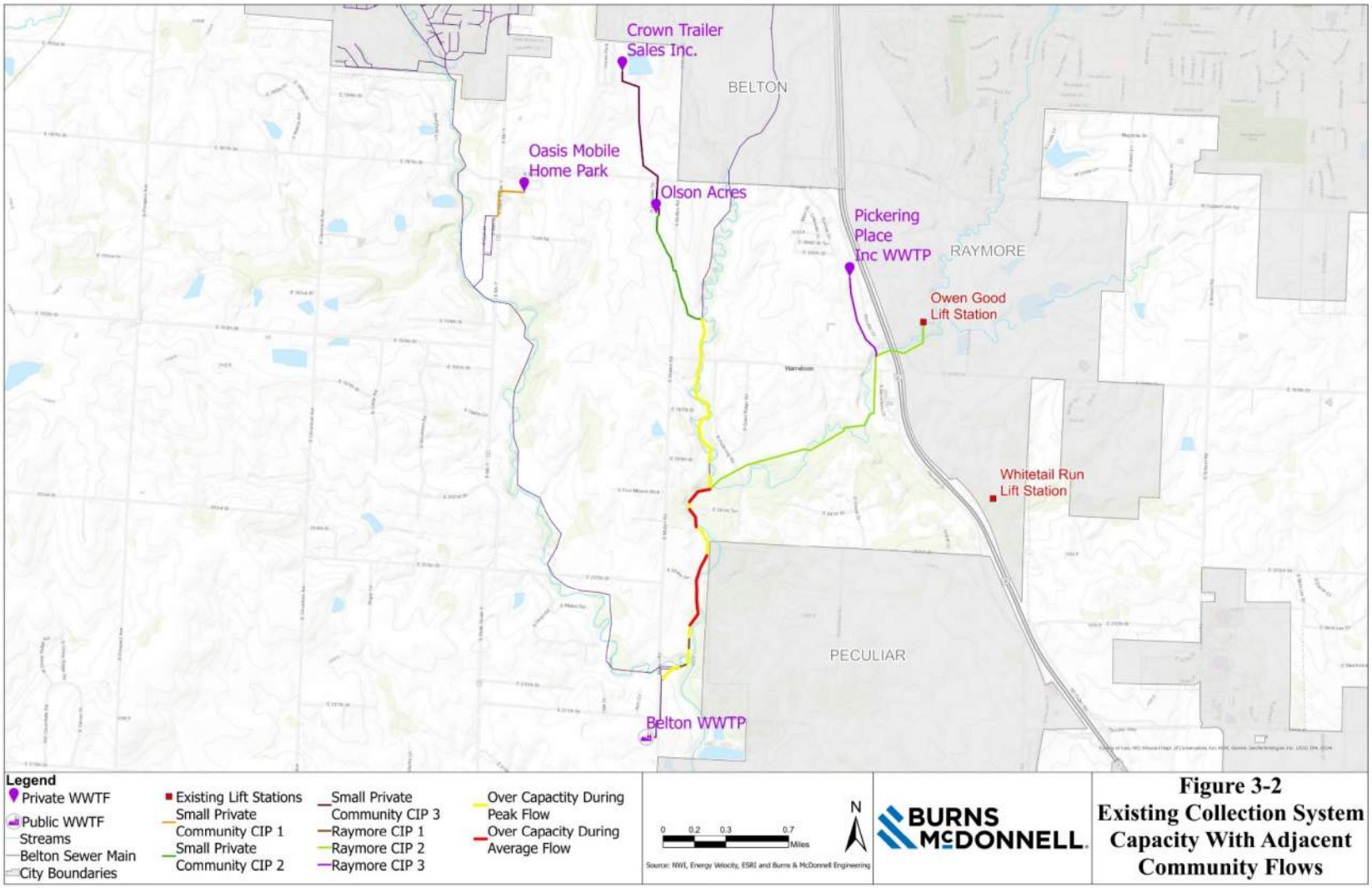


Figure 3-2 Existing Collection System Capacity with Adjacent Community Flows



4.0 COORDINATION WITH POTENTIAL CONTRIBUTORS

MDNR encourages regionalization to reduce the number of small facilities that are currently under or likely to come under enforcement action with the Department. Regionalization is beneficial for these small communities since they often lack the financial and technical resources to operate and upgrade their facilities and meet stringent limits. MDNR offers funding for smaller communities through a Regionalization Incentive Grant. In order for communities to be considered for the grant, MDNR requires proposed projects to be located a maximum of 5 miles from the applicant's treatment facility.

Small communities within a 5-mile radius of the City of Belton, shown in Figure 4-1, are considered to be feasible contributors to a regional WWTP. These adjacent communities have their own MDNR operating permits and currently treat their own wastewater flows with septic or onsite lagoon systems. Table 4-1 provides a summary of the design population and wastewater capacities for the smaller, private communities. Each of these communities were contacted to verify method of treatment, operation and maintenance concerns, anticipated growth, and their interest in regionalization of wastewater treatment. A summary and description of each of these communities is included in the paragraphs below.

Table 4-1 Summary of Adjacent Communities' Population and Wastewater Capacity

Owner	Design Population	Rated Wastewater Capacity (MGD)
Olson Acres	118	0.01
Oasis Mobile Home Park	200	0.02
Crown Trailer Sales	640	0.05
Pickering Place	300	0.03
MBCH-Byrne Campus	25	0.0025
RK Collision Repair Center	12	0.0012
Cleveland WWTF	1,000	0.1
Total	**2,295**	**0.21**

4.1 Olson Acres

The Olson Acres WWTF serves a population of approximately 118 people and has a rated wastewater capacity of 10,000 gallons per day (gpd) with no future growth anticipated. The Olson Acres treatment facility consists of a lagoon that is failing to meet permit requirements, and they do not have any improvements planned. The lagoon is undersized and frequently overflows. MDNR previously suggested Olson Acres connect to Belton's collection system, and subsequent discussions have occurred between Olson Acres management and the City of Belton on a possible connection. Olson Acres was not connected previously since they are located outside of Belton city limits.

4.2 Oasis Mobile Home Park

The Oasis Mobile Home Park was contacted to verify method of treatment, operation and maintenance concerns, anticipated population growth and to gauge their interest in regional wastewater treatment, but was unresponsive. According to their MDNR permit, the Oasis Mobile Home Park WWTF serves a population of approximately 200 people and has a rated wastewater capacity of 20,000 gpd.

4.3 Crown Trailer Sales

Crown Trailer Sales was contacted to verify method of treatment, operation and maintenance concerns, anticipated population growth and gauge their interest in regional wastewater treatment, but was unresponsive. According to their MDNR permit, the Crown Trailer Sales WWTF is a lagoon with a design population of 640 people and a rated wastewater capacity of 50,000 gpd.

4.4 Pickering Place

According to their MDNR permit, the Pickering Place WWTF is a mechanical plant that serves a population of approximately 300 people and has a rated wastewater capacity of 30,000 gpd. A Pickering Place representative confirmed that their plant has not experienced any operational issues and that no future growth is anticipated.

4.5 MBCH-Byrne Campus

The MBCH-Byrne Campus is located in Peculiar, Missouri. They operate a packaged plant that serves approximately 25 people and has a rated capacity of 2,500 gpd. No future growth is anticipated. The plant has occasionally exceeded their permitted E. coli limits but does not have any other significant operational or treatment issues. The MCBH-Byrne Campus and the City of Peculiar are coordinating which easements are needed for a connection to the City of Peculiar's collection system. The connection could flow either by gravity or a small lift station.

4.6 RK Collision Repair Center

The RK Collision Repair Center WWTF consists of individual aerated septic tanks, a two-cell lagoon, and sludge disposal by contract hauler. The facility has a design population of 12 people and flow of 1,200 gpd according to their MDNR operating permit. RK Collision Repair Center was contacted to verify method of treatment, operation and maintenance concerns, anticipated population growth and gauge their interest in regional wastewater treatment, but was unresponsive.

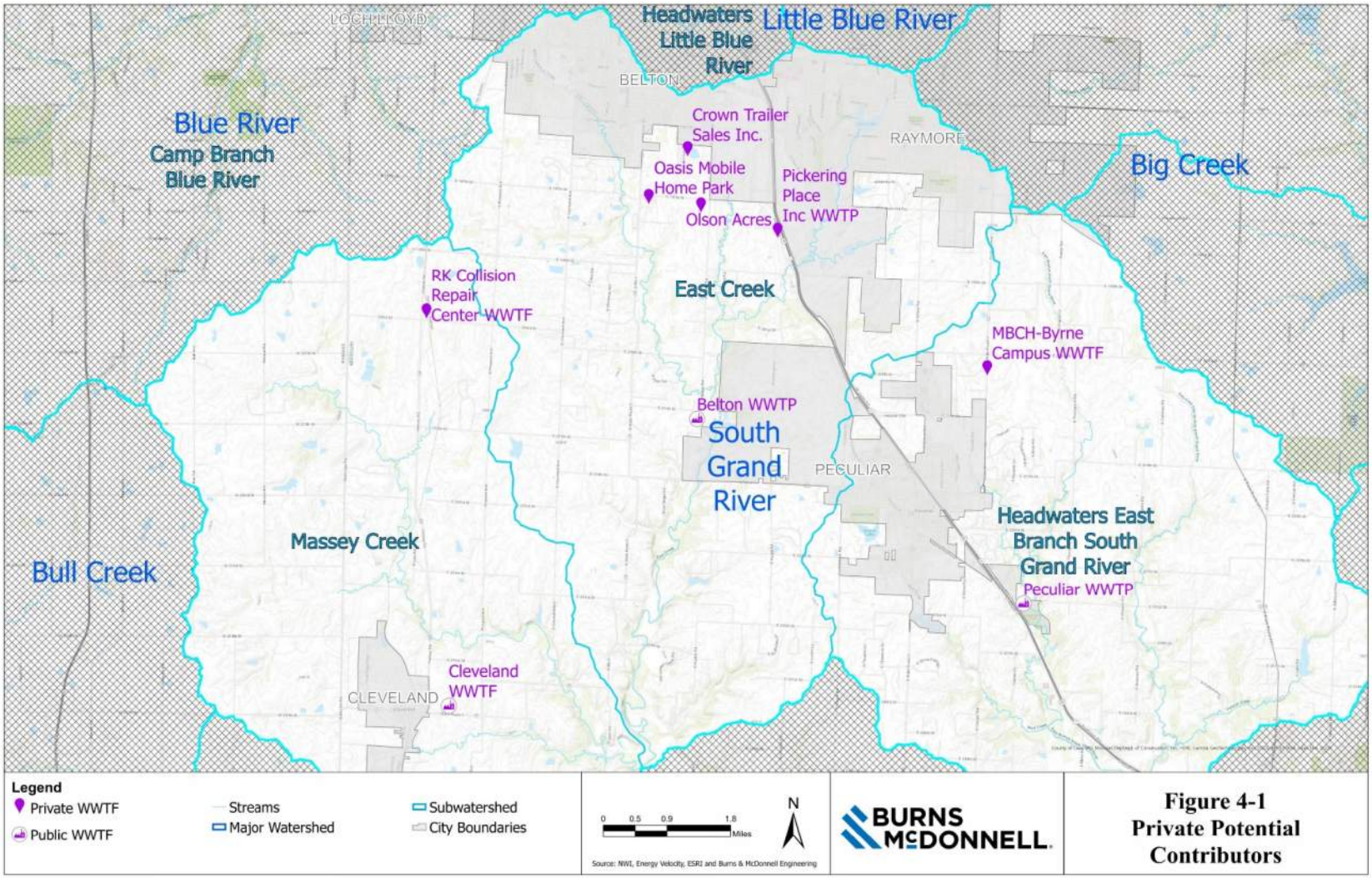
4.7 Cleveland WWTF

The Cleveland WWTF is a two-cell lagoon and partial wastewater irrigation system. According to their MDNR operating permit, it is designed for a population of 1,000 people and flows of 100,000 gpd. Based on information from the Cleveland Water and Wastewater Superintendent, the facility serves a population of approximately 670 people and actual flows to the lagoon are estimated to be 15,000 gpd. Minimal growth is expected to occur in the future. The lagoons are in good condition and operating well. The City of Cleveland does not currently have any plans to upgrade their facility.

4.8 Selected Regionalization Contributors

The RK Collision Repair Center and Cleveland WWTF were not selected to be included in this wastewater regionalization. Their location in an adjacent watershed would require the construction of new lift stations, force mains, and gravity lines to reach the Belton collection system or WWTF. Olson Acres, Oasis Mobile Home Park, Crown Trailer Sales, and Pickering Place are good candidates for inclusion in the wastewater regionalization plan due to their proximity to existing collection system infrastructure. Olson Acres, Oasis Mobile Home Park, and Crown Trailer Sales wastewater would be conveyed via the existing Belton collection system while Pickering Place would be conveyed via a new gravity trunk sewer from Raymore's Owen Good Pump Station. Additional detail on the phasing of regional treatment improvements is included in Section 7.0.

Figure 4-1 Private Potential Contributors



5.0 CONCEPTUAL TREATMENT AREA

5.1 Conceptual Treatment Area Contributors

The conceptual treatment area for the wastewater regionalization includes contributions from the cities of Belton, Peculiar, and Raymore, and the smaller private communities of Olson Acres, Oasis Mobile Home Park, Crown Trailer Sales, and Pickering Place. Raymore and the small private communities will connect to Belton's collection system by gravity lines. Once northwest Peculiar is developed, it will also connect to Belton's collection system.

5.2 Regional WWTP Location Options

Two options were considered for the location of the regional WWTP. The first option was to expand the existing Belton WWTF and send flows from all contributors to the existing IPS. The second option was to build a new plant approximately 2.5 miles downstream of the existing facility along East Creek. Location of contributors, accessibility, required pipe length, and associated cost were some of the factors considered in the regional plant location. Moving the plant further south would require a longer gravity main from the Headwaters East Branch South Grand River Subwatershed boundary and construction of an additional pipe from the existing facility.

On September 1, 2021, Burns & McDonnell met with the City of Belton to discuss the feasibility of regionalization and the location of the regional treatment plant. Since Peculiar would need to construct new force mains and upgrade their lift stations regardless of the regional plant location, the decision was made to proceed with expansion of the existing Belton WWTF and reduce costs by reusing some of the existing facility's infrastructure.

5.3 Current Belton WWTF Improvements

The existing Belton WWTF includes liquid treatment consisting of screening, grit removal, primary clarification, nutrient removal, final clarification, and UV disinfection and sludge treatment consisting of aerobic digestion, dewatering, and landfill disposal. Although the facility is designed for a flow of 2.26 MGD, flows from the IPS and through the facility have exceeded this capacity. Additionally, the Belton WWTF is currently experiencing mechanical issues with aerators and final clarifiers. Immediate improvements are needed to maintain treatment performance and consistently meet permit requirements.

5.4 Plant Expansion

The current Belton WWTF is designed for average flows of 2.26 MGD but will need to expand to treat average regional flows of 12 MGD by 2040. A 20-year planning period was considered to account for

population growth and land development in the region. This is a typical planning period for the design of WWTFs.

MDNR's *Wastewater Guidelines and Standards Document* provides an equation to calculate a peaking factor based on population (in thousands). Based on Belton's current population of 23,953, the peaking factor is 2.6. This was rounded up to 3 to be conversative and account for additional inflow and infiltration (I/I) in the collection system.

$$\text{Peaking Factor} = \frac{\text{Design Peak Hourly Flow}}{\text{Design Average Flow}} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Considering a future peaking factor of 3, the peak design flow will be 36 MGD. Due to water quality standards becoming more stringent in Missouri, the plant expansion will be designed for biological nutrient removal and solids processing to produce a Class B biosolid suitable for land application.

The expansion of the existing Belton WWTF to a regional WWTP is designed for three phases. In the first phase, the capacity of IPS and force main will be increased to handle additional flows from regional contributors and a wet weather holding basin will be constructed to handle peak flows. In the second phase, the new infrastructure will be built to increase the plant's treatment capacity from 2.26 MGD to 7 MGD. The 7 MGD regional WWTP will be able to accept flow contributions from either Raymore or northwest Peculiar, whichever connects first. In the third phase, the plant's capacity will be increased to 12 MGD. The 12 MGD regional WWTP includes contributions from Raymore, northwest Peculiar, and small private communities. Demolition and site plans for the plant's expansion are shown in Figures 5-1 through 5-4. The list of improvements required by phase for a regional treatment plant is as follows:

Phase 1 – Influent Pump Station Expansion

- Construction of a 10 million gallon (MG) wet weather holding basin;
- Expansion of the IPS to include four 4-MGD submersible pumps for a total firm capacity of 12 MGD;
- Construction of a new 36-inch force main from the IPS to the plant

Phase 2 – Plant Expansion to 7 MGD

- Demolition of the clarifier flow control structure and final clarifiers no. 2 and 3
- Construction of a new A2O biological treatment basin consisting of one anaerobic, one anoxic, and one aerobic (or oxic) zone;
- Construction of two new final clarifiers, each 115 feet in diameter;

- Expansion of the UV disinfection system where the two existing channels are increased to their maximum capacity of 12 MGD;
- Construction of two new aerobic digesters for the treatment of sludge flows, with a combined volume of 2.7 MG;
- Expansion of the existing solids processing building to include two belt filter presses; and
- Construction of a new solids storage area to store dewatered biosolids for 60 days until solids can be land applied

Phase 3 – Plant Expansion to 12 MGD

- Demolition of final clarifier no. 1, the return sludge pump station, aeration basin, and aerobic sludge holding station
- Expansion of the existing headworks building to include three 18 MGD mechanical bar screens and two 18 MGD grit removal units and two grit classifiers;
- Construction of a second Anaerobic-Anoxic-Oxic (A2O) biological treatment basin consisting of one anaerobic, one anoxic, and one aerobic (or oxic) zone;
- Construction of a third final clarifier, 115 feet in diameter;
- Expansion of the UV disinfection system to include one additional 12 MGD channel, for a total disinfection capacity of 36 MGD;
- Construction of two additional aerobic digesters for the treatment of sludge flows, for a total of 4 with a total sludge storage capacity of 5.4 MG; and
- Expansion of the existing solids processing building to include one additional belt filter press, for a total of three belt filter presses.

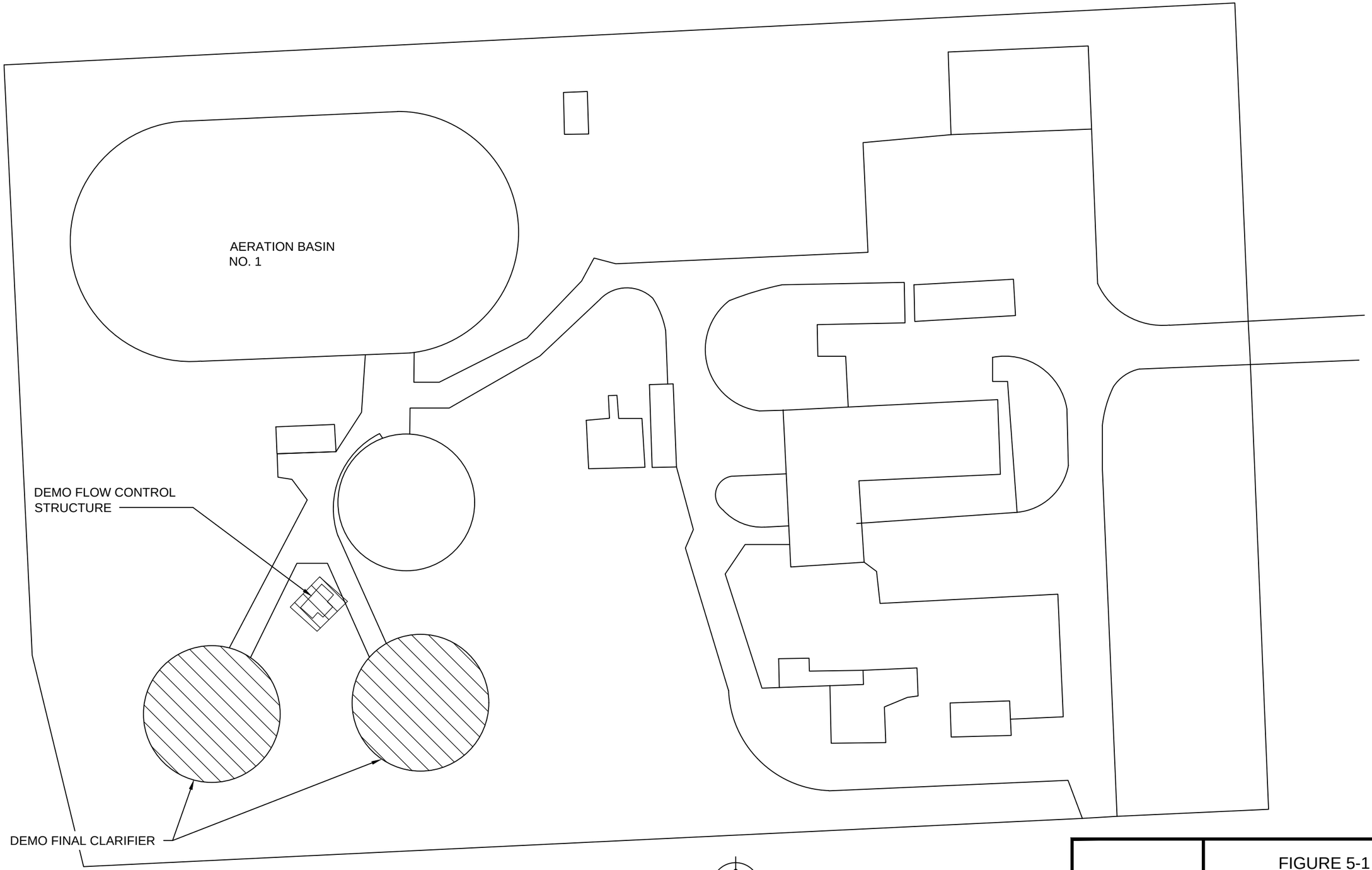
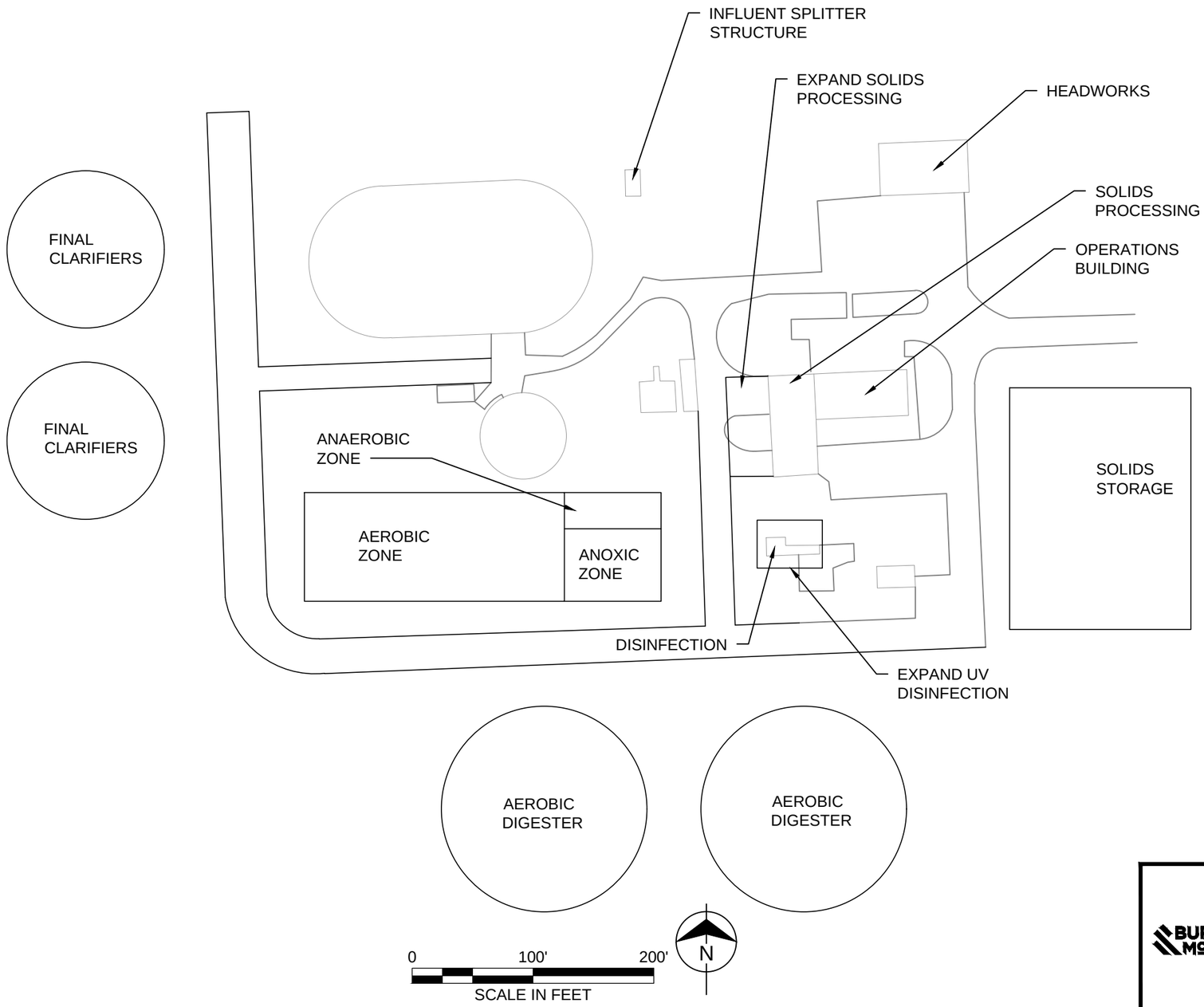


FIGURE 5-1

BELTON WWTF PHASE 2
DEMOLITION PLAN



BURNS McDONNELL

FIGURE 5-2

BELTON WWTF PHASE 2
EXPANSION SITE PLAN

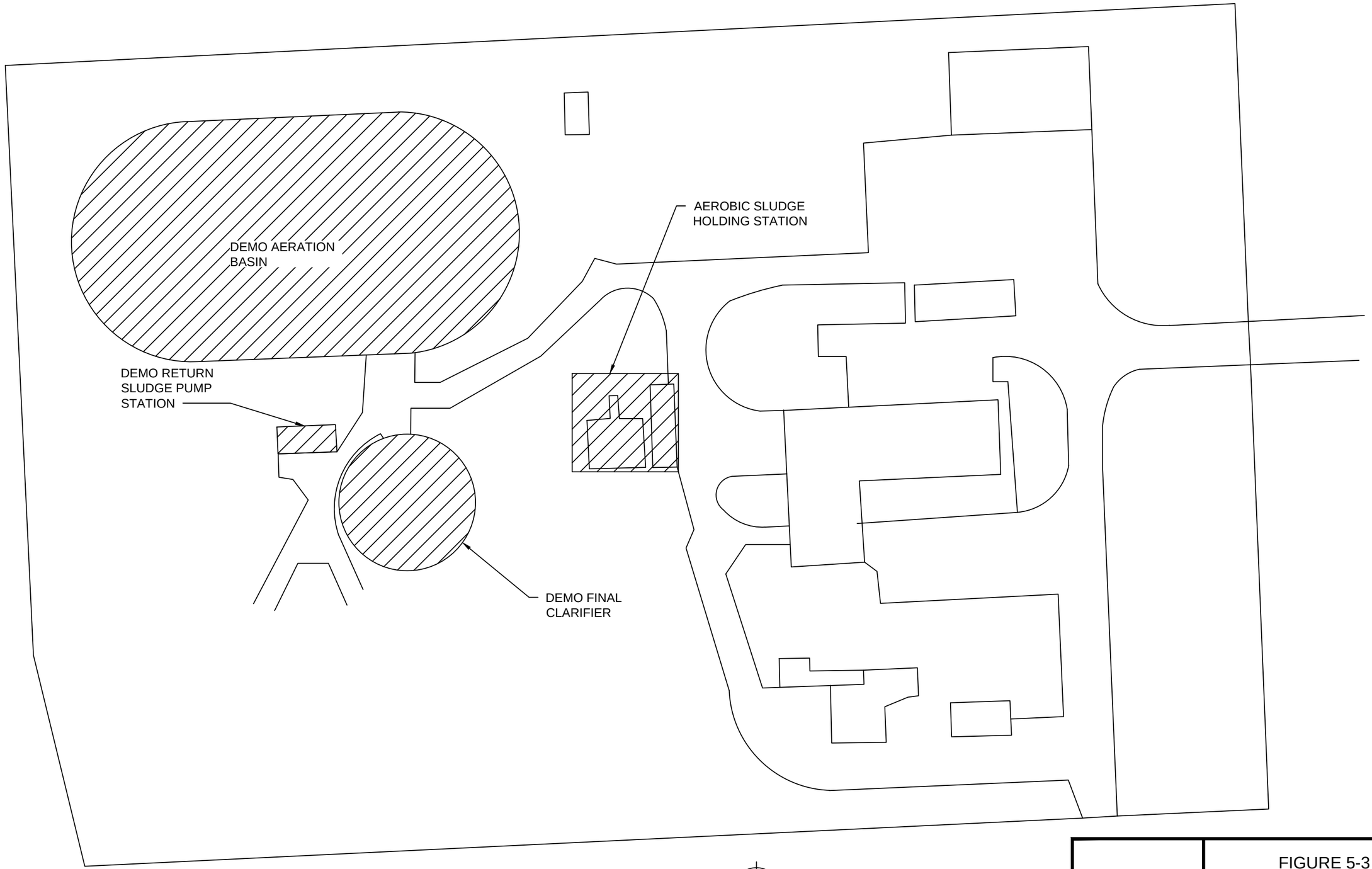


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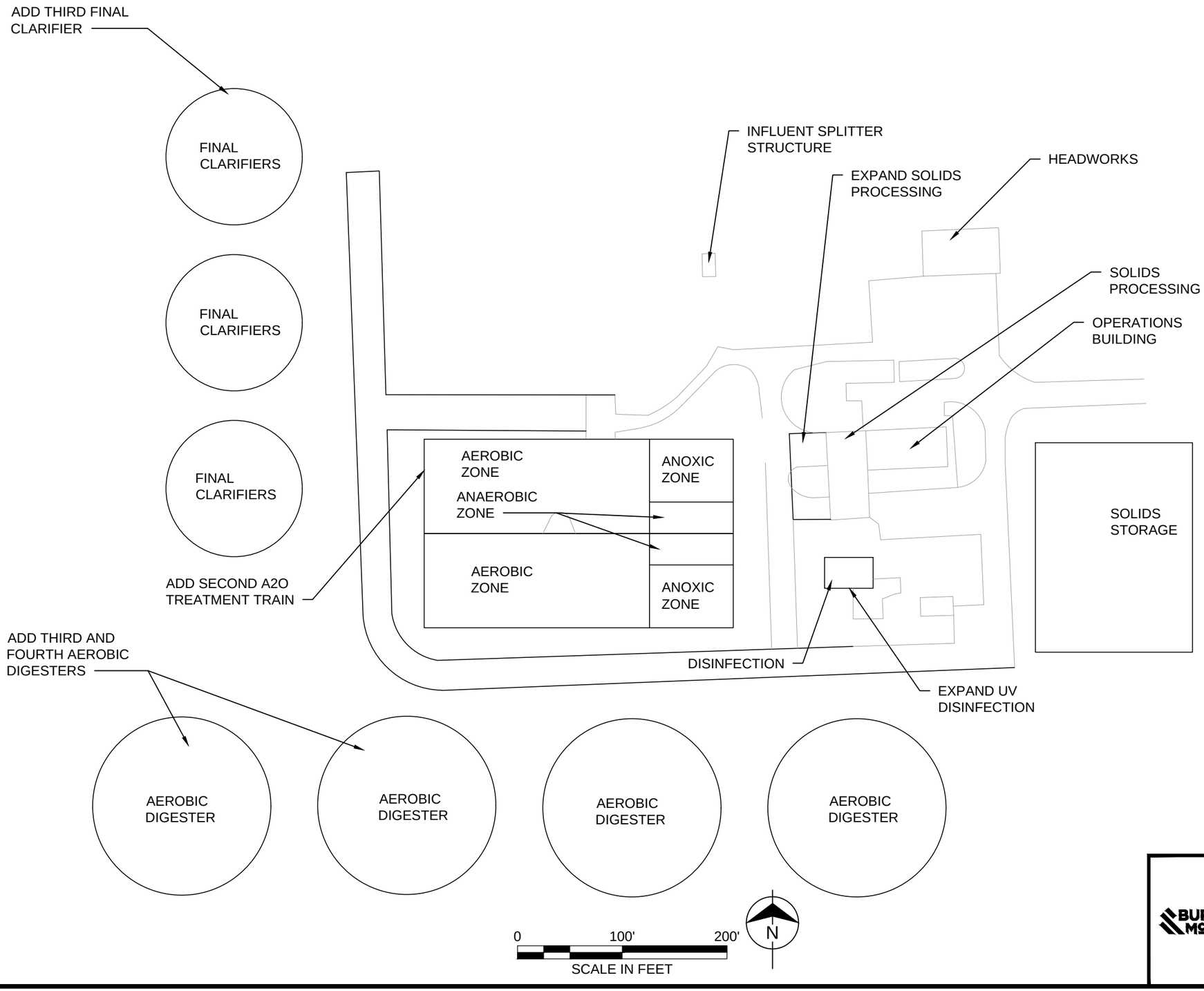
FIGURE 5-3

BELTON WWTF PHASE 3
DEMOLITION PLAN



BURNS McDONNELL

FIGURE 5-4

BELTON WWTF PHASE 3 EXPANSION SITE PLAN

6.0 FUTURE ANALYSIS

Both the current area tributary to the Belton WWTF and conceptual regional treatment area are located within the Cass County jurisdiction. Zoning designations and future land use designations from Belton and Raymore were reviewed to inform future growth projections. Cass County resources were reviewed to determine if they have adopted a comprehensive plan or a future land use map that would provide insight on future county-wide development. Neither of these resources were found online, however the code of ordinances references a comprehensive plan adopted in 2005. Additionally, population projections were reviewed from the Mid-America Regional Council (MARC).

6.1 MARC 2040 Forecast

MARC's population forecast provides the estimated number and distribution of population, households, and employment in the seven-county Kansas City region for the year 2040. The 2040 Forecast is an estimate of the land-use change most likely to occur in the Kansas City Metro area by 2040 given past trends, known demographic and economic shifts, and expected changes in federal, state and local government policy. The forecast assumes that some but not all aspirational growth and land use policies will be implemented by 2040. The forecast is used to inform the long-range transportation planning process in order to incorporate future demand into transportation infrastructure planning.

The 2040 Forecast was first adopted in 2014 and last updated in 2015, and used the latest data available at the time, which was principally from the 2010 Census. The forecast is produced by MARC's Research Services staff and the Technical Forecast Committee, which includes planners from local governments and other organizations in the Kansas City region. The following is a summary of the forecast process, from Appendix B of the Transportation Outlook 2040 plan:

1. A PI+ model from Regional Economic Models, Inc. (REMI) was used as the base of the forecast to establish regional growth totals for expected overall population and employment levels in 2020, 2030 and 2040. PI+ is a software solution for conducting dynamic macroeconomic impact analysis of public policy. The complex model, which includes over 2,000 equations solved simultaneously, is a computable general equilibrium model that combines an input-output model with a set of econometric models.

2. The regional growth totals were then allocated to small, sub-county areas using MARC's land use change model, Paint the Town. The areas used in the model were derived from parcel data provided by the counties in the MARC region. These differ from the actual parcels in that they are based on grid cells, 50 feet in developed areas and 500 feet in undeveloped

areas. Using the model, each geographic area was multiplied by the assumed density of development to convert the existing land use into number of housing units. Additional conversion factors specific to each area, such as vacancy rates and persons per household, converted number of housing units to population.

3. After collecting existing land use, MARC surveyed cities and counties to obtain their future land use plans. Typically, these plans are designed to visualize what the jurisdiction will look like once it is fully built-out or, in older areas, when anticipated redevelopment is completed. As such, these plans provided guidance for MARC's forecast concerning what kinds of development will occur and where, provided there is sufficient demand to make the development economically feasible.

    a. It was clear from all of the future land use plans that local governments intend to convert most of the region's vacant and agricultural land to single-family housing at some point in the future. Compared to current land use, this represents an increase in developed land acreage of 257 percent. Given that the population in the Kansas City region as a whole is only projected to grow by 31 percent between 2010 and 2040, however, this implies that not all of the land planned for development will, in fact, develop during the 30-year planning horizon.

4. Which land is most likely to develop was determined by Paint the Town's development probability models, of which there are four: new development (greenfield development within the area expected to be served sanitary sewers), rural development (greenfield development outside of the area served by sanitary sewers), refill development (redevelopment and infill within areas largely developed by 1990), decline (principally in the most distressed areas of the region). These models were calibrated based on how well they predicted the land use change that occurred between 2000 and 2010.

    a. Explanatory variables included a variety of measures, such as availability of vacant land, sewer availability, employment density, median household income, proximity to arterials and highways, destination density, age of housing, quality of school districts, percent minority and poverty rate.

    b. The land expected to be served by sewers each decade was critical to forecasting the potential extent of suburban development. The data for this was obtained from the local wastewater districts and wastewater departments in the region.

Based on this forecast process, MARC has made population projections for each municipality in the region. Chapter 8 of the Transportation Outlook 2040 plan summarizes the forecast and provides insight on the region's future growth. Figure 6-1 overlays the project area with the growth areas MARC identified in northern Cass County.

Figure 6-1 Northern Cass County 2040 Population Growth Areas

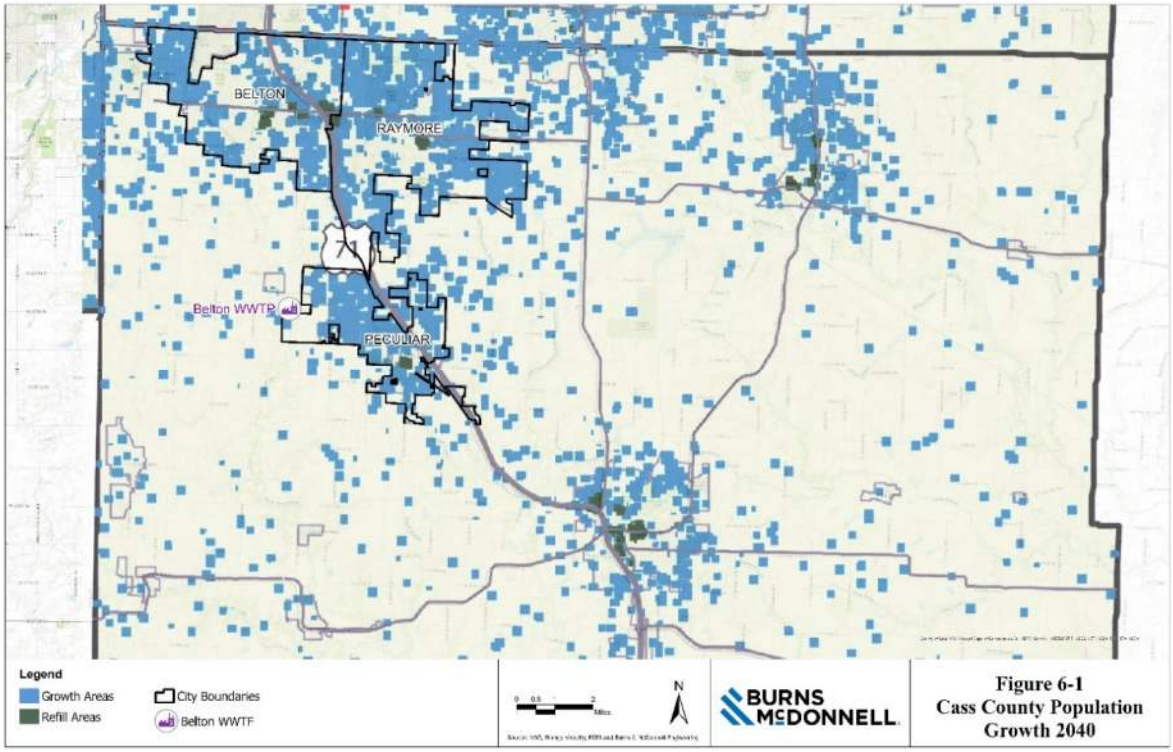


Table 6-1 summarizes the expected population growth through 2040 for Belton, Loch Lloyd, Peculiar, Raymore, and an estimate for the unincorporated area within the project area.

Table 6-1 Cass County Population Projections

City	2010 (US Census)	2020	2030	2040
Belton	23,116	24,162	25,143	25,886
Loch Lloyd	600	674	728	775
Peculiar	4,608	5,746	6,208	6,536
Raymore	19,206	21,984	24,743	26,077
Unincorporated[1]	1,547	1,940	2,429	2,995

[1]The population for the unincorporated area within the project area was adapted from the total unincorporated population, based on percent of unincorporated land area within project extents (approximately 6.3% of total unincorporated land area).

Population and flow projections for these communities are summarized in the following sections. The projections are based on discussions with individual cities, projected population growth from U.S. Census data, anticipated land development, and available engineering reports.

6.2 Belton Future Growth Analysis

According to data from the U.S. Census Bureau, the population of Belton increased from 23,116 to 23,953 from 2010 to 2020, a growth rate of 3.6 percent and less than 0.5 percent annual growth. Based on discussions with the City, the annual growth rate is expected to increase due to future development in the area. Therefore, an annual growth rate of 1 percent was used at the City's request to project the City's population over the next 20 years. LBVSD is responsible for treating wastewater flows produced in the northern sections of the City located in the Lower Missouri-Crooked Watershed. The remaining portion of Belton located in the South Grand Watershed sends wastewater flows south to the Belton WWTF. According to the 2020 WWTF Capacity Evaluation, most of the future growth is anticipated to occur in the southeast part of the City and would be within the service area for the Belton WWTF. Table 6-2 shows the population projection for Belton as well as the population and percentage of the City served by the future regional WWTP. The 2020 WWTF Capacity Evaluation assumes that a larger population and greater percentage of the City will be served by the WWTF over the 20-year period due to growth in the southeast area. By 2040, the population of Belton will be approximately 29,227 with 58.6 percent of the population sending wastewater flows to the treatment plant.

Table 6-2 Belton Population Projections

Year	City Population Projection[1]	Population Served by WWTF	Percentage Served by WWTF
2021	24,193	12,096	50.0%
2040	29,227	17,131	58.6%

[1] – Based on an annual population growth rate of 1%

The population projections described above were used to estimate future wastewater flows over the same 20-year time period. Based on the current population and flow data from the Belton WWTF, the average flow per person is approximately 165 gallons per capita per day (gpcd). The per capita flow rate was applied to the population served by the WWTF and used to project average daily flow rates. Peaking factors (PF) of 1.37 for the maximum month average day (MMAD) and 9.24 for the peak hour (PH) were provided in the 2020 WWTF Capacity Evaluation and were used to calculate maximum month and peak hour wastewater flows as shown in Table 6-3. The 9.24 PH PF was used for current flow conditions. Since Belton did not provide detailed I/I reduction plans that indicate anything less than a 9.24 PF for existing developed areas, Belton's I/I reduction efforts are assumed to maintain the peaking factor at 9.24

for existing developed areas. A PF of 3.0 was considered for future wastewater flows in areas that have not yet been developed.

Table 6-3 Belton Flow Projections based on 2% Population Growth

Year	WWTF Population Projection	Average Day[1] (MGD)	Maximum Month[2] (MGD)	Peak Hour[3] (MGD)
2021	12,096	2.0	2.7	18.5
2040	17,131	2.8	3.9	20.1

[1] – Based on a per capita flowrate of 165 gpcd
[2] – Based on a MM:AD of 1.37
[3] – Based on a PH:AD of 9.24 (2021) and 7.2 (2040)

6.2.1 Loch Lloyd Village

Loch Lloyd Village is located northwest of Belton and borders the state line between Missouri and Kansas. From 2015 to 2020, Loch Lloyd wastewater flows to JCW averaged around 35.4 million gallons per year (97,000 gpd). Based on discussions with the City of Belton, growth in the area is assumed to be 33 percent over the next 20 years due to planned development within Loch Lloyd. By 2040, it is anticipated that the average wastewater flows would be approximately 130,000 gpd (0.13 MGD). These flows would be pumped north to LBVSD service area for treatment.

6.2.2 Belton Future Development

Several single-family, multi-family, and large lot developments are expected in Belton within the next 20 years, as shown in Figure 6-2. This anticipated development and population growth is not accounted for in the 2 percent annual growth rate expected to occur in already developed parts of Belton. According to the City of Belton and recent development data, the number of lots in the development areas was assumed to be four single-family lots per acre, eight multi-family lots per acre, and one large lot for every ten acres. The U.S. Census Bureau provided statistics for the state of Missouri and listed 2.46 persons per household from 2015 to 2019. Based on this, an assumption of 2.5 people per lot and 100 gpcd flow rate were used to develop the projected development area population and associated wastewater flows. By 2040, the developments located in northwest Belton, within the Camp Branch Blue River Subwatershed, are projected to produce 0.37 MGD of wastewater flow. These flows are anticipated to be conveyed north to LBVSD service area for treatment. The development in the East Creek Subwatershed, located in southeast Belton, are projected to produce 1.34 MGD of wastewater flow by 2040. These flows would be conveyed to the regional WWTP for treatment. Existing flows and future flow conditions for anticipated future development in Belton are summarized in Table 6-4.

Table 6-4 Future Wastewater Flow Rates for Loch Lloyd and Belton Development

Contributor	Average Flow (MGD)	Peak Flow (MGD)
Loch Lloyd	0.13	0.36
Northwest Belton	0.37	1.11
Southwest Belton	1.34	4.02

6.3 Raymore Future Growth Analysis

The population of Raymore increased from 19,206 in 2010 to 22,941 in 2020, according to data from the U.S. Census Bureau. The growth rate over the 10-year time period was 19.5 percent. The annual growth rate of 1.8 percent was rounded to 2 percent and used to project the City's population over the next 20 years. Raymore's population projection for 2040 based on historic census data is included in Table 6-7.

Table 6-5 Raymore Population Projection based on 2% Population Growth

Year	City Population
2010 (Census)	19,206
2020 (Census)	22,941
2040 (Projected)	34,089

According to the City of Raymore, average flow conditions at the Owen Good Pump Station, which receives all wastewater flow from the City of Raymore, is approximately 2.0 MGD. Future average flow conditions are projected based on the annual 2 percent growth rate and a unit base wastewater flow of 100 gal/person/day as stipulated by MDNR's default design criteria. Additionally, Raymore is expected to develop three separate areas of 200, 400, and 600 lots within the next 20 years. These future development lots are shown in Figure 6-2. Assuming 2.5 people per lot, the population of Raymore in these development areas would increase by 3,000 and flows would increase by 0.30 MGD over 20 years. This anticipated development and subsequent population growth is in addition to the 2 percent annual growth rate expected to occur in already developed parts of Raymore.

The existing and future peak flows are based on a PF of 3.1 in 2025. This PF was listed in the 2006 *Owen Good Pump Station Design Memorandum* by Burns & McDonnell. The 3.1 PF assumes 40% reduction in I/I and is adjusted from the 7.8 PF in 2005 which assumed zero reduction in I/I at the time. Existing flows and future flow conditions based on population growth and land development for the City of Raymore are summarized in Table 6-6.

Table 6-6 Current and Future Wastewater Flow Rates in Raymore

Conditions	Average Flow (MGD)	Peak Flow (MGD)
Existing (2021)	2.0	6.2

Conditions	Average Flow (MGD)	Peak Flow (MGD)
Future (2040)	3.7	11.5

6.4 Peculiar Future Growth Analysis

According to data from the U.S. Census Bureau, the population of Peculiar increased from 4,608 to 5,621 from 2010 to 2020, a growth rate of 22 percent. The 2018 *Wastewater Treatment Plant Facility Plan* (2018 WWTP Facility Plan), written by George Butler and Associates (GBA), projected future wastewater flow rates at the Peculiar WWTP every decade from 2017 to 2080, assuming 2.5 percent annual growth. The projected population of 5,496 reported in the 2018 WWTP Facility Plan for 2020 was similar to the actual population of 5,621 recorded by census data. The projected annual average flow in 2020 of 0.552 MGD was also similar to average flow treated by the Peculiar WWTP from January 2018 to April 2021, 0.54 MGD. The projected population, annual average flow, maximum day, and peak hour flow is summarized in Table 6-7.

Table 6-7 Current and Future Wastewater Flow Rates at Peculiar WWTP

Year	Population	Annual Average (MGD)	Maximum Day (MGD)	Peak Hour (MGD)
2020	5,496	0.55	2.35	2.50
2040	9,006	0.90	3.62	3.89

6.4.1 Northwest Peculiar Future Development

There are 1,500 acres of undeveloped land in the northwest area of Peculiar, located within the East Creek Subwatershed. The 2016 *East Creek Wastewater System Engineering Report*, written by Carollo, estimated average and peak flows of 3.91 and 11.73 MGD respectively due to future industrial and commercial development in the area. The future development in this area of Peculiar are expected to contribute average flows of 3.91 MGD and peak flows of 11.73 MGD as shown in Table 6-8. It is anticipated that these flows would be conveyed to the IPS of the Belton WWTF via gravity due to its location within the East Creek Subwatershed.

Table 6-8 Future Development Flow Rates in NW Peculiar

Area	Average Flow (MGD)	Peak Flow[1] (MGD)
NW Peculiar	3.91	11.73

[1] – Based on a peaking factor of 3.0.

6.5 Summary of Future Growth Analysis

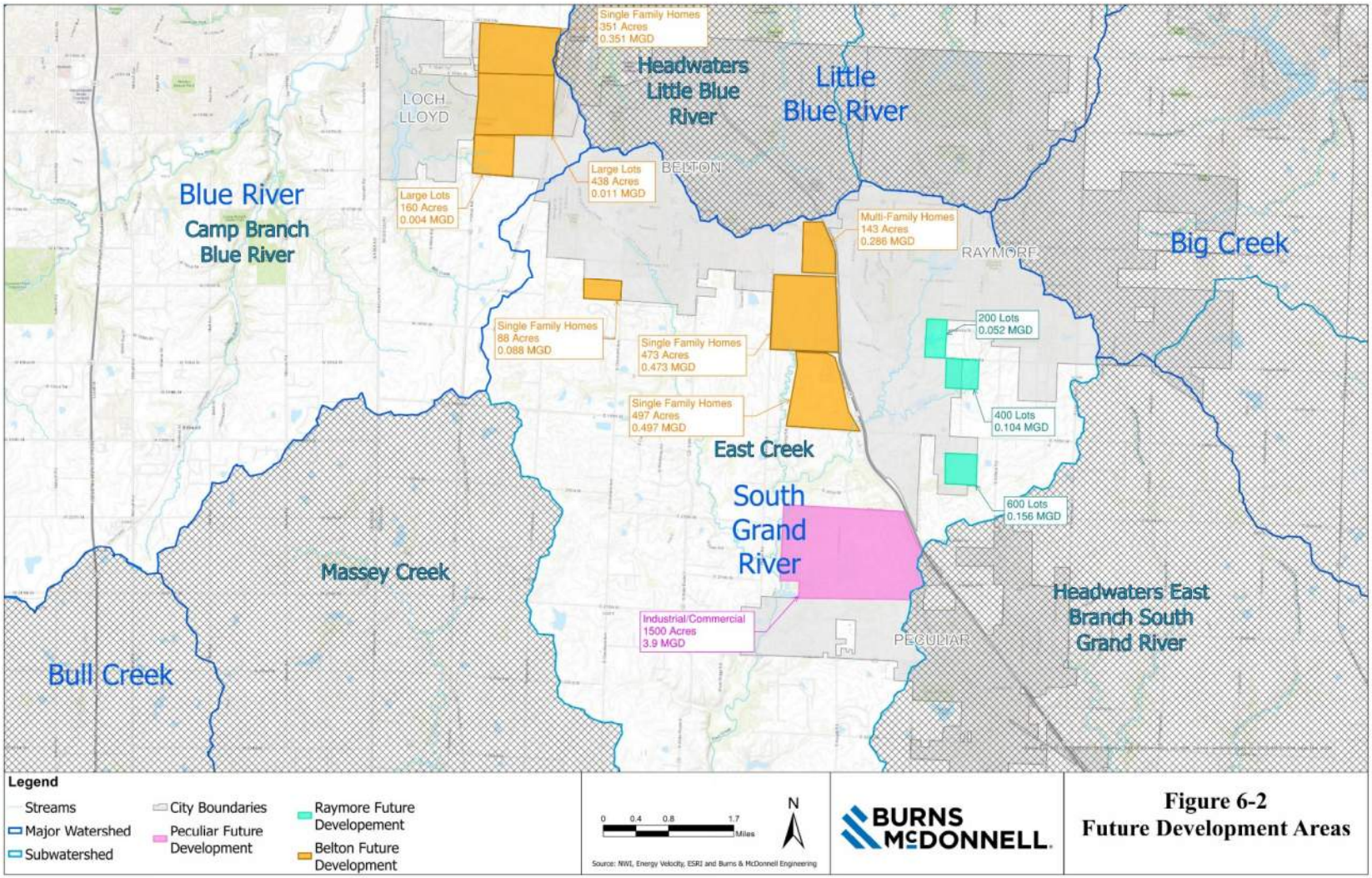
Figure 6-2 illustrates the future development areas as identified by the City of Belton in the September 1, 2021 feasibility review meeting. Table 6-9 summarizes both existing and future flow conditions in the

conceptual treatment area that would be treated at the Belton Regional WWTP. No growth is anticipated in the adjacent small communities. While future flows for Peculiar were analyzed, only the northwest area where future development is anticipated was considered for regionalization. Based on this analysis, the regional WWTP would need to be sized for future average flows of 12 MGD.

Table 6-9 Summary of Future Growth

	Existing Flow		Future Flow (2040)	
Community	**Average**	**Peak**	**Average**	**Peak**
Belton	2.0	18.5	2.8	20.1
Southeast Belton (Future Development)	--	--	1.34	4.02
Raymore	2.0	6.2	3.7	11.5
NW Peculiar (Future Development)	--	--	3.9	11.7
Adjacent Small Communities	0.11	0.11	0.11	0.11
Total	4.11	24.8	11.9	47.5

Figure 6-2 Future Development Areas



7.0 REGIONALIZATION PHASING APPROACH

MDNR encourages regionalization to reduce the number of small facilities that are currently under or likely to come under enforcement action with the Department. Benefits of regionalization include reducing the number of point sources releasing pollutants to waterways and increasing operating efficiency. MDNR initiated a discussion with the City of Belton regarding regionalization and historic issues with illicit discharges at the Olson Acres facility. The City does not currently accept customers from outside of the city limits.

Feasibility of regionalization was determined by ease of connection, constructability, cost, and funding opportunities. It is feasible for Olson Acres, Oasis Mobile Home Park, Crown Trailer Sales, Pickering Place, Raymore and the northwest portion of Peculiar to be included in wastewater regionalization because of their location within the same subwatershed as the existing Belton WWTF. The wastewater from these communities would flow by gravity to the WWTF. Connecting the remaining area of Peculiar, northwest Belton and Loch Lloyd to Belton's collection system is not feasible because of their location in adjacent watersheds and the associated lift station and force main additions. Due to the size and scope of the feasible regionalization improvements, phased project packages encompassing the necessary collection system improvements and WWTF expansion are recommended.

7.1 Little Blue Valley Sewer District – Subdistrict Formation

LBVSD was formed in 1968 to comply with federal and state water quality regulations for the Little Blue River. The District includes flows from several cities in Jackson and Cass County. LBVSD also runs and operates the Middle Big Creek Subdistrict. Middle Big Creek is a separate geographic watershed area that was established as a subdistrict of LBVSD in 1992. In order for LBVSD to own a facility or assume its debts, assets for the associated subdistrict need to serve multiple customers. Belton has expressed interest in also becoming a subdistrict and would ultimately allow LBVSD to own and operate the Belton WWTF once it is regionalized.

To initiate the formation of a subdistrict, the interested communities will first need to petition the LBVSD Board of Trustees with a letter of interest. The LBVSD staff will explore the option and determine whether or not to proceed. Then, service agreements detailing flows, timing, and financial obligation are created between LBVSD and each customer. MDNR will ultimately need to approve the subdistrict.

7.2 Regional Capital Improvement Projects

Several capital improvement projects (CIP) will need to be completed for each proposed capital improvement project as part of the regionalization effort. Belton would need to make improvements to the

West Fork trunk sewer and IPS to handle current average flows and account for larger future flows. In northwest Belton, a system of new lift stations and force mains would need to be constructed to send flows north to the existing LBVSD service area. Raymore, private communities, and northwest Peculiar will need to construct new gravity sewer lines to tie into the existing Belton collection system. Connections from Raymore and Peculiar would require a capacity increase at the Belton WWTF. The following sections summarize each of the five construction packages (Belton, Northwest Belton, Raymore, Private Communities, and Northwest Peculiar) and detail the CIPs that will need to occur in those respective areas. The CIPs are shown in Figure 7-1.

The gravity sewer line sizes were determined using the future flows of these communities and the Manning's equation, assuming a slope of 0.2 percent and a Manning's coefficient of 0.01. The force main and pump sizes were determined using the peak future flows and a system curve. The system curve is based on the smallest diameter force main to maintain a velocity between 2 and 5 fps, the length of the alignment, and the elevations gathered from USGS topographic map along the alignment.

7.2.1 Belton Package

The Belton Construction Package consists of improvements to the West Fork trunk sewer and to Belton WWTF. A summary of the CIPs for this package is provided in Table 7-1. Approximately 5,500 linear feet from manhole 9G-MH059 and manhole 9I-MH009 of the West Fork trunk sewer that is 27-inches in diameter, needs to be upgraded to a 30-inch PVC pipe (CIP B1) to accommodate current flows. The West Fork trunk sewer line CIP is shown in Figure 7-2. The existing IPS and force main will be sized to meet future wastewater flows of 12 MGD in 2040 (CIP B2). The package also includes the construction of a 10 MGD wet weather holding basin to prevent overloading of the treatment facility (CIP B3).

Table 7-1 Belton Package CIPs

CIP #	Project Description	Flow (MGD)	Pipe Diameter (in)	Linear Foot of Pipe (ft)
B1	West Fork Trunk Sewer	1.96	30	5,500
B2	IPS and Force main Improvements	12	36	3,000
B3	Wet Weather Holding Basin	10	--	--

7.2.2 Northwest Belton Package

The Northwest Belton Construction Package would connect both Loch Lloyd and the northwest portion of Belton in the Camp Branch Blue River Subwatershed to the existing LBVSD service area. Several private landowners in this area have initiated discussions with the City regarding potential development.

To better assist the City in understanding how these private developments might impact City assets, CIPs have been listed for each required lift station and gravity/force main. Information regarding development areas, including proposed lift station location, gravity/force main sizing, and gravity/force main routing was provided by the City. A summary of the CIPs for this package is provided in Table 7-2.

Northwest Belton CIPs include improvements to the existing Fairway Ridge Lift Station (CIP N1) and the construction of new lift stations: Holmes Road (CIP N3), 58 Highway (CIP N5), Effertz Farm (CIP N7), and Markey Park (CIP N10). Loch Lloyd would pump their flow east through approximately 5,500 linear feet of 8-inch PVC force main to the existing Fairway Ridge Lift Station (CIP N2). Flows from 351 acres of single-family homes, shown in Figure 6-2, will gravity flow south to the new Holmes Road Lift Station and be pumped to the Fairway Ridge Lift Station (CIP N4). Flows from 598 acres of large lots north of 58 Highway will be pumped north from the new 58 Highway Lift Station to the Fairway Ridge Lift Station (CIP N6). From Fairway Ridge, combined flows will be pumped across Effertz Farm to the Effertz Farm Lift Station (CIP N8). The Effertz Farm Lift Station (CIP N7) will pump flows to Markey Park Lift Station (CIP N10). An 8-inch diameter force main will convey flows from Markey Park to 155th Street (CIP N11). At 155th Street, a 24-inch diameter force main will connect flows to the LBVSD service area (CIP N12). Northwest Belton CIPs are shown in Figure 7-3.

Table 7-2 Northwest Belton Package CIPs

CIP #	Project Description	Flow (MGD)	Pipe Diameter (in)	Linear Foot of Pipe (ft)
N1	Fairway Ridge LS	0.51	--	--
N2	Loch Lloyd Tie-in to Fairway Ridge LS	0.13	8	5,500
N3	New Holmes Road LS	0.365	--	--
N4	Gravity Main/Force main to Fairway Ridge LS	0.365	8	4,700
N5	New 58 Highway LS	0.015	--	--
N6	Force main from 58 Highway LS to Fairway Ridge LS	0.015	8	6,000
N7	New Effertz Farm LS	0.38	--	--
N8	Force main across Effertz Farm	0.38	8	7,000
N9	Force main from Prospect & Markey to Markey Park LS	0.38	8	3,100
N10	New Markey Park LS	0.38	--	--
N11	Force main from Markey Park LS to 155th Street	0.38	8	5,700
N12	Force main from 155th Street to LBVSD	0.38	24	3,000

7.2.3 Raymore and Pickering Place Package

The Raymore Construction Package consists of connecting Raymore and Pickering Place and upgrading the East Creek sewer line from Raymore's connection point to the IPS at the Belton WWTF. A summary of Raymore's CIPs is provided in Table 7-3. The Raymore trunk sewer is approximately 8,300 linear feet of 30-inch PVC pipe originating at the Owen Good Pump Station and connecting to the Belton collection system at manhole 12L-MH007 (CIP R2). Pickering Place would tie into the collection system through the 30-inch PVC trunk sewer that connects Raymore to the collection system. At this point Raymore's trunk sewer becomes an interceptor, a sanitary sewer line that conveys sewer flows from more than one community by gravity. The Pickering Place sewer line is approximately 2,300 linear feet of 8-inch PVC pipe. The sewer line would start at the existing Pickering Place WWTF and connect into the Raymore trunk sewer near Peculiar Drive and E 195th Street after crossing under Owen Good Creek (CIP R3). Belton would need to increase the East Creek interceptor size from manhole 12L-MH007 to manhole 12N-MH002 from 15 to 36 inches. The interceptor from manhole 12N-MH002 to manhole 12N-MH001 would also need to increase from 18 to 36 inches. The interceptor upgrades total approximately 6,300 linear feet of 36-inch PVC pipe (CIP R1). In order to treat wastewater flows from Raymore and Pickering Place, the Belton WWTF would need to increase its treatment capacity by 5 MGD to either 7 MGD or 12 MGD depending on sequence of construction packages (CIP R4). Raymore's construction projects are shown in Figure 7-4.

Table 7-3 Raymore Package CIPs

CIP #	Project Description	Flow (MGD)	Pipe Diameter (in)	Linear Foot of Pipe (ft)
R1	East Creek Interceptor Improvements	5.53	36	6,300
R2	Raymore Tie-in from Owen Good PS	2.0	30	8,300
R3	Pickering Place Tie-in with Raymore	0.03	8	2,300
R4	Belton WWTP Expansion	7.0	--	--

7.2.4 Small Private Communities Package

The Small Community Construction Package includes the connections of Oasis Mobile Home Park, Crown Trailer Sales, and Olson Acres, as summarized in Table 7-4. Connection for the Oasis Mobile Home Park includes approximately 1,400 linear feet of 8-inch PVC pipe. The sewer line starts at their WWTF and goes southwest connecting to the Belton collection system at manhole 9I-MH008 (CIP C1). Connections for Crown Trailer Sales and Olson Acres would be combined into one sewer line. This sewer line is approximately 8,800 linear feet of 8-inch PVC pipe. Starting at the existing Crown Trailer Sales WWTF, the sewer line goes south toward Olson Acres (CIP C3). After Olson Acres connects, the sewer

line heads southeast until it combines with Belton's collection system at manhole 12J-MH004 (CIP C2). CIPs for private communities are shown in Figure 7-5.

Table 7-4 Small Private Communities Package CIPs

CIP #	Project Description	Flow (MGD)	Pipe Diameter (in)	Linear Feet of Pipe (ft)
C1	Oasis Tie-in to Belton Collection System	0.02	8	1,400
C2	Olson Acres Tie-in to Belton Collection System	0.01	8	5,500
C3	Crown Trailer Sales Tie-in to Belton Collection System	0.05	8	3,300

7.2.5 Peculiar Package

The Peculiar Construction Package includes the connection of northwest Peculiar to Belton's collection system and an increase in the capacity of the Belton WWTF, as shown in Table 7-5. This package will accommodate the future flow contributions from the northwest portion of Peculiar located in the East Creek Subwatershed. Once the northwest area is developed, it will require 10,600 linear feet of gravity trunk sewer to convey average wastewater flows of 3.9 MGD to the IPS of the Regional Belton WWTP (CIP P1). In order to treat wastewater flows from northwest Peculiar, the Belton WWTF would need to increase its treatment capacity to by 5 MGD to either 7 MGD or 12 MGD depending on the order of construction packages (CIP P2). Peculiar's construction project is shown in Figure 7-6.

Table 7-5 Peculiar Package CIPs

CIP #	Project Description	Flow (MGD)	Pipe Diameter (in)	Linear Foot of Pipe (ft)
P1	NW Peculiar Trunk Sewer to Belton WWTF	3.9	18	10,600
P2	Belton WWTP Expansion	7.0	--	--

7.3 Priority Regionalization Improvements

Several priority projects have been identified during discussions with the City of Belton and are listed below. The contributors named in these projects would tie in to the existing Belton collection system and have their wastewater flows treated at the regional Belton WWTP. In order to incorporate flows from neighboring communities, the capacity of the sewer collection system and the existing treatment facility would need to increase. The connection of either Raymore and Pickering Place or northwest Peculiar can occur interchangeably, and would require the existing Belton WWTF to expand from 2.26 MGD to 7.0

MGD. Ultimately, it would have to undergo a second expansion from 7.0 MGD to 12 MGD in order to treat flows from both Raymore and northwest Peculiar.

The priority regionalization projects are as follows:

- A new system of lift stations and force mains to convey wastewater flow from northwest Belton and the Village of Loch Lloyd north to LBVSD for treatment.
- An increase in the capacity of the West Fork trunk sewer, Belton WWTF IPS and force main, and the construction of a wet weather holding basin to handle peak flows.
- Connection of Raymore and Pickering Place to Belton's collection system via a new 24-inch gravity trunk main to connect to the existing trunk main, which would have to be upsized to accommodate the additional flow.
- Expansion of the 2.26 MGD Belton WWWTF to a 7 MGD regional WWTP.
- Connection of northwest Peculiar to Belton's collection system via an 18-inch gravity main.
- Connection of small, private communities to Belton's collection system via 8-inch gravity mains.
- Expansion of the regional WWTP from 7 MGD to 12 MGD.

7.4 Belton WWTF Expansion Phasing

Immediate mechanical improvements are needed at the Belton WWTF aeration basin and final clarifiers but are not considered as part of phased expansion. It is recommended that the major treatment plant improvements be conducted in three phases as discussed in Section 5.0. The first phase would increase the capacity of the IPS and force main and a wet weather holding basin would be constructed to handle peak flows. In the second phase, new infrastructure will be built to increase the plant's treatment capacity from 2.26 MGD to 7 MGD. In the third phase, the plant's capacity will be increased from 7 MGD to 12 MGD.

Figure 7-1 Regional Capital Improvement Project Packages

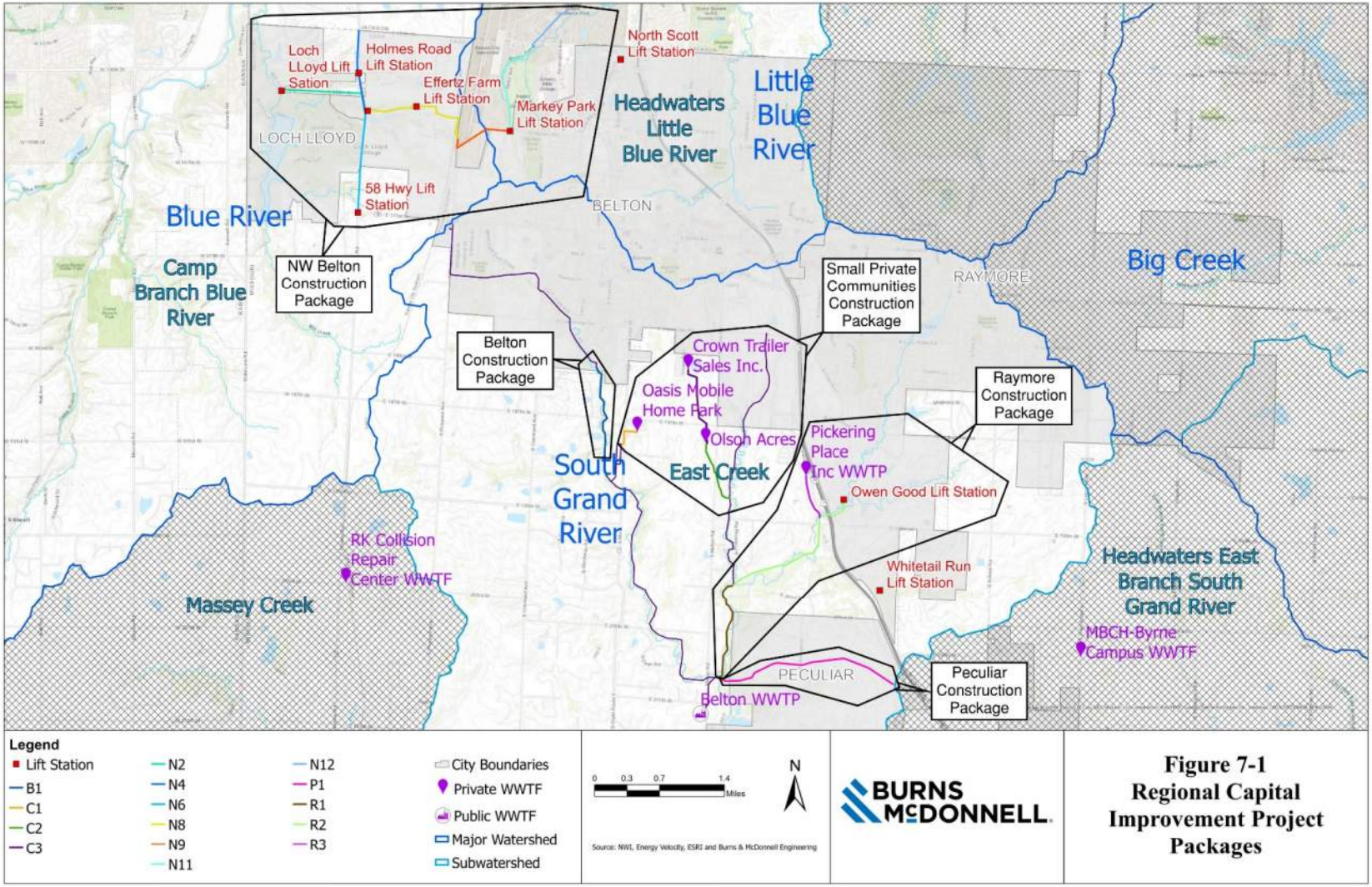


Figure 7-2 Belton Construction Package

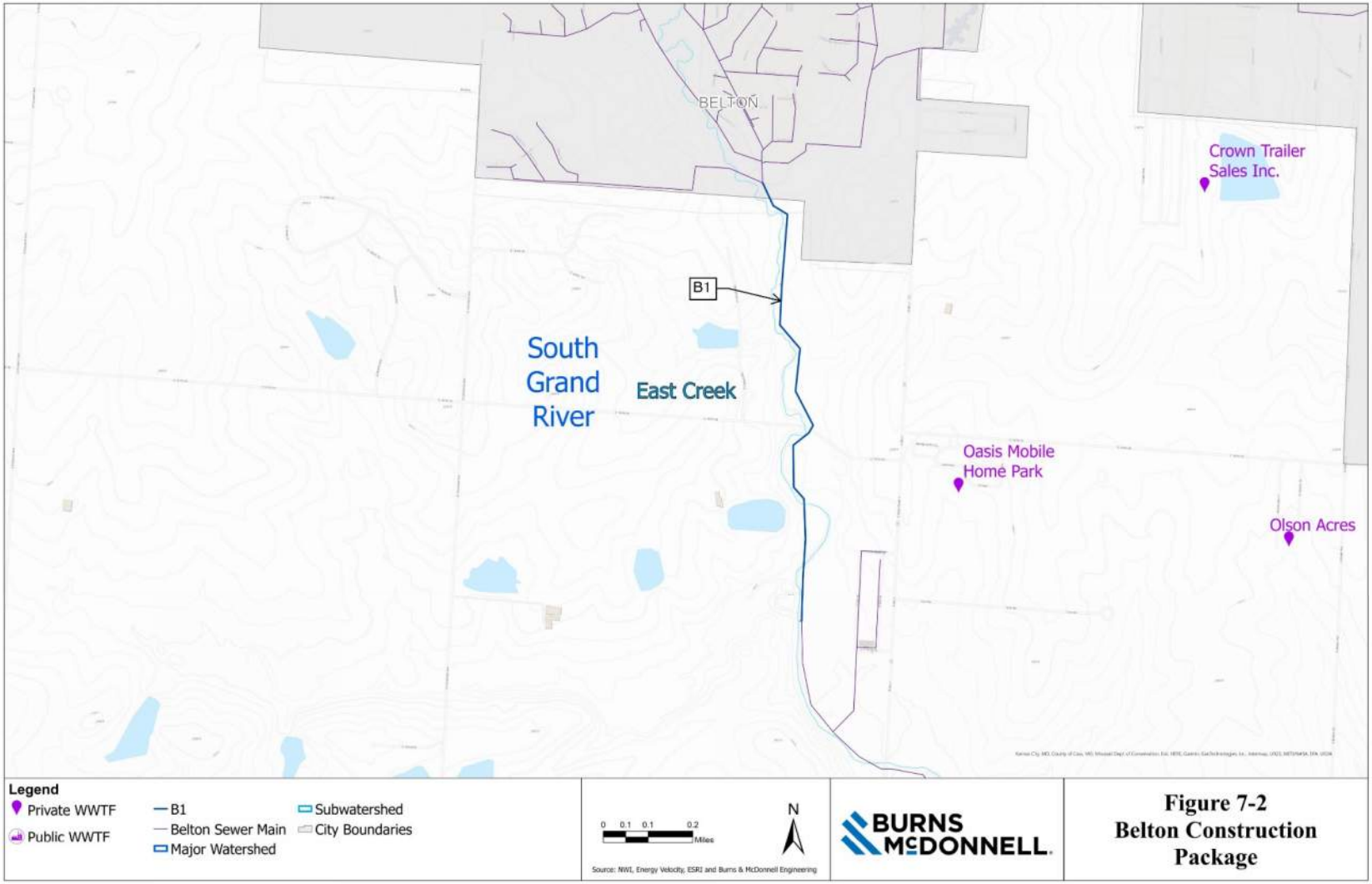


Figure 7-3 Northwest Belton Construction Package

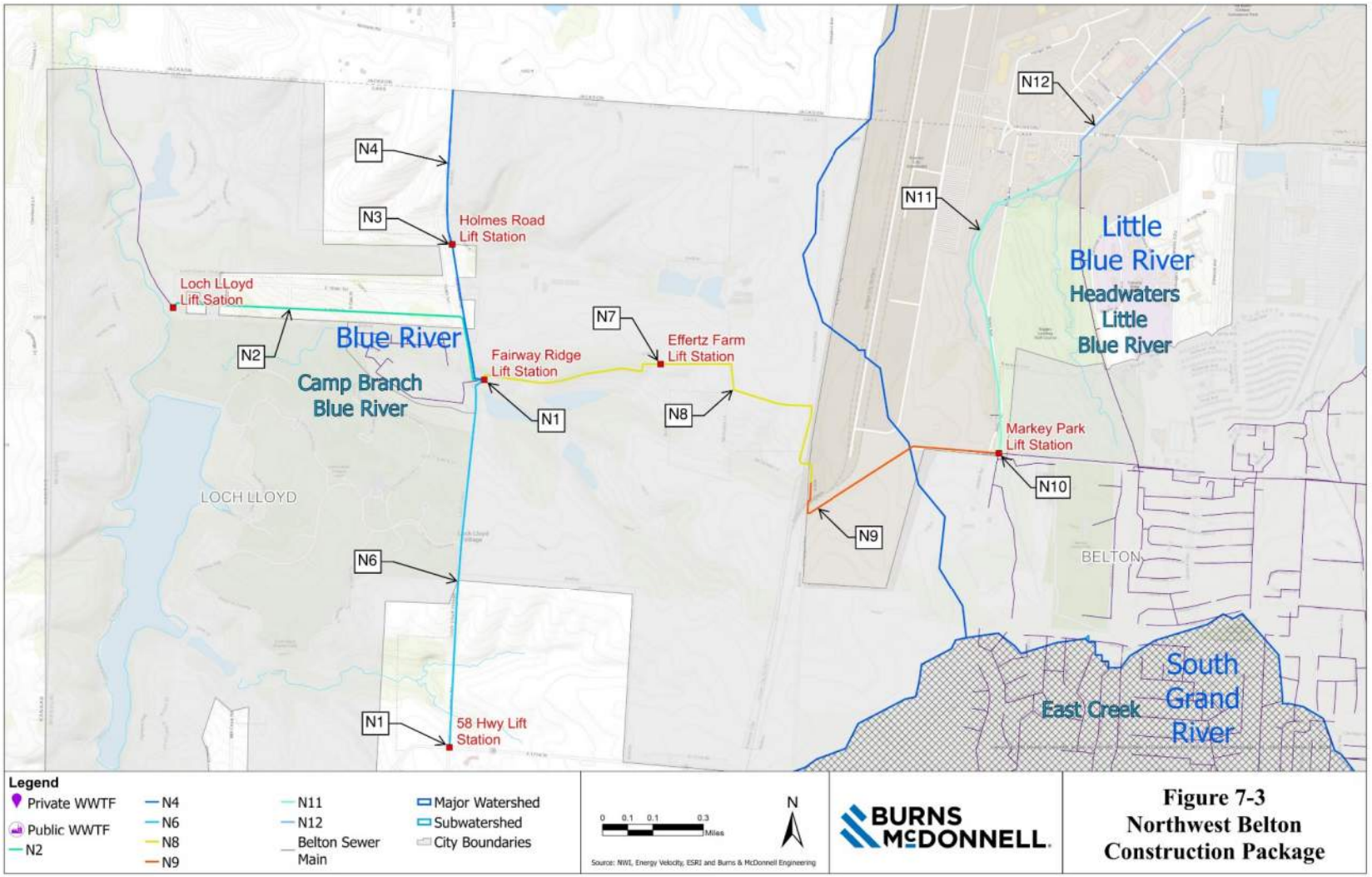


Figure 7-4 Raymore Construction Package

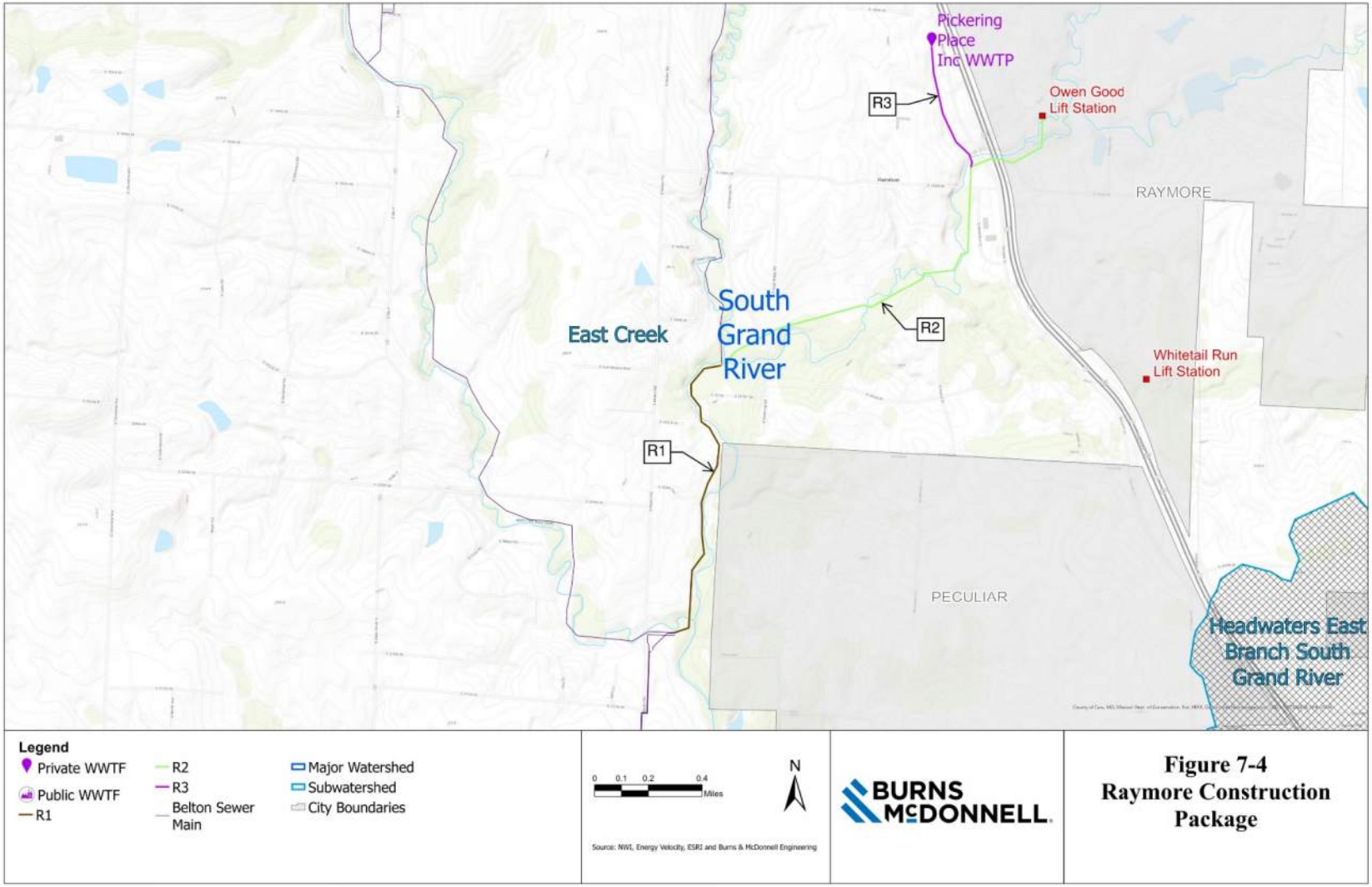


Figure 7-5 Small Private Communities Construction Package

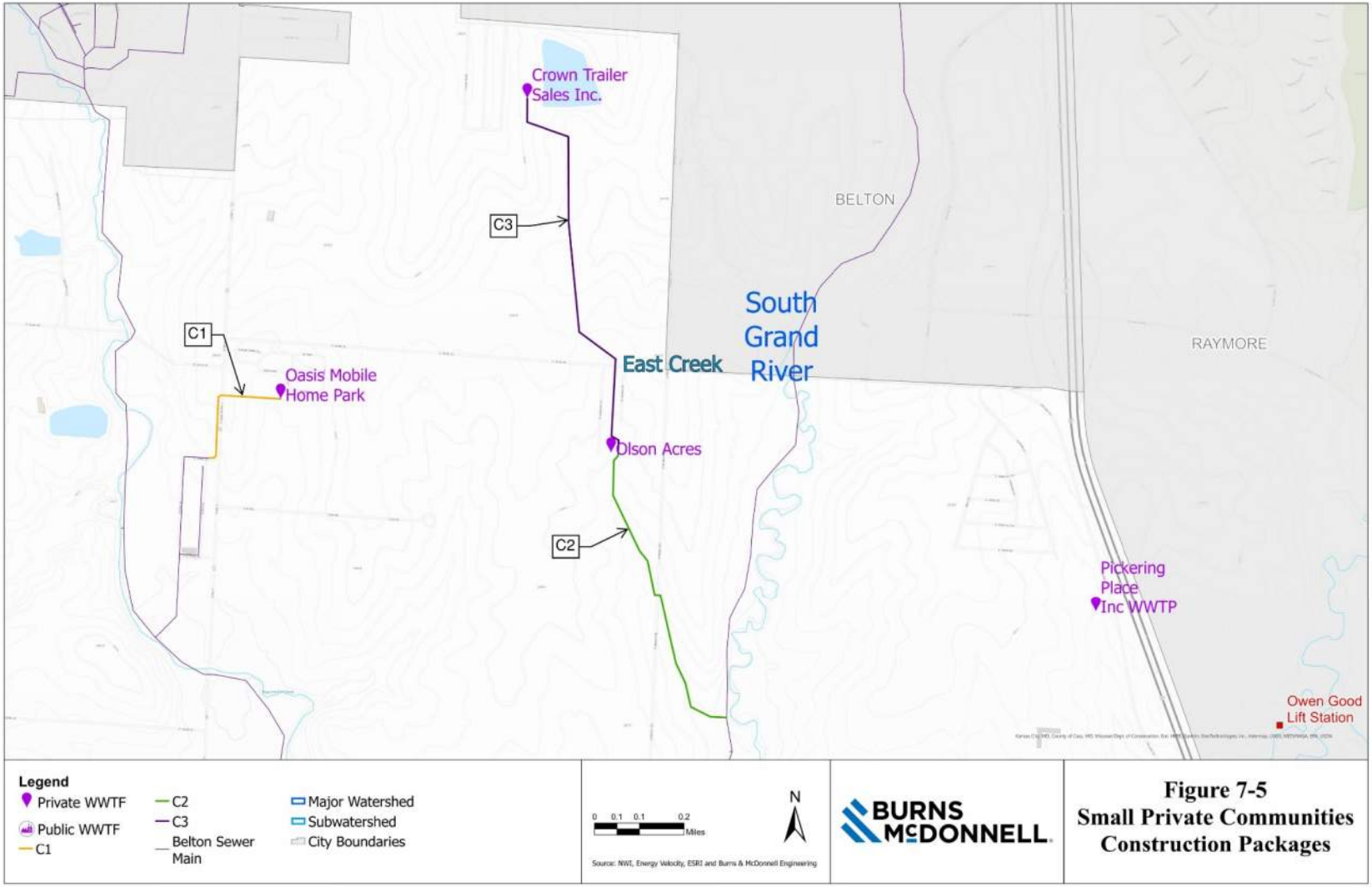
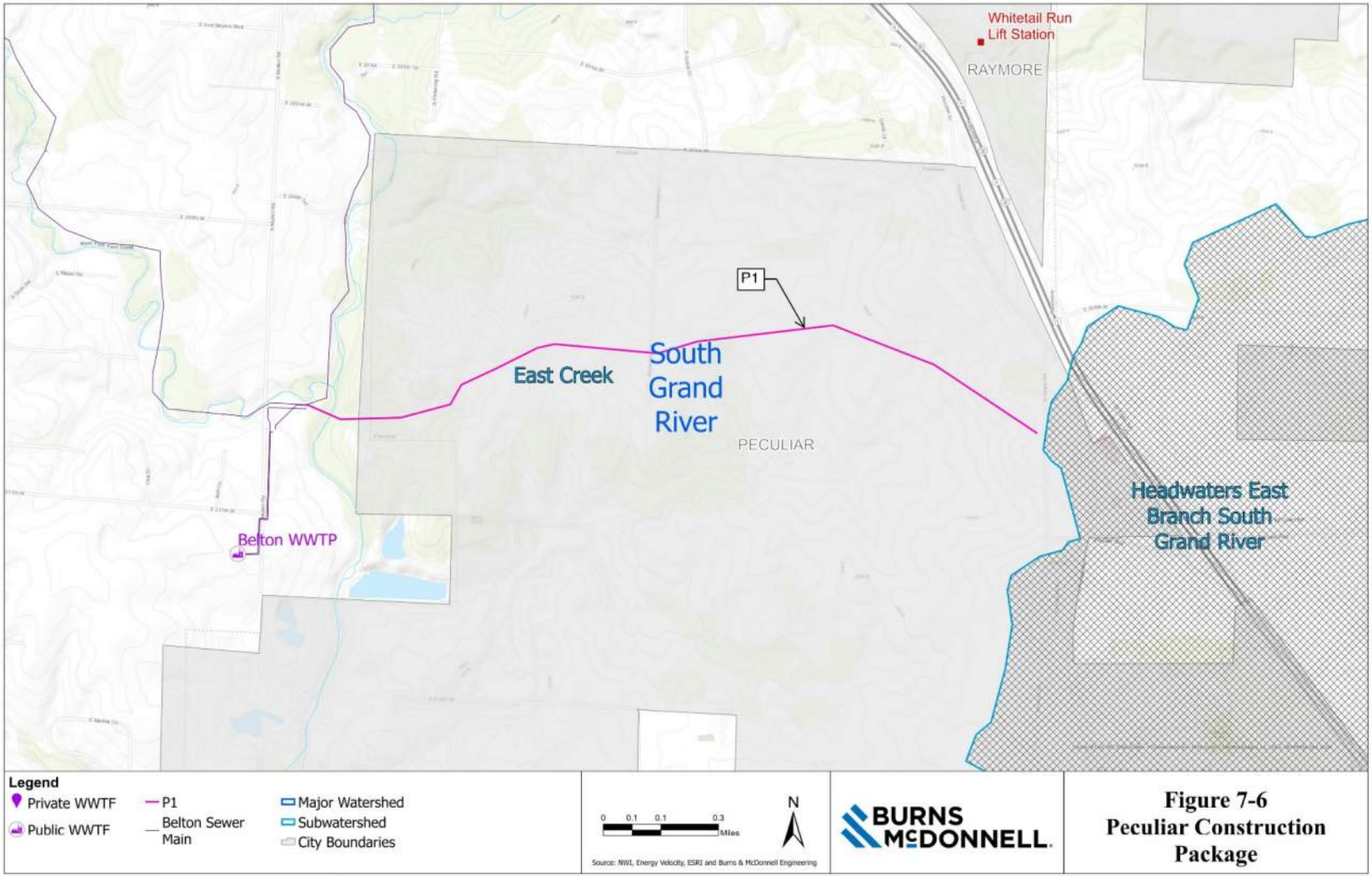


Figure 7-6 Peculiar Construction Package



8.0 OPINION OF PROBABLE COST

Based on the proposed CIPs in each construction package and plant expansion needs described for the City of Belton, Burns & McDonnell developed opinions of probable construction costs. The cost opinions outline the capital required for each project. Costs for the collection system and the Belton WWTF expansion based on the three phases described in Section 5.4 are shown in Table 8-1. The costs of connecting in regional contributors is determined on a dollar per linear foot of pipe basis. Expansion of the existing 2.26 MGD Belton WWTF to a 12 MGD regional WWTP is estimated to cost $144M, based on projects of similar size and scope of work. Since second phase of the plant expansion increases the treatment capacity by 4.74 MGD and the third phase increases it by 5 MGD, the total cost of expanding to a regional WWTP was estimated to be $72M for each of those two phases.

These order-of-magnitude cost opinions are based primarily on Burns & McDonnell's experience and judgment as a professional consultant combined with information from past construction bids on similar projects, vendors, and published sources. Since Burns & McDonnell has no control over weather, cost, availability of labor, availability of material and equipment, labor productivity, construction contractor's procedures and methods, unavoidable delays, construction contractor's methods of determining prices, economic conditions, government regulations and laws (including the interpretation thereof), competitive bidding or market conditions, and other factors affecting such opinions or projections, Burns & McDonnell does not guarantee the actual rates, costs, etc. will not vary from the opinions and projections developed herein.

American Association of Cost Engineering (AACE International) created a Cost Estimate Classification System to provide guidelines for project estimates for engineering, procurement, and construction work. This feasibility study is categorized as Class 5 estimate class. As such, the low accuracy range is defined as -20% to -50% and the high accuracy range is defined as +30% to +100%. A 30-percent contingency allowance is included to cover all types of unaccounted-for project costs resulting from conditions, details, or components which are not normally known or determined until final detailed design. Costs also include engineering and contractor markups. Costs specifically do not include geotechnical evaluations, deep foundations, surveys, permitting preparation and fees, utility services to site, and taxes.

Table 8-1 Opinion of Probable Cost for Regionalization Improvements

Project Description	Cost
Belton	
CIP B1: West Fork Trunk Sewer Improvements	$ 5,100,000
CIP B2: Influent Pump Station and Force main Improvements	$ 13,000,000
CIP B3: Wet Weather Holding Basin	$ 11,000,000
Belton Total	$ 29,100,000
Northwest Belton	
CIP N1: Fairway Ridge LS	$ 640,000
CIP N2: Loch Lloyd Tie-in to Fairway Ridge LS	$ 3,100,000
CIP N3: New Holmes Road LS	$ 460,000
CIP N4: Gravity Main/Force main to Fairway Ridge LS	$ 1,200,000
CIP N5: New 58 Highway LS	$ 200,000
CIP N6: Force main from 58 Highway LS to Fairway Ridge LS	$ 1,600,000
CIP N7: New Effertz Farm LS	$ 480,000
CIP N8: Force main across Effertz Farm	$ 1,900,000
CIP N9: Force main from Prospect & Markey to Markey Park LS	$ 800,000
CIP N10: New Markey Park LS	$ 480,000
CIP N11: Force main from Markey Park LS to 155th Street	$ 1,500,000
CIP N12: Force main from 155th Street to LBVSD	$ 1,000,000
Northwest Belton Total	$ 13,360,000
Raymore	
CIP R1: East Creek Interceptor Improvements	$ 5,400,000
CIP R2: Raymore tie-in from Owen Good Pump Station	$ 5,800,000
CIP R3: Pickering Place tie-in	$ 1,100,000
CIP R4: Belton WWTP Expansion	$ 72,000,000
Raymore Total	$ 84,300,000
Private Communities	
CIP C1: Olson Acres tie-in to Belton collection system	$ 2,700,000
CIP C2: Oasis tie-in to Belton collection system	$ 700,000
CIP C3: Crown Trailer Sales tie-in to Belton collection system	$ 1,600,000
Private Communities Total	$ 5,000,000
Peculiar	
CIP P1: Northwest Peculiar Trunk Sewer to Belton IPS	$ 3,600,000
CIP P2: Belton WWTP Expansion	$ 72,000,000
Peculiar Total	$ 75,600,000

9.0 FUNDING EVALUATION

9.1 MDNR Clean Water State Revolving Fund

The Clean Water State Revolving Fund (SRF) program is a federal-state partnership that offers low-cost financing to political subdivisions of the state. These subdivisions include counties, incorporated cities and towns, and regional water or sewer districts. The SRF program is applicable to new treatment plants, existing treatment plant improvements and upgrades, and acquisition of an existing wastewater treatment plant and treatment plant decommissioning activities associated with plant replacement or regionalization projects. All applicants must demonstrate technical, managerial, and financial capability to participate in the program.

The program features a fixed-rate loan with a standard interest rate that is 30 percent of the municipal market rate for loans with a term up to 20 years. Extended term loans may be available on a case-by-case basis. Partial grant funds may be made available for certain projects to offset a project's total loan amount based on project affordability or to incentive certain water quality actions.

The first step toward receiving SRF assistance is to submit an application form to the Financial Assistance Center. The department prioritizes available funding for and lists projects in the annual SRF Intended Use Plan (IUP). Once listed, a project coordinator assists the applicant with each step of the funding process. The department makes SRF loan and grant commitments once a year to eligible applicants who submit an application by March 1 with a facility plan and documentation of an acceptable debt instrument. The department also accepts applications throughout the year and may make loan only commitments with quarterly amendment to the IUP.

9.2 Regionalization Incentive Grant

Regionalization Incentive Grants are available to municipalities for development of facility plans or sewer extension construction projects. The program is intended to incentivize connections that reduce the number of small, struggling facilities through regionalization. Funding is offered through a competitive, annual funding cycle with applications due March 1. The department scores and obligates Regionalization Incentive Grant funds to applicants in the manner established by the Clean Water State Revolving Fund Grant Regionalization Incentive Grant Guidance, if additional subsidization funding is available.

Certain facility owners in Missouri that have capacity to accept and treat wastewater from proposed regional connections are eligible to apply for the grant. The applicant is the facility owner proposing to build the connection for the purpose of receiving and treating wastewater from another discharging facility and will be the recipient of all grant funds. Facilities to be eliminated by the proposed connection

cannot apply as the applicant. Therefore, the Owner of the Belton WWTF at the time of regionalization grant request would be the primary applicant for the connection of private communities.

The grant will fund 100 percent of all eligible costs include planning, designing, and constructing the sewer connection (with documentation of proper procurement of engineering services by the applicant), applicant's legal costs associated with negotiation and execution of a service agreement, and land acquisition or easements. Decommissioning costs are eligible if the facility to be decommissioned is publicly owned. Connection fees charged by the applicant to the connecting entity are not an eligible cost. The applicant is encouraged to waive such fees since the grant provides 100 percent of construction costs.

In order to be funded through the SRF, projects must be cost-effective. The Department will compare the cost for the construction of the proposed connection with the estimated cost to repair, replace, or upgrade the wastewater treatment facility that is to be eliminated. The applicant's facility plan should estimate the cost to repair, replace, or upgrade the wastewater treatment facility that is being connected if it is a publicly owned facility. Any connection project with a total estimated cost that is 110 percent or greater than the cost to upgrade the facility will be deemed ineligible. Projects will only be deemed eligible if the size and capacity of such works relate directly to the needs to be served by such works, including sufficient reserve capacity. Projects designed for potential development are not eligible.

Applications will be for funds to develop a facility plan and design and construction of the infrastructure connection that will convey wastewater effluent from the connecting entity's facility to the applicant's wastewater treatment plant. Applications must be signed by both the applicant and the owners of the wastewater facilities to be connected by the regionalization grant to ensure both parties have a mutual interest in the regional connection prior to the commitment of funds. The maximum distance that will be considered for proposed projects is 5 miles from the applicant's collection system to the facility to be connected. Applications for connections greater than 5 miles may be evaluated on a case-by-case basis.

9.3 Additional Funding Opportunities

The American Rescue Plan Act (ARPA) allocates funds for wastewater projects, but MDNR currently has limited information on available funding. It is anticipated that MDNR would accept applications for the ARPA grant funding in July and August of 2022 and funds would be allocated in 2024 and would need to be spent by 2026. Criteria for selecting projects eligible for these funds has not been established yet. Since ARPA provides state funds, there will not be an intended use plan.

The City of Belton has indicated that local ARPA funds are planned for other projects, and projects with matching local funds will be given priority for state ARPA funds.

9.4 Funding Recommendations for Belton Regionalization

It is recommended that the Owner at the time of Regionalization of of the Belton WWTF apply for the Regionalization Incentive Grant to construct a new sewer line to convey wastewater flows from Olson Acres to the Belton collection system. If additional funds are available, the Owner can also apply for Oasis Mobile Home Park and Crown Trailer Sales to connect to the collection system as well. Costs for expanding the Belton WWTF can be funded through loans from MDNR's Clean Water State Revolving Fund.

10.0 AFFORDABILITY ANALYSIS

10.1 Benefits of Regionalization

Regionalization is being considered because of the potential to cut costs to all the communities that are involved. When a group of cities, communities, or facilities come together to consolidate services, capital and operational costs are reduced for all parties. Mainly, it provides increased economies of scale. When multiple cities regionalize, they can better plan and budget, which lessens the impact of changing regulations in addition to the cost savings. An affordability analysis will look at what the potential future rates would be to each customer if the regionalization of the Belton Wastewater Treatment plant were to happen. Also, evaluate the potential rates for the City of Belton if regionalization does not happen.

10.2 Regionalization Budget and Estimated Rates

The LBVSD current rate structure is based on the number of total connections that are served by the subdistrict facilities. Since a subdistrict similar to LBVSD is being considered, the same rate structure is used for this study to estimate the potential cost per connection if regionalization were to be implemented. To calculate the estimated rates the budget for the new South Grand Subdistrict was projected for a 20-year planning period. The operational and maintenance costs, existing debt payments, and equipment replacement costs were estimated to build out the future budget. The table below shows the estimated budget for the year 2023 which includes a 20-year debt service to implement the first phase of the Belton Regionalization plan. The second debt service is added in the year 2032 to fund the second phase of the regionalization plan.

Table 10-1 Regionalization Budget and Rate

Budget Year	2023	2032
Operation and Maintenance Costs	$2,600,000	$4,800,000
Debit Payments	$2,600,000	$7,100,000
Equipment Replacement	$300,000	$600,000
Total Yearly Budget	$5,200,000	$12,500,000
Number of Connections	9,700	12,800
Estimated Rate	$50	$78

For the study purpose, it is assumed regionalization of Raymore will be implemented in year 2023 and the total connections will be approximately 9,700 at that time. Based on the number of connections the estimated rate would be $50 per connection. The second phase of regionalization will bring in the City of

Peculiar in the year 2032, and the total number of connections will increase to 12,756. The estimated rate in year 2032 would be $78, this rate includes the additional debt service to increase the plant to 7 MGD to facilitate the additional capacity to regionalize Belton, Raymore, and Peculiar.

10.3 Belton's Budget without Regionalization

The City of Belton's existing wastewater treatment facility was indicated in previous reports to require capacity upgrades to process equipment and replacement of existing equipment to continue to provide adequate service for the current customers and future customers as development occurs in the service area of the existing plant. As the City continues to grow, these previous studies have suggested the City plan for additional capacity upgrades. To facilitate these upgrades and equipment replacements, the City will potentially need to increase rates. The estimated increase in rates will be compared to the rates if regionalization were to be realized.

In the 2020 WWTF Capacity Evaluation, a capacity analysis at the existing Belton WWTF was completed for a 20-year planning period incorporating future population projections. Currently, the unit processes that limit plant capacity is the aeration basin and influent pump station. With the new population and flow projections developed as part of this study, it is estimated the aeration basin capacity will need to be upgraded by year 2029 for an estimated cost of $4,300,000 (2020 WWTF Capacity Evaluation report cost, converted to 2022 dollars). The influent pump station should be planned for an upgrade in the near future at an estimated cost of $13,000,000 (see cost developed in Section 8 of study). These

Also peak flow projections indicated that various other process improvements may be required during the 20-year planning period. The 2020 WWTF Capacity Evaluation report did not estimate a cost for these improvements, instead it recommended inflow/infiltration reduction efforts proceed to decrease peak flow and decrease the need for peak flow treatment. For the purposes of this study, it is recommended that a budget of $10,000,000 dollars be planned to implement future plant upgrades over the 20-year planning period. Also in the next 10 years, the cost of $5,100,000 was accounted for to implement the West Fork trunk sewer improvement, as recommended in Sections 7 and 8 of the report.

The operational and maintenance costs, existing debt payments, and equipment replacement costs were estimated to build out the future budget for the Belton WWTF. The table below shows the estimated budget for the year 2023 which includes operation and maintenance costs based on existing expenses, 20-year debt service to implement the improvements for the aeration basin and the influent pump station, and $300,000 to fund capital improvements yearly. Each year 3% was added to the operation and maintenance

costs to account for escalation. The second debt service was added in the year 2032 to fund additional plant capacity projects and the West Fork Truck sewer improvements.

Table 10-2 Belton WWTF Budget and Rates

Budget Year	2023	2032
Operation and Maintenance Costs	$1,600,000	$2,200,000
Debit Payments	$1,200,000	$2,300,000
Equipment Replacement	$300,000	$300,000
Total Yearly Budget	$3,100,000	$4,800,000
Number of Connections	5,000	5,950
Estimated Rate	$49	$65

Population projects predict above indicate approximately 5,000 connections in year 2023. Based on the number of connections the estimated rate would be $49. In 2032 the number of connections is projected to be 5,950, which would result in an estimated rate of $65 per connection.

APPENDIX A - COLLECTION SYSTEM CAPACITY REVIEW TABLES

Table A-1 Existing Capactiy Review for West Fork Sewer Line

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
9G-MH054	9G-MH053	24	0.26	104.26	0.46	4.11
9G-MH053	9G-MH059	21	0.0055	10.62	0.46	4.11
*9G-MH059	9H-MH008	27	0.0015	10.84	0.98	13.95
9H-MH008	9H-MH007	27	0.0027	14.54	0.98	13.95
9H-MH007	9H-MH006	27	0.0037	17.03	0.98	13.95
*9H-MH006	9H-MH005	27	0.0019	12.2	0.98	13.95
*9H-MH005	9H-MH004	27	0.0023	13.42	0.98	13.95
*9H-MH004	9H-MH003	27	0.0008	7.92	0.98	13.95
9H-MH003	9H-MH002	27	0.0027	14.54	0.98	13.95
*9H-MH002	9H-MH001	27	0.0022	13.13	0.98	13.95
9H-MH001	9I-MH015	27	0.0057	21.13	0.98	13.95
9I-MH015	9I-MH014	27	0.0074	24.08	0.98	13.95
9I-MH014	9I-MH013	27	0.0061	21.86	0.98	13.95
9I-MH013	9I-MH012	27	0.0065	22.57	0.98	13.95
9I-MH012	9I-MH011	27	0.0062	22.04	0.98	13.95
*9I-MH011	9I-MH010	27	0.0014	10.47	0.98	13.95
*9I-MH010	9I-MH009	27	0.0011	9.28	0.98	13.95
9I-MH009	9J-MH007	30	0.0016	14.83	0.98	13.95
9J-MH007	9J-MH006	30	0.002	16.58	0.98	13.95
9J-MH006	9J-MH003	30	0.0071	31.24	0.98	13.95
9J-MH003	9J-MH004	30	0.0054	27.24	0.98	13.95
9J-MH004	9J-MH008	30	0.0038	22.85	0.98	13.95
9J-MH008	10J-MH006	30	0.0023	17.78	0.98	13.95
10J-MH006	10J-MH005	30	0.0018	15.73	0.98	13.95
10J-MH005	10J-MH004	30	0.0019	16.16	0.98	13.95
10J-MH004	10J-MH003	30	0.0019	16.16	0.98	13.95
10J-MH003	10J-MH002	36	0.0014	22.56	0.98	13.95
10J-MH002	10J-MH001	36	0.00059	14.64	0.98	13.95
10J-MH001	10K-MH006	36	0.0018	25.58	0.98	13.95
10K-MH006	10K-MH005	36	0.0026	30.74	0.98	13.95
10K-MH005	10K-MH007	36	0.0035	35.66	0.98	13.95
10K-MH007	10K-MH004	36	0.0062	47.47	0.98	13.95
10K-MH004	10K-MH003	36	0.0016	24.11	0.98	13.95
10K-MH003	10K-MH002	36	0.0013	21.74	0.98	13.95
10K-MH002	10K-MH001	36	0.00094	18.48	0.98	13.95
10K-MH001	10L-MH007	36	0.0011	19.99	0.98	13.95
10L-MH007	10L-MH006	36	0.0016	24.11	0.98	13.95
10L-MH006	10L-MH005	36	0.0016	24.11	0.98	13.95
10L-MH005	10L-MH004	36	0.0029	32.46	0.98	13.95
10L-MH004	10L-MH003	36	0.0029	32.46	0.98	13.95

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
10L-MH003	10L-MH002	36	0.0012	20.88	0.98	13.95
10L-MH002	10L-MH001	36	0.0015	23.35	0.98	13.95
10L-MH001	10M-MH005	36	0.0057	45.51	0.98	13.95
10M-MH005	10M-MH004	36	0.0018	25.58	0.98	13.95
10M-MH004	10M-MH003	36	0.0034	35.15	0.98	13.95
10M-MH003	10M-MH002	36	0.0023	28.91	0.98	13.95
10M-MH002	10M-MH001	36	0.0024	29.53	0.98	13.95
10M-MH001	11M-MH005	36	0.0036	36.17	0.98	13.95
11M-MH005	11M-MH004	36	0.003	33.02	0.98	13.95
11M-MH004	11M-MH003	36	0.0017	24.86	0.98	13.95
11M-MH003	11M-MH002	36	0.0032	34.1	0.98	13.95
11M-MH002	11M-MH001	36	0.0031	33.56	0.98	13.95
11M-MH001	11N-MH007	36	0.0032	34.1	0.98	13.95
11N-MH007	11N-MH006	36	0.0038	37.16	0.98	13.95
11N-MH006	11N-MH005	36	0.0061	47.08	0.98	13.95
11N-MH005	11N-MH004	36	0.0072	51.15	0.98	13.95
11N-MH004	11N-MH003	36	0.0025	30.14	0.98	13.95
11N-MH003	11N-MH002	36	0.0018	25.58	0.98	13.95
11N-MH002	11N-MH008	36	0.0015	23.35	0.98	13.95
11N-MH008	12N-MH003	36	0.0017	24.86	0.98	13.95
12N-MH003	12N-MH001	36	0.0018	25.58	0.98	13.95

* Pipe segments designated with an asterisk are under sized and over capacity during peak flows.

Table A-2 Existing Capacity Review for East Creek Subwatershed Trunk Lines in City Limits

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
7F-MH014	7F-MH013	24	0.0028	10.82	0.46	4.11
7F-MH013	7F-MH012	24	0.0049	14.31	0.46	4.11
7F-MH012	7F-MH011	24	0.0032	11.57	0.46	4.11
7F-MH011	7F-MH010	24	0.0064	16.36	0.46	4.11

* Pipe segments designated with an asterisk are under sized and over capacity during peak flows.

Table A-3 Existing Capacity Review for Lower Missouri Crooked Watershed Trunk Lines

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
12A-MH043	E LBV MS	24	0.0095	19.93	1.7	13.41
11A-MH072	12A-MH043	24	0.011	21.44	1.7	13.41
11A-MH069	11A-MH072	24	0.008	18.29	1.7	13.41
11A-MH037	11A-MH069	24	0.0077	17.94	1.7	13.41
*11A-MH068	11A-MH037	24	0.0028	10.82	1.7	13.41

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
12A-MH042	11A-MH068	24	0.005	14.46	1.7	13.41
*12B-MH057	12A-MH042	24	0.0021	9.37	1.7	13.41
*12B-MH058	12B-MH057	24	0.0013	7.37	1.7	13.41
*12B-MH069	12B-MH058	24	0.0024	10.02	1.7	13.41
*12B-MH075	12B-MH069	24	0.0029	11.01	1.7	13.41
*12B-MH074	12B-MH075	24	0.0023	9.81	1.7	13.41
*12B-MH073	12B-MH074	24	0.0016	8.18	1.7	13.41
*12B-MH070	12B-MH073	24	0.002	9.14	1.7	13.41
*12B-MH071	12B-MH070	24	0.003	11.2	1.7	13.41
*12B-MH072	12B-MH071	24	0.002	9.14	1.7	13.41
12C-MH023	12B-MH072	24	0.0043	13.41	1.7	13.41
*11C-MH006	12C-MH023	24	0.004	12.93	1.7	13.41
11C-MH0024	11C-MH006	24	0.0066	16.61	1.7	13.41
11C-MH0008	11C-MH0024	24	0.0067	16.74	1.7	13.41
11C-MH0013	11C-MH0008	24	0.0064	16.36	1.7	13.41

* Pipe segments designated with an asterisk are under sized and over capacity during peak flows.

Table A-4 Existing Capacity Review for East Creek Sewer Line

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
*12G-MH010	12G-MH007	12	0.0023	1.54	0.5	4.29
*12G-MH007	12G-MH006	12	0.0083	2.93	0.5	4.29
*12G-MH006	12G-MH005	12	0.013	3.67	0.5	4.29
*12G-MH005	12G-MH004	12	0.0089	3.04	0.5	4.29
*12G-MH004	12G-MH003	12	0.0092	3.09	0.5	4.29
*12G-MH003	12G-MH002	12	0.0099	3.2	0.5	4.29
*12G-MH002	12G-MH001	12	0.009	3.05	0.5	4.29
*12G-MH001	12H-MH006	12	0.0085	2.97	0.5	4.29
*12H-MH006	12H-MH007	12	0.0092	3.09	0.5	4.29
*12H-MH007	12H-MH005	12	0.008	2.88	0.5	4.29
*12H-MH005	12H-MH004	12	0.0095	3.14	0.5	4.29
*12H-MH004	12H-MH003	12	0.014	3.81	0.5	4.29
12H-MH003	12H-MH002	12	0.018	4.32	0.5	4.29
*12H-MH002	12H-MH001	12	0.0069	2.67	0.5	4.29
*12H-MH001	12I-MH008	12	0.0028	1.7	0.5	4.29
*12I-MH008	12I-MH007	12	0.0032	1.82	0.5	4.29
*12I-MH007	12I-MH006	12	0.0037	1.96	0.5	4.29
*12I-MH006	12I-MH005	12	0.0035	1.9	0.5	4.29
*12I-MH005	12I-MH004	12	0.0032	1.82	0.5	4.29
*12I-MH004	12I-MH003	12	0.0028	1.7	0.5	4.29

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
*12I-MH003	12I-MH002	12	0.0027	1.67	0.5	4.29
*12I-MH002	12I-MH001	12	0.0025	1.61	0.5	4.29
*12I-MH001	12J-MH007	12	0.0023	1.54	0.5	4.29
*12J-MH007	12J-MH006	12	0.0029	1.73	0.5	4.29
*12J-MH006	12J-MH005	12	0.023	4.88	0.5	4.29
*12J-MH005	12J-MH004	12	0.0067	2.64	0.5	4.29
*12J-MH004	12J-MH003	12	0.0059	2.47	0.5	4.29
*12J-MH003	12J-MH002	12	0.0028	1.7	0.5	4.29
*12J-MH002	12J-MH001	12	0.0055	2.39	0.5	4.29
*12J-MH001	12K-MH010	12	0.0069	2.67	0.5	4.29
*12K-MH010	12K-MH009	12	0.0035	1.9	0.5	4.29
*12K-MH009	12K-MH008	12	0.0025	1.61	0.5	4.29
*12K-MH008	12K-MH007	12	0.0068	2.66	0.5	4.29
*12K-MH007	12K-MH006	12	0.0037	1.96	0.5	4.29
*12K-MH006	12K-MH005	12	0.0028	1.7	0.5	4.29
*12K-MH005	12K-MH004	12	0.0034	1.88	0.5	4.29
*12K-MH004	12K-MH003	12	0.0019	1.4	0.5	4.29
*12K-MH003	12K-MH002	12	0.0027	1.67	0.5	4.29
*12K-MH002	12K-MH001	12	0.0041	2.06	0.5	4.29
*12K-MH001	12L-MH008	12	0.0045	2.16	0.5	4.29
12L-MH008	12L-MH009	15	0.016	7.38	0.5	4.29
*12L-MH009	12L-MH007	15	0.0037	3.55	0.5	4.29
*12L-MH007	12L-MH006	15	0.0021	2.68	0.5	4.29
*12L-MH006	12L-MH005	15	0.0023	2.8	0.5	4.29
*12L-MH005	12L-MH004	15	0.0028	3.09	0.5	4.29
*12L-MH004	12L-MH003	15	0.002	2.61	0.5	4.29
*12L-MH003	12L-MH002	15	0.0015	2.26	0.5	4.29
*12L-MH002	12L-MH001	15	0.0031	3.25	0.5	4.29
*12L-MH001	12M-MH007	15	0.0026	2.98	0.5	4.29
*12M-MH007	12M-MH006	15	0.0042	3.78	0.5	4.29
*12M-MH006	12M-MH005	15	0.0019	2.54	0.5	4.29
*12M-MH005	12M-MH004	15	0.0016	2.34	0.5	4.29
*12M-MH004	12M-MH008	15	0.00051	1.32	0.5	4.29
*12M-MH008	12M-MH003	15	0.0022	2.74	0.5	4.29
*12M-MH003	12M-MH002	15	0.0017	2.41	0.5	4.29
*12M-MH002	12M-MH001	15	0.0024	2.86	0.5	4.29
*12M-MH001	12N-MH002	15	0.0025	2.92	0.5	4.29
12N-MH002	12N-MH005	18	0.0027	4.93	0.5	4.29
*12N-MH005	12N-MH004	18	0.0015	3.68	0.5	4.29
12N-MH004	12N-MH001	18	0.0027	4.93	0.5	4.29

* Pipe segments designated with an asterisk are under sized and over capacity during peak flows.

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)

Table A-5 Existing Capacity Review for Sewer Line From Combination MH to Pump Station

US MH	DS MH	Diameter (in)	Slope (ft/ft)	Capacity (MGD)	Average Flow (MGD)	Peak Flow (MGD)
12N-MH001	12N-MH006	36	0.0018	25.58	1.5	18.24
12N-MH006	12N-MH007	36	0.0026	30.74	1.5	18.24
12N-MH007	12N-MH008	36	0.0024	29.53	1.5	18.24
12N-MH008	12N-MH009	36	0.0025	30.14	1.5	18.24

* Pipe segments designated with an asterisk are under sized and over capacity during peak flows.

APPENDIX B - REGIONALIZATION CAPACITY REVIEW

Table B-1 Regionalization Capacity for West Fork Sewer Line

US MH	DS MH	Average Flow Left over Capacity (MGD)	Peak Flow Left over Capacity (MGD)	Addition Average Flow (MGD)	Addition Peak Flow (MGD)
9J-MH003	9J-MH004	26.26	13.29	0.02	0.02
9J-MH004	9J-MH008	21.87	8.9	0.02	0.02
9J-MH008	10J-MH006	16.8	3.83	0.02	0.02
10J-MH006	10J-MH005	14.75	1.78	0.02	0.02
10J-MH005	10J-MH004	15.18	2.21	0.02	0.02
10J-MH004	10J-MH003	15.18	2.21	0.02	0.02
10J-MH003	10J-MH002	21.58	8.61	0.02	0.02
10J-MH002	10J-MH001	13.66	0.69	0.02	0.02
10J-MH001	10K-MH006	24.6	11.63	0.02	0.02
10K-MH006	10K-MH005	29.76	16.79	0.02	0.02
10K-MH005	10K-MH007	34.68	21.71	0.02	0.02
10K-MH007	10K-MH004	46.49	33.52	0.02	0.02
10K-MH004	10K-MH003	23.13	10.16	0.02	0.02
10K-MH003	10K-MH002	20.76	7.79	0.02	0.02
10K-MH002	10K-MH001	17.5	4.53	0.02	0.02
10K-MH001	10L-MH007	19.01	6.04	0.02	0.02
10L-MH007	10L-MH006	23.13	10.16	0.02	0.02
10L-MH006	10L-MH005	23.13	10.16	0.02	0.02
10L-MH005	10L-MH004	31.48	18.51	0.02	0.02
10L-MH004	10L-MH003	31.48	18.51	0.02	0.02
10L-MH003	10L-MH002	19.9	6.93	0.02	0.02
10L-MH002	10L-MH001	22.37	9.4	0.02	0.02
10L-MH001	10M-MH005	44.53	31.56	0.02	0.02
10M-MH005	10M-MH004	24.6	11.63	0.02	0.02
10M-MH004	10M-MH003	34.17	21.2	0.02	0.02
10M-MH003	10M-MH002	27.93	14.96	0.02	0.02
10M-MH002	10M-MH001	28.55	15.58	0.02	0.02
10M-MH001	11M-MH005	35.19	22.22	0.02	0.02
11M-MH005	11M-MH004	32.04	19.07	0.02	0.02
11M-MH004	11M-MH003	23.88	10.91	0.02	0.02
11M-MH003	11M-MH002	33.12	20.15	0.02	0.02
11M-MH002	11M-MH001	32.58	19.61	0.02	0.02
11M-MH001	11N-MH007	33.12	20.15	0.02	0.02
11N-MH007	11N-MH006	36.18	23.21	0.02	0.02
11N-MH006	11N-MH005	46.1	33.13	0.02	0.02
11N-MH005	11N-MH004	50.17	37.2	0.02	0.02
11N-MH004	11N-MH003	29.16	16.19	0.02	0.02
11N-MH003	11N-MH002	24.6	11.63	0.02	0.02
11N-MH002	11N-MH008	22.37	9.4	0.02	0.02

US MH	DS MH	Average Flow Left over Capacity (MGD)	Peak Flow Left over Capacity (MGD)	Addition Average Flow (MGD)	Addition Peak Flow (MGD)
11N-MH008	12N-MH003	23.88	10.91	0.02	0.02
12N-MH003	12N-MH001	24.6	11.63	0.02	0.02

Table B-2 Regionalization Capacity for East Creek Sewer Line

US MH	DS MH	Average Flow Left over Capacity (MGD)	Peak Flow Left over Capacity (MGD)	Addition Average Flow (MGD)	Addition Peak Flow (MGD)
*12J-MH004	12J-MH003	1.97	-1.82	0.09	0.09
*12J-MH003	12J-MH002	1.2	-2.59	0.09	0.09
*12J-MH002	12J-MH001	1.89	-1.9	0.09	0.09
*12J-MH001	12K-MH010	2.17	-1.62	0.09	0.09
*12K-MH010	12K-MH009	1.4	-2.39	0.09	0.09
*12K-MH009	12K-MH008	1.11	-2.68	0.09	0.09
*12K-MH008	12K-MH007	2.16	-1.63	0.09	0.09
*12K-MH007	12K-MH006	1.46	-2.33	0.09	0.09
*12K-MH006	12K-MH005	1.2	-2.59	0.09	0.09
*12K-MH005	12K-MH004	1.38	-2.41	0.09	0.09
*12K-MH004	12K-MH003	0.9	-2.89	0.09	0.09
*12K-MH003	12K-MH002	1.17	-2.62	0.09	0.09
*12K-MH002	12K-MH001	1.56	-2.23	0.09	0.09
*12K-MH001	12L-MH008	1.66	-2.13	0.09	0.09
12L-MH008	12L-MH009	6.88	3.09	0.09	0.09
*12L-MH009	12L-MH007	3.05	-0.74	2.11	10.11
*12L-MH007	12L-MH006	2.18	-1.61	2.11	10.11
*12L-MH006	12L-MH005	2.3	-1.49	2.11	10.11
*12L-MH005	12L-MH004	2.59	-1.2	2.11	10.11
*12L-MH004	12L-MH003	2.11	-1.68	2.11	10.11
**12L-MH003	12L-MH002	1.76	-2.03	2.11	10.11
*12L-MH002	12L-MH001	2.75	-1.04	2.11	10.11
*12L-MH001	12M-MH007	2.48	-1.31	2.11	10.11
*12M-MH007	12M-MH006	3.28	-0.51	2.11	10.11
*12M-MH006	12M-MH005	2.04	-1.75	2.11	10.11
**12M-MH005	12M-MH004	1.84	-1.95	2.11	10.11
**12M-MH004	12M-MH008	0.82	-2.97	2.11	10.11
*12M-MH008	12M-MH003	2.24	-1.55	2.11	10.11
**12M-MH003	12M-MH002	1.91	-1.88	2.11	10.11
*12M-MH002	12M-MH001	2.36	-1.43	2.11	10.11
*12M-MH001	12N-MH002	2.42	-1.37	2.11	10.11
12N-MH002	12N-MH005	4.43	0.64	2.11	10.11

US MH	DS MH	Average Flow Left over Capacity (MGD)	Peak Flow Left over Capacity (MGD)	Addition Average Flow (MGD)	Addition Peak Flow (MGD)
*12N-MH005	12N-MH004	3.18	-0.61	2.11	10.11
12N-MH004	12N-MH001	4.43	0.64	2.11	10.11

* Pipe segments designated with an asterisk are under sized and over capacity during peak flows.
** Pipe segments designated with two asterisks are under sized and over capacity during average flows.

Table B-3: Regionalization Capacity for Sewer Line from Combination MH to Pump Station

US MH	DS MH	Average Flow Left over Capacity (MGD)	Peak Flow Left over Capacity (MGD)	Addition Average Flow (MGD)	Addition Peak Flow (MGD)
*12N-MH001	12N-MH006	24.08	7.34	2.56	13.1
*12N-MH006	12N-MH007	29.24	12.5	2.56	13.1
*12N-MH007	12N-MH008	28.03	11.29	2.56	13.1
*12N-MH008	12N-MH009	28.64	11.9	2.56	13.1

* Pipe segments designated with an asterisk are under sized and over capacity during peak flows.
** Pipe segments designated with two asterisks are under sized and over capacity during average flows.

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