Wastewater Utility Plan

Town of Erie

Erie, CO

August 20, 2020

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ACRONYMS AND ABBREVIATIONS

AADF	Annual Average Daily Flow
ATAD	Autothermal Thermophilic Aerobic Digestion
BMPs	Best Management Practices
BOD	Biological Oxygen Demand
CDPHE	Colorado Department of Health and Environment
CDPS	Colorado Discharge Permit System
CIP	Capital Improvement Plan
CLEAN	Center for Comprehensive, Optimal and Effective Abatement of Nutrients
CFR	Code of Federal Regulations
DM	Daily Maximum
EDC	Endocrine Disrupting Compound
EPA	Environmental Protection Agency
EQR	Equivalent Residential Unit
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FOG	Fats, Oils and Greases
FKC	Fukoku Kogyo Company
GIS	Geographical Information System
GPD	Gallons per Day
I&I	Infiltration and Inflow
IFAS	Integrated Fixed-Film Activated Sludge
IGA	Intergovernmental Agreement
IPP	Industrial Pretreatment Program
KICP	Keep It Clean Partnership
LOMR	Letter of Map Revision
M&E	Monitoring and Evaluation
MGD	Million Gallons per Day
MMDF	Maximum Month Daily Flow
MWAT	Maximum Weekly Allowable Temperature

NEPA	National Environmental Protection Act
NFRWQPA	North Front Range Water Quality Planning Association
NPV	Net Present Value
NWRF	North Water Reclamation Facility
O&M	Operation and Maintenance
ORC	Operator in Charge
PELs	Primary Effluent Limitations
PHF	Peak Hour Flow
PVC	Polyvinyl Chloride
RAS	Return Activated Sludge
RST	Rotary Screen Thickener
SCADA	Supervisory Control And Data Acquisition
SVSD	St. Vrain Sanitation District
TIN	Total Inorganic Nitrogen
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TVS	Table Value Standard
WAS	Waste Activated Sludge
WCR	Weld County Road
WRAP	Watershed Rapid Assessment Program
WQCC	Water Quality Control Commission
WQCD	Water Quality Control Division
WQBEL	Water Quality-Based Effluent Limits
WTP	Water Treatment Plant
WUSA	Wastewater Utility Service Area
WWTF	Wastewater Treatment Facility

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Executive Summary

Purpose

The purpose of this Utility Plan is to document the Town of Erie's (Town) existing wastewater collection and treatment system and proposed planning objectives necessary to maintain optimum service during the current and future periods of growth. The original Utility Plan was submitted to North Front Range Water Quality Planning Association (NFRWQPA) January 2013. This submittal provides an update based on the Town of Erie NWRF Expansion Master Plan completed in March 2019 by HDR (included in Appendix A).

The Town provides service to several local area entities accelerating the need to expand treatment capacity. Upcoming regulatory requirement changes and their potential impact on the Town's existing treatment system are also examined and summarized. The wastewater collection and treatment systems are reviewed herein. Related financial requirements are included with the recommendations for the treatment system expansion and upgrading.

Scope

The principal issues examined as part of this Utility Plan include the following:

1. Update tap/flow growth scenarios and develop plant expansion "trigger" points.
2. Evaluate existing and future wastewater characteristics.
3. Summarize potential future regulatory requirements and their impact on treatment.
4. Evaluate the existing wastewater collection system and treatment process in relation to future flows, loads, and discharge standards.
5. Develop wastewater treatment system options, including capital costs and O&M requirements.
6. Make recommendations on the most economical and environmentally sound course of action to pursue.
7. Update planning for future sewerage facilities to serve existing and expanded service area.

Planning Period

Growth projections for the purpose of planning for future capital improvements are based on a 20-year plus planning period from 2018 through the year 2038. Historical tap sales, population estimates, and hydraulic and organic loading data provide a basis from which expansion planning specific to the Town's infrastructure is projected for interim periods. Based on analysis of available information, the following recommendations outline projected near- and long-term improvements:

- Expansion of the Town's NWRF from a maximum month daily flow (MMDF) capacity of 1.5 MGD to 3 MGD. The MMDF capacity is the basis for permitting the facility expansion with the Colorado Department of Public Health and Environment (CDPHE). Additionally, the improvements will be implemented to meet anticipated effluent limits and will include the following:
  - Install a fourth influent pump that is identical to the NWRF's existing three influent pumps.

- Construct a third IFAS train with an anaerobic zone, pre-anoxic zone, two aerobic zones, a swing zone, a post-anoxic zone, and a re-aeration zone.
- Provide accommodations for tying in the fourth IFAS train in the future.
- Modify the existing grit basin effluent weir to allow it to discharge to the third IFAS train as well as the future fourth IFAS train.
- Construct swing zones, post-anoxic zones, and re-aeration zones on the existing two IFAS trains, such that all three trains are identical.
- Repurpose the NWRF's existing RAS/IR centrifugal pumps for RAS/WAS pumping only. Install new propeller-style in-basin pumps for IR pumping in all three IFAS trains.
- Decommission the FKC Class A Biosolids Stabilization system.
- Implement ATAD as new biosolids stabilization process at the Erie NWRF.
- Construct a new Solids Processing Building to house ATAD equipment with a Dewatering Room to hold new thickening and dewatering equipment.
- Install a new biosolids stabilization facility sized for 2028 conditions, with two ThermAer tanks, one SNDR tank, biofilter, space for ancillary equipment, and room for expansion to 2038 conditions.
- Install two new rotary drum thickeners in the new Solids Processing building to meet 2038 solids loading conditions.
- Install two new dewatering screw presses in the new Solids Processing building to meet 2038 conditions.
- Install new polymer system for both thickening and dewatering.
- Install a new ferric sulfate feed system in the new ATAD Building.
- Convert the existing lime stabilization basin to a WAS holding tank.
- Abandon the existing WAS holding tank and two existing feed tanks.

- Additionally, site improvements will be implemented to address operational issues including:
  - Provide SCADA and electrical wiring for the new influent flow measurement device to be installed by the Town.
  - Provide larger Non-potable water system pumps and flow meters at key process points.
  - Provide effluent flow monitoring of effluent discharge to Boulder Creek.

Initial hydraulic and organic capacities for the NWRF expansion are based on population growth estimates for a twenty (20) year period, with a plan to incrementally expand treatment capacity by constructing additional process trains. The Town's phased planning approach is based on increasing the treatment capacity of the NWRF at the current site.

Level of Treatment

Table ES-1 summarizes the design year (2028) influent flows and loads that will be used as the overall basis for design. These values impact equipment sizing, as well as downstream processes as determined by the solids mass balance. These values serve as sizing criteria and will determine the required capacity for each design task in this Utility Plan. The values are based on a compounded growth rate of 8% until 2022, and then a compounded growth rate of 5% from 2023 onward. See Figure ES-1 below. This projection method results in values that lie conservatively within the low and high ends of the other projection methods, and is the best representation of expected growth in the Town's service area based on historical data.

Table ES-1. Basis of Design Summary

Design Hydraulic Capacity	
Annual Average Daily Flow (AADF)	2.80 MGD
Max Monthly Daily Flow (MMDF)	3.03 MGD
Peak Hour Flow (PHF)	5.6 MGD
Design Influent Loadings	
BOD, average day	6,997 lb/d
BOD, max month	9,376 lb/d
TSS, average	7,193 lb/d
TSS, max month	9,709 lb/d
NH_3, average	840 lb/d
NH_3, max month	1,114 lb/d
TP, average	443 lb/d
TP, max month	618 lb/d
Design Effluent Limits and Treatment Goals	
BOD_5 (mg/L)	<45 (7-day avg.), <30 (30-day avg.)
TSS (mg/L)	<45 (7-day avg.), <30 (30-day avg.)
NH_3 (mg/L)	≤2.0 (30-day avg.)
Total Inorganic Nitrogen (TIN) (mg/L)	≤15 (annual median)
Total Phosphorus (TP) (mg/L)	≤1.0 (annual median)

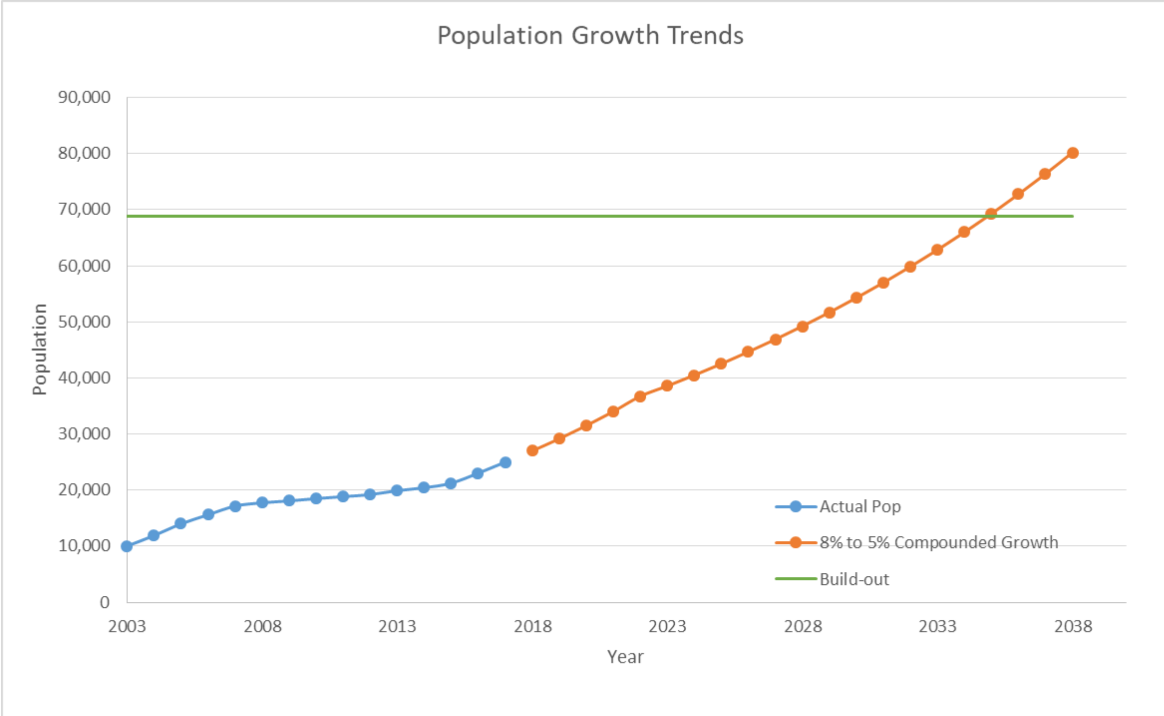

Figure ES-1. Town of Erie Population Projection

Project Recommendations

Growth within the Town's service area is anticipated to be similar to historical growth rates based on several factors including demographic studies conducted for Weld and Boulder Counties, available data from the Colorado Department of Local Affairs State Demography Office, platted development lots within communities served by the Town, and consolidation and intergovernmental agreements with surrounding wastewater providers. Maximum monthly influent wastewater flow conditions at the existing NWRF require the Town to begin design and construction of improvements to meet projected hydraulic and treatment capacity requirements which will exceed permit limits in the next few years. Influent data from 2019 indicates that the Erie NWRF is operating at approximately 88 percent of their hydraulic capacity, and 67 percent of their BOD loading capacity; however, in previous years they may have been operating at a higher percentage of their BOD loading capacity. (See Section 2.2 of this report for more information regarding the plant's BOD loading.) The purpose of this expansion is to meet the 20-year planning requirements for the Town.

Based on the Town's treatment objectives, revised PELs, and evaluation of applicable treatment processes and technologies, improvements to the liquid stream, solids stream, and existing plant site are recommended for near-term NWRF expansion efforts.

NWRF Financial Summary

The opinion of probable cost for the first phase of recommended improvements for the Erie NWRF is $31,613,395. The Town is financially solvent and has adequate fund reserves for constructing the proposed capital improvements projects.

The Town is also currently conducting a new Utility Rate & Connection Fee Study (Rate Study) to identify rate and connection fees that need to be implemented to adequately fund operation and maintenance as well as future capital improvements. If the current sewer rate is insufficient to generate funds prior to the next phase of expansion, the Town can consider increasing rates to defray the capital costs.

Implementation Schedule

The intended implementation schedule for the planning, design, and construction of improvements to the Town's infrastructure is shown below in Table ES-2.

Table ES-2. Implementation Schedule

Activity	Start Date	Completion Date
Preliminary Design	May 2018	February 2019
Final Design	April 2019	June 2020
Plant Site Application	May 2020	July 2020
Plant Construction	August 2020	September 2022

1 Introduction

1.1 Background

The Town of Erie is located along the Front Range, north of Denver and east of Boulder along Coal Creek. The Town currently encompasses 46 square miles and serves approximately 28,310 residential customer accounts as well as several commercial and industrial developments in Erie and areas of Weld and Boulder County. The planning area is bounded by Baseline Road (Highway 7) on the south, State Highway 52 on the north, Interstate 25 on the east, and Highway 287 on the west.

The Town of Erie has two wastewater reclamation facilities: the South Water Reclamation Facility (SWRF), and the North Water Reclamation Facility (NWRF). The SWRF is located just north of the intersection of Briggs Street and Evans Street. The SWRF is an extended aeration activated sludge plant and has a rated capacity of 1.6 mgd and 3,870 ppd of Biochemical Oxygen Demand (BOD). The North Water Reclamation Facility (NWRF) was constructed in 2010 and became operational in early 2011. The NWRF is located north of Highway 52 and east of County Line Road along Boulder Creek, and it has a rated capacity of 1.5 mgd and 3,233 lbs/day of BOD.

The SWRF was taken offline in 2011 when the NWRF became operational, and only the NWRF is currently in operation. Though not in use, the Town has opted not to decommission the SWRF in case the treatment facility needs to be brought back online in the future to accommodate future wastewater treatment needs. The discharge permit for the facility has not been terminated and remains in effect, however, the Town currently plans to abandon the existing outfall for the SWRF. At this time, the Town does not anticipate any needs to bring the SWRF back into service for the foreseeable future.

1.2 Facilities Plan Summary

The periods used for planning efforts for the Town's NWRF improvements and other infrastructure requirements are based on a twenty (20) year planning period. This period is the basis for evaluating population growth, estimating treatment capacity requirements, and evaluating treatment process alternatives. The overall planning period extends from 2018 through 2038. HDR recently completed a Master Plan which provides the Capital Improvements Plan for the next 20 years.

1.3 Implementation

The existing NWRF has a design capacity of 1.95 MGD and 5,233 lbs of BOD_5 per day. Due to rapid and sustained growth in the area, the NWRF is now operating at or above 80 percent of the rated hydraulic and treatment capacities. CDPHE requires that wastewater treatment facilities make plans to expand once the facility reaches 80 percent design capacity. Additionally, tighter effluent discharge regulations are anticipated with the implementation of CDPHE Regulation 85 and Regulation 31. Therefore, an expansion of the facility is needed to comply with the Town's Compliance Schedule and to accommodate phasing for anticipated future discharge limits as well as Policy 17-1 requirements. The newly expanded NWRF would accommodate reasonable projected growth and loading over the 20-year planning period.

1.4 General Format of Report & Supporting Information

This Wastewater Utility Plan was written in accordance with the outline provided by the NFRWQPA, and every attempt has been made to cover all issues that need to be addressed for Wastewater Utility Plan review. The report outline checklist has been completed to facilitate review of this document.

2 Existing Conditions

2.1 Current Planning Service Area

2.1.1 Land Use and Zoning

As in most areas in Colorado that are experiencing rapid growth, land use within the Town's service area is changing from predominantly agricultural to largely residential. The designation *rural lands* generally applies to much of the unincorporated areas that are not publicly owned parks and open space. Allowed uses and densities are determined by existing zoning. The land use category, *urban lands*, includes Growth Management Areas and other urban areas designated by the Town. In urban areas, specific land use categories are determined by an adopted community plan. Generally, urban planning provides for densities of three to five units per acre within an urban growth area, while rural areas are more commonly planned at about 0.5 units per acre. Changes in land use designation dramatically influence future planning and sizing of conveyance and treatment systems. The Town's service area incorporates both land use categories. The land use map for the service area is shown below in Figure 2-1.

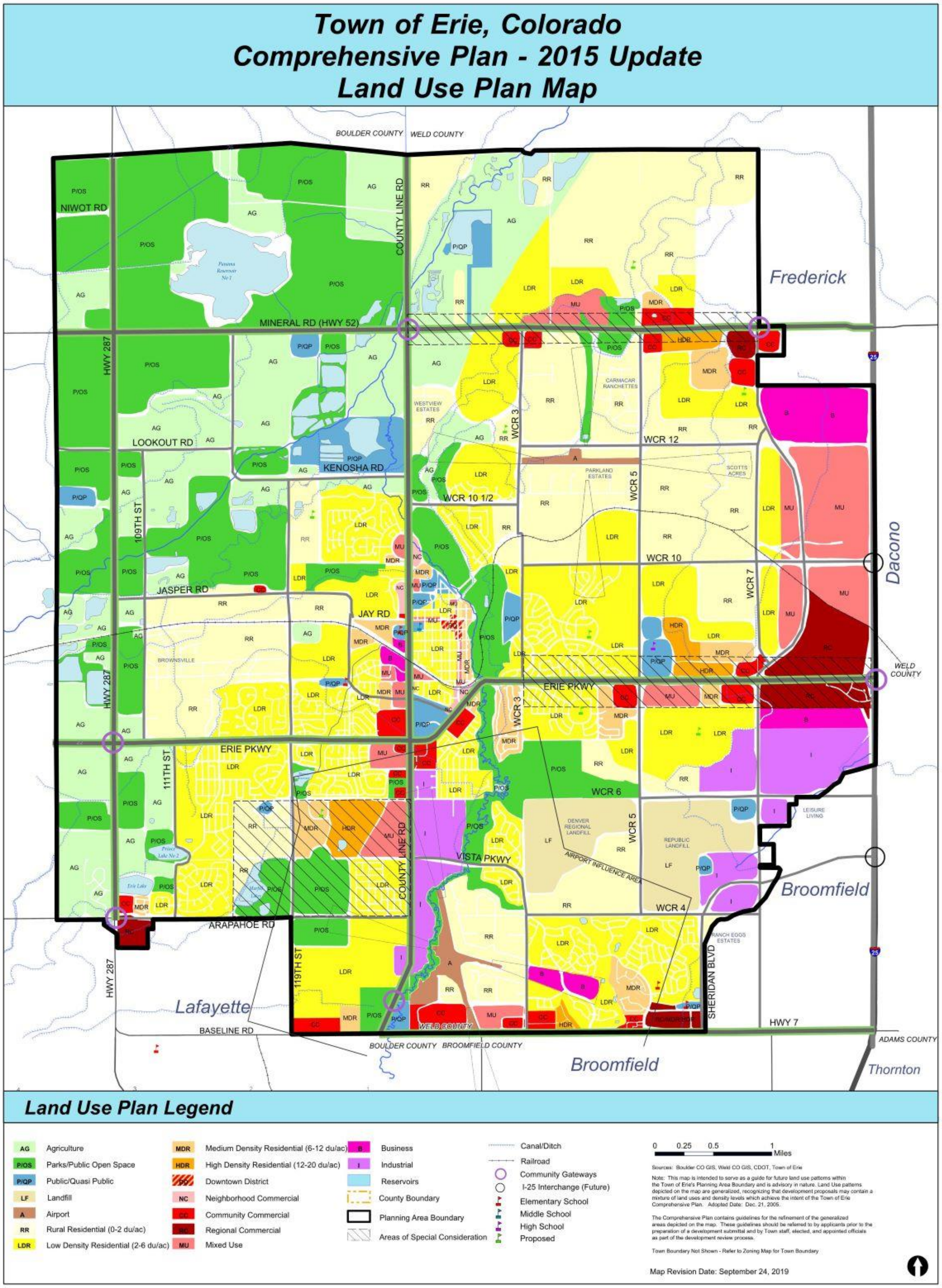

Figure 2-1. Town of Erie Land Use Plan Map

2.1.2 Current Wastewater WUSA & GMA

The existing Wastewater Utility Service Area (WUSA) is shown on Figure 2-2 on the following page and complies with the current NFRWQPA map for the Town. Figure 2-3 provides a map identifying public and private potable drinking water well sites located within 1-mile of the Erie NWRF, and Figure 2-4 provides a radius map identifying all WWTPs located within a 5-mile radius.

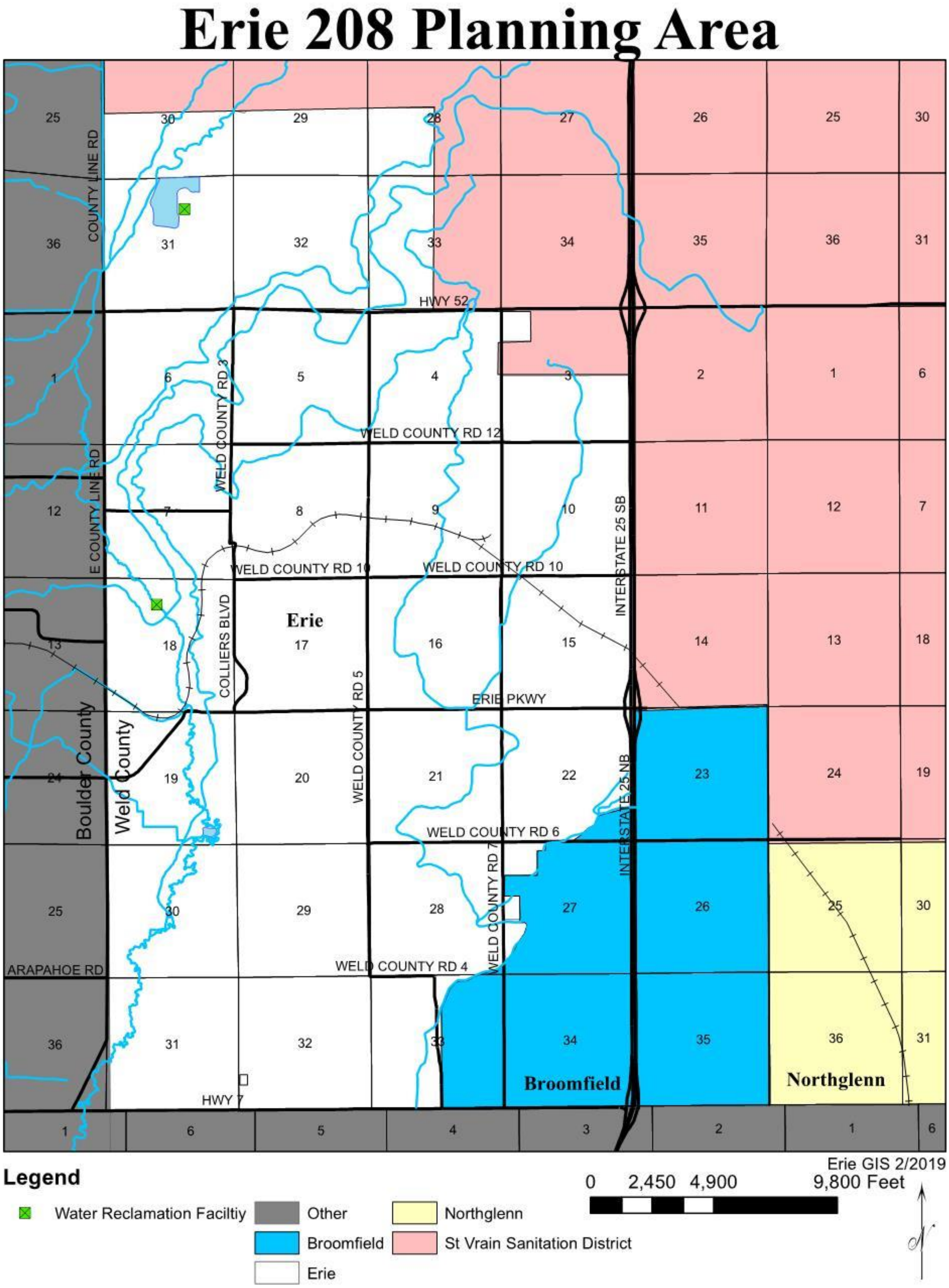

Figure 2-2. Town of Erie WUSA Boundary

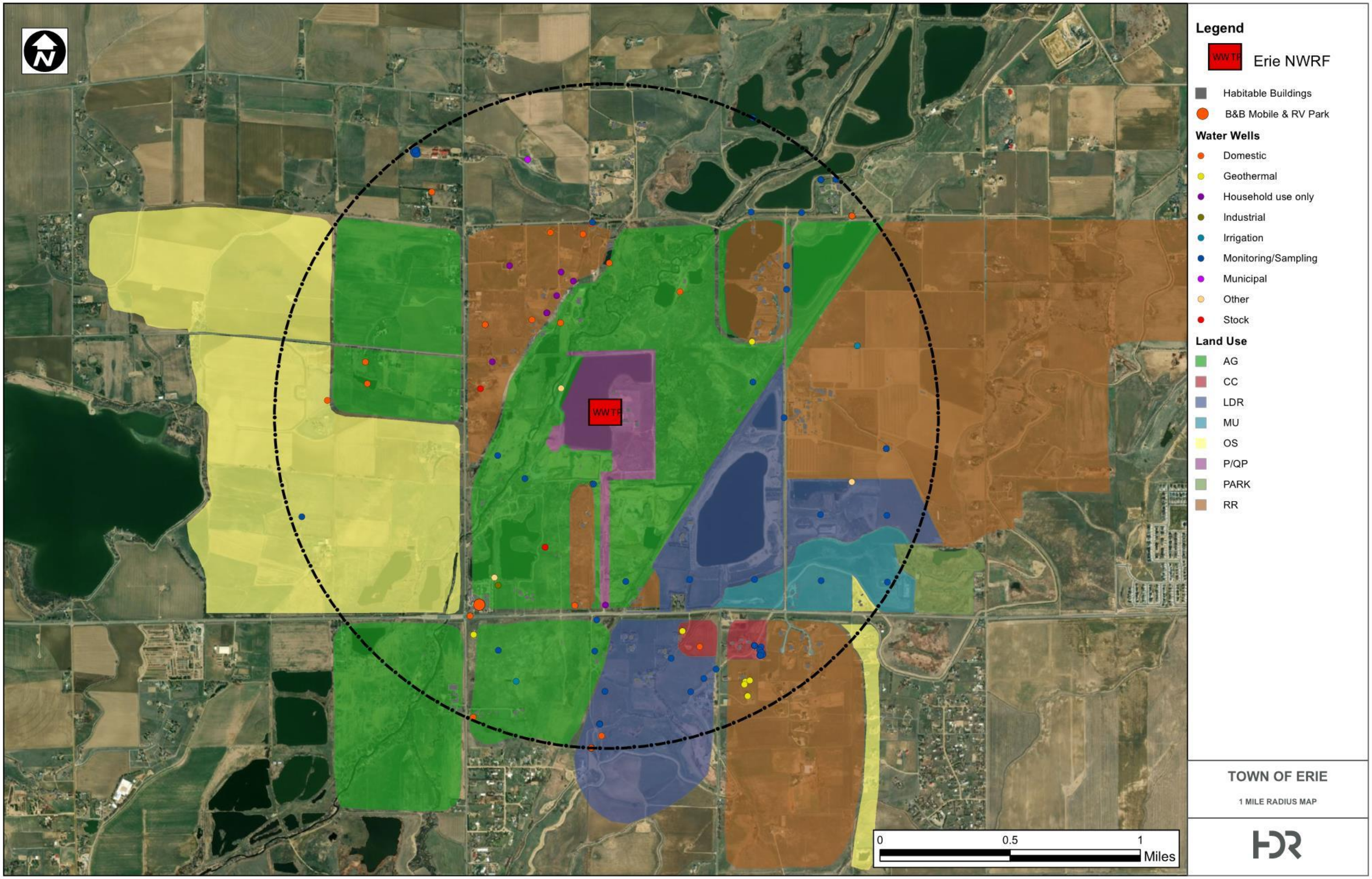

Figure 2-3. Erie NWRF 1-Mile Radius Map

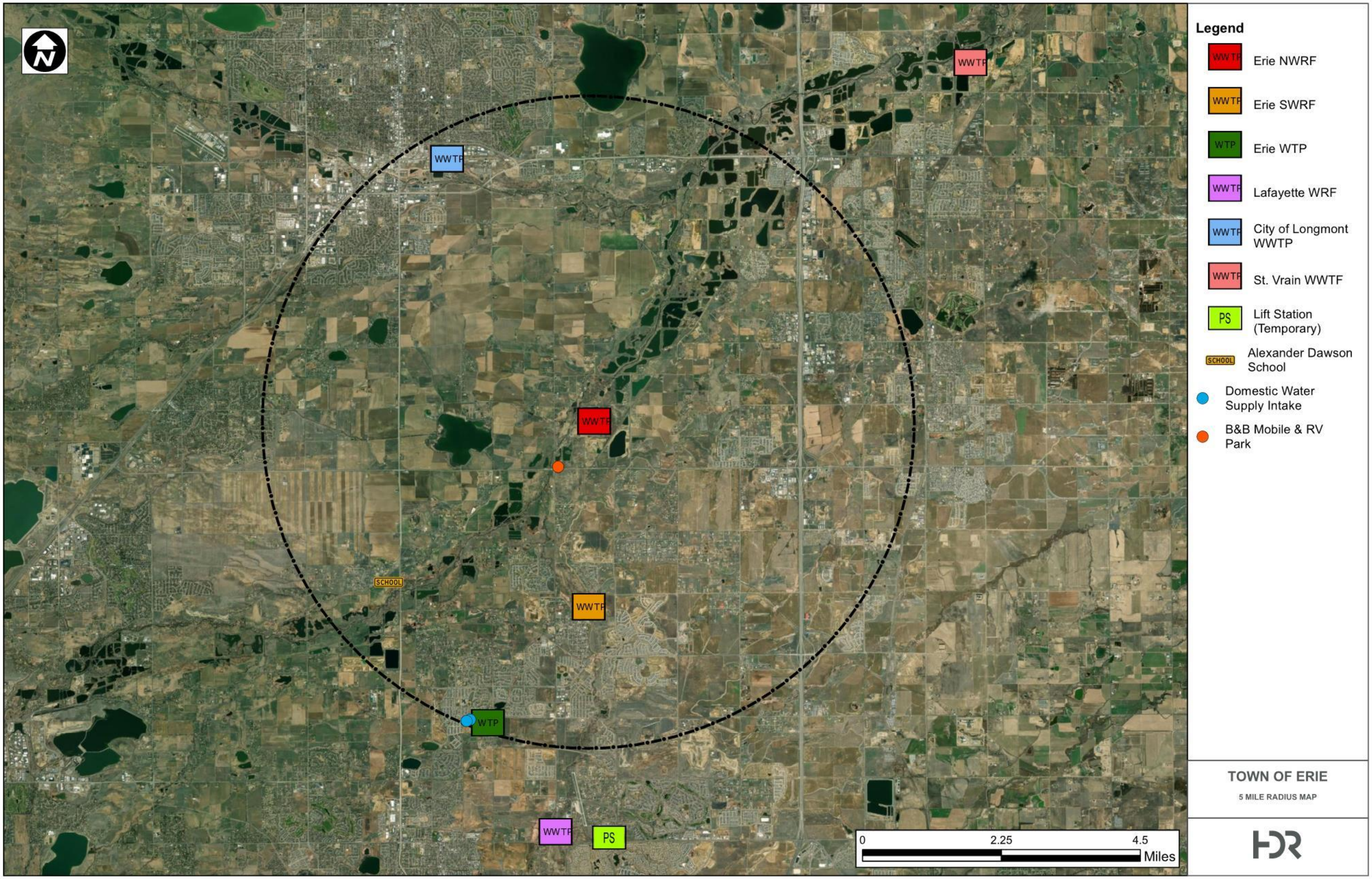

Figure 2-4. 5-Mile Radius Map

2.1.3 Current Service Area Population (WUSA)

Historical data for the total population serviced each year by the Town are shown in Table 2-1. Historical growth rates observed in Erie since 2003 are provided as well.

Table 2-1. Historical Population Growth Rate

Year	Historical Population Data	Yearly Percent Growth
2003	10,041	
2004	11,908	18.6%
2005	13,996	17.5%
2006	15,610	11.5%
2007	17,164	10.0%
2008	17,750	3.4%
2009	18,088	1.9%
2010	18,497	2.3%
2011	18,855	1.9%
2012	19,215	1.9%
2013	19,915	3.6%
2014	20,431	2.6%
2015	21,243	4.0%
2016	23,031	8.3%
2017	25,000	8.5%
2018	26250	5%
2019	28,308	7.8%
	Average	**6.9%**

2.2 Current Wastewater Flows and Loads

Historical flow and loading data have been compiled and analyzed for the NWRF. This data provides the basis for projecting future flows and loadings to better understand the timing when a capacity restriction may occur at one of the treatment processes, and thus must be addressed in order to provide adequate capacity to serve future growth. Table 2-2 summarizes the historical and current values for flow, BOD, TSS, NH_3, TIN, and TP concentrations at the NWRF.

Table 2-2. Historical and Current Influent Flows and Loads at the NWRF

Parameter	Unit	2016	2017	2018	2019
Avg Annual Flow	MGD	1.30	1.43	1.50	1.56
Max Month Flow	MGD	1.38	1.58	1.56	1.72
Max Month BOD Loading[a]	lb/day	4,261	4,893	4,391	3,445
Max Month BOD Concentration	mg/L	371	372	352	281
Max Month TSS Loading[a]	lb/day	5,007	4,419	3,786	3,717
Max Month TSS Concentration	mg/L	436	336	326	281
Max Month Ammonia Loading[a]	lb/day	389	430	599	611
Max Month Ammonia Concentration	mg/L	39	49	48	50
Max Month TIN Loading	lb/day	147	162	143	166
Max Month TIN Concentration	mg/L	13.9	11.32	11.88	14.34
Max Month Total Phosphorus Loading[a,b, c]	lb/day	287	316	261	--
Max Month Total Phosphorus Concentration[b, c]	mg/L	25	24	23	--

[a] Assumes max month constituent concentration and average monthly influent flow (for the month corresponding to max month constituent concentration).
Also, BOD (lb/d) = Influent flow (MGD)*BOD (mg/L)*8.34
[b] Influent phosphorus values only available for first five months of 2018.
[c] Influent phosphorus values not available for 2019

Based on historical data, HDR used a per capita wastewater production of 57 gpcd for average daily influent flow, and 61 gpcd for maximum month influent flow. These values were calculated by averaging several years of data for population and NWRF influent flow. As shown above, the influent BOD value dropped slightly in 2019. This may be due to a number of reasons, but a likely contributor may have been that prior to 2019 the dewatering pressate return to the head of the plant was upstream of the influent sampling point. Thus, influent loading data from 2016 – 2018 included BOD and TSS loads from the dewatering return stream. The NWRF staff changed the dewatering return point to downstream of the influent sampler in 2019, which likely brought about the lower maximum month BOD and TSS concentration values in that year. Other factors that may have contributed to lower BOD concentration in 2019 may include a more effective FOG handling program, or elimination of a substantial industrial discharger.

Figure 2-5 shows the daily influent flow and BOD data to the Erie NWRF from the beginning of 2016 through the end of 2019. Wastewater influent BOD loading remain fairly constant throughout the year, but changes from year to year, depending on multiple factors, including measurement method and accuracy, number of water-efficient units installed in households, and population fluctuations.

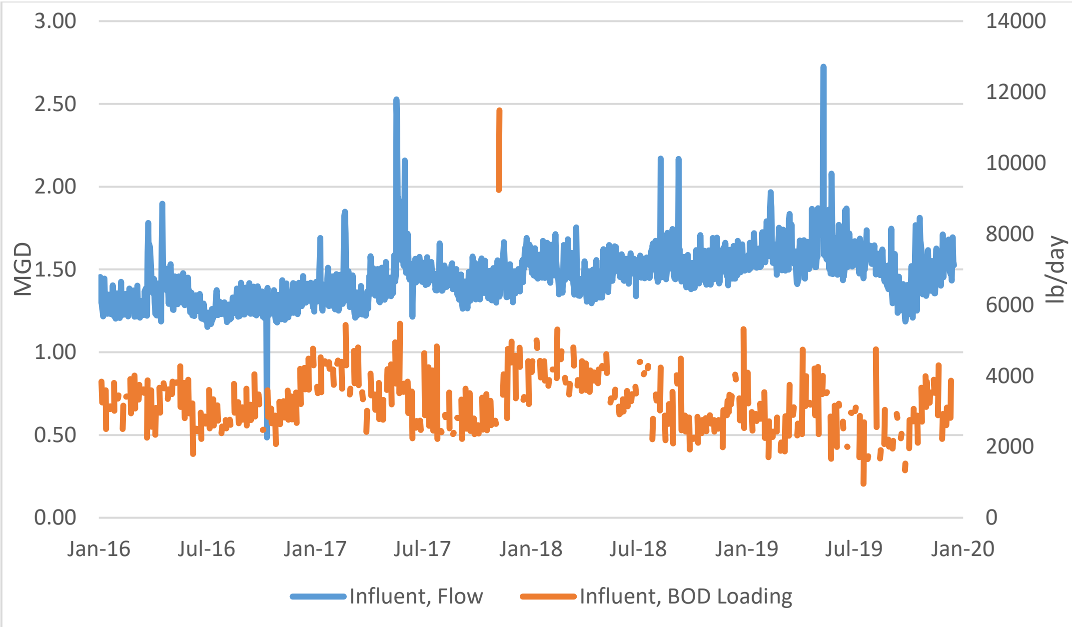

Figure 2-5. NWRF Influent Flow and BOD Loading

As shown on Figure 2-6, the TSS loading has also been widely varied. Factors for variability in TSS include, but are not limited to, including measurement method and accuracy, number of water-efficient units installed in households, and population fluctuations.

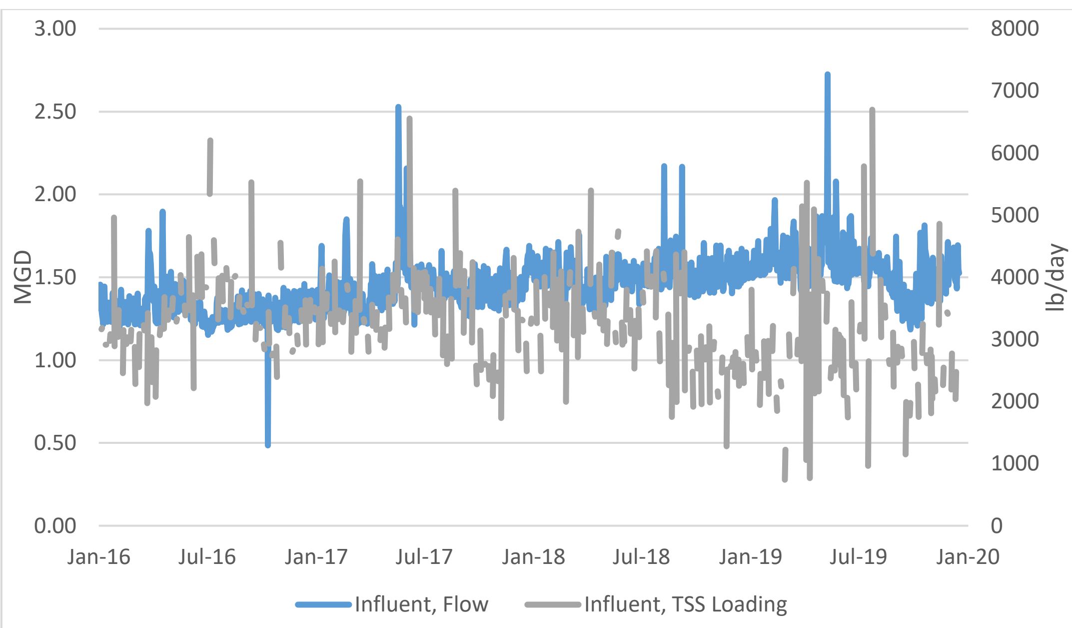

Figure 2-6. NWRF Influent Flow and TSS Loading

As shown on Figure 2-7 and Figure 2-8, ammonia and total phosphorus loadings have also been widely varied but there is a general trend where concentrations have increased over the years. Total phosphorus data is not available beyond May of 2018, therefore the timeline for Figure 2-8 only spans from the beginning of 2016 to May of 2018.

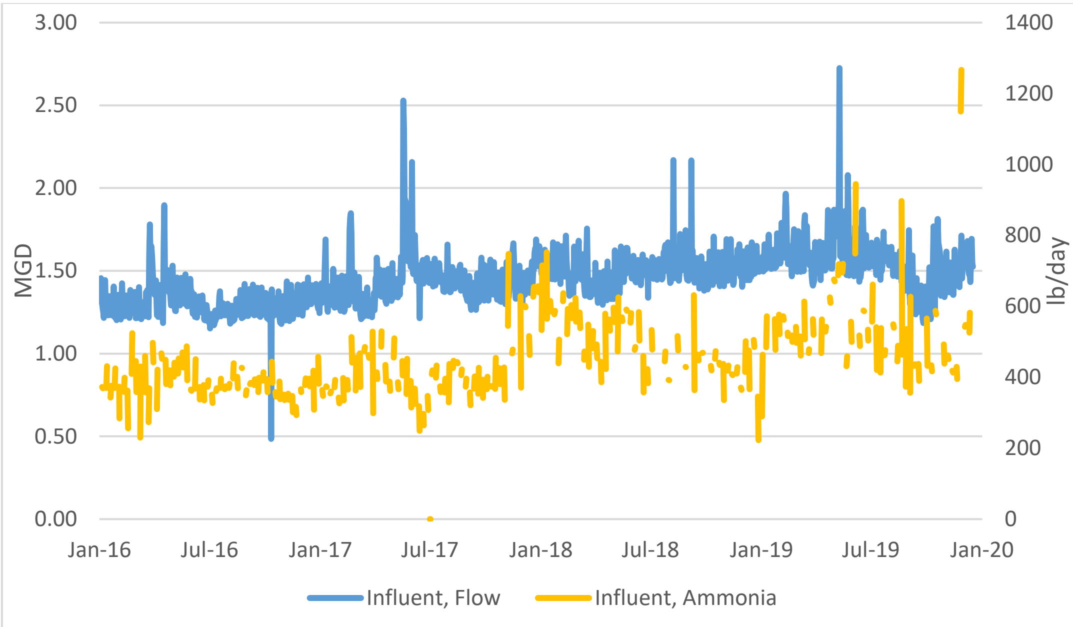

Figure 2-7. NWRF Influent and Ammonia Loading

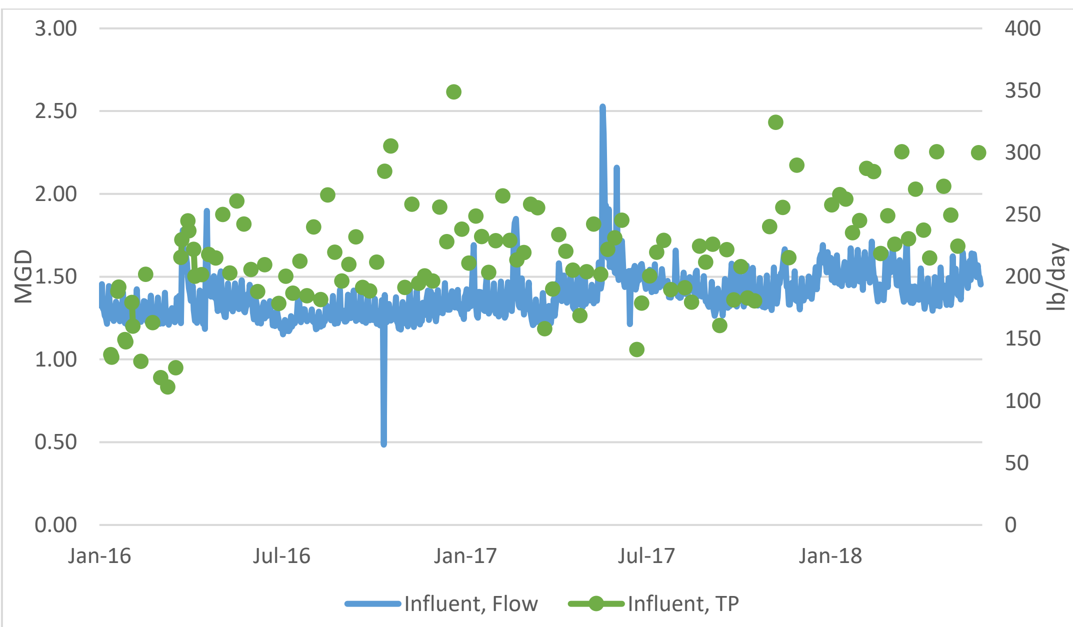

Figure 2-8. NWRF Influent and TP Loading

Figure 2-9 shows the daily influent flow and total inorganic nitrogen values for the Erie NWRF from the beginning of 2016 through the end of 2019. Wastewater influent TIN loading is widely varied throughout the year, but it appears to loosely coincide with the general pattern of influent flows.

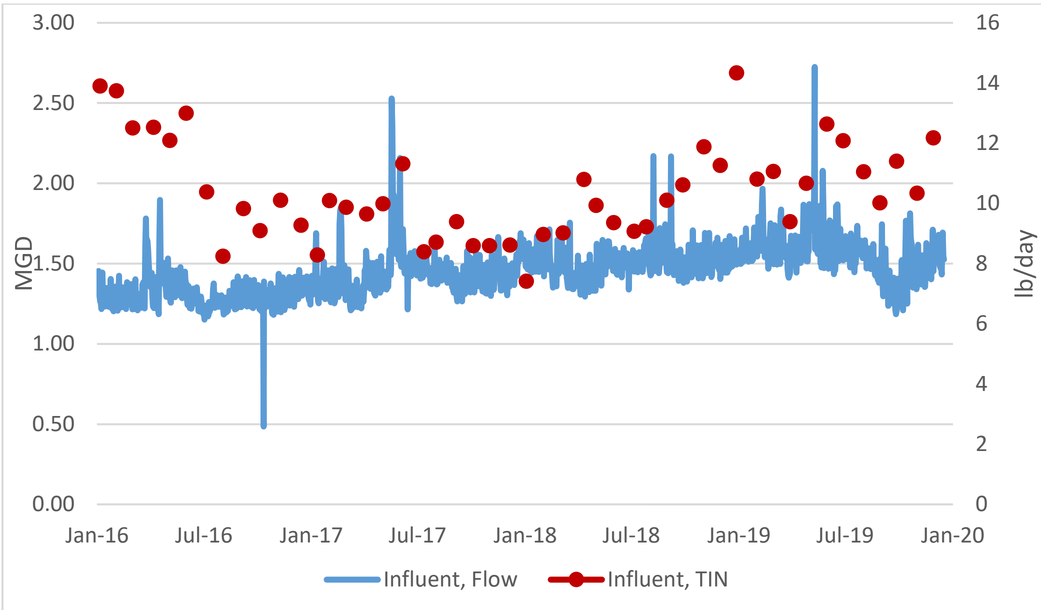

Figure 2-9. NWRF Influent and TIN Loading

As demonstrated in Table 2-2, the influent concentrations for ammonia have consistently risen over the past five years while BOD and TSS have shown a decrease in concentrations. TIN and TP seem to vary, however the trends are inconclusive due to the limited number of datasets available at this time.

2.2.1.1 Assessment of Infiltration & Inflow

The Town's collection system is relatively new and consists of mostly PVC pipe. Older portions of the system have been CIPP lined to prevent I&I issues. In August of 2020, a new Wastewater Collection System Master Plan was developed for the Town of Erie by Merrick and Company (Merrick). The plan conducted a comprehensive assessment of the existing wastewater collection system and included an evaluation of I&I contributions to peak loadings experienced by the collection system. A copy of the Wastewater Collection System Master Plan has been provided in Appendix B.

HDR also performed a preliminary assessment of estimated I&I contributions at the Erie NWRF by comparing production values from the Town of Erie's water treatment plant to the quantity of wastewater received by the NWRF. HDR found that the quantity of clean water produced by the water treatment plant is typically greater than the quantity of wastewater received by the NWRF. The calculations for estimating I&I are summarized in Table 2-3 below. Calculations that returned negative values for estimated I&I flows were reported as zero instead. As shown in Table 2-3, nearly all estimated I&I flows at the NWRF were reported as zero. Therefore, the preliminary assessment suggests that I&I is an unlikely issue for the Town of Erie.

Table 2-3. Historical Estimated Infiltration and Inflow

Estimated Infiltration & Inflow (I&I)												
Month	2017			2018			2019			2020		
	WTP Flows (gpcd)	NWRF Flows (gpcd)	I&I Flows (gpcd)	WTP Flows (gpcd)	NWRF Flows (gpcd)	I&I Flows (gpcd)	WTP Flows (gpcd)	NWRF Flows (gpcd)	I&I Flows (gpcd)	WTP Flows (gpcd)	NWRF Flows (gpcd)	I&I Flows (gpcd)
Jan	56	55	0	63	59	0	60	58	0	56	54	0
Feb	54	56	2	57	55	0	54	59	5	52	55	2
Mar	61	52	0	58	57	0	53	59	6	56	56	0
Apr	93	56	0	71	54	0	68	57	0	71	62	0
May	121	64	0	129	58	0	107	57	0	186	62	0
Jun	257	61	0	260	57	0	189	54	0	244	60	0
Jul	287	57	0	262	59	0	214	56	0	294	58	0
Aug	224	57	0	243	60	0	258	57	0			
Sep	214	55	0	225	58	0	226	49	0			
Oct	72	56	0	85	59	0	85	52	0			
Nov	58	57	0	58	58	0	50	51	2			
Dec	62	60	0	57	59	1	54	55	1			

Note: I&I is estimated by subtracting the clean water produced (WTP Flows) from the influent wastewater received (NWRF Flows).
Equation: NWRF Flow (gpcd) - WTP Flow (gpcd) = I&I (gpcd)
Example Calculation (July, 2020): 58 gpcd - 294 gpcd = -235 gpcd, which is reported as zero in the table above.

EPA has also developed a guideline for determining the amount of I&I that is considered excessive for municipalities. The national average dry weather flow has been established as 120 gpcd. This value is a standard value which includes domestic wastewater flow, infiltration, and nominal industrial and commercial flows. EPA recommends that the national average dry weather flow value be used as an indicator for determining whether I&I is considered excessive at a municipality. Per the guidelines, if the average daily flow per capita for a wastewater treatment plant is less than 120 gpcd, then the amount of I&I occurring is considered non-excessive, and further infiltration analysis is not required.

Table 2-4 summarizes the historical influent flow at the Erie NWRF. As shown in the table, the average daily influent flows have been less than 63 gpcd for the past three and a half years. These flows are significantly less than the EPA mandated value of 120 gpcd, and therefore indicate the Town of Erie does not have an excessive I&I issue. Per EPA guidelines, further I&I studies are not needed.

Table 2-4. Historical Influent Flows for I&I Assessment

Erie NWRF Influent Flows												
Month	2017			2018			2019			2020		
	NWRF Influent (MGD)	Population	NWRF Influent (gpcd)	NWRF Influent (MGD)	Population	NWRF Influent (gpcd)	NWRF Influent (MGD)	Population	NWRF Influent (gpcd)	NWRF Influent (MGD)	Population	NWRF Influent (gpcd)
Jan	1.37	25,000	55	1.52	26,000	59	1.58	27,000	58	1.53	28,500	54
Feb	1.41	25,000	56	1.44	26,000	55	1.59	27,000	59	1.55	28,500	55
Mar	1.29	25,000	52	1.47	26,000	57	1.59	27,000	59	1.58	28,500	56
Apr	1.41	25,000	56	1.39	26,000	54	1.53	27,000	57	1.76	28,500	62
May	1.60	25,000	64	1.50	26,000	58	1.54	27,000	57	1.78	28,500	62
Jun	1.52	25,000	61	1.49	26,000	57	1.45	27,000	54	1.71	28,500	60
Jul	1.41	25,000	57	1.53	26,000	59	1.53	27,500	56	1.66	28,500	58
Aug	1.43	25,000	57	1.56	26,000	60	1.56	27,500	57			
Sep	1.37	25,000	55	1.51	26,000	58	1.36	27,500	49			
Oct	1.41	25,000	56	1.54	26,000	59	1.42	27,500	52			
Nov	1.44	25,000	57	1.51	26,000	58	1.41	27,500	51			
Dec	1.49	25,000	60	1.52	26,000	59	1.52	27,500	55			

2.2.2 Current Effluent Limitations (PELs)

The NWRF is permitted by the WQCD to discharge treated wastewater effluent to Boulder Creek per Colorado Discharge Permit System (CDPS) No. CO-0048445. The discharge permit was set to expire on January 31, 2016, however it has been administratively extended.

The SWRF is permitted to discharge treated wastewater effluent to Coal Creek per CDPS No. CO0045926. This discharge permit was set to expire on September 30, 2016, however, it has also been administratively extended. A copy of both discharge permits is included in Appendix C.

In September of 2019, the Town requested a review by CDPHE of PELs developed for the Erie NWRF. The PELs were received from CDPHE on April 23, 2020 and are included in Appendix D. A summary of the PEL values are provided in Table 2-5.

Table 2-5. Primary Effluent Limits for the Erie NWRF

Preliminary Effluent Limits for Evaluation under the Site Approval Process Discharge to Boulder Creek at Design Flow of 3.03 MGD	
Parameter	**Technology Based Limitations**
BOD_5	45 (7-day average), 30 (30-day average)
BOD_5 (% removal)	85 (30-day average)
Total Suspended Solids (mg/L)	45 (7-day average), 30 (30-day average)
TSS (% removal)	85 (30-day average)
Oil and Grease (mg/L)	10 (maximum)
pH (s.u.)	6.5-9.0 (minimum-maximum)
Parameter	**WQBEL**
Temp DM and Temp MWAT (°C) March-Nov*	28.6 (DM), 27.5 (MWAT)
Temp DM and Temp MWAT (°C) Dec-Feb*	25.2 (DM), 13.8 (MWAT)
E. coli (#/100 ml)	124 (7-day geomean)
TRC (mg/l)	0.023 (DM), 0.015 (30-day average)
Total Inorganic Nitrogen as N (mg/l)	NA
NH_3 as N, Tot (mg/l) Jan	4.8 (DM)
NH_3 as N, Tot (mg/l) Feb	2.8 (DM)
NH_3 as N, Tot (mg/l) Mar	3.3 (DM), 3.1 (30-day average)
NH_3 as N, Tot (mg/l) Apr	2.9 (DM)
NH_3 as N, Tot (mg/l) May	2.3 (DM)
NH_3 as N, Tot (mg/l) Jun	3.8 (DM)
NH_3 as N, Tot (mg/l) Jul	2.0 (DM)
NH_3 as N, Tot (mg/l) Aug	1.9 (DM)

NH_3 as N, Tot (mg/l) Sep	2.1 (DM)
NH_3 as N, Tot (mg/l) Oct	4.4 (DM)
NH_3 as N, Tot (mg/l) Nov	9.0 (DM)
NH_3 as N, Tot (mg/l) Dec	7.8 (DM)
(DM) - Daily Maximum *(MWAT) – Maximum Weekly Allowable Temperature*	

2.3 Existing Wastewater Treatment System

2.3.1 Description of Existing Treatment System

The existing treatment facility is designed to treat 1.95 MGD and the most recent upgrades were completed in 2017. The basic treatment components include:

- Headworks
- Biological Treatment with Integrated Fixed Film Activated Sludge
- Secondary Clarifiers
- Disc Filter
- UV Disinfection
- Alkaline Biosolids Stabilization with Lime
- Biosolids Drying

2.3.1.1 System Schematic, Flow Diagram showing inputs, and waste streams

Figure 2-10 provides a flow schematic of the existing Erie NWRF. Figure 2-11 shows an aerial image of the facility highlighting the major components.

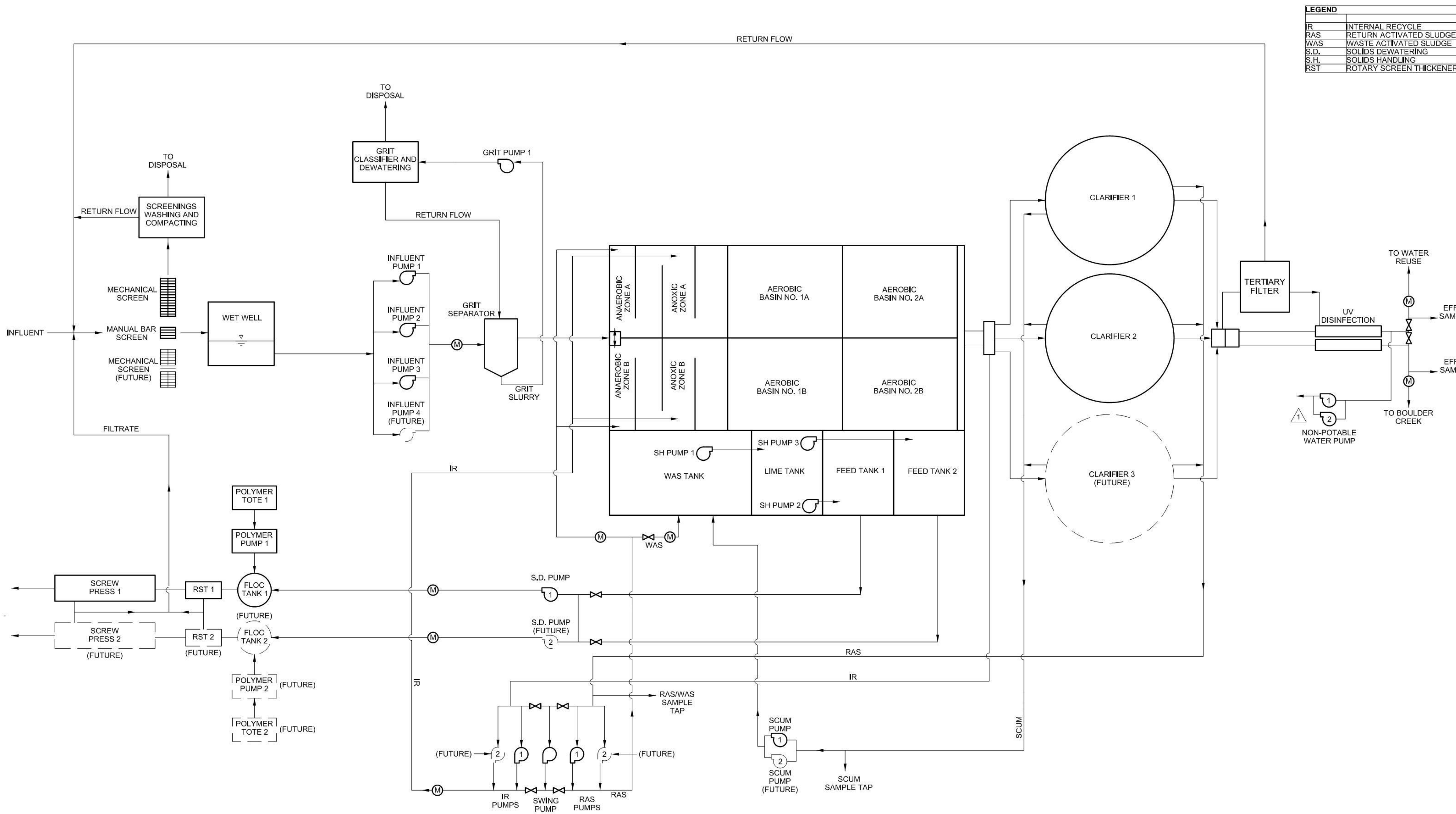

Figure 2-10. Process Schematic of Existing Erie NWRF

Figure 2-11. Aerial View of the Erie NWRF

In 2017, an upgrade was completed for several miscellaneous processes at the NWRF. The following information summarizes individual treatment system processes currently in service at the NWRF:

UNIT PROCESS	**DESIGN CONDITIONS**
1. INFLUENT PUMP STATION	
A. Influent Pumps	
• Type	Self-Priming Centrifugal
• Number	3
• Capacity	2.89 MGD per pump
• Horse Power	30 HP
• Firm Capacity	5.8 MGD (with one pump out of service)
2. HEADWORKS	
A. Barscreen	
• Type	Mechanical (1), Manual (1)
• Number	2
• Capacity	4.3 MGD
• Bypass	Manual Barscreen
• Discharge	Ground Level to Screenings Dumpster
B. Screenings Compactor	
• Type	Spiral Press
• Number	2
• Capacity	99 ft^3 /hr of wet screenings
• Discharge	Ground Level Screenings Dumpster
C. Grit Removal	
• Type	Collection Basin with Trays
• Number	1
• Capacity	4.2 MGD
• Discharge	Grit Pump
D. Grit Pumping	
• Type	Self-Priming Centrifugal
• Number	1
• Capacity	314 gpm
• Discharge	Grit Dewaterer
E. Grit Clarifier/Dewaterer	
• Type	Slurry Cup with Dewatering Belt
• Number	1
• Capacity	200 gpm
• Discharge	Ground Level Grit Dumpster

3. <u>INTEGRATED FIXED-FILM ACTIVATED SLUDGE (IFAS) SYSTEM</u>

A. Anaerobic Zones

• Number of Basins	2
• Number of Passes	2
• Volume (Per Basin)	77,000 Gal
• Water Depth	18.5 ft
• Number of Mixers	2
• Max. Month Flow @ Design	1.95 MGD
• RAS Flow @ Design	2.30 MGD
• IR Flow @ Design	7.8 MGD
• Number of Mixers Per Train	2

B. Anoxic Zones

• Number of Basins	2
• Number of Passes	2
• Volume (Each)	111,000 Gal
• Number of Mixers Per Train	2

C. Aerobic Zones

• Number of Basins	4 (2 per train)
• Volume (Each)	174,500 Gal
• Water Depth	17.5 ft
• Max month air requirement	5,000 SCFM

D. Blowers

• Type	High Speed Turbo
• Number	3
• Capacity	1 @ 3,885 scfm, 2 @ 3,500 scfm each
• Horsepower	1 @ 200 HP, 2 @ 170 HP
• Firm Capacity	7,385 scfm

4. <u>SECONDARY CLARIFIERS</u>

A. Secondary Clarifiers

• Number	2
• Volume (Each)	420,760 Gal
• Diameter	70 Feet
• Depth (swd)	13.7 Feet

5. SLUDGE PUMPS

A. Return Activated Sludge

• Type	Self-Priming Centrifugal
• Number	2
• Design Capacity	1,900 gpm @ 10 ft TDH, each
• Firm Capacity	3,800 gpm (Includes Swing Pump)
• Motor HP	15 HP, Each

B. Internal Recycle/Swing

• Type	Self-Priming Centrifugal
• Number	3
• Design Capacity	2,777 gpm @ 21 ft TDH, each
• Firm Capacity	5,554 gpm (Includes Swing Pump)
• Motor HP	30 HP, Each

C. Solids Handling Pumps

• Type	Self-Priming Centrifugal
• Number	3
• Design Capacity	350 gpm @ 22 ft TDH, Each
• Firm Capacity	628 gpm, Each
• Motor HP	5 HP, Each

D. Dewatering Feed Pumps

• Type	Progressive Cavity
• Number	1
• Design Capacity	50 gpm
• Motor HP	7.5 HP

6. SOLIDS PROCESSING

A. Solids Handling Tanks

• Number of Tanks	4
• WAS Holding Total Volume	178,000 Gal
• Lime Mixing Total Volume	98,675 Gal
• Feed Tanks Volumes	98,675 Gal Each (2 total)
• Number of Mixers	5

B. Rotary Drum Thickener

• Number	1
• Max Capacity	125 gpm
• Motor HP	1.5 HP

C. Dewatering Screw Press

• Number	1
• Max Solids Loading	255 lbs/hr
• Motor HP	3 HP

D. Dewatered Cake Screw Conveyor

- Number 1
- Max Solids Loading 45 cu. Ft./hr

7. UV DISINFECTION/TERTIARY FILTRATION

A. Ultraviolet System

- Type Open Channel, Low Pressure
- Number of Banks 2
- Number of modules 18
- Number of lamps per module 8
- Total No. of Bulbs 144

2.3.2 Performance of Existing System

Effluent results indicate the NWRF is producing effluent water quality consistently meeting permit requirements. Figure 2-12 provides data from 2013-2019 and illustrates average monthly BOD_5 and TSS concentrations are generally below the 30-day average permit value of 30 mg/L. Average monthly effluent NH_3 concentrations are also observed to be below the minimum daily maximum permit values.

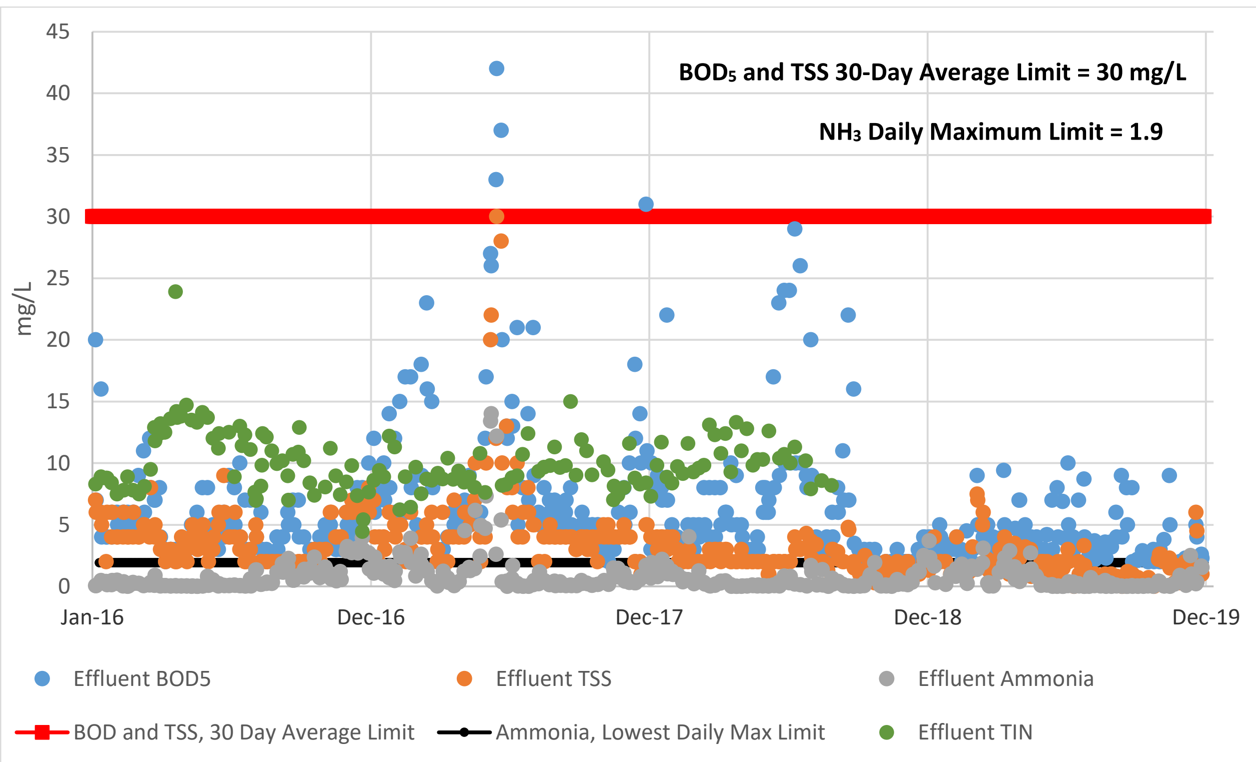

Figure 2-12. NWRF Effluent Performance for BOD_5, TSS, Ammonia, and TIN

Effluent results for E. Coli are provided in Figure 2-13, and effluent sample results for numerous metal constituents are shown in Figure 2-14 through Figure 2-16. Additionally, staff at the NWRF have continuously monitored and sampled for arsenic from 2016 through 2019, however all sample results were below detection limit and were reported as zero on historical records.

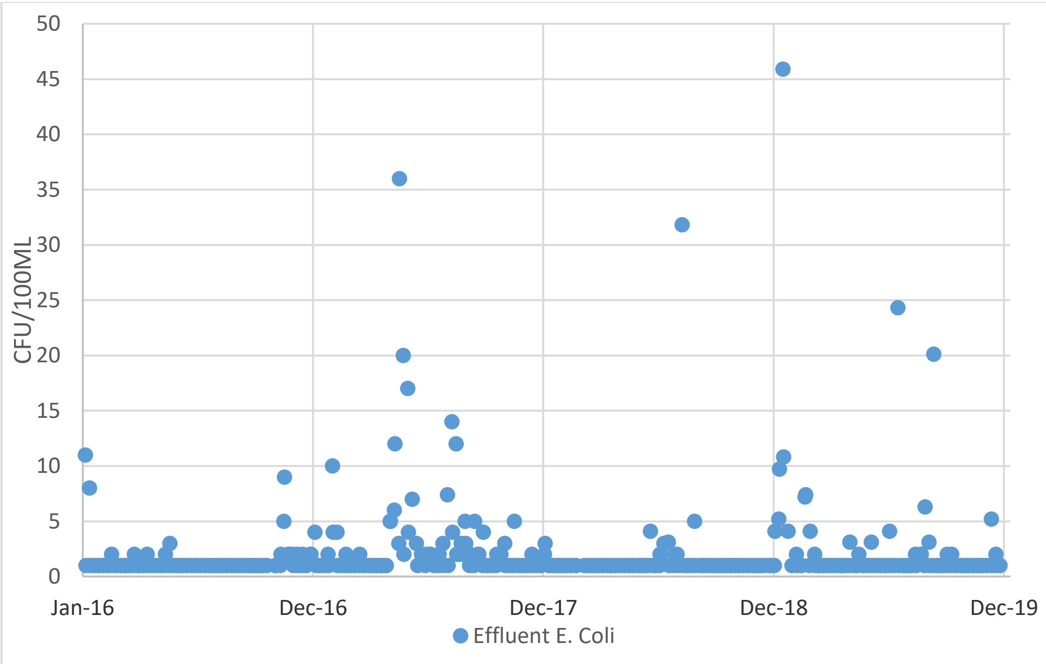

Figure 2-13. NWRF Effluent Performance for E. Coli

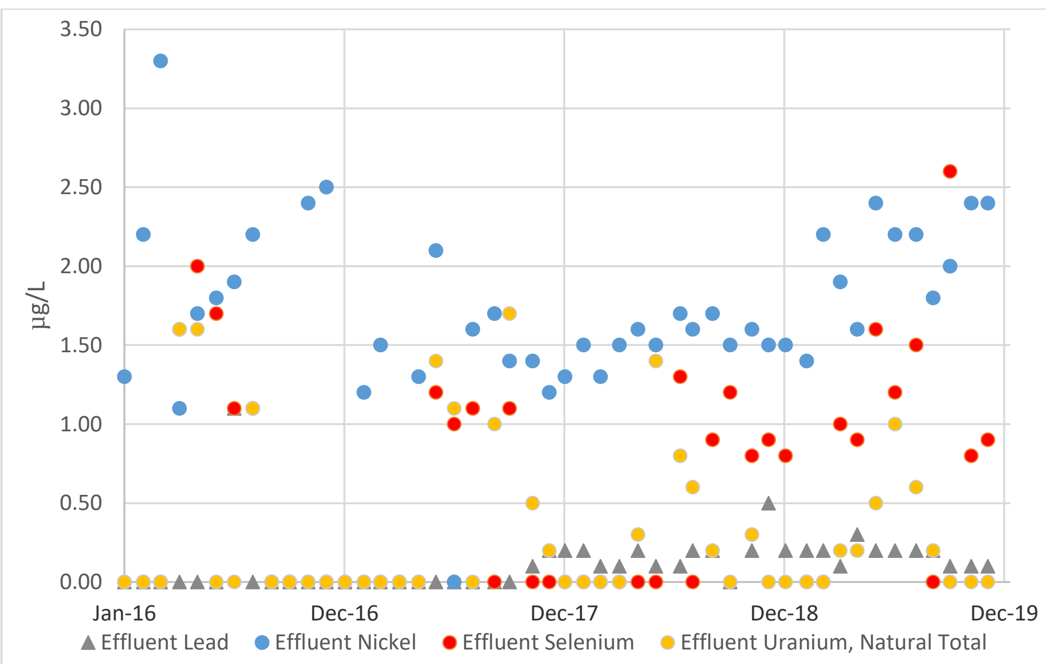

Figure 2-14. NWRF Effluent Performance for Nickel, Selenium, and Uranium

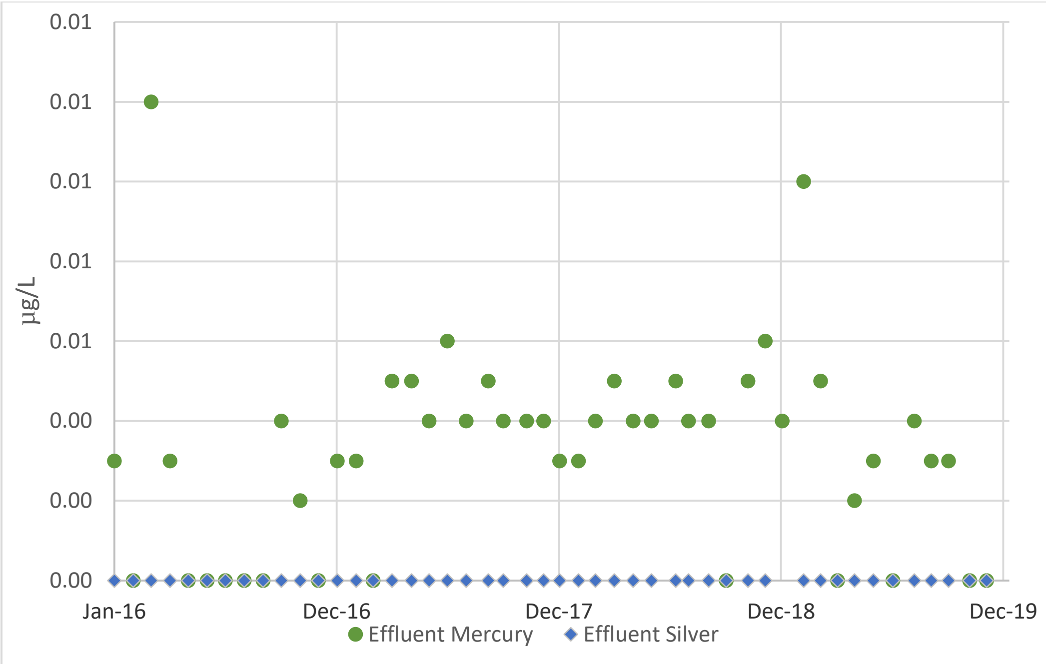

Figure 2-15. NWRF Effluent Performance for Mercury and Silver

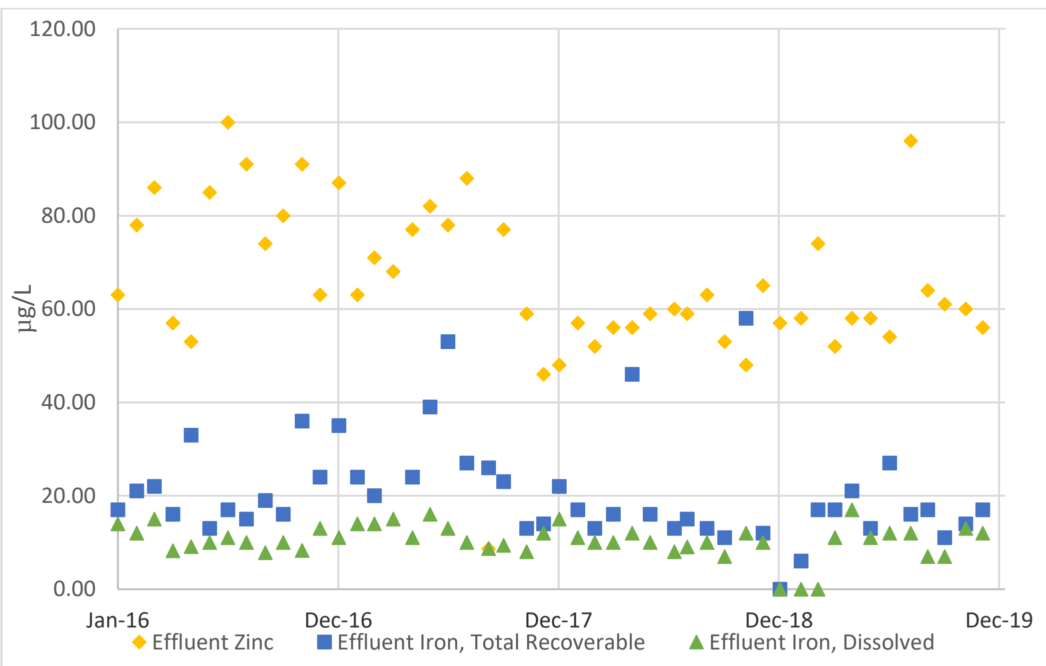

Figure 2-16. NWRF Effluent Performance for Zinc and Iron

2.3.3 Existing Air Quality Permit

The Town does not have an air quality permit for the existing wastewater treatment facilities, nor is one required. Odor control has not been a significant issue at this facility given the rural location.

Biofilters are currently used for treating foul air from the headworks building. When future expansions are undertaken, odor control for some aspects of the treatment processes proposed may become a consideration. The Town, along with the State, will evaluate odor control concerns at that time.

2.3.4 Existing Stormwater Management Plan

Since the SWRF is not in operation and is not discharging, a stormwater discharge permit is not required for the facility. Previously, the NWRF was operating under the Stormwater Discharge Permits No. COR900835 and COR900843, however, the CDPHE granted a termination for both of these permits. The effective date of termination of both stormwater discharge permits was May 1, 2017.

2.3.5 Existing Site Characterization

The SWRF site is within the 100-year flood plain for Coal Creek. Treatment facilities were protected from flooding by importing fill to raise the elevation of the site surface above the 100-year flood level prior to constructing facilities. No part of the SWRF mechanical treatment plant is within the 100 year flood plain for Coal Creek.

Figure 2-17 shows the Flood Insurance Rate Map (FIRM) for the 100-year flood plain in relation to the NWRF. As part of the land agreement with the Town of Erie, the mining company was required to fill the NWRF site to an acceptable elevation for the treatment plant. A floodplain analysis was conducted by Martin/Martin Inc. ,to ensure that the floodway would not be altered by the filling project and that no adjacent properties would be adversely affected. It was determined that the 100-year floodplain elevation at the southern edge of the NWRF property is 4934.7. Knowing the 100 year floodplain elevation, the site was graded to 4940.0 at a minimum to ensure that the site is located well above the 100 year floodplain. No part of the NWRF site is within the floodway of Boulder Creek. A Letter of Map Revision (LOMR) for Lower Boulder Creek was completed by FEMA in March of 2013, and a copy of the LOMR has been included in Appendix E. A soils analysis is also provided in Appendix E.

2.3.6 Existing Facility Emergency Response Protocols

Both wastewater treatment facilities incorporates a plant-wide supervisory control and data acquisition (SCADA) system which monitors critical processes and equipment. Alarm functions within the plants are tied to dial-up service which alerts the operator on call. Offsite, remote SCADA functions include monitoring the lift station located at Bonanza and State Highway 7. Emergency generators have been permanently installed at all treatment and key facilities which powers critical processes in the event of power failure. A portable generator is also on standby for the lift station. Alarm notifications are sent to operators when emergency power is called for by the SCADA system.

A copy of the Town's Emergency Operations Plan is included in Appendix F. A memo which clarifies additional emergency response procedures not otherwise included in the Emergency Operations Plan is also included in Appendix F.

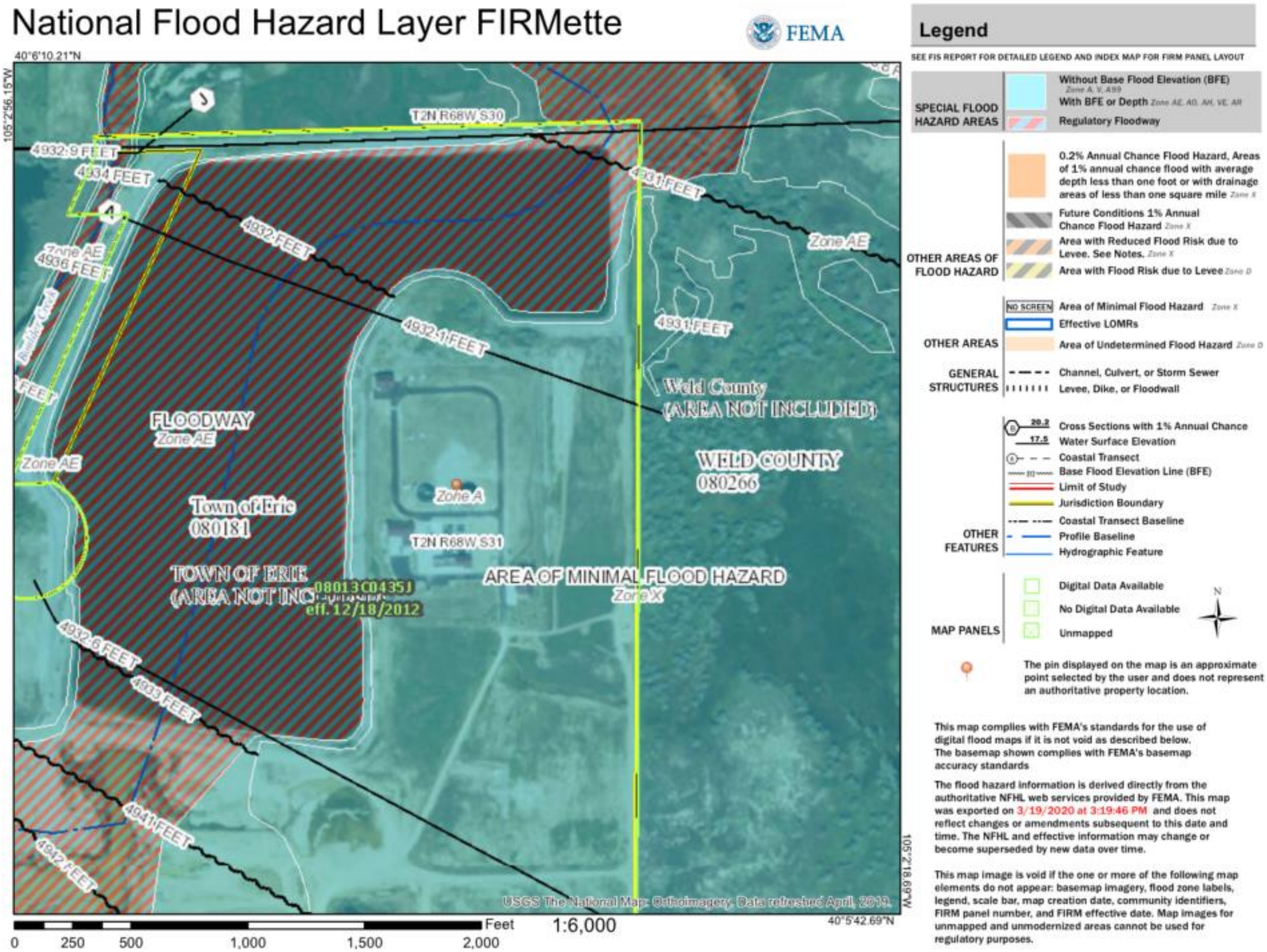

Figure 2-17. FEMA FIRM Floodplain Map for the Erie NWRF

Along the west side of the NWRF treatment site is a storage reservoir. Since the storage reservoir is located closer to the floodway, Martin/Martin, Inc. determined that raising the bank height above the 100 year floodplain elevation would affect adjacent or downstream properties. Therefore the reservoir is being used as the Town's augmentation plan by periodically releasing stored water into Boulder Creek. Water stored in the reservoir will also be used for irrigation of parks and public areas. Since the reservoir will only be used for non-potable water, the bank elevations were left at an elevation closer to historic levels to prevent any impact on adjacent properties.

In the event of a flood, flows will split into two streams upstream of the NWRF due to the existence of an existing berm along the east bank of Boulder Creek which forms a natural barrier. This natural barrier will divide the stream under food conditions, and a portion of the flow will be conveyed within Boulder creek and the remainder will be conveyed through the reservoir.

In the event of a flood, water stored in the reservoir may be pushed into the creek. No negative impacts to water quality in Boulder Creek are expected as water quality in the reservoir as water stored in the reservoir will meet the NWRFs discharge permit limits and reuse standards under Regulation No. 84. Following a flood event, the water quality in the reservoir may need to be reassessed to determine suitability for discharge and/or reuse.

2.3.7 Existing Biosolids Management Program

The NWRF's existing solids treatment process utilizes an alkaline biosolids stabilization process, provided by FKC. The process is designed to achieve Class A cake, though it is not currently performing as designed. See Section 4.2.6 of this report for more information concerning the system's deficiencies and proposed improvements. The solids treatment process begins after the secondary clarifiers. Waste Activated Sludge (WAS) is pumped from the secondary clarifiers to a WAS holding tank with approximately 3 days of storage. WAS is then pumped to a lime tank, where lime is mixed with WAS until the slurry reaches a pH of higher than 12, to achieve Class A biosolids conditions required in 40 CFR, Part 503, *Standards for the Use or Disposal of Sewage Sludge* (the "Biosolids Rule"). The WAS and lime slurry is pumped in parallel to the feed tanks, where the WAS and lime continue mixing. The lime and biosolids must remain above a pH of 11.5 for 22 hours in these tanks to achieve a Class A biosolids classification.

The slurry is then transferred from the feed tanks to an FKC rotary screen thickener (RST), where polymer is injected to promote flocculation, and the slurry is thickened from an average solids concentration of 1.5% TS to an average of 10.4% TS. From the RST, the thickened solids drop into the FKC screw press, where steam is introduced to increase the biosolids temperature to a set-point of 72 degrees Celsius, and the biosolids are simultaneously pasteurized for 30 minutes retention time and dewatered, in order to meet the Class A requirements provided in the Biosolids Rule.

The screw press dewaters the sludge from an average influent solids concentration of 10.4% TS to an average of 30.2% TS. The thickenate from the drum thickener and the pressate from the screw press are returned to the head of the plant. The thickening and dewatering system is fed continuously, 24 hrs a day, 7 days a week at an average flow rate of 30 – 40 gpm. Additional information regarding the solids handling system is provided in Table 2-6.

Table 2-6. Solids Handling

Description	Capacity
FKC Biosolids Treatment System	6,120 lb/day
WAS Holding Tank	178,000 gal, provides 3 days storage
Lime Mixing Tank	98,675 gal
Lime System	1,200 lb/day (380-420 lb lime/DT solids)
Feed Tank (2)	98,675 gal per tank

In 2014, the NWRF started experiencing frequent shutdowns of the dewatering system due to significant scaling in the screw press, caused by the high dosage of lime. To reduce the scaling effects of the lime, the Town experimented with dosing sulfuric acid to the feed tanks to decrease the pH to below 9.5 prior to dewatering. As a result of this testing, the Town saw a reduction in the lime scaling on the dewatering screw press due to the lower pH sludge. Acid addition was consequently introduced as a permanent solution, and since then the scaling issues in the FKC screw press have decreased substantially.

The Town is currently authorized under CDPHE BMP No. 2146 to treat and distribute Class A Biosolids. However, since sulfuric acid is used to lower the pH of the sludge, some pathogens are "reactivated" during the process, thereby producing a biosolids product that does not meet Class A standards. Therefore, the Town of Erie contracts with Veris Environmental, LLC. To have the Class B biosolids product hauled off and land applied instead.

2.3.8 Condition Assessment of Existing System

Treatment system alternatives are covered in greater detail in the Master Plan which can be found in Appendix A. The overall assessment of the facility was based on four key drivers:

- Increased Flows and Loads: population increases and associated increases in wastewater flows and loads within the WUSA are expected to continue. The NWRF is currently unable to provide treatment to future wastewater flow and loadings beyond 1.95 MGD and 5,233 lbs BOD_5/day, thereby triggering a need for a facility expansion.
- Future Regulations: the NWRF is unable to meet anticipated future TP, TN, metals, and temperature water quality standard effluent levels without significant modification to or expansion of the existing facility.
- CDPHE Requirements: CDPHE requires that wastewater treatment facilities make plans to expand once the facility reaches 80 percent design capacity, and they must commence

construction at or before 95 percent capacity. The Erie NWRF is currently at 80 percent design capacity.

- Biosolids Stabilization: the Erie NWRF is currently unable to produce a biosolids product that meets the requirements for a Class A Biosolids designation. Additionally, the existing biosolids stabilization system utilizes lime and has resulted in lime buildup issues throughout the plant.

2.4 Existing Collection System

The Town of Erie's wastewater collection system provides service to over 9,000 accounts within the service area. The existing collection system is comprised of approximately 112 miles of sanitary sewer, over 3,100 manholes, and two flow monitoring vaults. The existing collection system contains fifteen sewer basins which are identified in Figure 2-18. The existing collection system currently serves nine basins, with one additional basin in development. The five remaining basins are undeveloped. The sub basins are not shown in Figure 2-18 for clarity.

The principle interceptor sewers for these basins include:

1. South Coal Creek Interceptor
2. West Side Interceptor
3. 119th Street Interceptor
4. County Road 3 Interceptor
5. Coal Creek Interceptor

The size range is 4-inch to 36-inch diameter. There are approximately 591,600 lineal feet of pipe and 3,100 manholes currently installed.

The main collection interceptor (South Coal Creek) runs north through Town along Coal Creek and NE County Line Road to the NWRF. Other major existing collection mains include the West Side Interceptor, 119th Street (Orchard Glen) Interceptor, County Road 3 (Colliers Hill) Interceptor, and Coal Creek (Erie Parkway) Interceptor.

Since the collection system is relatively new and mostly constructed with PVC pipe, it is probable that manholes are the primary contributor of I&I. The results of the manhole monitoring evaluation suggest that I&I are not a regular concern for the collection system but high intensity storm events during the monitoring period did affect the peak hour wastewater flows. Town operators have also noted influent increases at the NWRF following snow fall events, which indicates that snowmelt may be pooling around manholes and entering the collection system. The Town has expressed interest in infiltration dishes to minimize inflow into sanitary sewer manholes.

The Town is developing rapidly with planned developments along Erie Parkway in the east, along Jay Road in the west, along Colorado Highway 7 in the south, and along I-25 and State Highway 52 in the northeast.

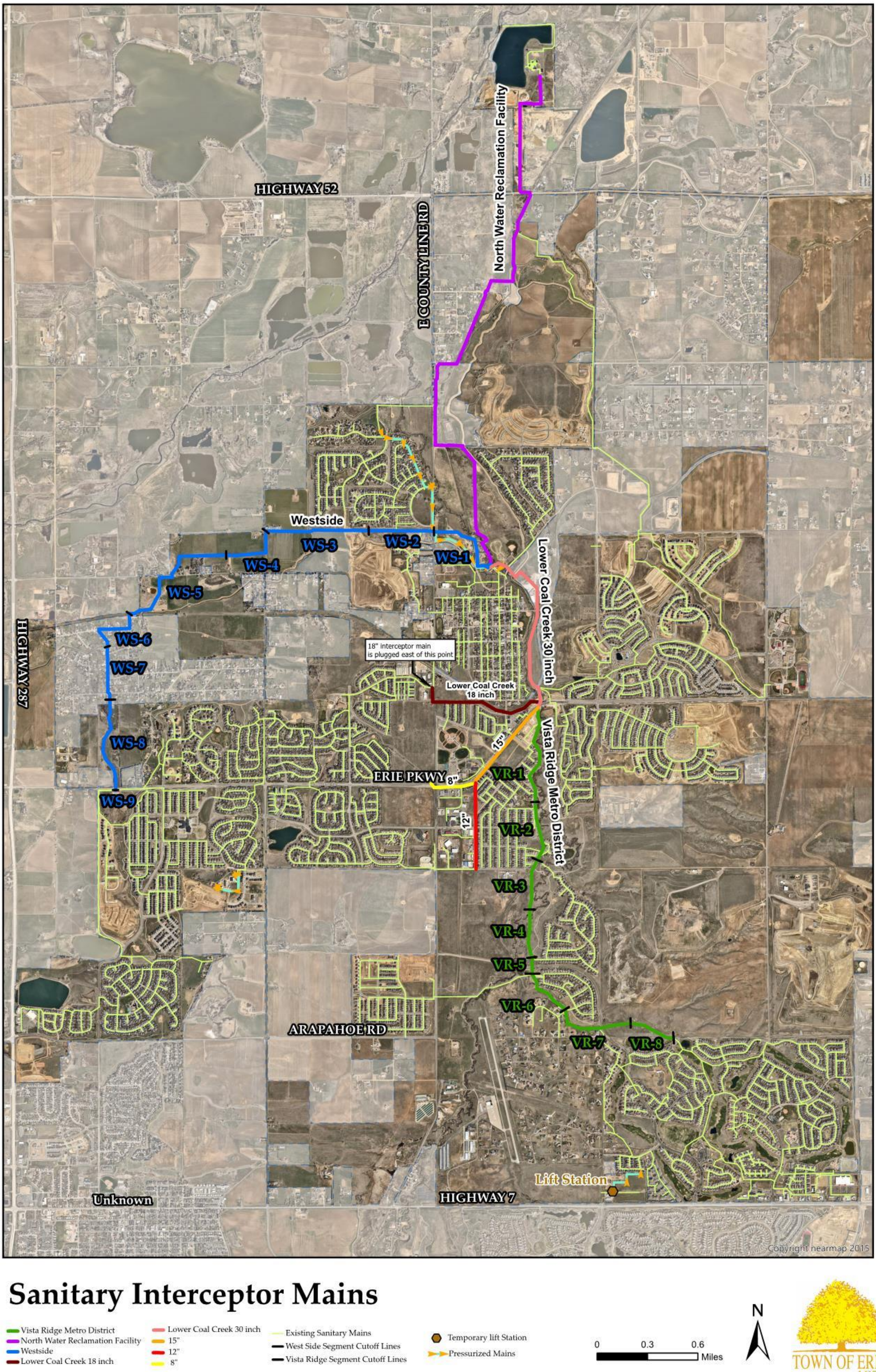

Figure 2-18. Town of Erie Wastewater Collection System Map

2.4.1 Existing Lift Stations

The Town currently has one lift station in service for the Kum & Go gas station located at the northeast corner of the lot. This lift station is temporary and has been installed to accommodate interim conditions until gravity sewer pipes can be constructed to serve outlying development. It is fully intended for the temporary lift station to be removed from service once the gravity lines are installed. The location of this temporary lift station is shown on Figure 2-4.

The lift station has a hydraulic design capacity of 0.01996 MGD (maximum month daily average flow) and a peak hydraulic capacity of 100 gpm. When at full capacity, the lift station only accounts for 1.3% of the receiving treatment facility's hydraulic loading capacity. At current conditions, the highest peak hour flow for the lift station has been 69 gpm.

The run time hours of the lift station are tracked by the Town on a biweekly basis with a quarterly stress test. The lift station pump and well are cleaned on an annual basis. A portable power generator is retained on standby for the lift station, and alarm notifications are sent to the operators on call when emergency power is called for by the SCADA system.

2.4.2 Existing Condition Assessment of Collection System

Most of the Town's collection system is relatively new and is constructed of Polyvinyl Chloride (PVC). VCP in the "old Town" area have been lined using CIPP. GIS information provided by the Town reveals that several sewers have either a flat (0 percent) or adverse (negative) slope which may impact interceptor capacity locally. There are also several instances where existing pipes exceed capacity and have potential to become pressurized as development occurs. Additionally, there are several pipes that exceed capacity criteria and become marginal at build-out conditions.

For inspection and cleaning, the Town's collection system is split up into sections to be cleaned and inspected on a rotating five-year basis as part of the Town's General Maintenance program. Trouble spots are cleaned either monthly or bi-monthly, and all cleaning is performed using a Vactor 2100i combination vacuum and jet truck. Inspections are performed using the IBAK CCTV inspection trailer, and all operators are NASSCO PACP certified.

2.4.3 Entity Pretreatment Program Discussion

Wastewater treatment facilities that are designed to treat flows of more than 5 mgd and treatment facilities that accept wastewater from categorical industrial users are required to establish a formal pretreatment program. The Town of Erie is not required to develop a formal pretreatment program as their service area only contains residential and light commercial users. In lieu of a formal pretreatment program, the Town does enforce local limits and grease trap ordinance at EPA's request.

2.4.4 Recommendations for Collection System & Lift Stations Improvements

In the new Wastewater Collection System Master Plan, Merrick conducted an assessment of the Town's collection system which provides recommendations for updating the existing water utility assets and addresses changes and issues within the wastewater collection system. The plan included the following actions:

- Reviewed previous reports and models.
- Reviewed planned development and established future flow loadings.
- Summarized flow monitoring data previously collected.
- Assessed the condition and operations of the major trunk sewer mains.
- Created an up-to-date hydraulic model of the collection system.
- Prepared preliminary cost estimates and timelines for phased improvements recommended within the next 15 years.

Two categories of recommended improvements were identified in the Wastewater Collection System Master Plan: capacity improvements and development driven extensions.

- Capacity Improvements: Projects needed to address capacity issues in the collection system. These upgrades would include addressing pipe sizes and slopes to provide pipes that meet design criteria.
- Development Driven Improvements: New sewer extensions, new interceptors, upgrades, and improvements needed to meet projected flow increases in the next 20 years due to development.

Development driven improvements recommended by Merrick are covered in in greater detail Section 0. The recommended capacity improvements for the existing collection system are presented in Table 2-7.

Table 2-7. Capital Improvements Plan Recommendation

Item	Type of Improvement	Description	Trigger for Project Initiation
West Side Interceptor Capacity Improvements	Capacity	Replace approximately 612 feet of 18-inch sewer, 2,002 feet of 21-inch sewer, and upsize 683 feet of 18-inch to 21-inch sewer at appropriate slopes.	Developments upstream of Arapahoe Ridge and Flatiron Meadows
Canyon Creek Interceptor Capacity Improvements	Capacity	Replace approximately 2,710 feet of 12-inch sewer with 15-inch sewer from Bonnell Ave to Erie Parkway along Mason St.	Development upstream of Canyon Creek

2.5 Existing Service Area Nonpoint Source Contributions

Nonpoint source data was obtained through Colorado State Universities' eRAMS Watershed Rapid Assessment Program (WRAP) and Center for Comprehensive, optimal and Effective Abatement of Nutrients (CLEAN) database in May 2020. The potential nonpoint sources and the information available for the WUSA from the eRAMS WRAP database are shown in Table 2-8. The full WRAP Report is included in Appendix G.

Table 2-8. Nonpoint Sources in the WUSA

Nonpoint Sources	eRAMS Data
Irrigated Agriculture	3.5 square miles
Livestock Operations Excluding CAFOs	No Data Available
Urban Stormwater Excluding MS4s	No Data Available
Mining Related Activities	36 CDRMS Features
Possible Saltwater Intrusions	No Data Available
Cumulative Runoff Effects	Nitrogen Phosphorus

The primary means of nonpoint source pollution transport is from stormwater runoff. The Town of Erie has partnered up with a local organization in an effort to collaborate on stormwater management as well as to address broader water quality issues within the watershed basin.

According to the Town's website:

> The Town of Erie participates in the Keep it Clean Partnership (KICP), a regional stormwater program, which was formed in 2003 to share, coordinate, and develop resources to reduce stormwater pollution from entering our streams and lakes from residential, commercial, and municipal activities as well as meet the requirements of Colorado Discharge Permit System (CDPS) stormwater permitting program. The Town of Erie's Program Description Document is available to the public for review and comment. (https://www.erieco.gov/1047/Water-Wastewater)

Since most watersheds cross multiple jurisdictional boundaries, a coordinated watershed planning effort among local governments is most effective for improving water quality and mitigating nonpoint source pollution to streams and lakes. The KICP was established to work with local municipalities to implement a shared water quality monitoring program. The KICP is now a partnership of multiple Colorado communities in the Boulder and St. Vrain watersheds, and includes:

- Boulder County
- The City of Boulder
- The City of Longmont
- The City of Lafayette
- The City of Louisville
- The Town of Erie
- The Town of Superior

2.5.1 Existing NPS Contribution Loads

Total Phosphorus and Total Nitrogen loadings provided on the eRAMS CLEAN database for nonpoint source contributions is shown in Table 2-9.

Table 2-9. Annual Nonpoint Source Loading in the WUSA

Nutrient	Total (lbs/year)	WWTF (lbs/year)	Nonpoint Source (lbs/year)
Total Nitrogen (TN)	281,711	236,119	45,592
Total Phosphorus (TP)	21,718	17,305	4,413
Note: Loading values listed above have been rounded.			

It should be noted that a second analysis of the Town of Erie's WUSA was conducted without stormwater BMPs included, but this analysis produced loading results with a negligible difference. This serves as an indication that stormwater BMPs either do not exist for the service area, or that BMPs may be in place but are not effective and need to be modified.

2.5.1.1 Recommendations for Existing NPS Improvements

General recommendations for water quality improvements and enhancements were included in the 2018 Annual Water Quality Report developed by KICP (included in Appendix J), and the recommendations pertaining to nonpoint source pollution control included the following:

- Continuing implementation of construction and post-construction stormwater quality BMPs. Because of the general nature of the water quality analysis included in the report, more detailed recommendations for stormwater quality BMPs are not appropriate at this time. However, it has been noted that practices that result in a reduction of runoff volume through infiltration and/or filtration are expected to be beneficial for the reduction of bacteria.

- Identify opportunities for implementation of agricultural BMPs by inventorying practices already in place for various agricultural parcels. Where practices are already in place, the effectiveness of various practices can be assessed. Where practices are not being implemented, a significant opportunity for improvements exists. Additionally, the City of Boulder Open Space and Mountain Parks has developed a comprehensive master planning process that addresses best practices on open space.

3 Future Conditions

3.1.1 Population & Land Use Projections

In order to accurately estimate the projected growth rate over a 20-year planning timeframe, multiple planning scenarios were prepared for further discussion with the Town. These included projections compounded annually and linearly from the actual 2017 population value, with growth rates of 4 percent, 6 percent, and 8 percent for five years, and 5% afterwards. The results of these projection calculations are shown graphically on Figure 3-1.

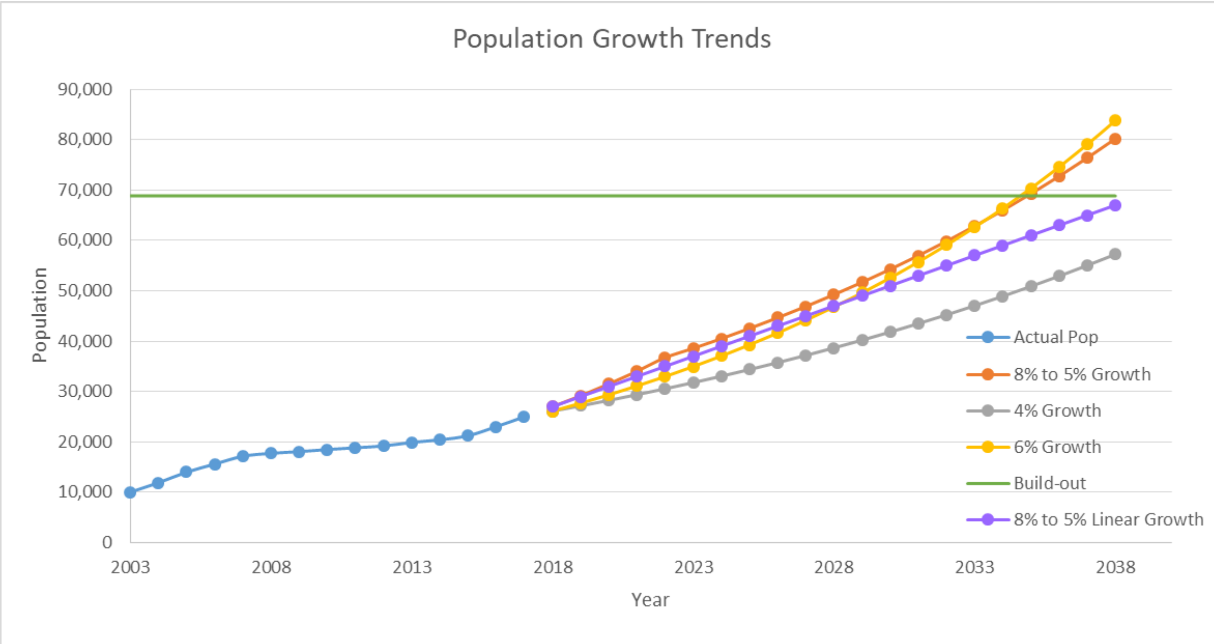

Figure 3-1: Recommended Population Projection for the Town of Erie

Although past growth trends appear to reflect compounded growth, steady, but slowed, growth over the planning period is expected for long term conditions. The Town recommended a growth rate of 8% until 2022, and then a growth rate of 5% from 2023 onward. As shown above, the recommended projection rate shows the Town's Build-out conditions being nearly the same as a 6% growth rate, which is close to the average growth rate seen in Erie since 2003. Ultimately, the growth rate of 8% until 2022, and a growth rate of 5% for each year thereafter, was used as the basis for determining the final design year values for influent flows and loading. Table 3-1 below shows the projected population values for the Town of Erie.

Table 3-1. Town of Erie Population Projection Estimate

Year	Population
2010	18,497
2015	21,243
2020	25,845
2025	31,445
2030	38,257
2035	46,546
Build-out	68,820

Ultimate development projections have been estimated and provided in the Town's 2015 Comprehensive Plan. The Land Use Plan Map is shown in Figure 2-1. The residential land use densities from the Comprehensive Plan are presented in Table 3-2 below.

Table 3-2. Land Use Density

Land Use	Density
Rural Density	1 unit/acre
Low Density	4 units/acre
Medium Density	8 units/acre
High Density	16 units/acre
Mixed Use	50% Land Medium Density

3.1.2 Projected Flows and Loadings

To plan for future treatment needs, it is necessary to project wastewater flows and loads to the NWRF. In order to project each of the influent parameters shown, historical values were divided by the population value for each respective year, and these values were averaged to find a per capita wastewater generation and loading rate. The projected population values were then multiplied by the per capita wastewater generation and loading rate for each parameter to obtain projected influent loads and flows. A summary of the projected flows and loads for the ten and twenty year design condition are shown below in Table 3-3.

Table 3-3. 2028 and 2038 Condition Flows and Loads

	2028		2038	
Parameter	Avg. Annual Value	Max. Month Value	Avg. Annual Value	Max. Month Value
Influent Flow (MGD)	2.80	3.03	4.56	4.93
BOD Loading (lb/d)	6,997	9,376	11,398	15,273
TSS Loading (lb/d)	7,193	9,709	11,717	15,815
Ammonia Loading (lb/d)	840	1,114	1,368	1,814
TP Loading (lb/d)	443	618	722	1,007
TIN Loading (lb/d)	32	3,904	52	6,360

Solids flows and loads were calculated by dividing the historical average day RAS and WAS flows in pounds per day by the average day influent BOD in pounds per day. The resultant yield value was then used to project both average day and maximum month values for RAS and WAS. The yield values used for RAS and WAS are shown below in Table 3-4.

Table 3-4. Yield Values for Projecting Biosolids Flows

Parameter	Average Yield Value (lb solids/lb influent BOD)
Recycled Activated Sludge	28.4
Waste Activated Sludge	1.3

For each solids stream flow, the corresponding yield value was multiplied by the average day or maximum month influent BOD value to find the resultant expected solids volume produced. The WAS or RAS value was converted from pounds per day to gallons per day using the average percent total solids concentration, which was based on historical data provided by the Town. Table 3-5 below summarizes the projected solids stream flows for the twenty year design condition.

Table 3-5. Projected Solids Flows at the Erie NWRF

Parameter	2038
Max Month RAS Flow (MGD)[b]	4.93
Max Month RAS Flow (lb/day)[b]	563,291
Max Month WAS Flow (gpd)[b]	160,650
Max Month WAS Flow (lb/day)[b]	18,300
Max Month Dewatered Solids Flow (lb/day)[c]	21,960

[a] Based on 61.5 gpcd wastewater generation rate per capita.
[b] Based on projected solids flow rates provided by Kruger. Assumes secondary treatment expansion.
[c] Assumes no change in existing solids treatment process. Based on a 1:5 ratio of lime to WAS solids use.

Several constituents have been identified as parameters of concern due to the impairment of receiving water bodies are discussed further in Section 3.3 below. Though these parameters have been identified as parameters of concern due to the detrimental effect on the quality of the receiving stream, the NWRF has not historically sampled for these parameters at the influent sampling location. Instead, these parameters are sampled and monitored at the NWRF effluent. Historical effluent data can be found in Section 2.3.2.

3.1.3 Future Collection System Interceptor Alignments & Lift Stations

3.1.3.1 Future Lift Stations

No future lift stations are being proposed, however, there is currently one temporary lift station located within the Erie WUSA. Gravity sewer pipes will be implemented to serve the Town's needs in the future, and the existing temporary lift station will then be removed.

3.1.3.2 Future Interceptor Layout and Sizing for WUSA Changes

Adequate capacity for future upstream development should continue to be provided by developers as new development occurs. For build-out conditions, the new Wastewater Collection System Master Plan proposes several new interceptors which will need to be constructed. The proposed interceptors include major interceptors along Highway 52, I-25, Weld County Road (WCR) 5, and WCR 7. Development along these highways as well as within the basin will trigger these improvements.

The recommended development driven collection system improvements included in Merrick's Wastewater Collection System Master Plan are presented in Table 3-6. Both the existing sewer system and proposed interceptors are shown on the Town of Erie Wastewater Collection System Master Plan Map provided in Appendix H.

Table 3-6. Development Driven Improvements Plan Recommendation

Item	Type of Improvement	Description	Trigger for Project Initiation
South Coal Creek Interceptor	Development Driven	Install approximately 7,800 feet of 8-inch, 10-inch, 12-inch and 15-inch sewers.	Parkdale, Fuller, or Sierra Vista developments.
Highway 52 Interceptor	Development Driven	Install approximately 14,400 feet of 24-inch and 36-inch sewer from NRWF along HWY 52 to WCR 7.	**Developments along Highway 52
Interstate Interceptor	Development Driven	Install approximately 39,500 feet of 8-inch, 12-inch, 15-inch and 24-inch sewer from HWY 52 & WCR 7, along I-25 to WCR 6.	**Development along I-25
Weld County Road 5 Interceptor	Development Driven	Install approximately 16,200 feet of 10-inch, 12-inch, and 15-inch sewer from HWY 52 along WCR 5 to south of WCR 10.	**Development along WCR 5
Weld County Road 7 Interceptor	Development Driven	Install approximately 10,600 feet of 8-inch and 10-inch sewer from HWY52 along WCR 7 to WCR 10.	**Development along WCR 7

3.1.3.3 Timeline for Staging Future Collection System Improvements

The recommended timeline for the construction of future trunks is for improvements to be undertaken on a schedule as dictated by development. The location of trunks has been laid out to provide gravity service and to utilize existing capacity where possible. The sizing values provided in the table above are approximate values only and should be reviewed during the design process during actual development.

3.1.4 Future Service Area Nonpoint Sources Contributions

Though significant changes to nonpoint source contributions within the future service area are not anticipated over the next 20-year horizon period, nonpoint source contributions should continuously be monitored, and BMPs should continuously be evaluated. Therefore, each new development will model the changes in nonpoint sources for consideration of BMPs for the developer and the Erie Planning Commission.

3.2 Receiving Stream Water Quality

The CDPHE develops water quality standards for the state of Colorado and stream segments can be classified as attaining the developed standards, requiring additional monitoring and evaluation, or impaired and placed on CDPHE's 303(d) list for impaired waters. Stream segments that are identified as impaired will be assigned a Total Maximum Daily Load (TMDL) which assigns load allocations to known sources of the pollutant contributing to the impairment.

The Erie NWRF discharges effluent to Segment COSPBO10 of the Boulder Creek. The beneficial use classifications for Segment COSPBO10 of Boulder Creek are summarized as follows:

- Recreation, Class E – Existing Primary Contact: Not Supported
- Aquatic Life, Class 1 – Warm Water: TMDL Assigned
- Agricultural: Fully Supporting
- Domestic Water Supply: Not Supported

The classifications are described as:

> Recreation, Class E – Existing Primary Contact: These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975. The numeric standard is 126 colonies per 100 mL of E. Coli.
>
> Aquatic Life, Class 1 – Cold Water: These are waters that (1) currently are capable of sustaining a wide variety of warm water biota, including sensitive species, or (2) could sustain such biota but for correctable water quality conditions. Waters shall be considered capable of sustaining such biota where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of specifies.
>
> Agriculture: These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado and which are not hazardous as drinking water for livestock.
>
> Domestic Water Supply: These surface waters are suitable or intended to become suitable for potable water supplies. After receiving standard treatment (defined as coagulation, flocculation, sedimentation, filtration, and disinfection with chlorine or its equivalent) these waters will meet Colorado drinking water regulations and any revisions, amendments, or supplements thereto.

The beneficial use classifications have defined numerical in-stream water quality values for the NWRF. The water quality standards for Segment COSPBO10 of Boulder Creek are shown in Table 3-7.

Table 3-7. Stream Standards for Segment COSPBO10 of Boulder Creek

Physical and Biological		
	Maximum Weekly Average Temperature	**Daily Maximum**
Temperature (°C) (March – Nov)	27.5	28.6
Temperature (°C) (Dec – Feb)	13.8	14.3
	Acute	**Chronic**
Dissolved Oxygen (DO)	--	5 mg/L
pH	6.5 – 9.0	--
E. Coli (per 100 mL)	--	126
Inorganic (mg/L)		
	Acute	**Chronic**
Ammonia	TVS	TVS
Boron	--	0.75
Chloride	--	250
Chlorine	0.019	0.011
Cyanide	0.005	--
Nitrate	10	--
Nitrite	--	0.5
Phosphorus	--	--
Sulfate	--	0.002
Metals (µg/L)		
	Acute	**Chronic**
Aluminum	--	--
Arsenic	340	--
Beryllium	--	--
Arsenic(T)	--	0.02
Cadmium	TVS	TVS
Cadmium(T)	5.0	--
Chromium III	--	TVS
Chromium III(T)	50	--
Chromium VI	TVS	TVS
Copper	TVS	TVS
Iron	--	WS
Iron(T)	--	1000
Lead	TVS	TVS
Lead(T)	50	--
Manganese	TVS	TVS/WS
Mercury	--	0.01(t)
Molybdenum(T)	--	150
Nickel	TVS	TVS
Nickel(T)	--	100
Selenium	TVS	TVS
Silver	TVS	TVS
Uranium	--	--
Zinc	TVS	TVS

Prior to being taken offline, the Erie SWRF discharged effluent to Segment COSPBO07b of Coal Creek. The beneficial use classifications for Segment COSPBO07b of Coal Creek are summarized as follows:

- Recreation, Class E – Existing Primary Contact: Not Supported
- Aquatic Life, Class 1 – Warm Water: Not Supported
- Agricultural: Fully Supporting
- Domestic Water Supply: Not Supported

Since the SWRF is currently not in operation and is not discharging effluent wastewater, numerical in-stream water quality values do not apply and are not being covered as part of this Utility Plan.

3.2.1 Wastewater Issues: 303d and or M&E Listings.

The WQCC's Regulation No. 93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring Evaluation List establishes the list of impaired surface waters, including those that require monitoring and evaluation (M&E) and TMDLs.

Segment COSPBO10 includes the mainstem of Boulder Creek from the confluence with Coal Creek to the confluence with St. Vrain Creek. This water body segment has been categorized as a high priority. This portion was added to the Section 303(d) list in 2004 includes listed impairments for pH, ammonia, E. coli, and total arsenic, however it has been proposed for the pH impairment to be removed, and it is anticipated that this impairment may be modified prior to adoption by the CDPHE.

3.2.2 Watershed Basin Map (showing WWTF & discharge locations in/on segment.)

The Town of Erie lies within the St. Vrain River Watershed Basin as shown in Figure 3-2.

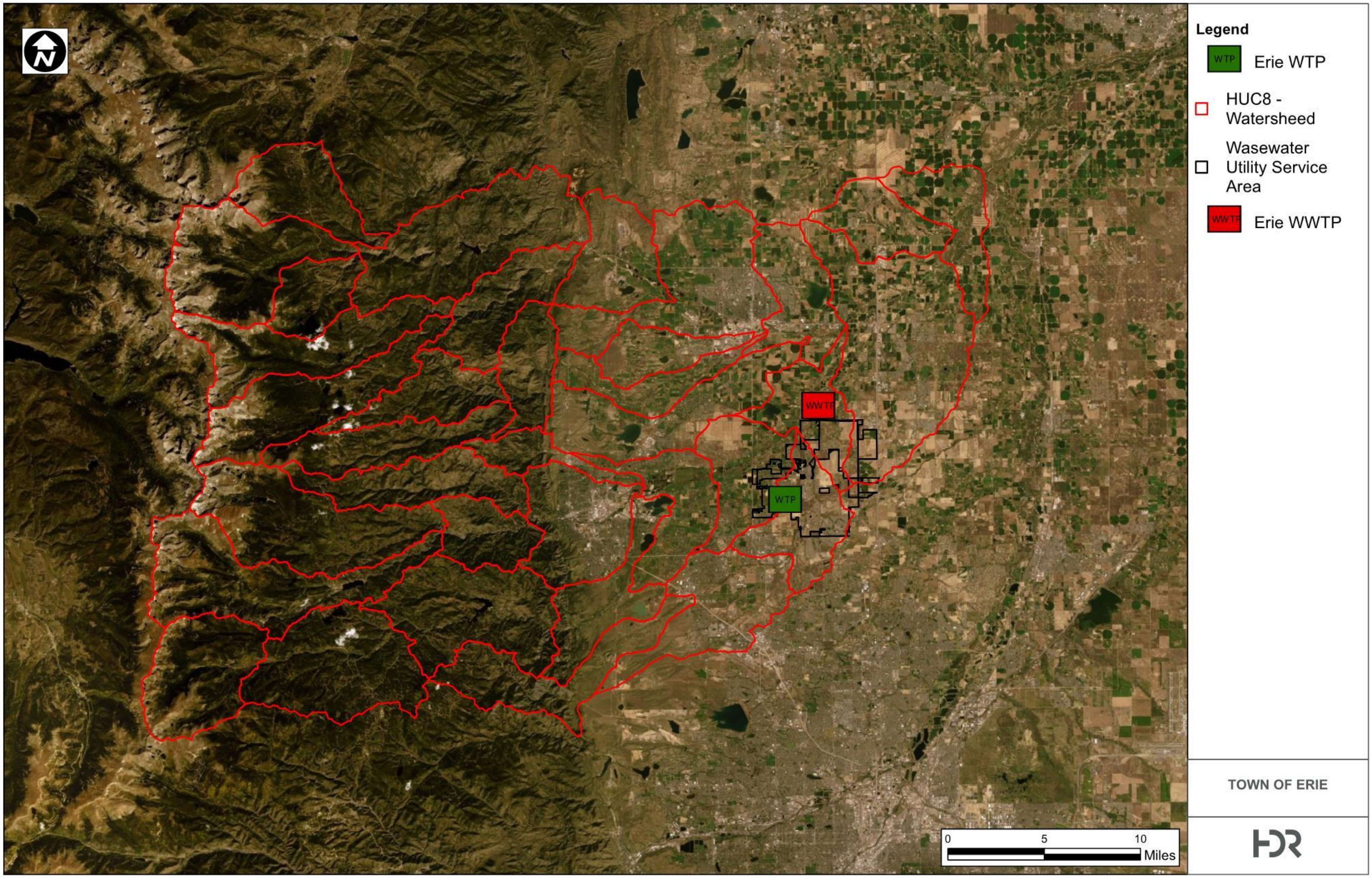

Figure 3-2. St. Vrain River Watershed Basin

3.3 TMDLs and or Wasteload Allocations or Reductions.

With the exception of ammonia, all of the listed parameters on the Section 303(d) List for COSPBO10 are listed as impaired without a TMDL completed. A TMDL has been completed for ammonia within Segment COSPBO10. Total arsenic and pH are listed for their effect on water supply use. E. coli is listed for its effect on recreational use, and arsenic is listed for its effect on water supply use.

The Colorado Water Quality Control Commission (WQCC) adopted a chronic water quality standard for un-ionized ammonia of 0.06 mg/L (30 day average) for Segment COSPBO10 of Boulder Creek in May of 2003. At that same time, the acute standard for un-ionized ammonia was established as TVS, which is based upon the pH and temperature of the receiving stream.

The TMDL assessment was conducted for un-ionized ammonia, and this particular assessment was accomplished through the use of a water-quality model. The St. Vrain basin and its major tributary, Boulder Creek, were included in the model. Segments 9 and 10 of Boulder Creek and segment 3 of St. Vrain Creek are impaired with respect to ammonia, however, Boulder Creek segments 2, 5, 7a, 7b, 8, 11, 12, and St. Vrain segments 2, 5, and 6 are included in the model.

3.3.1.1 Significant Point-Source Dischargers

The overall contributions of ammonia to the listed stream segments from the upstream segments are very small or negligible. The primary sources of ammonia in the St. Vrain watershed are the municipal wastewater treatment facilities located within the segments listed above. In 2003, the CDPHE published a document titled "*Total Maximum Daily Load Assessment Ammonia, Boulder Creek, South Boulder Creek to Coal Creek – Segment 9, Boulder Creek, Coal Creek to St. Vrain Creek, Segment 10, St. Vrain Creek, Hygiene Rd to S. Platte River – Segment 3 Boulder and Weld Counties, Colorado"* which provides an in-depth analysis of ammonia loadings to the river basin. The document identified thirteen wastewater treatment facilities which discharge the St. Vrain watershed, thus serving as the primary sources of ammonia to the basin. Boulder and Longmont are the major dischargers, while Louisville, Lafayette, Erie, Niwot, Lyons, Superior (Rock Creek), and St. Vrain Sanitation District also discharge to the basin. Smaller effluent sources of ammonia include Red Lion Inn, Orodell Inc. (Boulder Mountain Lodge), San Lazaro Mobile Home Park, and B&B Mobile and RV Park.

3.3.1.2 Other Permitted Dischargers

Additional facilities are authorized to discharge to the watershed, but they do not contribute significant quantities of ammonia. CDPHE identified multiple smaller facilities that have the potential to discharge ammonia, however most facilities either have infrequent discharges or the quantity of flows are insignificant and are not likely sources of ammonia.

3.3.1.3 Contributions from Upstream Dischargers

Upstream sources of ammonia were also considered in CDPHE's assessment report. The upstream physical boundary of the model were the "boundary reservoirs" of Gross Reservoir, Barker Reservoir, and Buttonrock Reservoir. Several small wastewater treatment facilities reside upstream of these reservoirs, however, it was determined that these facilities contribute negligible amounts of ammonia to the impacted portions of the listed stream segments.

3.3.1.4 Nonpoint Sources

The contribution of ammonia from non-point sources is considered minimal. In most cases, non-effluent water sources provide dilution of ammonia. CDPHE's TMDL assessment for ammonia showed that there were six locations where non-effluent sources are contributing some (very small, less than 1 mg/l) total ammonia to the stream.

3.3.2 EPA Protective Use Categories and Assessments

Water quality segments are those in which one or more classification or standard is not or may not be fully achieved. A TMDL addressing ammonia was first developed for Boulder Creek in 1985 when the wastewater discharge permit was renewed for City of Boulder's 75th street facility. Although the facility has continuously demonstrated compliance with the ammonia limits included in their permit, in stream monitoring efforts showed that chronic un-ionized ammonia exceeded the standards several miles downstream. Ammonia has since continued to be a problem even as treatment plants and riparian habitat restoration projects occurred. In 1992, Segment COSPBO10 of Boulder Creek was included on the 303(d) list with un-ionized ammonia as the basis for listing. The segment was listed as "partially supporting" the assigned aquatic life use classification. This segment was included on the 303(d) list again in 1994, 1996, 1998, and 2018 as monitoring continued to demonstrate non-attainment of the assigned ammonia standards.

3.4 Future Level of Treatment Required

3.4.1 Division issued PELs

The Town of Erie is permitted by the CDPHE Water Quality Control Division (WQCD) to discharge treated effluent to Boulder Creek from the NWRF per CO-0048445. The discharge permit was originally issued on December 29, 2010, however it was modified and reissued of May 1, 2015. CO-0048445 was originally set to expire as of January 31, 2016, but has been administratively extended.

The Town of Erie is also permitted to discharge treated effluent to Coal Creek from the SWRF per CO-0045926. The discharge permit for the SWRF became effective as of October 1, 2011 and was originally set to expire at midnight, September 30, 2016. Discharge Permit No. CO-0045926 has also been administratively extended.

Preliminary Effluent Limits (PELs) have been requested for the proposed NWRF expansion project. The discharge location for the NWRF will remain unchanged and will continue to be the outfall to Boulder Creek. No new PELs are needed for the SWRF as no changes are being made to the SWRF or its permitted discharge location.

3.4.2 Water Quality Target Limits Discussion

CDPHE developed nutrient quality rules which were adopted by the WQCC in May 2012. The State adopted a phased approach to establishing numeric nutrient standards throughout Colorado. These regulations set TP and TIN permit limits for the largest wastewater dischargers (>2 MGD) and set phosphorus and nitrogen interim values for both lakes and reservoirs and rivers and streams.

The first phase is implementation of CDPHE Regulation No. 85, which set interim effluent standards for TP of 1.0 mg-P/L and total inorganic nitrogen (TIN) of 15 mg-N/L, respectively. The permit limits will be incorporated into permits at the next renewal and compliance schedules will be used to allow the permittee time to come into compliance with these limits. CDPHE has recently indicated that dischargers to the South Platte River watershed basin are tentatively scheduled to have their permits updated in 2021. As such, it is anticipated that the NWRF will be required to meet the Regulation No. 85 TIN and TP requirements in the next few years.

The second phase of CDPHE's roll-out of nutrient quality criteria is implementation of Regulation No. 31. This regulation sets interim annual median in-stream nutrient quality values, and the rule was approved with the presumption that these values would not be established as definitive water quality criteria until 2027 except in very limited cases. The in-stream TP and Total Nitrogen (TN) values for warm water streams are 0.17 mg-P/L and 2.01 mg-N/L, respectively.

To provide utilities with near-term certainty of regulatory requirements and additional compliance schedule, CDPHE has implemented Policy 17-1: Voluntary Incentive Program for Early Nutrient Reductions. The purpose of the program is to encourage facilities to reduce TP and TIN below Regulation No. 85 required limits. Participating treatment facilities are incentivized by the accrual of "incentive months" which will delay the date that a facility will need to comply with Regulation No. 31 limits through the extension of a compliance schedule. Table 3-8 summarizes the Policy 17-1 requirements.

Table 3-8. Policy 17-1 Incentive Program Requirements

Parameter	Regulation No. 85	Incentive Target
TP (mg-P/L) Annual Median	≤1.0 mg/L	≤0.7 mg/L
Months Earned	0	12 for each calendar year
TIN (mg-N/L) Annual Median	≤15	≤7 mg/L
Months Earned	0	12 for each calendar year
The scale for earning months is linear based on annual median. For example, if a facility's annual median concentration is 0.85 mg/L total phosphorus, the facility is eligible to earn incentive credit for that year. Based on the linear scaling of the total phosphorus median, the facility would earn six months toward a compliance schedule. The months of incentive credit from each year will be summed at the end of the 10-year period and rounded down to the next whole month. Partial months will not be incorporated into compliance schedules.		

Table 4-2 summarizes the applicable discharge limits of Regulation No. 85 (revised November 13, 2017) and No. 31 (revised January 31, 2018).

Table 3-9. Regulation No. 85 and Regulation No. 31 Nutrient Limits for Existing WWTF

Parameter	Regulation No. 85 (Effluent Standard)	Regulation No. 31 (Warm Water In-Stream Standard)
TP (mg-P/L)	1.0 (1)	0.17 (1)
TIN (mg-N/L)	15 (1)	NA
TN (mg-N/L)	NA	2.01 (1,2)
Attached Algae Chlorophyll a, milligrams per square meter (mg/m^2)	NA	150

1 Running Annual Median: The median of all samples taken in the most recent 12 calendar months

2 Determined as the sum of nitrate as N, nitrite as N, and ammonia as N

The TN concentration presented in Regulation No. 31 is lower than most treatment technologies are capable of achieving if applied to “end of pipe”. Attainment of effluent limits based on predicted in-stream numeric criteria at the point of discharge may be possible for phosphorus, but to get to levels below 3 mg/L for total nitrogen will require denitrification filters and/or effluent membrane filtration. Table 3-10 provides a summary of the effluent limits that can be met for nitrogen and phosphorus for different available technologies.

CDPHE has acknowledged that the nitrogen limit may not be attainable and has discussed the inclusion of variances based on “limits of technology”. Based on the current discussions, limit of technology for nitrogen removal is considered enhanced nutrient removal. For phosphorus removal, an additional filtration step might be required. However, facilities which do not currently meet the limit of technology standard are expected to be required to implement these improvements.

Table 3-10. Numeric Nutrient Criteria and Limits of Wastewater Technology

Parameter	Typical In Stream Nutrient Criteria	Typical Municipal Raw Wastewater	Standard Secondary Treatment	Typical Advanced Treatment Nutrient Removal	Enhanced Nutrient Removal	Limits of Treatment Technology
TP (mg-P/L)	0.020 to 0.050	4 to 8	4 to 6	1	0.25 to 0.50	0.03 to 0.08
TN (mg-N/L)	0.3 to 0.6	35 to 50	20 to 30	10	4 to 6	3 to 4

Revised Federal Ammonia Criteria

The EPA released a revised freshwater ammonia criteria first issued for public comment in December 2009. The revised criteria update the current 1999 ammonia criteria included in most state water quality standards and lead to more stringent effluent ammonia limits in NPDES permits for many wastewater treatment facilities.

The 1999 criteria are based on ammonia toxicity to fish and whether or not sensitive fish species are present in the water body. Revised ammonia criteria are being proposed for the protection of certain species of freshwater unionid mussels and snails, which recent studies have shown to be more sensitive to ammonia toxicity than fish. The revised criteria include a bifurcated criteria approach, with different sets of acute and chronic values depending on mussels being present or absent in the water body.

Table 3-11 provides a comparison of the 1999 criteria with what EPA originally published as a draft revision in 2009 and with the final 2013 criteria.

Table 3-11. Summary Comparison of Ammonia Criteria

Criteria Duration	1999 Criteria Based on Juvenile Salmonids		2009 Draft Revised Criteria Mussels Present		Final 2013 Criteria Single Criteria Mussels Present	
	pH 8, Temp=25degC	pH 7, Temp=20degC	pH 8, Temp=25degC	pH 7, Temp=20degC	pH 8, Temp=25degC	pH 7, Temp=20degC
Acute (mg/L)	5.6	24	2.9	19	2.6	17
Chronic (mg/L)	1.2	4.5	0.26	0.91	0.56	1.9

States are now in the process of adopting and incorporating the revised criteria into their state water quality standards. The state adoption process typically is a two to three year process initiated during the states' triennial review of their water quality standards. It is expected revised criteria will start to appear in Colorado water quality standards in 2027.

Temperature

The Town is currently reporting effluent temperature as noted previously. It is expected that some form of a temperature standard will be included in permits issued after 2027. Metro Wastewater Reclamation District and the City of Boulder have already had negotiations with CDPHE regarding this issue and received site specific variances. This approach should also be implemented by the Town as the cost for cooling effluent can be extremely costly.

Conventional Pollutants

The conventional pollutant parameters that the Town currently monitors are BOD, TSS, E. coli, pH, total residual chlorine, oil and grease. Based on the current regulatory environment, it is not anticipated that parameters will change during this planning period.

Trace Inorganic and Organic Constituents of Concern

In addition to conventional pollutants, such as BOD or ammonia, that are present in significant concentrations, there are a number of trace inorganic and organic constituents for which future standards could be set at very low levels. These constituents include a diverse group of relatively unknown and unmonitored chemicals, such as pharmaceuticals, personal care products, endocrine-disrupting compounds (EDCs) and other trace organics that have emerged as potential contaminants of concern. Currently, state and EPA regulators have established water quality standards for the following constituents:

- Nonylphenol
- Arsenic
- Selenium
- Mercury
- Perchlorate
- 1,4-dioxane
- N-nitrosodimethylamine (NDMA)
- Copper
- Cadmium
- Dissolved iron
- Trace wastewater constituents
- Aluminum

Water quality stream standards exist for these constituents, therefore effluent limits may be included in future permits. Among other solutions for effluent compliance, source control of these constituents may be the most viable methodology. Note that for some of these parameters, the compliance strategy will include source control through Industrial Pretreatment Program (IPP).

3.5 Point and Nonpoint Contributions to the River Basin.

The Boulder and St. Vrain watershed is a 980 square mile area watershed located along the front range of Colorado and is known to have generally good water quality, however, it has been impacted by both point and non-point source pollution over the years. Several waterbodies in the Boulder and St. Vrain watershed basin have elevated levels of E. coli intermittently throughout the year. E. coli is used as an indicator of potential fecal contamination and disease-causing organisms. E. coli can originate from wildlife, pets, human sources, or be present in the environment outside of a living host.

Like many areas in the Colorado Front Range, the Boulder and St. Vrain basin has a long history of mining. Although most mines have been abandoned, the excavated areas and their tailings can still leak metals into nearby bodies of water. As a result, elevated metal concentrations have been found in several areas in the upper watershed.

3.5.1 NWRF Point Source Contributions

The NWRF point source contributions in pounds per year (lbs/year) are presented in Table 3-12.

Table 3-12. NWRF Effluent Point Source Contributions

Year	Effluent Flow (MGD)	Average BOD_5 (lb/day)	Average TSS (lb/day)	Average NH_3 (lb/day)	Average TIN (lb/day)	Average TP (lb/day)	Average E. coli (lb/day)
2016	1.3	57.53	42.63	8.77	123.02	1.75	1.4
2017	1.43	116.09	64.25	8.2	111.99	2.05	2.5
2018	1.5	81.79	27.92	5.48	123.92	3.16	1.25
2019	1.43	45.86	21	7.66	136.58	2.41	3.3

3.5.2 River Basin Nonpoint Source Contributions

Information available for the St. Vrain River Basin was obtained from the eRAMS WRAP database and is shown below in Table 3-13. Loading values for TN and TP loading were provided by the eRAMS CLEAN database and are shown in Table 3-14.

Table 3-13. Nonpoint Sources in the St. Vrain River Watershed Basin

Nonpoint Sources	eRAMS Data
Irrigated Agriculture	127.85 sq. miles
Livestock Operations Excluding CAFOs	No Data Available
Urban Stormwater Excluding MS4s	No Data Available
Mining Related Activities	4,288 Features: • BLM: 358 mines • CDRMS: 2,139 mines • DOE: 11 mines • USEPA: 10 mines • USFS: 1,757 mines
Possible Saltwater Intrusions	No Data Available
Cumulative Runoff Effects	Nitrogen Phosphorus

Table 3-14. Annual Nonpoint Source Loading in the St. Vrain River Watershed Basin

Nutrient	Total (lbs/year)	WWTF (lbs/year)	Nonpoint Source (lbs/year)
Total Nitrogen (TN)	2,537,129	1,491,003	1,046,126
Total Phosphorus (TP)	314,973	224,165	90,808

3.5.3 MS4 Permits

The Town of Erie has a general stormwater discharge permit and an accompanying stormwater management plan. The CDPS certification number is COR900021. Copies of the stormwater discharge permit and the stormwater management plan are included in Appendix I.

4 WASTEWATER TREATMENT SYSTEM IMPROVEMENTS.

4.1 Development and Screening of Treatment System Alternatives.

4.1.1 Regional Consolidation Opportunities

There are several wastewater treatment plants located within five miles of Erie's wastewater treatment facilities, including: the City of Longmont Wastewater Treatment Plant (WTP), Alexander Dawson School, and the B&B Mobile and RV Park. Additionally, the St. Vrain Sanitation District (SVSD) Wastewater Treatment Facility (WWTF) is located just outside of the five mile radius boundary.

The facilities at the Alexander Dawson School and the B&B Mobile and RV Park only process a few thousand gallons of flow per day and are not capable of processing additional flows from the Town of Erie. They may opt to send their flows to the Erie NWRF in the future, however, they would be required to update their infrastructure to meet the Town's construction standards. These facilities would also be required to pay tap and service fees on top of providing infrastructure for making the connection.

Lafayette's WRP is located uphill from the Town of Erie's service area on the south side. To consolidate flows and send them to this facility, a large lift station as well as a ten-mile long-force mail would be required. Not only are force mains and lift stations costly, but they are also prone to failure and have the potential to cause serious environmental damage. The Lafayette WRP would also have to significantly increase its treatment capacity to be able to meet nutrient limits with the additional loads. Therefore, consolidation with the Lafayette WRP is not a viable option.

The Longmont WTP is located northwest of Erie's service area. The facility is rated for 17 mgd and currently discharges to the St. Vrain Creek at an average daily flow of 8 mgd. Though the Longmont WTP has excess capacity to properly treat flows from the Town of Erie's service basin, there are two large ridges between the Longmont WTP and the Erie NWRF. Each ridge has an elevation gain of more than 100 feet, which would require a minimum of two lift stations plus four miles of force main. This approach is also cost prohibitive and presents environmental concerns with long force mains and lift stations, therefore consolidation with Longmont is not a viable option.

The next closest wastewater treatment facility is the SVSD WWTP. The Town of Erie could feasibly send all wastewater to the SVSD WWTP via gravity, thereby avoiding costs and environmental concerns associated with lift stations and force mains. However, the SVSD WWTP is already at permitted capacity and cannot accept additional flows from the Erie NWRF. Similar to the Erie NWRF, the SVSD WWTP is also pursuing a facility expansion to increase treatment capacity in an effort to keep up with a booming population within their service basin. The WWTP would need to be expanded significantly to handle the increased service demands within their own service area as well as flows from the Erie NWRF. Therefore, consolidation with the SVSD WWTP is not a viable option. Additional reasons for forgoing this option were provided by the Town of Erie via email to HDR and SVSD. Correspondence between HDR, the Town of Erie, and SVSD regarding this alternative analysis is included in Appendix N.

Water rights also play a significant role in whether or not wastewater treatment should be consolidated. Currently, Erie is able to reduce demand for raw and potable water by reusing a large portion of its treated effluent. If Erie consolidated, they would lose reuse water rights. Therefore, due to technical challenges, financial costs, and water rights, regional consolidation is not a viable option for the Town of Erie.

4.1.2 Wastewater Re-Use Opportunities

The Town of Erie uses both potable and non-potable water in its water management plan. Currently, non-potable water supplies consist of both untreated water and reclaimed treated wastewater effluent. By including non-potable water in their diverse water portfolio, the Town is able to effectively reduce the demand on Erie's potable water system. Non-potable water can be used for irrigation in parks as well as for landscape irrigation in commercial, industrial, and multi-family settings.

The NWRF is permitted to process 1.95 MGD of wastewater, and treated effluent is discharged to either Erie's Reuse Reservoirs for reclaimed water and augmentation, or Boulder Creek for standard effluent discharge. Erie's NWRF reuse reservoir has a 40 acre surface area, and 1000 acre-ft storage capacity. This water is rated Class 2 reuse water and can be used for irrigation of parks and open space, reducing the Town's dependency on potable water supplies. The NWRF reservoir can store reclaimed water treated in the winter for delivery the following irrigation season, and can provide regulatory storage throughout the year. The associated NWRF reuse water pump station has the capacity to pump reclaimed water to the highest point in the Bridgewater development, located approximately 225 feet higher in elevation than the NWRF.

Although the Town currently has the ability to accurately measure effluent directed to the reuse reservoir, there is currently no flow measurement method if effluent is discharged to Boulder Creek. Total effluent flow values are collected at the secondary clarifier effluent line. The upcoming plant expansion (see Section 4.3 of this report) will incorporate effluent flow metering for Boulder creek effluent, so that each discharge flow can be directly and accurately measured. However, NWRF staff have indicated that the over the past three or so years, discharge to the reuse ponds has occurred over 3 to 4 months at most.

4.2 Treatment Alternative Selection

The Erie NWRF was designed to treat 1.95 million gallons per day (MGD) of wastewater. Influent data from 2019 indicates that the Erie NWRF is operating at approximately 88 percent of their hydraulic capacity, and 67 percent of their BOD loading capacity. Incorporating return loads from the dewatering pressate stream also decreases the plant's capacity to accept higher influent BOD loads. This section provides a roadmap for defining the specific liquid stream improvements and upgrades required for the next 20-year planning window. Figure 4-1 provides an aerial image of the facility highlighting the plant expansions expected over the next 20 or so years. The following sections describe the existing system, alternatives analysis, and recommended improvements.

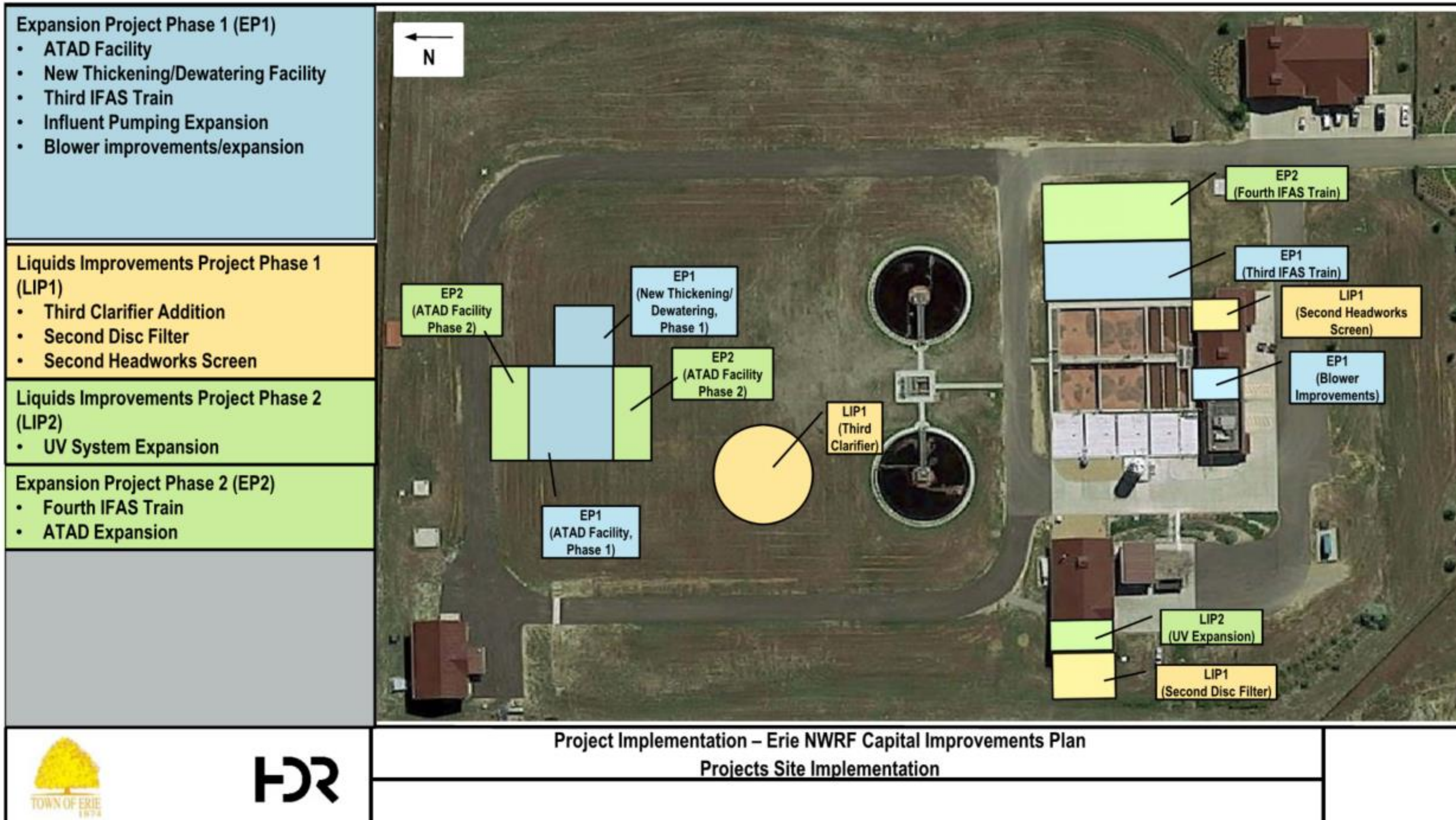

Figure 4-1. Aerial View of the Erie NWRF – Future Plant Expansions

4.2.1 Summary of Drivers

The drivers for the liquid stream improvements are two fold; 1) meet future anticipated flows and loads, and 2) meet more stringent effluent quality limits. At a minimum the improvements need to be able to treat the 2038 flow and load condition and produce effluent that meets the Regulation No. 85 requirements for total inorganic nitrogen (TIN) and total phosphorus (TP). The liquid stream process improvements are sized to meet the maximum month condition while hydraulically the facility must be able to handle the peak hour condition. CDPHE has provided Policy 17-1 to allow dischargers an opportunity to gain compliance schedule credits toward Regulation No. 85. The liquid stream improvements are designed to meet an effluent TIN of 10 mg/L and an effluent TP of 0.7 mg/L to gain the full 10 years of additional compliance schedule.

Table 4-1. Liquid Stream Evaluation Future Flows and Loads

Flow Parameters	Design Year Value (2038)
Avg. Day Influent Flow (MGD)	4.56
Max Month Influent Flow (MGD)	4.96
Peak Hour Flow (MGD)	9.4
Avg. Day Influent BOD Loading (lb/day)	11,398
Max Month Influent BOD Loading (lb/day)	15,273
Avg. Day Influent TSS Loading (lb/day)	11,717
Max Month Influent TSS Loading (lb/day)	15,815
Avg. Day Influent Ammonia Loading (lb/day)	1,368
Max Month Influent Ammonia Loading (lb/day)	1,814
Avg. Day Influent TP Loading (lb/day)	722
Max Month Influent TP Loading (lb/day)	346
Avg. Day Influent TIN Loading (lb/day)	52
Max Month Influent TIN Loading (lb/day)	6,360

Table 4-2. Policy 17-1 Incentive Program Requirements

Parameter	Regulation No. 85	Incentive Target
TP (mg-P/L) Annual Median	≤1.0 mg/L	≤0.7 mg/L
Months Earned	N/A	12 for each calendar year
TIN (mg-N/L) Annual Median	≤15	≤10 mg/L
Months Earned	N/A	12 for each calendar year
The scale for earning months is linear based on annual median. For example, if a facility's annual median concentration is 0.85 mg/L total phosphorus, the facility is eligible to earn incentive credit for that year. Based on the linear scaling of the total phosphorus median, the facility would earn six months toward a compliance schedule. The months of incentive credit from each year will be summed at the end of the 10-year period and rounded down to the next whole month (i.e. 4.3 equals 4). Partial months will not be incorporated into compliance schedules.		

Table 4-3. Liquid Stream Evaluation Future Regulatory Requirements

Parameter	Near Term Target (<20 years)	Long Term Target (>20 Years)
Key Regulatory Driver	Regulation No. 85 (Policy 17-1)	Regulation No. 31
TP (mg-P/L) Annual Median	≤1.0 mg/L	≤0.17 mg/L
TIN (mg-N/L) Annual Median	≤15	N/A
TN (mg-N/L) Annual Median	N/A	≤2.01 mg/L
Ammonia	≤2.0 mg/L	≤1.0 mg/L
Other Drivers	Selenium, copper, cadmium, arsenic, nonylphenol, mercury	Temperature

4.2.2 Hydraulic Capacity Analysis

A hydraulic analysis was performed on the liquid stream system of NWRF using the Visual Hydraulics© program. The model was used to simulate NWRF operating at the 2028 peak hour flow of 5.6 MGD. The goal of the evaluation was to determine if the proposed plant expansion could accommodate peak hour flow of 5.6 MGD. Two levels of failure were investigated for each scenario: a process control failure and a catastrophic failure. A process control failure occurs when a weir is flooded and the flow split between process trains is no longer controlled. A catastrophic failure occurs when a process overflows.

The Visual Hydraulics© model shows that when all processes are online, they can accommodate the peak hour flow of 5.6 MGD without risk of overflow or submerging weirs. With minimal process adjustments, the plant can comfortably accommodate 2028 peak hour flows with one of the three IFAS basins offline.

The Secondary Clarifiers are the hydraulic bottleneck for the NWRF. At 2028 peak hour flow, the loss of a Secondary Clarifier would the complete submergence of four weirs. This means that every process downstream of the Grit Unit and upstream of the UV Effluent weir would be hydraulically connected without an air gap. In addition to the loss of control, there would be a potential overflow risk at the

Secondary Clarifier Splitter Structure. Reducing the recycle rates to zero would mitigate the overflow risk, but most of the weirs would remain flooded.

Even with IFAS and Secondary Clarifier capacity reduced, there is no direct evidence that catastrophic overflow would occur at 2028 peak hour flows. In this worst case scenario, the available freeboard dipped to approximately 8-inches and all flow control was lost. Despite concerns associated with reduced capacity, the modeled plant was still able to hydraulically pass the 5.6 MGD peak hour flow.

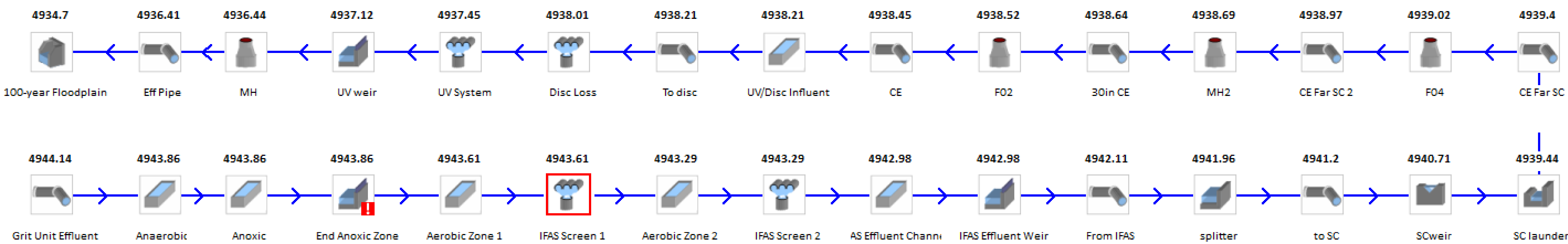

Figure 4-2: Components of the Visual Hydraulics Model

4.2.3 Secondary Treatment System

The Visual Hydraulics® model was used to predict operation under future (2038) liquid stream flow, load, and effluent nutrient quality scenarios (TIN/TP). This evaluation represents the near-term alternatives planning window and the basis of planning for this Utility Plan. The first step in this evaluation was to develop improvement alternatives and determine the highest flow rate the improved liquid treatment system could treat while meeting future effluent criteria including CDPHE Policy 17-1. This step is referred to as the "near-term alternatives" or what the facility needs to meet within the 20-year planning window. Alternatives are described and evaluated in the upcoming sections with recommendations for implementation.

Overall, the analysis determined that the existing IFAS basins are not adequate for 2028 and 2038 flows and conditions, and that the NWRF must be upgraded to meet future flows. The Town opted to continue using IFAS for secondary treatment, therefore, current improvement measures include the addition of a third IFAS basin to provide treatment capacity for 2028 conditions. Provisions will be made for a future fourth IFAS basin to provide treatment capacity for 2038 conditions.

Using the 2038 flows and loads, improvement alternatives to increase capacity and performance of the existing treatment system were evaluated. Three main alternatives were developed by HDR and the Town of Erie following several meetings and facility tours with staff members at the Town. The three main alternatives for liquid stream process improvements are:

- IFAS Expansion Layout Alternative 1: New Basins with Swing Zone
- IFAS Expansion Layout Alternative 2: New Basins with Common Reactors
- IFAS Expansion Layout Alternative 3: Repurpose Solids Storage Basins

In review of the layout alternatives for expansion of the Town's IFAS system, the alternative that provides the greatest overall benefit while providing a project that meets the 20-year design window is Alternative 1. IFAS Expansion Layout Alternative 1 is designed to meet all the effluent standards required to meet Policy 17-1 standards. It also provides process redundancy and offers the most operational flexibility and treatment capacity with the addition of the swing zone. The following sections provide a summary of the proposed secondary treatment improvements.

4.2.4 Secondary Treatment Improvements – Inclusion of a Swing Zone to New and Existing IFAS Trains

This upgrade includes the following improvement measures:

- One new swing basin, post-anoxic basin, and reaeration basin to be constructed at the end of the two existing IFAS trains.
- A third identical train to be constructed for 2028 design conditions as part of the current expansion project.
- A fourth identical train to be constructed for 2038 design conditions during the next phase of expansions.

These improvements will provide process redundancy that offers the most operational flexibility and treatment capacity. Once constructed, the third train will treat a third of the plant influent flow during normal operations, and it will process up to half of the influent flows should one of the other IFAS trains be taken offline.

4.2.5 Solids Treatment System

The Erie NWRF was constructed to treat a maximum month influent flow of 1.95 MGD and 5,233 lbs/day of influent BOD. Currently, the solids stream process is operating at greater than 80 percent of design capacity. The NWRF has also had issues with the existing solids processing equipment and pipe scaling throughout the plant. The existing solids treatment process at the NWRF (a FKC Class A Biosolids stabilization system) has failed to produce Class A biosolids despite higher doses of lime, and the higher doses of lime have created lime scaling issues in the dewatering lines. Continued growth combined with the need to produce Class A biosolids has resulted in the need for the NWRF to expand and improve the solids treatment system.

For this expansion, a new biosolids stabilization technology will be provided along with new equipment to meet projected flows and loads as shown in Table 4-4.

Table 4-4. Projected Solids Stream Treatment Flows and Loads

Flow Parameters	2028	2038
Avg. Day Influent Flow (MGD)	2.80	4.56
Max. Month Influent Flow (MGD)[a]	3.03	4.93
Max Month WAS Flow (gpd)[b]	208,791	340,098
Max Month WAS Flow (lb/day)	12,189	19,855
Max Month Thickened WAS (Solids Processing Feed) (gpd)[c]	23,141	37,694
Max Month Dewatered Solids Flow (lb/day)	6,050	9,855

[a] Based on 61.5 gpcd wastewater generation rate per capita.
[b] Assumes total solids concentration of approximately 0.7% TS of WAS/RAS, based on historical data.
[c] Assumes total solids concentration of approximately 6% TS of TWAS.

4.2.6 Non-Monetary Evaluation of Alternatives

A non-economic evaluation played a key role in the selection process of the solids stream alternatives. The evaluation captured criteria that are not associated with cost, but remain important for ensuring that the new biosolids stabilization alternative is implemented as seamlessly as possible at the NWRF. For the non-economic evaluation of the solids stream alternatives, HDR compared the solids stream alternatives based on the following criteria:

- Operator attention
- Operator Familiarity
- Maintenance Requirements and Complexity
- Flexibility to Meet Future Flows and Loads Needs
- Footprint
- Implementability
- Redundancy
- Robustness/Long-Term Sustainability
- Safety

Each criterion was assigned a rating from 1 to 5, with 5 being the highest (best) rating attainable. The ratings were then added and divided by the total possible score to define a weighted score for each alternative.

The non-economic evaluation for the solids stream alternatives was based on scoring of each criterion, applying a weighting factor, and calculating a "total benefit" for each alternative. The "total benefit" values, coupled with the economic analysis, provide an overview of the relative costs and benefits for each alternative. The weighted benefit scores for the solids stream alternatives are shown in Figure 4-3 below.

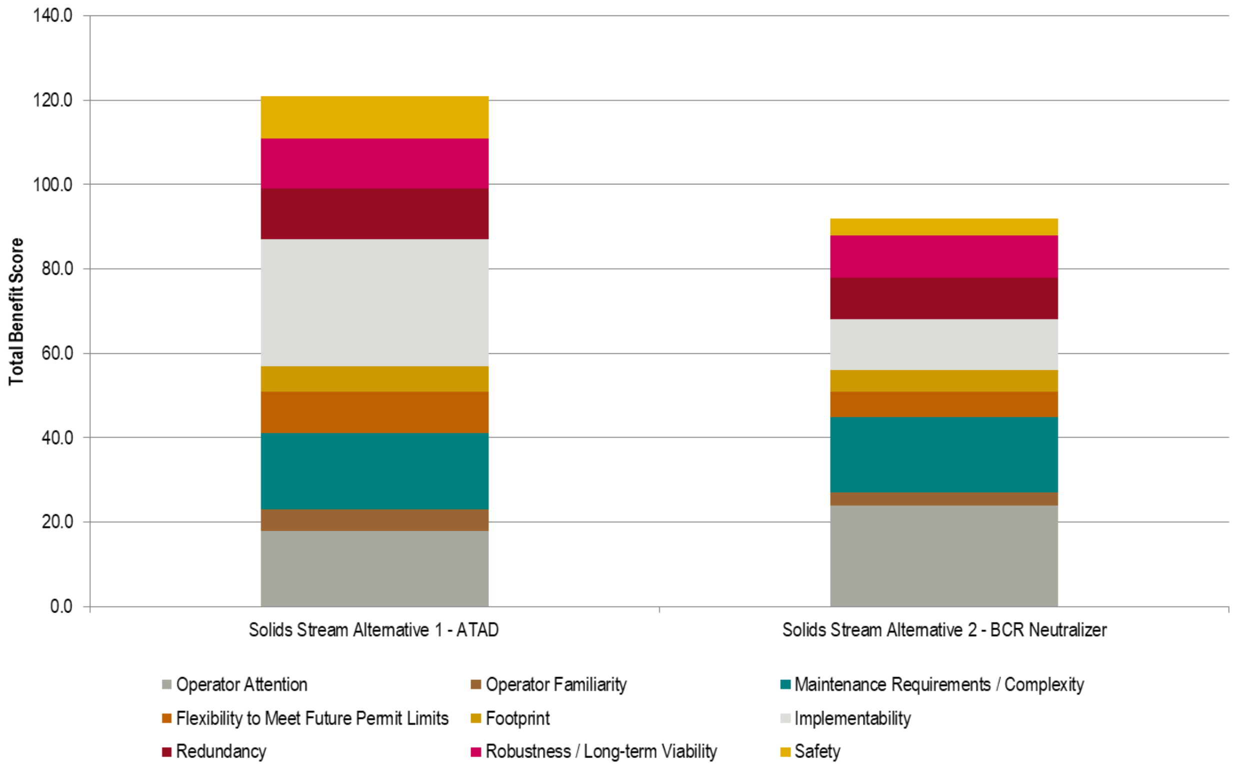

Figure 4-3. Non-Economic Evaluation of Narrowed Solids Stream Alternatives

A non-economic evaluation was not performed for the liquids stream expansion alternatives during master planning efforts. The alternatives provided for the expansion of the liquids stream are generally all variations of the same process and technologies, which makes a non-economic evaluation less applicable and of limited value for the liquids stream improvements.

4.2.7 Monetary Evaluation

To evaluate the relative cost savings of keeping the existing solids handling system in place at the NWRF, the 10 and 20 year Net Present Value (NPV) calculations were performed for two alternative options: "Keep Existing System" and "ATAD". The results of the evaluation are shown in Table 4-5 below.

Table 4-5. NPV Analysis for Solids Stream Alternatives

Alternative	Total Anticipated Project Cost (TAPC)
ATAD	$15,202,000
Keep Existing System	$7,814,000
Alternative	**10 Year NPV**
ATAD	$23,947,000
Keep Existing System	$23,659,000
Alternative	**20 Year NPV**
ATAD	$45,334,000
Keep Existing System	$65,191,000

The analysis showed that although the initial capital costs of implementing a new ATAD system is significantly higher than the option of keeping the existing system intact, the total NPV costs converges over time. The convergence is attributed to the continued use of lime as well as the higher biosolids hauling costs associated with keeping the existing system. Additionally, if the existing system were to be utilized in lieu of a new ATAD system, substantial improvements including two new FKC Class A systems, additional building expansions, and improvements to the existing solids storage tanks would still be required to meet 2038 conditions.

4.2.8 Solids System Improvements – Implementation of Autothermal Thermophilic Aerobic Digestion

The Erie NWRF has faced numerous issues with the existing solids processing equipment. The solids treatment process at the Erie NWRF (a FKC Class A Biosolids stabilization system) has been failing to produce Class A Biosolids as originally designed. Operators at the facility have increased the lime dose in an effort to produce Class B Biosolids, however, the higher doses of lime have created significant lime scaling issues in the pipelines.

Since the existing solids treatment system is loaded at 80 percent of capacity, additional volume is required to accommodate future loads and flows. Since the existing solids treatment system has not been able to produce Class A Biosolids, an entirely new treatment system is also needed. Therefore, additional capacity as well as an entirely new treatment method are being implemented as part of the facility improvements. A solids stream process performance evaluation was completed for the Erie NWRF, and Autothermal Thermophilic Aerobic Digestion (ATAD) was chosen as the final option to be implemented for the purpose of providing solids stabilization for the Erie NWRF. For a summary of the long-term alternatives evaluated for solids stabilization options, please see the Master Plan in Appendix A.

Overall biosolids stabilization system improvement efforts will include the following:

- Construct a new ATAD Building (sized for 20-year design condition) with two new thickeners, two new ATAD tanks, one new SNDR tank, two new dewatering units, blowers for ATAD aeration, TWAS, transfer, jet motive, and dewatering feed pumps, a chemical storage tank and pumps for ferric sulfate dosing, and a new emulsion polymer system.
- The dewatering screw presses will discharge via shaftless screw conveyors into a pile on the ground directly outside the building.
- New odor control biofilter will be provided for new ATAD tanks.

These improvements provide a 10-year solution with the capability to expand to 2038 conditions. They also provide the benefits of a single digestion process that produces Class A Biosolids while resolving operations and maintenance issues due to lime scaling. The reduced solids volume production is also expected to provide the Town with a cost savings with respect to biosolids hauling. Additionally, the quality of the Class A biosolids product may attract independent farmers or material companies who are willing to haul off the biosolids at no cost to the Town. Table 4-6 provides the design criteria for the new ATAD/SNDR digestion system.

Table 4-6. ATAD/SNDR Design Criteria

Parameter	Design Criteria
ATAD Reactor Volume	251,000 gallons (each)
Number of ATAD Reactors	2
Total ATAD HRT	12 days (Total)
ATAD Motive Pump HP	125
Number of ATAD Motive Pumps	2
Number of heat exchangers	1
ATAD Transfer Pump Capacity	400 gpm (each)
Number of ATAD Transfer Pumps	2
SNDR Tank Capacity	359,000 gal
Total SNDR HRT	12 days
SNDR Motive Pump HP	75 HP
Number of SNDR Motive Pumps	1

4.3 Recommended Treatment System Improvements

The following projects are recommended for the NWRF:

- Secondary Treatment Improvements
- Solids Treatment Improvements
- Existing System Improvements

4.3.1 Secondary Treatment Improvements

Secondary treatment improvements are recommended to address the following project drivers:

- Continued growth in the service area
- Pending permit renewal, anticipated to include nutrient removal requirements in accordance with Regulation No. 85 and Policy 17-1

Table 4-7 summarizes the key components of the secondary treatment improvements and provides a summary of costs. Detailed cost estimates are provided in the Master Plan included in Appendix A.

Table 4-7. Secondary Treatment Project Summary

Project Component
Construction of swing zone, post-anoxic zone, and reaeration zones in the two existing IFAS trains.
Construction of an identical third IFAS train.
Repurpose the NWRF's existing RAS/IR centrifugal pumps for RAS/WAS pumping only.
Install propeller-style in-basin pumps and piping for MLR pumping in all three trains.
Construction of new splitter box to the clarifiers.
Installation of fourth high speed turbo blower with magnetic bearings.
Modification of effluent trough in existing IFAS trains to accommodate flow to new swing zone basins.
Replacement of existing spray nozzles with non-clogging spray nozzles.
Total Liquids Stream Improvements Cost: $8,274,368

The existing facilities were constructed approximately seven years ago and are assumed to be in good condition, with no significant rehabilitation required. The existing Influent Pump Station, Headworks, Secondary Clarifiers, and UV disinfection processes do not require any process improvements.

4.3.2 Solids Treatment Improvements

Solids treatment improvements are recommended to address the following project drivers:

- Continued growth in the service area
- Provide ability to produce a Class A Biosolids Product and eliminate lime buildup.
- Operational improvements to address existing issues within the system

Table 4-8 summarizes the key components of the solid treatment improvements. A summary of costs is provided in the table, and detailed cost estimates are provided in the Master Plan included in Appendix A.

Table 4-8. Solids Treatment Project Summary

Project Component
Decommission the FKC Class A Biosolids Stabilization system.
Implement ATAD as new biosolids stabilization process at the Erie NWRF.
Install a new biosolids stabilization facility sized for 2028 conditions, with two ThermAer tanks, one SNDR tank, a biofilter, building space for ancillary equipment, and leave room for expansion to 2038 conditions.
Install two new rotary drum thickeners in the new Solids Processing building.
Install two new fully redundant screw presses in the new Solids Processing building.
Convert the existing feed tanks into WAS storage tanks.
Provide repairs for the existing solids storage tank as needed.
Install new emulsion polymer system for both thickening and dewatering.
Install a new ferric sulfate feed system in the new Solids Processing Building.
Total Solids Stream Improvements Cost: $18,063,984

4.3.3 Existing System Improvements

Table 4-9 summarizes the key components of miscellaneous improvements being made to the existing system as well as summary of costs. Detailed cost estimates are provided in the Master Plan included in Appendix A.

Table 4-9. Existing System Improvements Project Summary

Project Component
Provide NPW System Improvements and Irrigation Tie-In.
Provide flow monitoring at the manhole upstream of the existing Solids Processing Building.
Provide flow monitoring of effluent to Boulder Creek.
Total Existing Site Improvements Cost: $150,000

4.3.4 Green Elements

One of the major goals that the Town of Erie has regarding new infrastructure projects is sustainability, and the Town Board has emphasized this goal in numerous planning documents. Therefore, while evaluating the solids treatment options, several green elements were considered by HDR and the Town of Erie in the alternatives analysis. For example, as described in Section 2.3.7 of this report, the NWRF's existing solids treatment facility consists of a lime pasteurization process. This treatment system utilizes a substantial amount of chemicals, including lime and sulfuric acid, to reduce pathogen count and prevent scaling of equipment and pipelines. Converting the NWRF's solids facility to an ATAD system eliminates the need for harsh chemicals in the biosolids treatment process, enhancing operational safety and sustainability at the NWRF.

Additionally, the end-product produced by ATAD increases the re-usability of the dewatered biosolids. The plant's existing process generates a biosolids product saturated with lime, which must either be blended with other compost products to become suitable for land application, or landfilled. ATAD biosolids are a reliable Class

A product, which can be used dependably and beneficially for land application. Hauling costs are also expected to decrease with the implementation of ATAD, not only because the more desirable end-product may eliminate the need for third party hauling services, but also because the digestion aspect of ATAD reduces the resultant overall biosolids volume. These green elements of the selected treatment alternative all contribute to the sustainability of the Erie NWRF.

4.3.5 Emergency Standby Power System

The Town has permanently installed a backup power generator for the NWRF. This generator will continue to be provided for the NWRF and will continue to provide emergency power to the newly expanded NWRF in emergency situations.

4.3.6 Odor Considerations

The NWRF's existing solids treatment process produces a substantial odor component at the plant. Although the Erie NWRF does not currently have any nearby neighbors that may complain about the plant's odors, they remain a nuisance to the plant staff. As part of the ATAD facility recommendation, HDR has included a biofilter that will collect and treat process air from the headspace of the ATAD and SNDR tanks. The biofilter consists of an air scrubber just upstream that will regulate the incoming air temperature to protect the odor-consuming bacteria on the organic media. An air plenum distributes odorous air through a media bed consisting of rock and wood chips. This biofilter is expected to significantly reduce odors at the plant, allowing for more flexibility with respect to future potential neighbors.

4.3.7 Air Quality Requirements

No new air quality requirements are being implemented as part of the NWRF expansion project.

4.3.8 Site – Stormwater Management Plan

As mentioned previously, the previous stormwater discharge permit for the NWRF was terminated. No new stormwater discharge permits will be required following the expansion of the NWRF; however, the Town of Erie will continue to operate under the Stormwater Management Plan as described. The current Stormwater Management plan can be found in Appendix I.

4.3.9 Site Map

The aerial view of the plant with planned expansions over the next 20 or so years is depicted above in Figure 4-1, in Section 4.2. A Site Plan for the next planned plant expansion is shown below in Figure 4-4. Bolded items indicate additions as part of the next plant expansion. The flow diagrams for the liquids stream expansion and solids stream improvements to be included in this project are shown in Figure 4-5 and Figure 4-6, respectively.

4.3.10 Site Characteristics

Since the Town is expanding and improving an existing facility and not constructing an entirely new wastewater treatment facility, the site characteristic evaluations that were performed for the initial plant build in 2011 and 2012 still apply. No new floodplain or natural hazard studies or evaluations are required. However, a soil test was conducted as part of the facility expansion efforts, and a soil test report has been included in Appendix E.

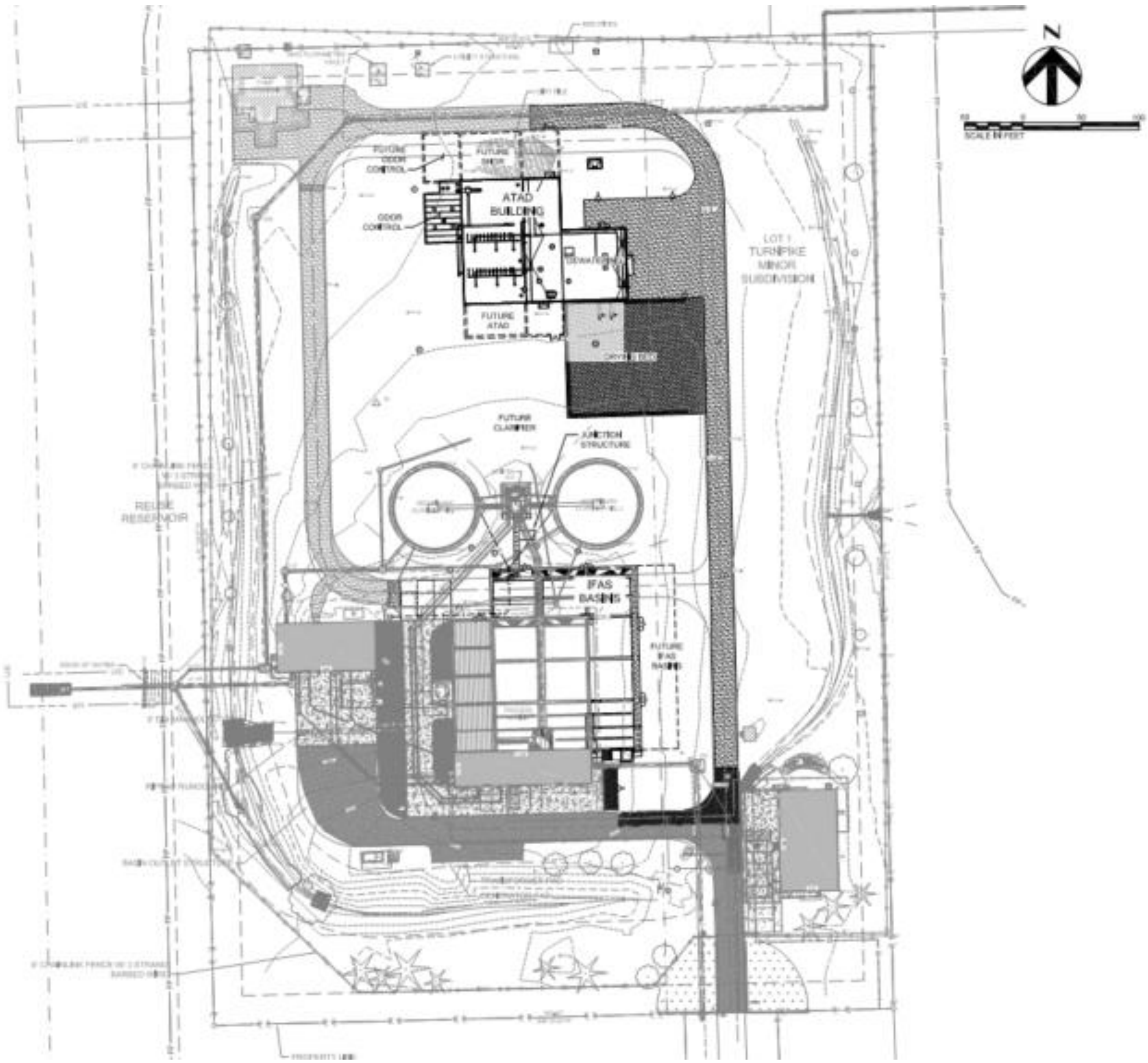

Figure 4-4: Erie NWRF Expansion Site Plan

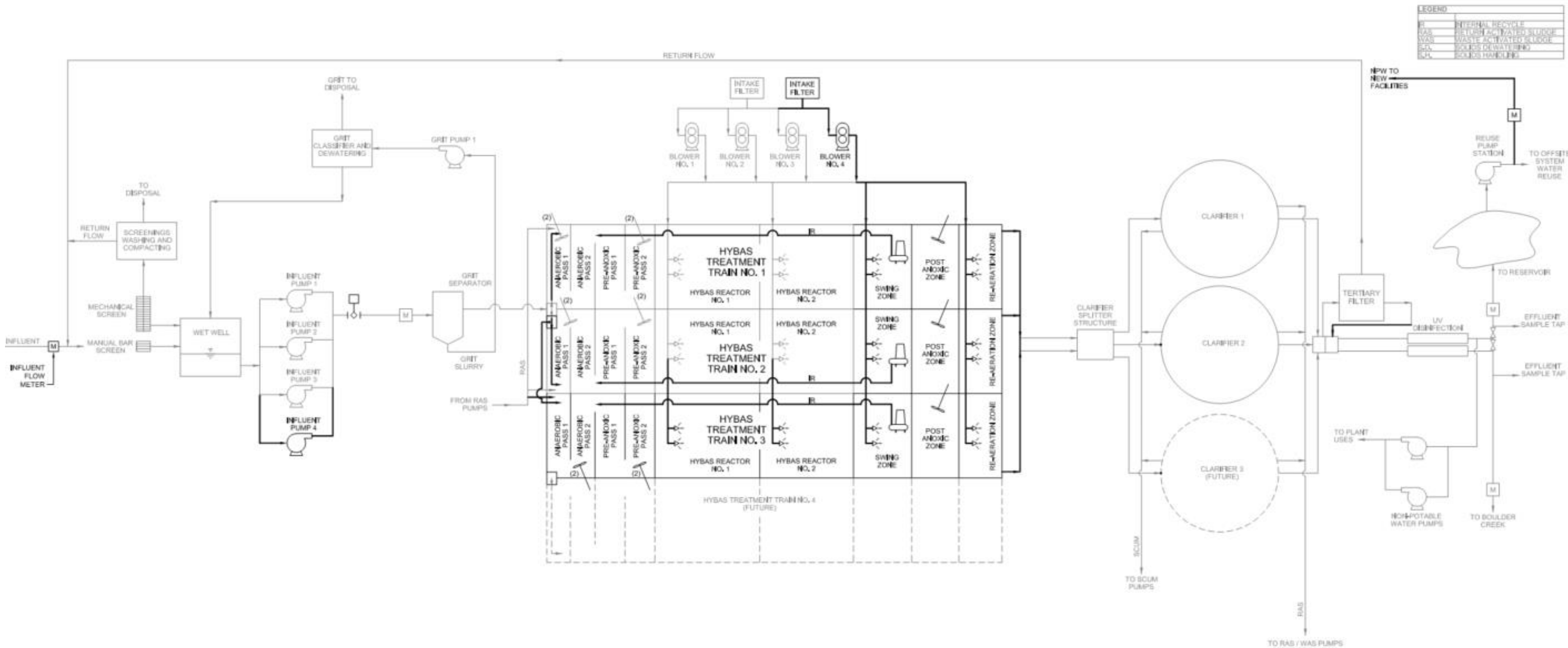

Figure 4-5: Erie NWRF Liquids Stream Flow Schematic

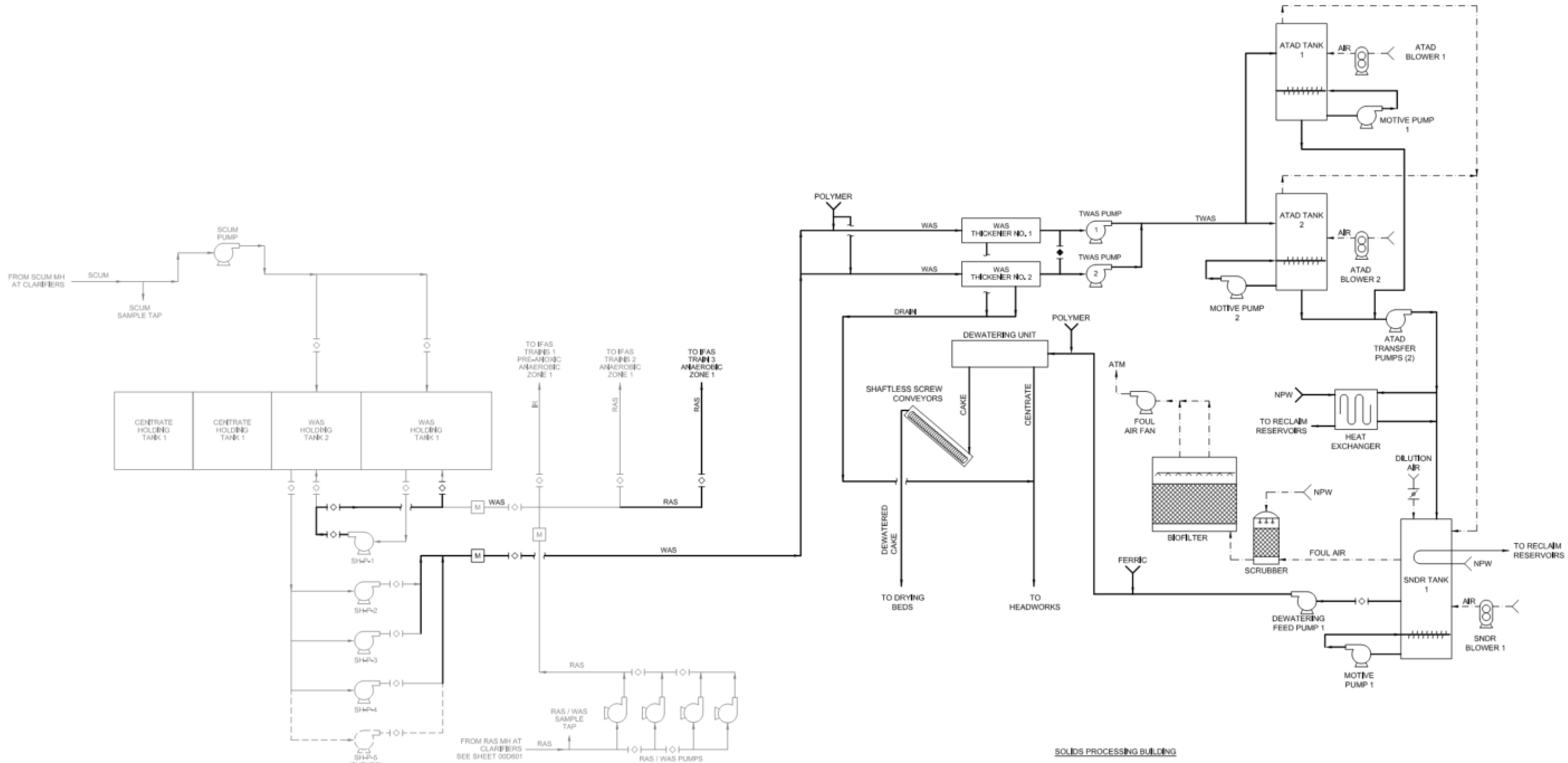

Figure 4-6: Erie NWRF Solids Stream Flow Schematic

4.3.11 NEPA

The Town does not intend to apply for any state revolving loans, therefore NEPA application and planning requirements do not apply.

4.3.12 Public Participation

HDR and the Town of Erie wastewater staff presented to the Town Board for approval of the selected expansion and improvement alternatives. The public hearing minutes are included in Appendix L. At this board meeting, HDR and Erie informed the Board of the project's purpose, drivers, process descriptions, and anticipated cost. After hearing the presentation the Board approved of the project design to be performed by HDR.

5 SERVICE AREA NONPOINT SOURCE IMPROVEMENTS.

Based on the nonpoint source data provided in Section 2.5 and 3.5, it is evident that Total Phosphorus and Total Nitrogen are the primary pollutants of concern. Background concentrations, stormwater, and agricultural runoff comprise the three nonpoint sources identified for nutrients. It is recommended that nonpoint source improvements and specific BMPs be developed and implemented by the Town of Erie as well as Boulder County.

6 SYSTEM MANAGEMENT AND FINANCIAL PLAN.

6.1 Wastewater Management Plan.

6.1.1 Management Structure of the Entity or Agency.

The Town of Erie is a Statutory Town which operates under Title 31 of the Colorado Revised Statutes, which has the authority to provide wastewater services and to charge users of the facilities for those services. The Town of Erie is the management agency for operation of the collection system and wastewater treatment facility and is composed of a seven-member board with one Mayor, one Mayor Pro Tem, and five trustees.

The Town owns, operates, and manages both water reclamation facilities as well as the collection system. The Town of Erie is located in both Weld and Boulder Counties, however, both water reclamation facilities are located within Weld County. Therefore, the NFRWQPA is the primary water planning agency for the Town. Part of the Town's planning area is located within Boulder County which now has review responsibilities assigned to the State level.

Per input from the Town of Erie, there is currently no Intergovernmental Agreements (IGAs) in place with Boulder County. Furthermore, Boulder County is outside of the NFRWQPA service and mapping area, meaning that Boulder County 208 Planning Area issues are handled by Colorado Department of Health and Environment (CDPHE) as there is currently no 208 Agency in Boulder County. Erie does have an active IGA with SVSD; however, last year Erie removed the last two areas from their 208 plan that were previously considered "Coordination Areas" that Erie or SVSD could serve. It was agreed that Erie would serve them and both parties jointly supported that change. This plan was reviewed and accepted by NFRWQPA. Therefore, while the IGA was not eliminated, it has no control over anything. The Town of Erie's IGA with SVSD, and email correspondence regarding existing IGAs between HDR and the Town of Erie are included in Appendix N.

6.1.2 Provisions for Operation and Maintenance.

The NWRF utilizes activated sludge for secondary treatment. Per Regulation No. 100, the operator in responsible charge (ORC) for activated sludge facilities with permitted capacities between 1.01 and 4.0 MGD is required to hold a Class B operator's license. The SWRF also utilizes activated sludge for secondary treatment, and the Town originally planned to use existing staff to operate both facilities. However, in 2011, the Town elected to take the SWRF offline and utilize only the NWRF once it became operational. All flows have been diverted from the SWRF to the NWRF since that time.

Should the SWRF be brought back online, it is anticipated that the existing staff will be adequate to operate and manage the SWRF as well as the NWRF. The Town will provide training, sampling, and analysis as required for the short-term or long-term operation of the SWRF.

6.1.3 Proposed Implementation Schedule.

To maintain the Town's desired level of service and comply with CDPHE regulatory requirements, the preliminary schedule for implementing the Erie NWRF Expansion Project is shown in Table 6-1.

Table 6-1. Project Implementation Schedule

Activity	Target Date
Study and Planning Phase	February 2019
Primary Limit Effluent Application	April 2020
Utility Plan Approval	July 2020
Plant Site Application Approval	July 2020
Plant Design Approval	June 2020
Bidding Date	May 2020
CMAR Guaranteed Maximum Price	July 2020
Plant Construction	September 2022
Project Startup	October 2022

6.2 Arrangements for Plan Implementation.

6.2.1 Control of Site-Ownership Documentation (Deed or Title).

In 2008, the Town of Erie purchased the property from Spallone & Scafer Ventures, LLC. for the NWRF. The memorandum of agreement for the property is included in Appendix K.

6.3 Financial Management Plan.

The plant expansion and associated improvements will be funded by sewer rates and bond issuances. The average sewer bill for the Town includes a base rate of $15.68/SFE/month and a charge of $8.20 per 1,000 gallons of water used for residential and commercial users. Currently, average residential sewer user rates are $48.48 per month. Rate impacts from the implementation of the master plan are difficult to determine because revenues and expenditures are variable from year to year, however, the Town has recently requested a new Utility Rate Study to review and revise water and wastewater rates and tap fees to ensure that costs are recovered equitably.

6.3.1 User Charge Rate Studies.

The last rate study was prepared in 2013 and re-examined all charges and fees the Town requires from existing and new customers. Wastewater Tap Fees are paid per tap by new customers as a means of buying a proportional share of capacity of the system infrastructure. The monies are then used to defray the capital costs of expanding the system facilities and to recover the cost of growth to the system. It is therefore exceedingly important that the fees be set at a proper level that will allow sufficient funds to accrue. The fund balance must also be sufficient to allow the Town to afford expansion costs without having to borrow or bond large sums of money.

Tap fees are determined based on the size of the service line, and the fees are posted under Section 2-10-4 of the Erie Municipal Code which is publically available on the Town's website.

Table 6-2. Town of Erie Tap Fees for Commercial and Residential Users

Water Tap Size	Water Tap Fee	Raw Water Fee	Sewer Tap Fee
¾-inch	$15,080.00	$15,300.00	$5,200.00
1-inch	$25,133.00	*	$8,667.00
1.5-inch	$50,267.00	*	$17,333.00
2-inch	$80,427.00	*	$27,733.00
3-inch	$150,800.00	*	$52,000.00
4-inch	251,333.00	*	$86,667.00
6-inch	$502,667.00	*	$173,333.00
**Section 8-1-9 of the Erie Municipal Code defines the manner in which the Town determines the amount of fees in lieu of water dedication.*			

The Town of Erie has recently requested proposals from qualified organizations to assist with the preparation of a new Utility Rate & Connection Fee Study (Rate Study). The goal of the study is to identify rate and connection fee structures that adequately fund operation and maintenance, capital improvement and bond debt of the utilities, promote water conservation, and keep rates and connection fees competitive with neighboring communities. Of particular interest to the current near-term and long-term expansion project, the scope of the Rate Study includes the task of determining the total annual revenue requirements through 2029, including existing and projected capital financing taking into account the future growth of the Town. The Rate Study will provide recommendations for revising the water and wastewater tap fees to ensure that newly established rates meet short-term cash needs as well as long-term requirements for infrastructure renovation and replacement.

To address capital improvement needs, the Town of Erie develops and manages a 5-Year Capital Improvement Plan (CIP) to ensure that the appropriate projects are undertaken. The CIP has been updated to reflect anticipated expenditures, including the planned expansion of the NWRF. Table 6-3 summarizes the planned improvements. Overall, the Town is planning for $45.2 million worth of improvements, with an engineer's estimate of $26.4 million allocated to the NWRF expansion project.

Table 6-3. Town of Erie 5-Year Capital Improvement Plan

Capital Improvement Projects 2020-2025						
Projects	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Vehicles - Pickups	$58,900					
Heavy Equipment	$46,200					
GIS Development Project	$37,800	$10,000	$10,000	$10,000	$10,000	$10,000
South Coal Creek Sanitary Sewer-on hold						
Sewer Rehabilitation	$180,000			$370,000		
Wastewater Collection System Master Plan	$9,700					
LED Lighting Upgrade at Town Facilities	$1,500					
NWRF Expansion	$26,488,000	$5,000,000				
North Side Interceptor to WCR 7			$600,000	$600,000	$600,000	$600,000
Asset Management	$7,500	$60,000	$7,500	$7,500	$7,500	$7,500
North Side Interceptor WCR 7 to I-25				$844,000	$2,700,000	
North Side I-25 Interceptor Extension					$1,675,250	$4,778,000
SCADA System Upgrade		$200,000				
Sanitary Sewer Upgrade for Arapahoe/SH287		$200,000	$1,100,000			
Total Capital Expenditure	**$25,833,200**	**$5,470,000**	**$1,717,500**	**$1,831,500**	**$4,992,750**	**$5,395,500**

To assess the Town's available funds for CIP projects, cash flow projects were developed using cash assets from 2019 as the baseline from which future income is estimated. The assessment is based on the following assumptions and information:

- A conservative number of 400 taps was estimated for the anticipated number of new sewer taps to occur each year.
- The sewer tap fee is $5,200 for all areas within the Town's service area and will be used for the planning period for a conservative estimate.
- The Town's capital reserves were $95.9 million as of December 2019.
- A total project budget of $45.2 million includes engineering, legal, construction administration, and administration costs.
- A rate of return of 1.0% is the basis for estimating earnings on the Town's cash reserves.

Beyond the initial 5-Year CIP, the next expansion is expected to occur in 2038 unless significant growth or regulation dictates the addition of more treatment capacity.

Figure 6-1 shows a graphical representation of the projected cash flow, indicating both income from sewer tap fees and expenditures. The resulting cumulative impact of planned CIP projected on cash reserves is also shown. The Town's fiscal position indicates that it has the available resources available to fully fund upcoming projects.

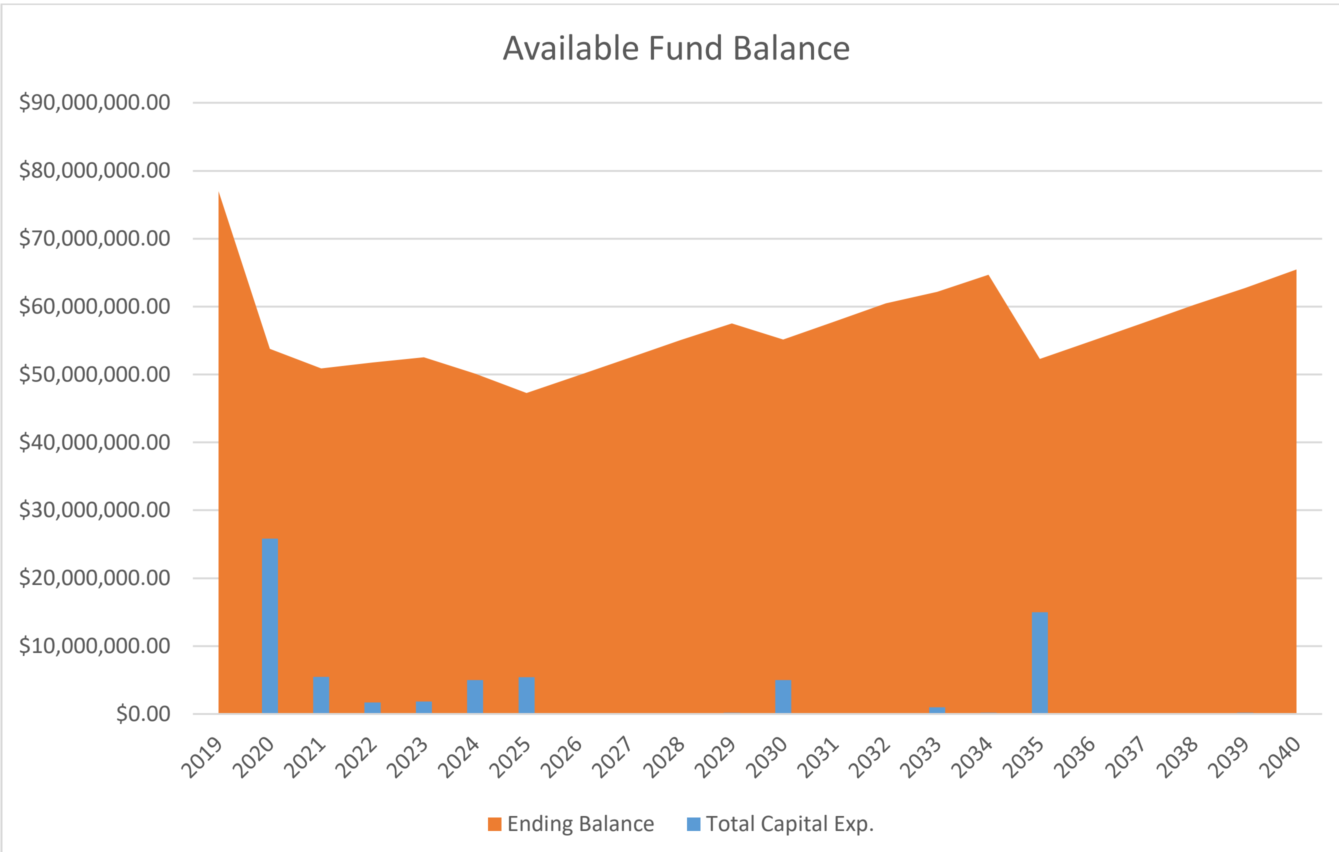

Figure 6-1. Tap Fee and Capital Reserve Cash Flow

7 NFRWQPA REGIONAL 208 AWQMP DATA SUMMARY.

7.1 Agency Data Summary Tables and Watershed Assessments

Table 7-1. Existing and Projected Future Point Source Data and Conditions

Erie NWRF	CDPS Permit No.	Permit Effective Date	Permit Expiration Date	Permit Status	Design Capacity (mgd)	Organic Capacity (ppd BOD5)	Existing Load (ppd Ammonia)	Existing Load (ppd TP)	WWTF % Flow Capacity	Year @ 80% Design	Year @ 90% Design	Discharge Location Segment	Segment Parameters (TMDL) of Concern	Other Parameters of Concern
Existing Conditions	CO0048445	1-May-15	31-Jan-16	Administratively Extended	1.95 MGD	5,233	700	400	80 – 90%	2020	2020	COSPBO10	Arsenic, Ammonia, *E. Coli.*, pH	
Projected 20 Year Conditions	-	-	-	-	5 MGD	15,300	1,800	1,000	Unknown	Unknown	Unknown	COSPBO10	Unknown	Temperature, TP, TIN, Chorophyll *a*, Cadmium, Selenium

Table 7-2. Existing & Projected Future Nonpoint Source Data and Conditions Table

Town of Erie	Point Source Contribution (TN) to Basin (lbs/year)	Service Area Nonpoint Source Contribution (TN) to Basin (lbs/year)	Point Source Contribution (TP) to Basin (lbs/year)	Service Area Nonpoint Source Contribution (TP) to Basin (lbs/year)	Existing Population (2020)	5 Year Population Projection	10 Year Population Projection	15 Year Population Projection	20 Year Population Projection	Population Projection @ Service Area Buildout	Population Buildout Year Projection	Parameters of Concern
Existing Conditions[1]	236,119	45,576	17,305	5,925	31,493	45,523	54,272	69,266	80,184	68,820	2034	TN, TP
Projected 20 Year Conditions[2,3]	28,758	45,576	2,430	5,925	80,184	88,403	143,999	183,783	234,559	68,820	2034	

[1] Existing conditions of point source and nonpoint source TN and TP loading are provided by the eRAMS CLEAN database.
[2] It is anticipated that the projected future 20 year conditions will not increase nonpoint source contributions.
[3] Projected point source contributions of TN and TP from the Town's NWRF are calculated using Regulation No. 31 WQBELs (provided in Appendix D) and a projected average annual influent flow of 4.7 MGD in 2040.

7.2 CSU's eRAMS CLEAN Report

Both the Town of Erie's WUSA and the St. Vrain River Basin were analyzed using the eRAMS CLEAN database. In all scenarios, there was no change to the Total Nitrogen (TN) and Total Phosphorus (TP) loadings with the BMPs options disabled. The TN and TP values provided by the CLEAN database for the Town's WUSA boundary are shown in Figure 7-1 through Figure 7-4.

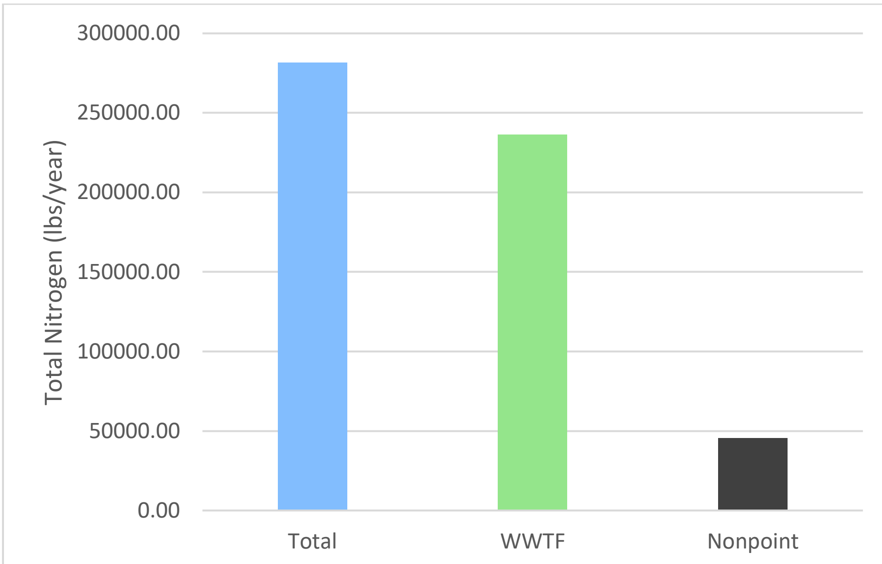

Figure 7-1. eRAMS CLEAN TN Data Summary for the WUSA

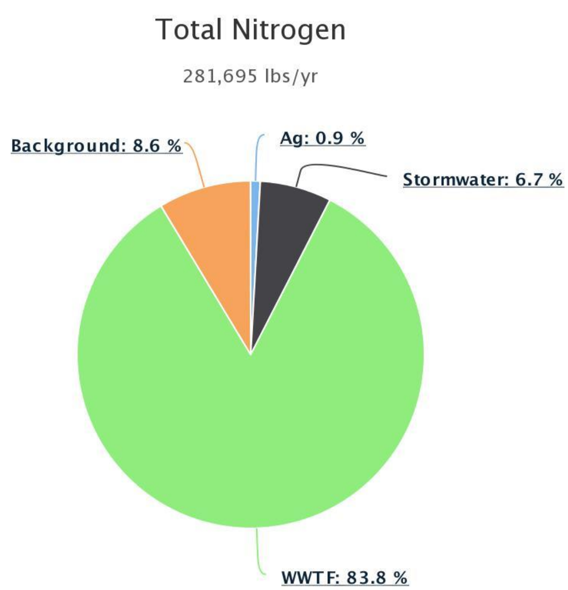

Figure 7-2. eRAMS CLEAN TN Source Percentages for the WUSA

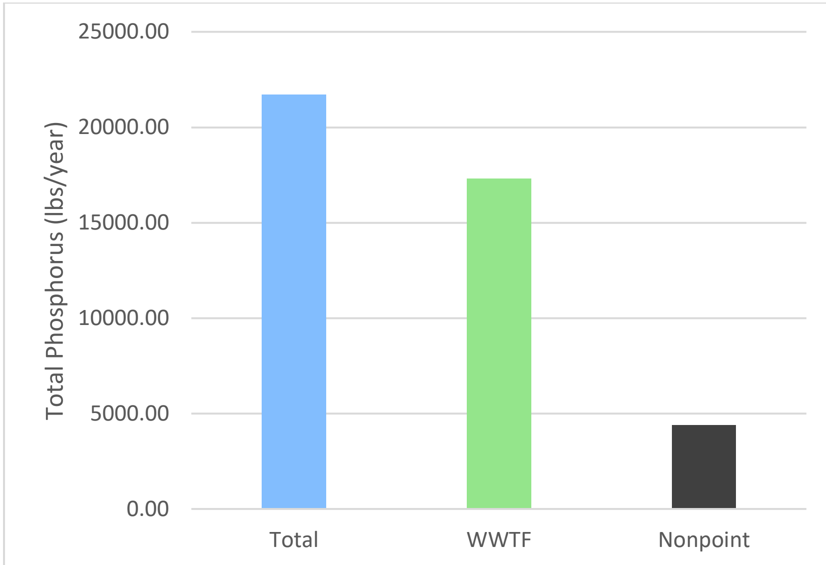

Figure 7-3. eRAMS CLEAN TP Data Summary for the WUSA

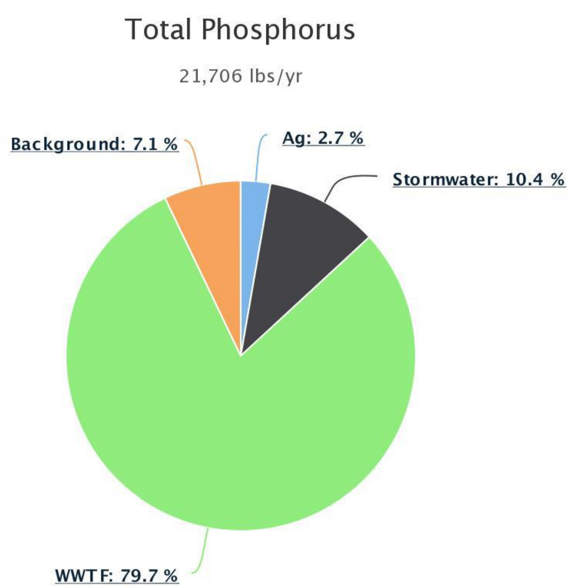

Figure 7-4. eRAMS CLEAN TP Source Percentages for the WUSA

Within the WUSA, the WWTF contributes the majority of the TP and TN loadings. Stormwater contributes the second highest quantity of TP loadings while background concentrations are the secondary source of TN loadings.

Data provided by the eRAMS CLEAN database for the St. Vrain River Basin are provided in Figure 7-5 through Figure 7-8.

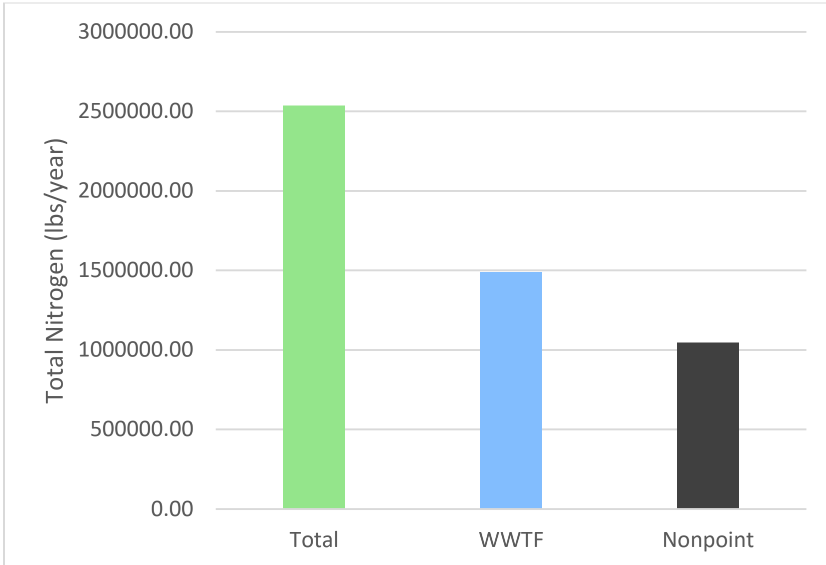

Figure 7-5. eRAMS CLEAN TN Data Summary for the St. Vrain River Basin

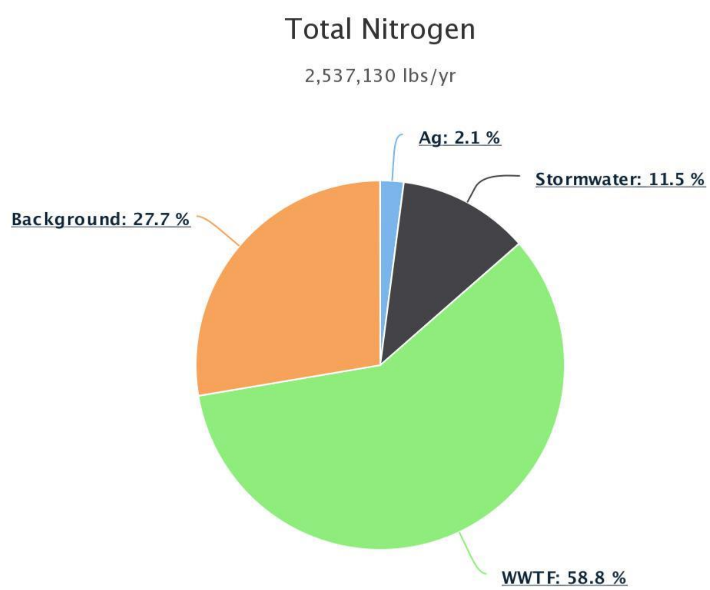

Figure 7-6. eRAMS CLEAN TN Source Percentages for the St. Vrain River Basin

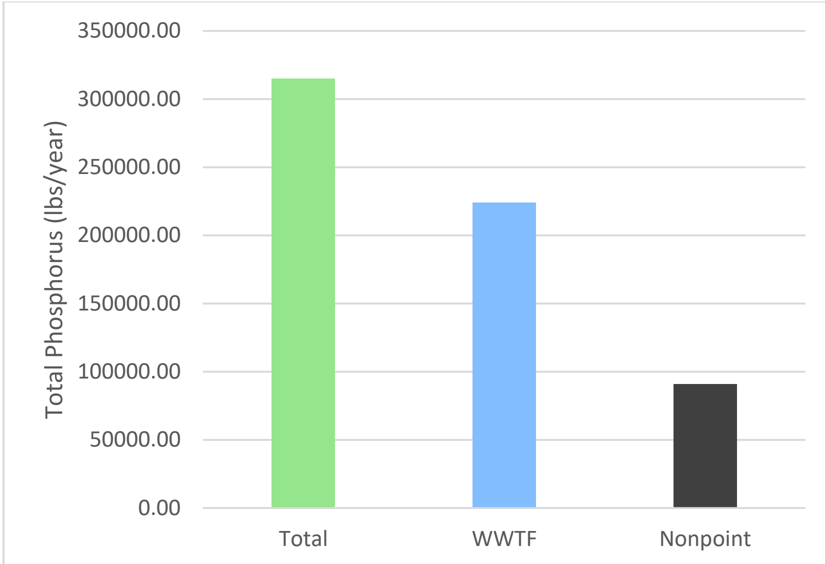

Figure 7-7. eRAMS CLEAN TP Data Summary for the St. Vrain River Basin

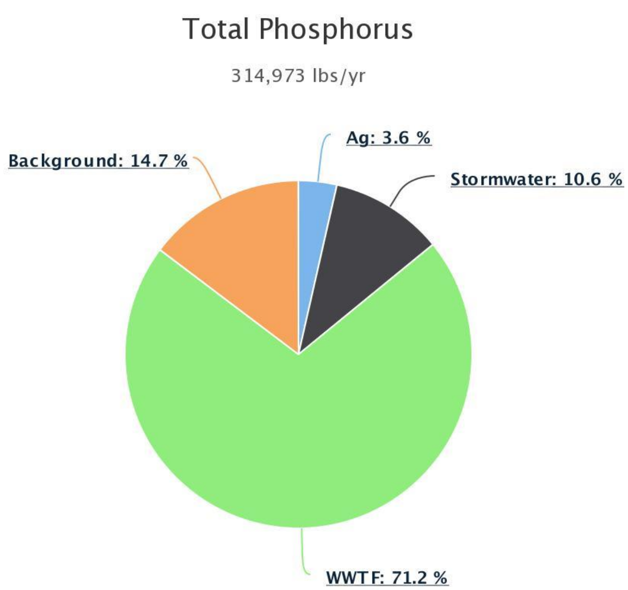

Figure 7-8. eRAMS CLEAN TP Source Percentages for the St. Vrain River Basin

Within the St. Vrain River Basin, the majority of nonpoint sources for both TN and TP comes from WWTFs, followed by background concentrations, and then stormwater and agriculture.

The three nonpoint sources identified for nutrients are background concentrations, stormwater, and agricultural runoff.

7.3 CSU's eRAMS WRAP Report

The eRams WRAP report provides an overall assessment of the St. Vrain River watershed condition, including water quality, stream segments, and nonpoint source data.

The information provided in the WRAP Report indicates that the two main areas of concern for the St. Vrain River Basin are impaired streams and the presence of abandoned mines.

The river basin includes 127.85 square miles of irrigated agricultural fields as well as over 4,000 abandoned mine features. Approximately 94.3% of the area is not located within the floodplain, and approximately 69.2% is natural land cover. 4.1% of the landscape is considered a high risk for wildfires.

The WRAP Reports for both the Town's WUSA and the St. Vrain River Basin are included in Appendix G.

Appendix A

Appendix B

Appendix C

Appendix D

Appendix E

Appendix F

Appendix G

Appendix H

Appendix I

Appendix J

Appendix K

Appendix L

Appendix M

Appendix N

Appendix N

Appendix O