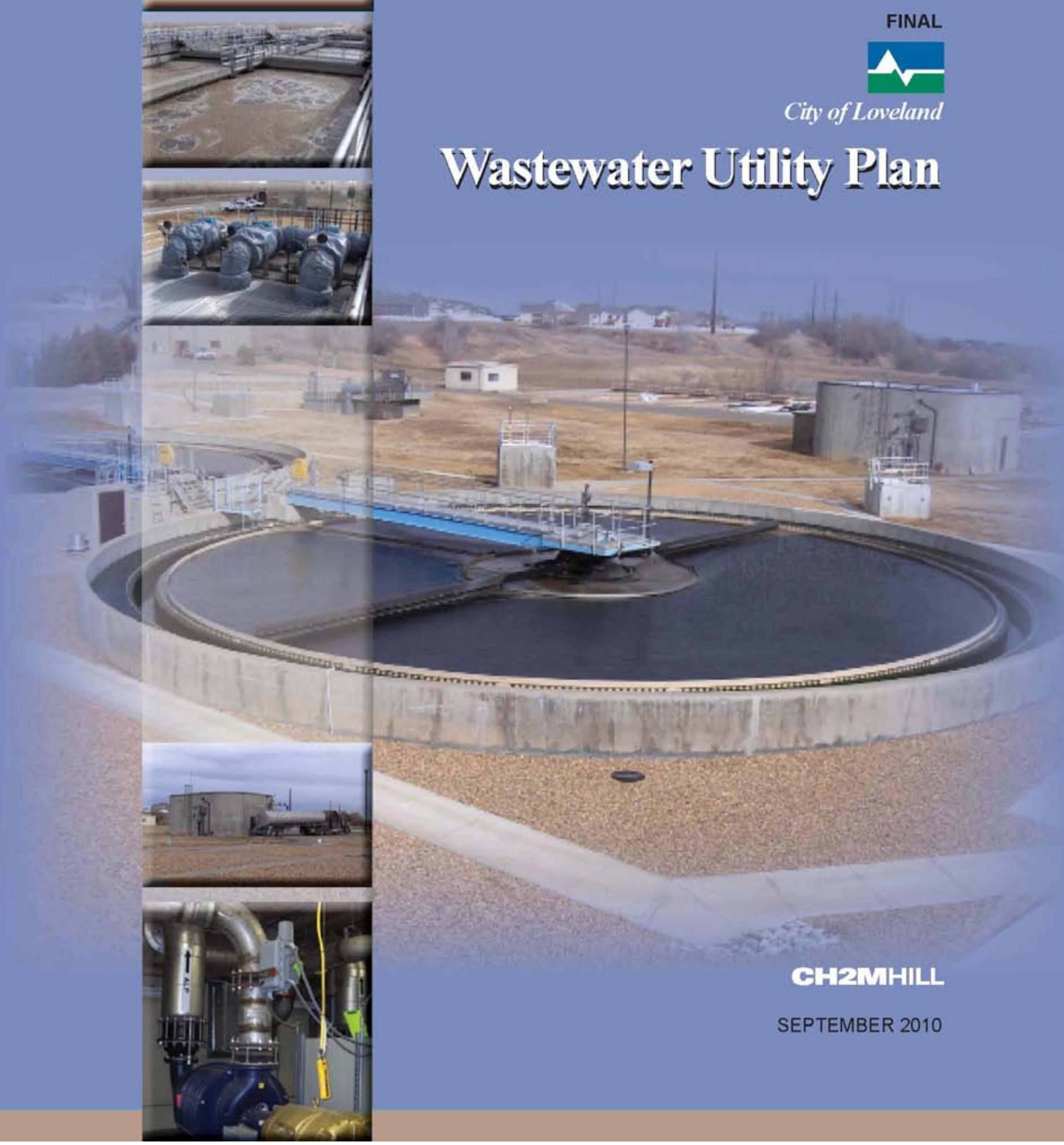
FINAL

City of Loveland

Wastewater Utility Plan



CH2MHILL

SEPTEMBER 2010

Table of Contents

List of Appendixes

List of Tables

List of Figures

Acronyms and Abbreviations

µg/L	micrograms per liter
APEN	Air Pollution Emission Notice
BOD	biochemical oxygen demand
BTWF	Big Thompson Watershed Forum
CAQCC	Colorado Air Quality Control Commission
C-BT	Colorado-Big Thompson
CDPHE	Colorado Department of Public Health and Environment
CDPS	Colorado Discharge Permit System
CIP	Capital Improvement Plan
CIPP	cured-in-place pipe
CMOM	Capacity, Management, Operation, and Maintenance
DAFT	Dissolved Air Filtration Thickener
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FTU	Formazin turbidity unit
gpd	gallons per day
gpm	gallons per minute
I/I	infiltration and inflow
IFAS	integrated fixed film activated sludge
kW	kilowatt
mg/L	milligrams per liter
mgd	million gallons per day
MWAT	maximum weekly average temperature
NAAQS	national ambient air quality standard
NEPA	National Environmental Policy Act
NFRWQPA	North Front Range Water Quality Planning Association

NFRMPO	North Front Range Metropolitan Planning Organization
NH_3	ammonia
NO_3	nitrate
NO_x	oxides of nitrogen (gaseous)
PEL	preliminary effluent limit
POTW	publicly owned treatment works
ppd	parts per day
PVC	polyvinyl chloride
RAS	return activated sludge
RCP	reinforced concrete pipe
RDII	rainfall – derived I/I
SFCSD	South Fort Collins Sanitation District
SIU	significant industrial user
SRF	State Revolving Fund
SSO	sanitary sewer overflow
s.u.	standard units
TDH	total dynamic head
TMDL	total maximum daily load
TSS	total suspended solids
typ	tons per year
UPA	ultimate planning area
USGS	U.S. Geological Survey
UV	ultraviolet
VCP	vitrified clay pipe
VOC	volatile organic compound
WAD	weak acid dissociable
WAS	waste activated sludge
WQCC	Water Quality Control Commission
WWTP	wastewater treatment plant
WWUP	Wastewater Utility Plan

1.0 Executive Summary

1.1 Introduction

The City of Loveland wastewater utility is located in Larimer County and is part of the North Front Range Water Quality Planning Association (NFRWQPA). The NFRWQPA is charged with updating the 208 Plan, as required by the Clean Water Act, for the Larimer-Weld County Region. The 208 Plan must describe the treatment works required to meet the needs of the area and a plan to achieve these needs. Beginning in 2008, the North Front Range Water Quality Planning Association is requiring a wastewater utility plan (WWUP) for all public wastewater treatment agencies in Larimer and Weld Counties. NFRWQPA policy states that an approved WWUP is required prior to review of a site application by NFRWQPA. The City of Loveland will be submitting site applications in the near future for a treatment plant capacity increase and collection system improvements, and wishes to have an approved WWUP on file with NFRWQPA.

1.2 Purpose and Scope

The purpose of the City of Loveland's WWUP is to project wastewater utility needs over the next 20 years and provide a capital improvements plan to implement solutions to those needs. The WWUP consists of the following main sections:

- Section 1.0 – Executive Summary
- Section 2.0 – Introduction
- Section 3.0 – General Planning
- Section 4.0 – Water Quality and Regulatory Issues
- Section 5.0 – Wastewater Characterization
- Section 6.0 – Management and Financial Plans
- Section 7.0 – References
- Section 8.0 – Technical Support Appendices

1.3 Service Area

Service areas define the boundaries of wastewater collection for a utility. Loveland's current 208 Plan service area is outlined in **Figure 1-1**. In addition, this figure also presents Loveland's ultimate planning area (UPA), which represents the area, which the utility plans to provide wastewater service collection and treatment at ultimate buildout.

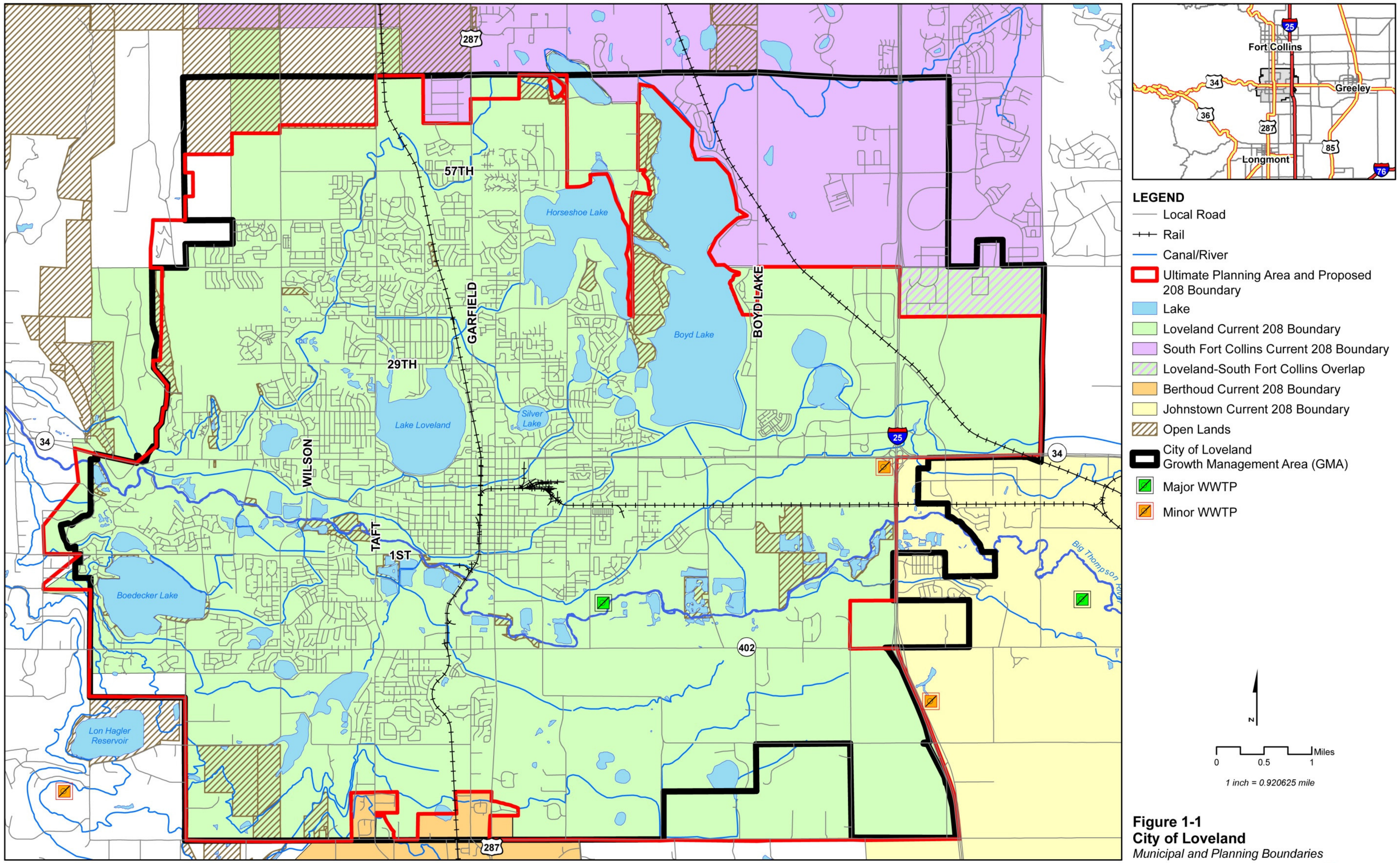


Figure 1-1
City of Loveland
Municipal and Planning Boundaries

\\COBRA\GIS\PROJECTS\LOVELAND\MAPFILES\UTILITY_PLAN.MXD ZVALCHAR 1/20/2010 10:38:41

1.4 Water Quality Regulatory Issues

The Loveland wastewater treatment plant (WWTP) discharges to Segment 4c of the Big Thompson River. The WWTP's current discharge permit limits are shown below in **Table 1-1**. The plant consistently meets all of its discharge permit parameters.

TABLE 1-1
Current Permit Limitations for City of Loveland WWTP

Parameter	30-Day Average[b]	7-Day Average[c]	Daily Maximum
Flow, million gallons per day (mgd)	10.0	NA[d]	Report
BOD_5, mg/L[a]	30	45	NA
Total Suspended Solids (TSS), mg/L	30	45	NA
Fecal Coliform			NA
May 1 to October 15	221	442	
October 16 to April 30	2254	4508	
pH, s.u.			6.5 – 9.0
Oil and Grease, mg/L			10
Total Ammonia as N, mg/L	Monthly limit range: 6.2 to 7.8	NA	Daily limit range: 8.2 to 20
WAD Cyanide, µg/L	NA	NA	5.5
Hexavalent Chromium, µg/L	12		17
Total Mercury, µg/L	Report	NA	NA
Potentially Dissolved Copper, µg/L	Report	NA	NA
Potentially Dissolved Selenium, µg/L	Report	NA	NA
Whole Effluent Toxicity, Chronic	NA	NA	Statistical Difference

[a] Units of measure: mg/L = milligrams per liter; org = number of organisms; ml = milliliters; µg/L = micrograms per liter; NA = No standard is applicable
[b] 30-Day Average is the sum of all samples taken in a 30-day period
[c] 7-Day Average is the sum of all samples taken in a 7-day period.
[d] NA = Not applicable.

Nutrients, metals, temperature, and selenium are all water quality issues of concern in the Big Thompson River. Future discharge permits may contain limits for these parameters. The City is expecting to receive stricter ammonia limits in its next permit, which is expected from the State in 2010.

1.5 Current Wastewater Flows and Loads

Influent water quality data to the wastewater treatment plant were evaluated from January 2005 to June 2009, and are summarized in **Table 1-2**. On a per capita basis, the current flows and loads are within a typical range as is the current wastewater concentrations of biochemical oxygen demand (BOD) and total suspended solids (TSS).

TABLE 1-2
Influent Water Quality Data (January 2005 to June 2009)

Parameter	Daily Average	Daily Maximum
BOD Loading	14,245 ppd	17,774 ppd[a]
BOD Concentration	295 mg/L	374 mg/L
TSS Loading	14,005 ppd	19,993 ppd
TSS Concentration	289 mg/L	414 mg/L
Flowrate	5.8 mgd	6.9 mgd[b]

[a] Design organic capacity is 20,236 ppd, and 80 percent of the design capacity is 16,189 ppd.
[b] Permitted flowrate capacity is 10.0 mgd, and 80 percent of the permitted flowrate is 8.0 mgd.

1.6 Wastewater Flow and Load Projections

Critical components for determining the schedule of wastewater system projects are the flow and load projections. Projections are evaluated against patterns of historical data and their trends into the future. The City participates in extensive planning and flow monitoring efforts to ensure projections are based on sound measurements, detailed studies, and reasonable engineering judgments.

The projected annual rate of increase for flow and BOD is equivalent to the projected increase in population projections from the City of Loveland's Planning Department. Population increases are projected to average 2.5 percent from 2009 to 2029. Historical data of flow and loads are separated into winter and summer seasons because these variations are important for the biological systems in wastewater treatment. Historical and projected wastewater flows and BOD loads are presented in **Figure 1-2** and **Figure 1-3**.

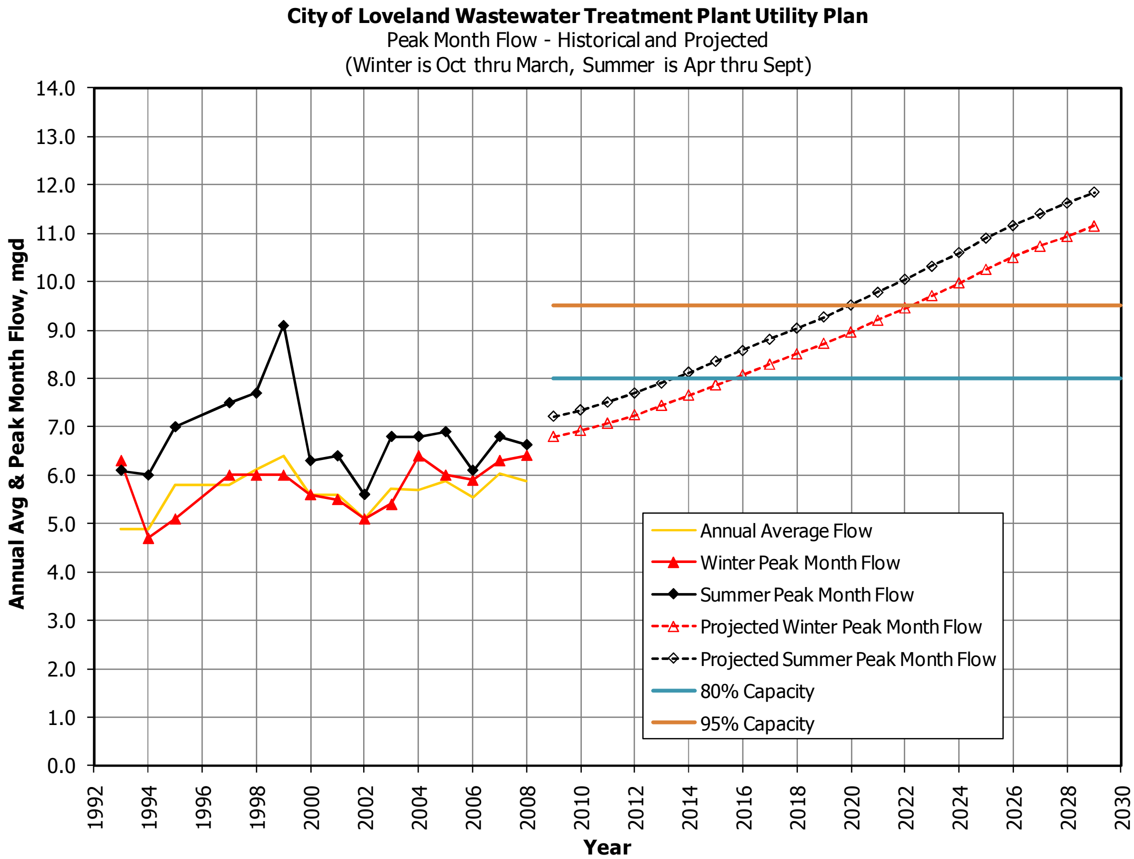


FIGURE 1-2
Peak Month Flow – Historical and Projected

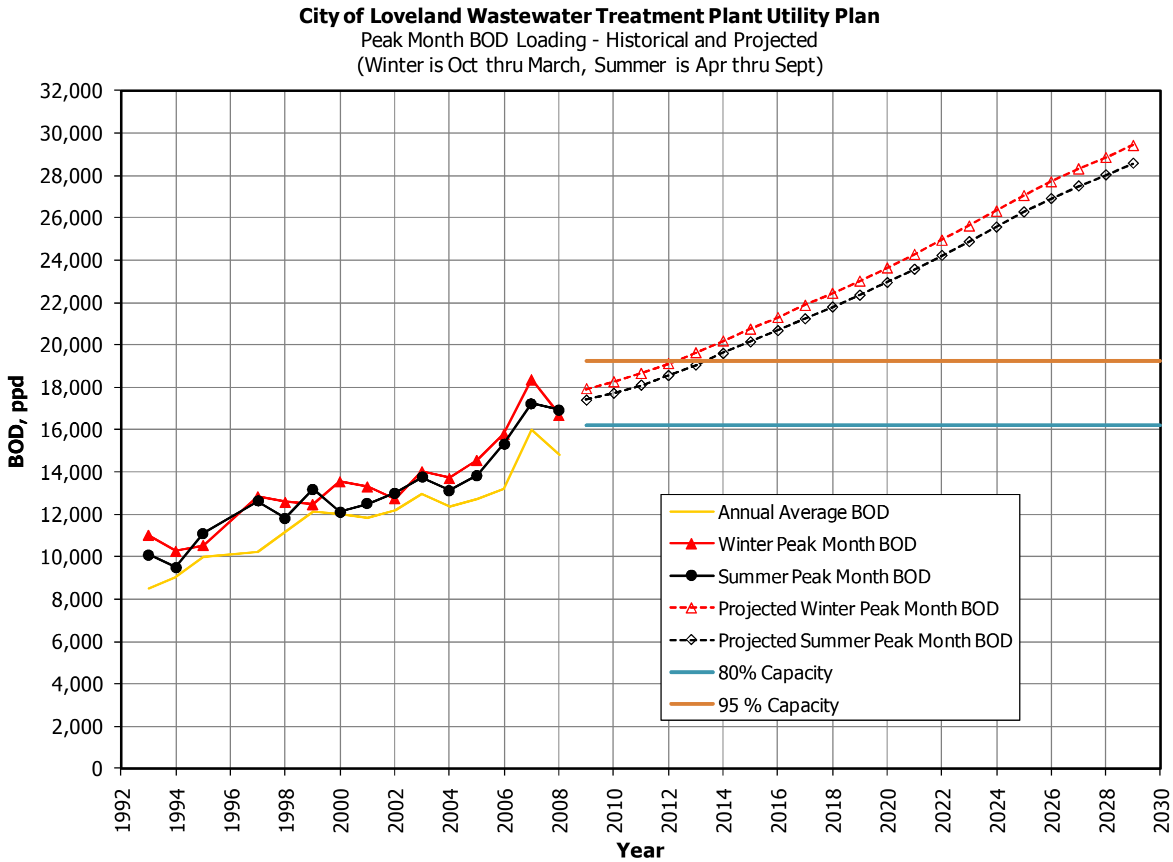


FIGURE 1-3
Peak Month BOD Loading – Historical and Projected

1.7 Collection System

The City of Loveland has initiated wastewater flow monitoring of the City's collection system with the goal of using that data to develop a real-world wastewater collection system computer hydraulic model. This model is currently 17 percent complete based on the final analysis of the 2008 flow data. The 2009 flow data have been collected and are currently being processed.

The City's wastewater collection system contains a total of six interceptors and 14 lift stations, and includes 332 miles of sewer lines as of 2008. The collection system is defined by a total of seven sanitary sewer basins. The basins are shown in **Figure 1-4**. Future growth areas for the collection system are shown in **Figure 1-5**.

Proposed capital improvements for the collection system as a result of this study are described in **Table 1-3**. The majority of the projected capital improvements are rehabilitation-oriented as opposed to new infrastructure. The initial hydraulic modeling effort has not shown any capacity-related issues with any of the interceptors or lift stations.

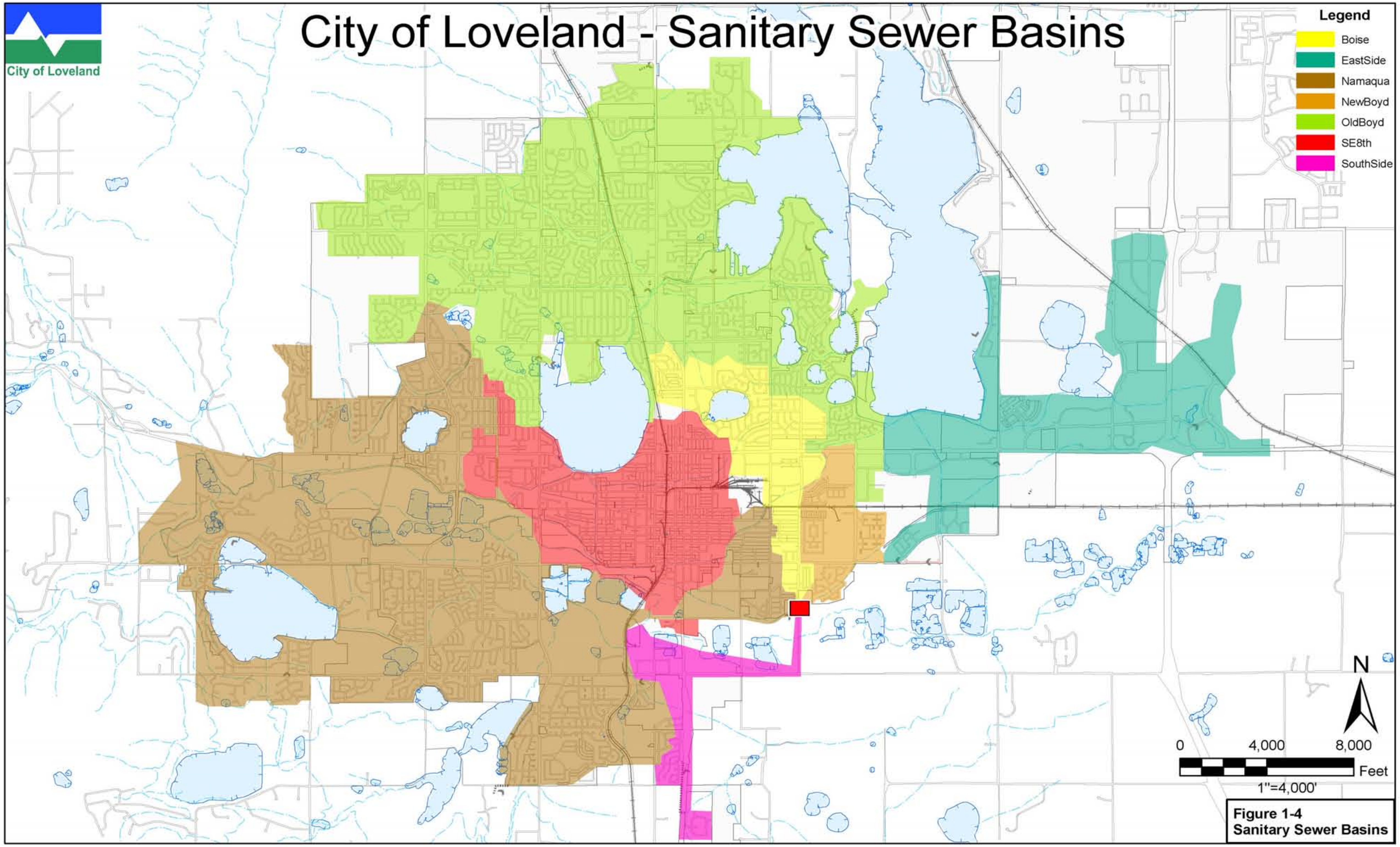
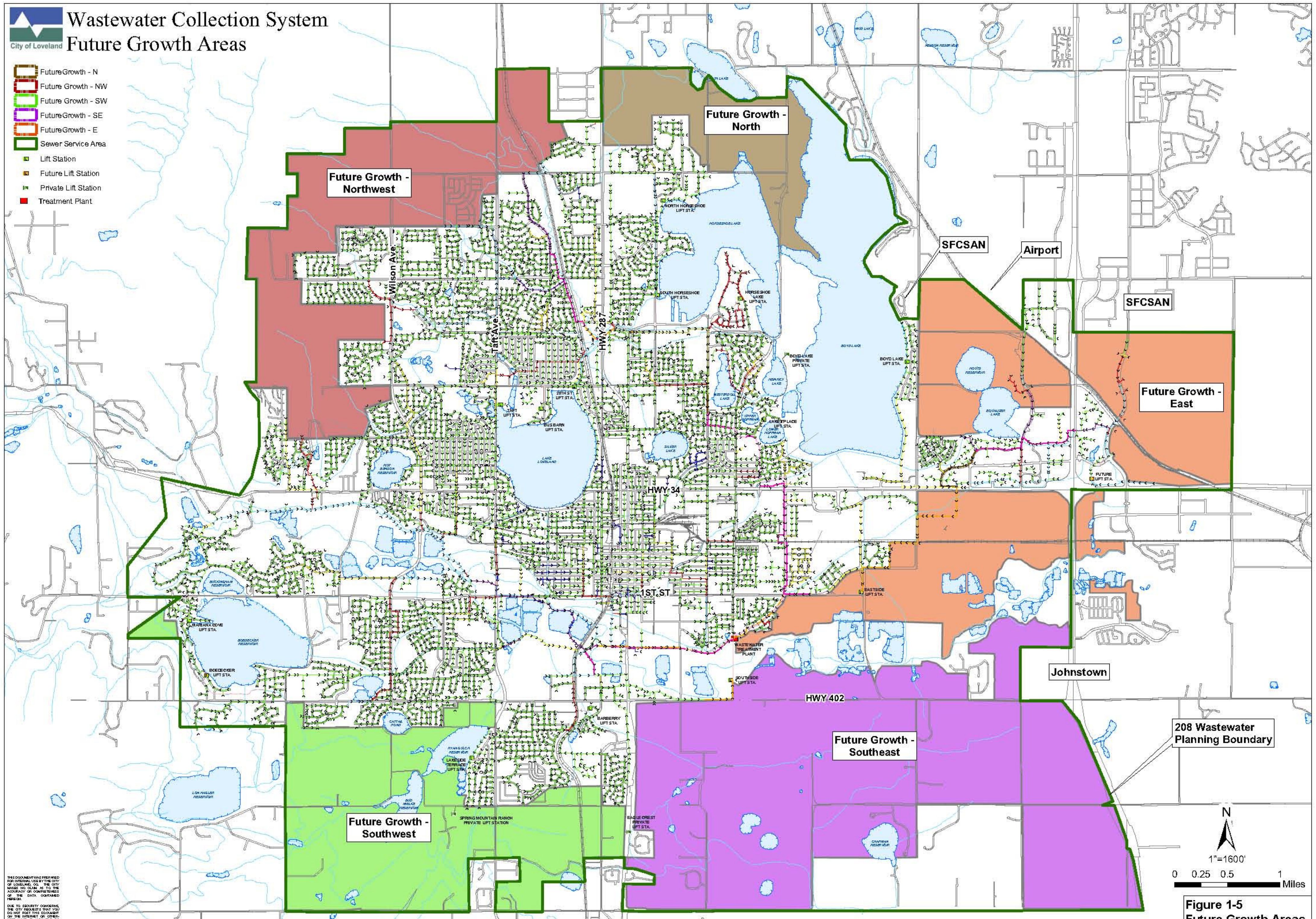

City of Loveland
City of Loveland - Sanitary Sewer Basins
Legend
Boise
EastSide
Namaqua
NewBoyd
OldBoyd
SE8th
SouthSide
N
0
4,000
8,000
Feet
1"=4,000'
Figure 1-4
Sanitary Sewer Basins

FIGURE 1-5
Future Growth Areas



20-Year Wastewater CIP Project Projection (2010-2029)

UNRESTRICTED FUNDS (General)

Project	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	TOTAL
In House Labor/Fleet Charges	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$1,200,000
ROW Utility Relocate	$0	$0	$10,000	$10,000	$20,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$490,000
Manhole Rehab Phase 1	$50,000	$50,000																			$100,000
CMOM Initial Audit		$125,000																			$125,000
Fairgrounds/Namaqua Intcp. Rehab-St. Louis to Lincoln (PH 2) / Construction		$412,000																			$412,000
4th & Cleveland Sewer Line Repair			$160,000																		$160,000
West 2nd St Sewer Line Replacement			$160,000																		$160,000
Boyd Interceptor Phase V - Construct	$250,000	$265,000																			$515,000
Boyd Interceptor Phase VI			$400,000																		$400,000
Boyd Interceptor Phase VII				$425,000																	$425,000
Design/Rehab/Replace Misc. Sewer, 2.5 miles/year (0.75 of 320 miles, assume 140 year life)					$500,000	$500,000	$500,000	$500,000	$901,250	$901,250	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$8,802,500
Recurring 8" VCP Sewerline Rehab					$50,000	$50,000					$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$600,000
South Horseshoe Lift Station Design (43% Gen Portion)					$43,000																$43,000
South Horseshoe Lift Station Construct (43% Gen Portion)						$242,523															$242,523
South Horseshoe Lift Station SDC's (43% Gen Portion)						$31,003															$31,003
Barberry Place Lift Station Abandonment								$265,740													$265,740
Miscellaneous Wastewater Capital Projects (General Funds)											$750,000	$772,500	$795,675	$819,545	$844,132	$869,456	$895,539	$922,405	$950,078	$978,580	$8,597,909
GEN SUBTOTAL	$360,000	$912,000	$790,000	$495,000	$673,000	$913,526	$590,000	$855,740	$991,250	$991,250	$1,390,000	$1,412,500	$1,435,675	$1,459,545	$1,484,132	$1,509,456	$1,535,539	$1,562,405	$1,590,078	$1,618,580	$22,569,676

Wastewater CIP Projects 2010-2029

RESTRICTED FUNDS (SIF's)

Project	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	TOTAL
Oversizing & Extensions Agreement	$0	$0	$30,000	$75,000	$75,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$1,680,000
Consultant Hire for DRT				$30,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$830,000
Geotechnical Testing for Development Trenches	$2,000	$2,000	$3,000	$5,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$172,000
Wastewater Master Model incl Software / Three Stages 2008-2010	$164,800																				$164,800
Wastewater Development Modeling Assistance		$5,000	$5,000	$10,000	$15,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$335,000
Carlisle Phase IV (Taft to Railroad) - Parallel 15" Sewer line / Easements and Design	$60,000																				$60,000
SDC		$50,000																			$50,000
Construct		$460,000																			$460,000
*Boyd SL Intcp. Relief - Hwy 34 to Hoffman (PH 2) / Easements and Design			$30,000	$80,000																	$110,000
SDC					$48,410																$48,410
Construct					$741,600																$741,600
South Horseshoe Lift Station Design (57% SIF Portion)					$57,000																$57,000
SDC						$41,097															$41,097
Construct						$321,485															$321,485
*Boyd SL Intcp. Relief - Hoffman to 29th St. (PH 3) / Easements and Design						$30,000	$80,000														$110,000
SDC								$31,930													$31,930
Construct								$530,450													$530,450
*Boyd SL Intcp. Relief - 29th St. to 37th St. (PH 4) / Easements and Design									$30,000	$80,000											$110,000
SDC																					$0
Construct																					$0
North Horseshoe Lift Station Upgrades / Design									$75,190												$75,190
SDC										$31,930											$31,930
Construct										$530,450											$530,450
East Side Lift Station Upgrades / Design										$75,000											$75,000
SDC (value of $75,000)																					$0
Construct (value of $500,000)																					$0
East Side Discharge Trunk to WWTP / Design $125,000 value)										$125,000											$125,000
SDC (value of $100,000)																					$0
Construct (value of $1,000,000)																					$0
SIF Capital Expenditure – 402 Sewer Line			$255,000	$2,345,000																	$2,600,000
Miscellaneous Wastewater Capital Projects (Restricted Funds)											$750,000	$772,500	$795,675	$819,545	$844,132	$869,456	$895,539	$922,405	$950,078	$978,580	$8,597,909
SIF SUBTOTAL	$226,800	$517,000	$323,000	$2,545,000	$997,010	$572,582	$260,000	$742,380	$285,190	$1,022,380	$930,000	$952,500	$975,675	$999,545	$1,024,132	$1,049,456	$1,075,539	$1,102,405	$1,130,078	$1,158,580	$17,889,251
Yearly Total =	$586,800	$1,429,000	$1,113,000	$3,040,000	$1,670,010	$1,486,108	$850,000	$1,598,120	$1,276,440	$2,013,630	$2,320,000	$2,365,000	$2,411,350	$2,459,091	$2,508,263	$2,558,911	$2,611,078	$2,664,811	$2,720,155	$2,777,160	$40,458,927
Cumulative Total =	$586,800	$2,015,800	$3,128,800	$6,168,800	$7,838,810	$9,324,918	$10,174,918	$11,773,038	$13,049,478	$15,063,108	$17,383,108	$19,748,108	$22,159,458	$24,618,549	$27,126,812	$29,685,723	$32,296,801	$34,961,612	$37,681,767	$40,458,927	

TABLE 1-3
Wastewater Collection System Capital Improvements

1.8 Wastewater Treatment Plant

The existing WWTP is located in the southern portion of the City at 920 South Boise Avenue. The plant began operating in 1963. The plant uses a step feed aeration process for biological treatment and anaerobic digestion for solids stabilization.

Capital improvements for the WWTP for the next 20 years are described in **Table 1-4**. A variety of improvements are needed to rehabilitate aging structures and equipment, provide treatment capacity for future flow and load increases, and to meet projected future nutrient requirements. Both liquids and solids facilities will require additions.

The current WWTP site is large enough to accommodate the projected future facility additions over the 20-year planning period. Expected nutrient removal criteria for the South Platte River will have the most impact on the sizing of future facilities with basin sizes being dependent on actual future permit limits. A site plan showing projected future capital improvements is shown in **Figure 1-6**.

1.9 Financial Plan

The City of Loveland Water Utilities (Utilities) owns, operates, and manages its own wastewater treatment facilities as well as collection system. The purpose of the Utilities is to plan, design, acquire, finance, own, maintain, operate, and manage a wastewater treatment plant and other Utility facilities to treat and dispose of wastewater.

Utility ratepayers and the public are involved in the Utility's annual budgeting process for proposed utility rates and capital improvement projects. Prior to presentation to the City Manager and Council for review and approval, the Utility coordinates with the Loveland Utility Commission for review and approval. This Commission, consisting of Citizen volunteers, works closely with Staff to ensure proposed projects receive review and consideration by the public. In addition, the Commission meetings are open to the public for observation, comment, and participation. Meeting agendas and minutes are posted publicly to maximize the notification of the Utility's budgeting efforts.

Management of City functions is through its Home Rule Charter and the Code of the City of Loveland. The Wastewater Utility is an Enterprise Fund whose policies include pledge of revenues, flow of funds, rate maintenance, and wastewater capital funding. User charges are evaluated annually and adjusted when necessary to remain fiscally sound. Charges are to be computed, made, imposed, and collected so that income collected will be at least sufficient to: pay for the requirements of the annual budget, and comply at all times in all respects with the terms and resolutions of the City Council.

The City's 20-year Financial Plan is presented in **Table 1-5. Table 1-5** shows revenue, operating expenses, and capital expenditures for the 20-year period.

No.	Project	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Notes
1.1	Influent Collection Wetwell (Periodic Manhole A Media Replacement)								$20,500													Every 10 to 20 years
1.2	Replacement of Carbon for Existing Odor Scrubber	$55,800										$55,800										Every 5 to 10 years
2.1	Utility Plan Update		$10,000			$10,000			$10,000			$100,000			$10,000			$10,000			$10,000	Minor updates every 3 years
3.1	Update CIP	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	annual cost
4.1	NPDES Permit Application					$22,800					$22,800					$22,800					$22,800	Every 5 years
5.1	Vulnerability Assessment			$85,200																		
6.1	River Monitoring for Bio Criteria Standard Development						$12,500															
7.1	River Monitoring for Nutrient Standard Development							$59,800	$59,800	$59,800												
7.2	Basic Standards hearing Assistance	$10,700																				
7.3	South Platte Basin Hearings Assistance					$10,900					$10,900					$10,900					$10,900	Every 5 years
8.1	Asbestos Abatement of Admin Building Floor											$32,700										
9.1	Design & SDC, WAS Thickening	$560,000	$254,200	$254,200																		
9.2	Construction, WAS Thickening		$2,572,000	$2,572,000																		
10.1	Inspection and Interior Coating of Digester Roofs				$560,400																	
10.2	Clean Digesters (prior to renovation)				$53,300																	
10.3	Design & SDC, Digester Flare Modifications			$30,700	$15,900																	
10.4	Construction, Digester Flare Modifications				$90,000																	
10.5	Design & SDC, Digester Compressor Modifications				$10,000																	
10.6	Construction, Digester Compressor Modifications					$200,000																
10.7	Design & SDC, Digester Complex Mixing System & Boiler Replacement							$125,000	$125,000													
10.8	Construction, Digester Complex Mixing System & Boiler Replacement							$245,500	$1,000,000													
11.1	Provide Soft Starts For Blowers 1-4	$50,000																				
12.1	Design & SDC, New Blower & Aeration Basin Diffusers				$85,000	$50,000																
12.2	Construction, New Blower & Aeration Basin Diffusers					$760,000																
12.3	Design & SDC, Aeration Basin								$297,000	$150,000												
12.4	Construction, Aeration Basin									$2,810,000												
12.5	Design & SDC, Nutrient Removal Facilities - Phase 1										$490,000	$220,000	$215,000									
12.6	Construction, Nutrient Removal Facilities - Phase 1											$2,200,000	$2,200,000									
13.1	Headworks and Odor Control Facilities - Warranty Services	$10,000																				

TABLE 1-4
City of Loveland Wastewater Utility Plan
WWTP Capital Improvement Plan, 2010-2029

No.	Project	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Notes
14.1	Design & SDC, Primary Clarifier							$250,000	$230,500													
14.2	Construction, Primary Clarifier								$1,820,000													
14.3	Design & SDC, Demo of Trickling Filters							$43,000	$43,000													
14.4	Construction, Demo of Trickling Filters								$418,900													
15.1	Design & SDC, Automated Data Acquisition, Process Control & Monitoring System										$37,000	$10,200	$10,200									
15.2	Construction, Automated Data Acquisition, Process Control & Monitoring System											$143,900	$143,900									
16.1	Design & SDC, Heating, Ventilation, & Lighting System Upgrades								$30,700	$30,700												
16.2	Construction, Heating, Ventilation, & Lighting System Upgrades									$233,500												
17.1	Design & SDC, Digested Sludge Dewatering								$439,000	$439,000												
17.2	Construction, Digested Sludge Dewatering									$4,286,000												
18.1	Evaluate Laboratory Options										$47,700											
18.2	Design & SDC, New Laboratory Building											$166,000	$166,000									
18.3	Construction, New Laboratory Building												$1,660,300									
19.1	Modifications to Existing Chlorine Building Electrical & Controls		$125,000	$125,000																		
20.1	Design & SDC, Additional Primary Anaerobic Digester													$410,000	$410,000							
20.2	Construction, Additional Primary Anaerobic Digester														$4,166,000							
21.1	Design & SDC, Headworks, Influent Pump Station, Aeration Lift Pump Station, and UV Expansion														$717,300	$717,300						
21.2	Construction, Headworks, Influent Pump Station, Aeration Lift Pump Station, and UV Expansion															$7,173,400						
22.1	Design & SDC, Nutrient Removal Facilities Phase 2 and Secondary #4																$1,085,000	$1,085,000				
22.2	Construction, Nutrient Removal Facilities Phase 2 and Secondary #4																	$10,850,000				
23.1	Greenhouse Gas Evaluation			$50,000																		
	Yearly Total =	$699,810	$2,974,511	$3,130,412	$827,913	$1,067,014	$25,815	$736,616	$4,507,717	$8,022,318	$621,719	$2,941,920	$4,408,721	$423,322	$5,316,623	$7,937,724	$1,098,325	$11,958,326	$13,327	$13,328	$57,029	
	Cumulative Total =	$798,119	$3,772,630	$6,903,042	$7,730,955	$8,797,969	$8,823,784	$9,560,400	$14,068,117	$22,090,435	$22,712,154	$25,654,074	$30,062,795	$30,486,117	$35,802,740	$43,740,464	$44,838,789	$56,797,115	$56,810,442	$56,823,770	$56,880,799	

TABLE 1-4
City of Loveland Wastewater Utility Plan
WWTP Capital Improvement Plan, 2010-2029

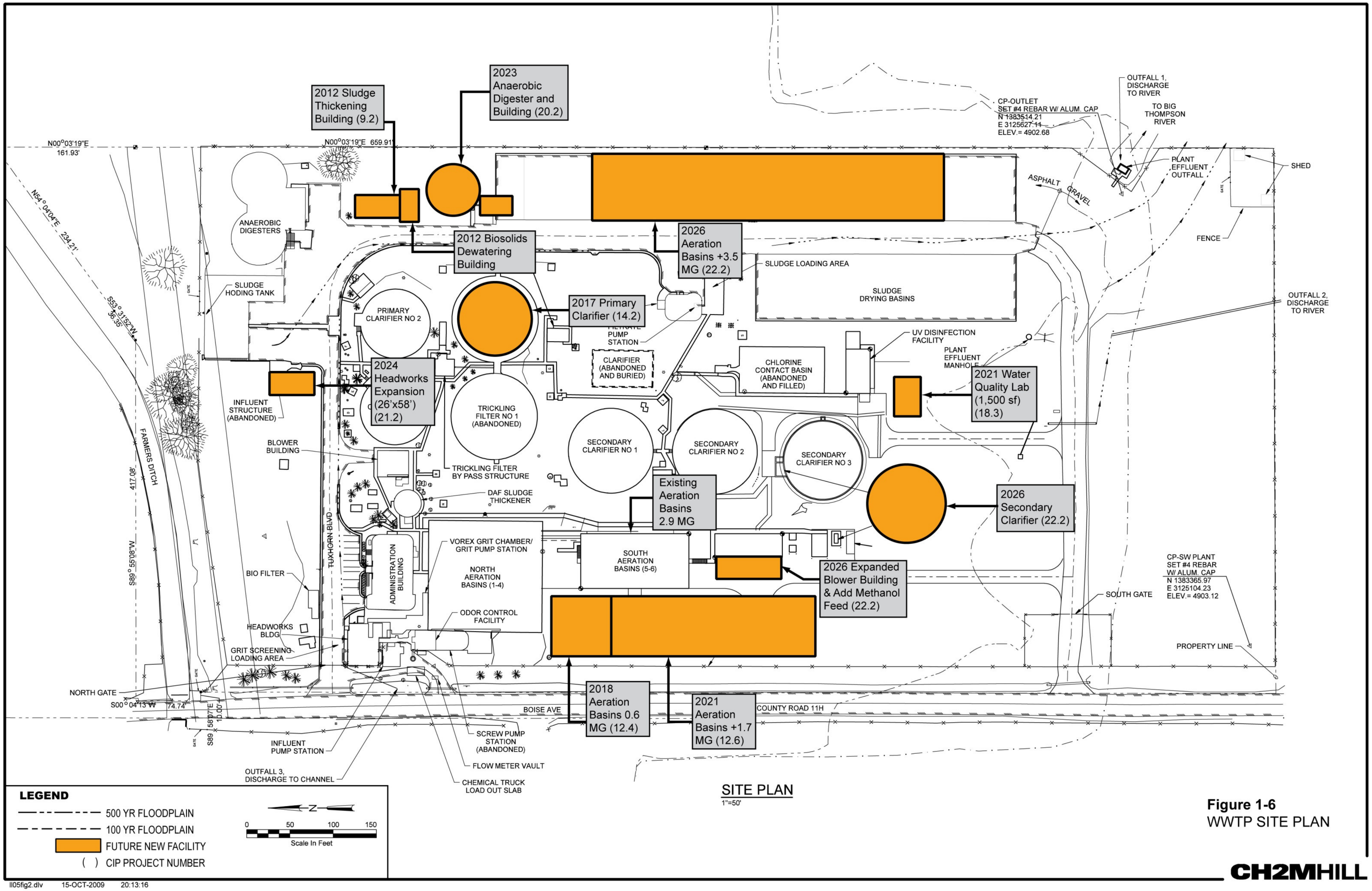


Figure 1-6
WWTP SITE PLAN

LOVELAND WATER AND POWER
WASTEWATER UTILITY
FINANCIAL FORECAST

	Forecast 2009	Budget 2010	Projected 2011	Projected 2012	Projected 2013	Projected 2014	Projected 2015	Projected 2016	Projected 2017	Projected 2018
Unrestricted Funds										
1 BEGINNING WORKING CASH BALANCE:	**$5,367,684**	**$5,751,231**	**$6,622,321**	**$5,400,241**	**$4,087,761**	**$4,383,461**	**$5,563,401**	**$6,623,223**	**$7,544,004**	**$5,849,931**
REVENUES & SOURCES:										
2 Sanitary Sewer Charges	$6,769,700	$6,825,760	$6,962,300	$7,171,200	$7,386,300	$7,607,900	$7,836,100	$8,071,200	$8,313,300	$8,562,700
3 Hi Strength Surcharge	252,500	203,500	207,600	213,800	220,200	226,800	233,600	240,600	247,800	255,200
4 Interest on investments	187,870	158,160	198,670	189,010	163,510	175,340	222,540	264,930	301,760	234,000
5 Other revenues	18,540	1,250	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
6 Year-end cash adjustments	0	0	0	0	0	0	0	0	0	0
7 **TOTAL REVENUES & SOURCES**	**$7,228,610**	**$7,188,670**	**$7,369,870**	**$7,575,310**	**$7,771,310**	**$8,011,340**	**$8,293,540**	**$8,578,030**	**$8,864,160**	**$9,053,200**
OPERATING EXPENSES:										
8 Treatment	$2,009,690	$2,075,370	$2,116,900	$2,180,400	$2,245,800	$2,313,200	$2,382,600	$2,454,100	$2,527,700	$2,603,500
9 Collection System Maintenance	1,028,850	1,018,930	1,039,300	1,070,500	1,102,600	1,135,700	1,169,800	1,204,900	1,241,000	1,278,200
10 Technical Services	561,720	548,260	559,200	576,000	593,300	611,100	629,400	648,300	667,700	687,700
11 Administrative and general	632,860	599,310	611,300	629,600	648,500	668,000	688,000	708,600	729,900	751,800
12 Payment in-lieu-of taxes	421,330	421,760	430,190	443,100	456,390	470,080	484,180	498,710	513,670	529,070
13 Repayment Loan from Raw Water (2004 Loan)	325,000	355,000	395,000	440,000	485,000	0	0	0	0	0
14 Services rendered-other depts.	340,660	424,630	433,100	446,100	459,500	473,300	487,500	502,100	517,200	532,700
15 **TOTAL OPERATING (excl depreciation)**	**$5,320,110**	**$5,443,260**	**$5,584,990**	**$5,785,700**	**$5,991,090**	**$5,671,380**	**$5,841,480**	**$6,016,710**	**$6,197,170**	**$6,382,970**
16 **NET OPERATING REVENUE/(LOSS) (excl depn)**	**$1,908,500**	**$1,745,410**	**$1,784,880**	**$1,789,610**	**$1,780,220**	**$2,339,960**	**$2,452,060**	**$2,561,320**	**$2,666,990**	**$2,670,230**
17 FOOTNOTE: Depreciation Expense	$1,845,820	$1,901,200	$1,939,200	$1,997,400	$2,057,300	$2,119,000	$2,182,600	$2,248,100	$2,315,500	$2,385,000
18 CAPITAL EXPENDITURES	$1,524,953	$874,320	$3,006,960	$3,102,090	$1,484,520	$1,160,020	$1,392,238	$1,640,539	$4,361,064	$6,787,675
19 **NET CHANGE IN WORKING CASH BALANCE**	**$383,547**	**$871,090**	**($1,222,080)**	**($1,312,480)**	**$295,700**	**$1,179,940**	**$1,059,822**	**$920,781**	**($1,694,074)**	**($4,117,445)**
20 **ENDING WORKING CASH BALANCE**	**$5,751,231**	**$6,622,321**	**$5,400,241**	**$4,087,761**	**$4,383,461**	**$5,563,401**	**$6,623,223**	**$7,544,004**	**$5,849,931**	**$1,732,486**
21 Desired Balance (15% of Oper Exp excl'g depn)	$798,017	$816,489	$837,749	$867,855	$898,664	$850,707	$876,222	$902,507	$929,576	$957,446
22 Fav/(Unfav) to Desired Balance	$4,953,214	$5,805,832	$4,562,492	$3,219,906	$3,484,797	$4,712,694	$5,747,001	$6,641,498	$4,920,355	$775,040
Restricted Funds (SIF)										
23 **BEGINNING BALANCE-SYSTEM IMPACT FEES**	**$3,610,102**	**$3,171,475**	**$3,045,935**	**$2,159,375**	**$2,220,685**	**$1,700,555**	**$1,825,285**	**$3,343,105**	**$4,991,995**	**$2,853,345**
24 SIF Collections	442,560	460,510	961,900	1,724,200	1,936,000	2,238,200	2,305,000	2,369,000	2,744,000	3,175,600
25 SIF Interest Income	126,350	87,220	91,380	75,580	88,830	68,020	73,010	133,720	199,680	114,130
26 SIF Capital Expenditures	(1,007,537)	(673,270)	(1,939,840)	(1,467,940)	(532,420)	(2,289,390)	(968,090)	(961,730)	(5,190,230)	(8,483,420)
27 SIF Capital Expenditure - 402 Sewer Line	0	0	0	(270,530)	(2,562,440)	0	0	0	0	0
28 Reimbursement from General Fund - 402 Sewer Line	0	0	0	0	442,000	0	0	0	0	0
29 Development Reimbursements - 402 Sewer Line	0	0	0	0	107,900	107,900	107,900	107,900	107,900	107,900
30 Year-end Cash Adjustment	0	0	0	0	0	0	0	0	0	0
31 **ENDING BALANCE-SYSTEM IMPACT FEES**	**$3,171,475**	**$3,045,935**	**$2,159,375**	**$2,220,685**	**$1,700,555**	**$1,825,285**	**$3,343,105**	**$4,991,995**	**$2,853,345**	**($2,232,445)**
32 **TOTAL AVAILABLE FUNDS**	**$8,922,706**	**$9,668,256**	**$7,559,616**	**$6,308,446**	**$6,084,016**	**$7,388,686**	**$9,966,328**	**$12,535,999**	**$8,703,276**	**($499,959)**

	Projected 2019	Projected 2020	Projected 2021	Projected 2022	Projected 2023	Projected 2024	Projected 2025	Projected 2026	Projected 2027	Projected 2028	Projected 2029
Unrestricted Funds											
1 BEGINNING WORKING CASH BALANCE:	**$1,732,486**	**$1,747,733**	**$1,659,252**	**$1,562,298**	**$1,456,663**	**$1,341,644**	**$1,216,892**	**$1,081,688**	**$935,354**	**$777,388**	**$607,292**
REVENUES & SOURCES:											
2 Sanitary Sewer Charges	$8,819,600	$9,084,200	$9,356,700	$9,637,400	$9,926,500	$10,224,300	$10,531,000	$10,846,900	$11,172,300	$11,507,500	$11,852,700
3 Hi Strength Surcharge	262,900	270,800	278,900	287,300	295,900	304,800	313,900	323,300	333,000	343,000	353,300
4 Interest on investments	69,300	69,910	66,370	62,490	58,270	53,670	48,680	43,270	37,410	31,100	24,290
5 Other revenues	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
6 Year-end cash adjustments	0	0	0	0	0	0	0	0	0	0	0
7 **TOTAL REVENUES & SOURCES**	**$9,153,100**	**$9,426,210**	**$9,703,270**	**$9,988,490**	**$10,281,970**	**$10,584,070**	**$10,894,880**	**$11,214,770**	**$11,544,010**	**$11,882,900**	**$12,231,590**
OPERATING EXPENSES:											
8 Treatment	$2,681,600	$2,762,000	$2,844,900	$2,930,200	$3,018,100	$3,108,600	$3,201,900	$3,298,000	$3,396,900	$3,498,800	$3,603,800
9 Collection System Maintenance	1,316,500	1,356,000	1,396,700	1,438,600	1,481,800	1,526,300	1,572,100	1,619,300	1,667,900	1,717,900	1,769,400
10 Technical Services	708,300	729,500	751,400	773,900	797,100	821,000	845,600	871,000	897,100	924,000	951,700
11 Administrative and general	774,400	797,600	821,500	846,100	871,500	897,600	924,500	952,200	980,800	1,010,200	1,040,500
12 Payment in-lieu-of taxes	544,950	561,300	578,140	595,480	613,340	631,750	650,690	670,210	690,320	711,030	732,360
13 Repayment Loan from Raw Water (2004 Loan)	0	0	0	0	0	0	0	0	0	0	0
14 Services rendered-other depts.	548,700	565,200	582,200	599,700	617,700	636,200	655,300	675,000	695,300	716,200	737,700
15 **TOTAL OPERATING (excl depreciation)**	**$6,574,450**	**$6,771,600**	**$6,974,840**	**$7,183,980**	**$7,399,540**	**$7,621,450**	**$7,850,090**	**$8,085,710**	**$8,328,320**	**$8,578,130**	**$8,835,460**
16 **NET OPERATING REVENUE/(LOSS) (excl depn)**	**$2,578,650**	**$2,654,610**	**$2,728,430**	**$2,804,510**	**$2,882,430**	**$2,962,620**	**$3,044,790**	**$3,129,060**	**$3,215,690**	**$3,304,770**	**$3,396,130**
17 FOOTNOTE: Depreciation Expense	$2,456,600	$2,530,300	$2,606,200	$2,684,400	$2,764,900	$2,847,800	$2,933,200	$3,021,200	$3,111,800	$3,205,200	$3,301,400
18 CAPITAL EXPENDITURES	$2,563,402	$2,743,091	$2,825,384	$2,910,145	$2,997,449	$3,087,372	$3,179,994	$3,275,394	$3,373,656	$3,474,866	$3,579,112
19 **NET CHANGE IN WORKING CASH BALANCE**	**$15,248**	**($88,481)**	**($96,954)**	**($105,635)**	**($115,019)**	**($124,752)**	**($135,204)**	**($146,334)**	**($157,966)**	**($170,096)**	**($182,982)**
20 **ENDING WORKING CASH BALANCE**	**$1,747,733**	**$1,659,252**	**$1,562,298**	**$1,456,663**	**$1,341,644**	**$1,216,892**	**$1,081,688**	**$935,354**	**$777,388**	**$607,292**	**$424,310**
21 Desired Balance (15% of Oper Exp excl'g depn)	$986,168	$1,015,740	$1,046,226	$1,077,597	$1,109,931	$1,143,218	$1,177,514	$1,212,857	$1,249,248	$1,286,720	$1,325,319
22 Fav/(Unfav) to Desired Balance	$761,566	$643,512	$516,072	$379,066	$231,713	$73,674	($95,826)	($277,503)	($471,860)	($679,428)	($901,009)
Restricted Funds (SIF)											
23 **BEGINNING BALANCE-SYSTEM IMPACT FEES**	**($2,232,445)**	**($986,065)**	**$130,139**	**$1,290,905**	**$2,539,544**	**$3,881,780**	**$5,323,801**	**$6,872,162**	**$8,533,913**	**$10,316,600**	**$12,228,297**
24 SIF Collections	3,310,500	3,418,072	3,529,717	3,645,622	3,765,975	3,891,067	4,021,093	4,156,350	4,297,138	4,443,759	4,596,520
25 SIF Interest Income	0	0	5,210	51,640	101,580	155,270	212,950	274,890	341,360	412,660	489,130
26 SIF Capital Expenditures	(2,172,020)	(2,409,768)	(2,482,061)	(2,556,523)	(2,633,219)	(2,712,216)	(2,793,582)	(2,877,389)	(2,963,711)	(3,052,622)	(3,144,201)
27 SIF Capital Expenditure - 402 Sewer Line	0	0	0	0	0	0	0	0	0	0	0
28 Reimbursement from General Fund - 402 Sewer Line	0	0	0	0	0	0	0	0	0	0	0
29 Development Reimbursements - 402 Sewer Line	107,900	107,900	107,900	107,900	107,900	107,900	107,900	107,900	107,900	107,900	107,900
30 Year-end Cash Adjustment	0	0	0	0	0	0	0	0	0	0	0
31 **ENDING BALANCE-SYSTEM IMPACT FEES**	**($986,065)**	**$130,139**	**$1,290,905**	**$2,539,544**	**$3,881,780**	**$5,323,801**	**$6,872,162**	**$8,533,913**	**$10,316,600**	**$12,228,297**	**$14,277,646**
32 **TOTAL AVAILABLE FUNDS**	**$761,668**	**$1,789,391**	**$2,853,203**	**$3,996,207**	**$5,223,424**	**$6,540,693**	**$7,953,850**	**$9,469,267**	**$11,093,988**	**$12,835,589**	**$14,701,956**

TABLE 1-5
Financial Forecast

2.0 Introduction

2.1 Background

The City of Loveland wastewater utility is located in Larimer County and is a utility member of the North Front Range Water Quality Planning Association (NFRWQPA). The NFRWQPA is charged with updating the 208 Plan, as required by the Clean Water Act, for the Larimer-Weld County Region. The 208 Plan must describe the treatment works required to meet the needs of the area and a plan to achieve these needs. Beginning in 2008, the NFRWQPA is requiring a wastewater utility plan (WWUP) for all public wastewater treatment agencies in Larimer and Weld Counties. Per the *NFRWQPA Utility Plan Guidance* document, a WWUP is designed to meet the following four basic functions:

1. Primary support document to amend the *Areawide Water Quality Management Plan* (208 Plan).
2. Primary support document for site approval, per Colorado Department of Public Health and Environment (CDPHE) Regulation No. 22.
3. Background and planning information needed by the CDPHE Water Quality Control Division in the discharge permitting process.
4. Support document for a State of Colorado Revolving Loan Fund (SRF) application.

NFRWQPA policy states that an approved WWUP is required prior to review of a site application by NFRWQPA. The City of Loveland will be submitting site applications in the near future for a treatment plant capacity increase and collection system improvements, and wishes to have an approved WWUP on file with NFRWQPA.

Submitting a site application that is consistent with the WWUP on file will expedite the review of the site application by the local planning agency (e.g., NFRWQPA).

2.2 Facilities Plan Summary

The City of Loveland has completed multiple planning documents in the recent past for its wastewater treatment plant (WWTP) and wastewater collection system. The most comprehensive recent planning effort was the 1998 Water and Wastewater Master Plan Report (1998 Master Plan). The purpose of the 1998 Master Plan for the wastewater system was to:

- Provide the City with an analytical tool to evaluate the impacts of development needs

- Identify existing wastewater collection system deficiencies
- Develop a wastewater system improvement strategy to satisfy ultimate development conditions
- Develop a capital improvement program
- Select a hydraulic model for collection and train City staff in its use

A companion study that focused on the WWTP was completed at about the same time.

The City has been using the *Water Reclamation Site Feasibility/Incremental Expansion Study* from March 1999 as its primary planning document for wastewater treatment, although elements of the plan are updated annually. A summary of this and other planning documents prepared for the City follows:

- *Water Wastewater Financial Master Plan*, Loveland, CO, Black and Veatch, 1980 (1980 Master Plan)
- *Infiltration/Inflow Analysis*, Black and Veatch, 1982 (1982 I/I Study)
- *Water and Wastewater Master Plan Report*, CH2M HILL, May 1998 (1998 Master Plan)
- *Water Reclamation Site Feasibility/Incremental Expansion Study*, CH2M HILL, March 1999 (1999 WWTP Study)
- *Site Application for Step Feed, UV Disinfection, and Secondary Electrical Improvements*, CH2M HILL, 2002 (2002 Site App.)
- *Wastewater Treatment Plant Secondary Electrical Study*, CH2M HILL, 2002 (2002 Electrical Study)
- Second Use Water Program Development, Richard P. Arber Associates, 2004 (2004 Reuse Study)
- *Wastewater Treatment Plant Odor Management Phase 2 Final Report*, CH2M HILL, May 2005 (2005 Odor Report)
- Raw Water Master Plan, Spronk Water Engineers, 2005 (2005 Raw Water Master Plan)
- *2007 CDPS Permit Application for Permit No. CO-0026701*, CH2M HILL, 2007 (2007 Permit Application)
- *Headworks Evaluation and Final Design Report*, CH2M HILL, 2007 (2007 Headworks Report)
- *Wastewater Treatment Plant Solids Processing Evaluation*, CH2M HILL, November 2007 (2007 Solids Evaluation)
- *Wastewater Collection Modeling Study*, Ayers, 2007 (2007 Collection Study)
- *2009-2018 Capital Improvement Plan,* CH2M HILL, 2008 (2008 CIP)

This WWUP will utilize these and other past planning documents for background information to support the current planning efforts. Of the listed documents, the most comprehensive planning document for the WWTP was the 1999 WWTP Study, which contained recommendations for future improvements to replace aging equipment and facilities and expand future treatment capacity to meet City needs. Most of the improvements recommended in the 1999 WWTP Study have been implemented.

The City has embarked on a multi-year collection system study to assess the condition of the system in terms of flow capacity, lift station capacity, level of corrosion, and infiltration and inflow. The study began in 2007 and likely will continue into 2011. This WWUP will document the study results available to date.

2.3 Implementation

The WWUP will be utilized by the City of Loveland as a planning tool for future improvements to the WWTP and wastewater collection system. The City of Loveland will make annual adjustments to the schedule of improvements during its Capital Improvement Plan (CIP) process. The City's annual CIP adjustment includes review of the flow and load projections, regulatory changes, condition assessments, funding, and prioritization of projects to serve customers using a cost-effective and efficient approach. The WWUP also serves as the Engineering Report required by CDPHE Regulation No. 22 for site approval.

2.4 Public Participation and Neighboring Agency Involvement

Prior to submission to the North Front Range Water Quality Planning Association, this utility plan was reviewed by the City of Loveland Utilities Commission and the Loveland City Council. Approval by both of these bodies was obtained during formal public meetings.

During the planning process for the WWUP, City of Loveland staff met with representatives from the towns of Johnstown, Berthoud, and Windsor as well as the South Fort Collins Sanitation District. The meeting was held to discuss service boundary consolidation issues. Details of the meetings are found in Section 3.0.

Utility ratepayers and the public are involved in the Utility's annual budgeting process for proposed utility rates and capital improvement projects. Prior to presentation to the City Manager and Council for review and approval, the Utility coordinates with the Loveland Utility Commission for review and approval. This Commission, consisting of Citizen volunteers, works closely with Staff to ensure proposed projects receive review and consideration by the public. In addition, the Commission meetings are open to the public for observation, comment, and participation. Meeting agendas and minutes are posted publicly to maximize the notification of the Utility's budgeting efforts.

2.5 Summary of Utility Plan Structure

The WWUP consists of the following main sections:

- Section 1.0 – Executive Summary
- Section 2.0 – Introduction
- Section 3.0 – General Planning

- Section 4.0 – Water Quality and Regulatory Issues
- Section 5.0 – Wastewater Characterization
- Section 6.0 – Management and Financial Plans
- Section 7.0 – References
- Section 8.0 – Technical Support Appendices (separate document)

To assist with the review process, a listing of the WWUP contents per the *NFRWQPA Utility Plan Guidance* document with page number references is provided prior to the Executive Summary (see **Table 2-1** below).

TABLE 2-1
Utility Plan Checklist

NFRWQPA Chapter	Includes	Section and Page in This Document
Executive Summary		Section 1, p. 1-1
I. Introduction	Background	Section 2, p. 2-1
	Facilities Plan Summary	Section 2, p. 2-1
	Implementation	Section 2, p. 2-3
	Summary of Utility Plan Structure	Section 2, p. 2-3
II. General Planning	Feasibility of Consolidation of Facilities (Reg 22 @ 22.8(1)(b)	Section 3, p. 3-3
	Wastewater Reuse	Section 3, p. 3-9
	Environmental Components	Section 3, p. 3-10
	Environmental (NEPA) Information	Section 3, p. 3-10
III. Wastewater Characterization	Service Area Designations	Section 3, p. 3-1
	Population Datasets and Forecasts	Section 3, p. 3-6
	Wastewater Flow and Projections	Section 5, p. 5-5
	Infiltration and Inflow Analysis	Section 5, p. 5-25
	Character of Influent	Section 5, p. 5-1
	Industrial Pretreatment Program	Section 4, 4-26
	Treatment Works	Section 5, p. 5-48
	Process System	Section 5, p. 5-48
	Infrastructure Sizing and Staging	Section 5, p. 5-62
	Location and Siting	Section 5, p. 5-62
	Biosolids Handling	Section 5, p. 5-54
	Schematic of Treatment Works	Section 5, p. 5-51
	Odor Control Considerations	Section 5, p. 5-60
	Air Quality Permit	Section 4, p 4-27
	Stormwater Management Plan	Section 4, p. 4-29
	Site Characterization Report	Section 4, p. 4-31
	Collection System	Section 5, p. 5-12
	Major Lift Stations	Section 5, p. 5-18
	Interceptors	Section 5, p. 5-13
	Maps	
	Treatment Plant Site Envelope	Section 5, p. 5-50
	Service Areas	Section 3, p. 3-1
	Collection System	Section 5, p. 5-12
IV. Water Quality Characterization	Water Quality of Receiving Water	Section 4, p. 4-1
	TMDLs and/or Wasteload Allocations	Section 4, p. 4-3
	Watershed Issues	Section 4, p. 4-6
	Level of Treatment (Permit Limits)	Section 4, p. 4-9

TABLE 2-1
Utility Plan Checklist

NFRWQPA Chapter	Includes	Section and Page in This Document
	Maps	
	Watershed and Receiving Waters	Section 4, p. 4-2
	Impaired Waters	Section 4, p. 4-5
V. Alternatives Analysis	Treatment Works	Section 5.6.5, p. 5-62
	Level of Treatment	Section 4, p. 4-23
	Public Participation in Selection Process	Sections 2, p. 2-3 and Section 8.N
V. Management and Financial Plans	Management Structure and Agreements	Section 6, p. 6-1
	Wastewater Management Plan	Section 6, p. 6-1
	Financial Management Plan	Section 6, p. 6-3
	Revolving Loan Interest	Section 6, p. 6-7
	User Charge Summary	Section 6, p. 6-7
VI. References	Reports and Special Studies	Section 7, p. 7-1
VII. Technical Support Appendices	Legal Description and Evidence of Site Ownership	Section 8.A
	Agency Contacts	Section 8.C
	Special Surveys (e.g. Endangered Species)	Section 8.B
	NEPA Process	Section 8.C
	Site Characterization Report	Section 8.D
	Soil Test Results	Section 8.E
	Preliminary Effluent Limits (new sites)	Section 8.F
	Effluent Limits (existing sites)	Section 8.G
	Planning and Zoning Information	Section 8.H
	Intergovernmental Agreements	Section 8.I
	User Charge Study Analysis	Section 8.J
	Air Quality Permit	Section 8.K
	Odor Control Studies or Plans	Section 8.L
	Stormwater Management Plan	Section 8.M
	Summary of Public Hearings and Process	Section 8.N
	Infiltration and Inflow Study	Section 8.O

3.0 General Planning

3.1 Service Area Designations

As mentioned previously, the City of Loveland wastewater utility service area is located in Larimer County and is part of the NFRWQPA, the entity in charge of updating the 208 Plan for the Larimer-Weld County Region. The 208 Plan must describe the treatment works required to meet the needs of the area and a plan to achieve these needs. Service areas define the boundaries of wastewater collection for a utility. Loveland's current 208 Plan service area is outlined in **Figure 3-1.** Loveland's current 208 service area is approximately 369,536 acres. For Loveland, the 208 plan boundary is the same as the UPA. The figure also presents Loveland's ultimate planning area (UPA), the area to which the utility plans to provide wastewater service collection and treatment at ultimate buildout.

Neighboring service areas include the South Fort Collins Sanitation District to the north, the City of Johnstown to the east, and the Town of Berthoud to the south. Unincorporated Larimer County borders the service area to the west. Loveland's current service area extends east to the Larimer and Weld County border, at which point it borders Johnstown or unincorporated Weld County. Overlapping service areas are allowed only when there is an understanding between the service entities defining how service will be provided. There are two overlapping service areas within the Larimer-Weld County Region. One is located in northeast Loveland where the Loveland service area overlaps that of South Fort Collins Sanitation District. Currently, the District serves this area through the use of lift stations. In the future, however, the City of Loveland may be willing to accept this area at the District's request. Typically, these areas are best served by one entity in the near term, and the other entity in the long term, once infrastructure has been extended through the development process. The area of overlap is approximately 505 acres.

Figure 3-1 shows proposed changes to the City of Loveland's current 208 Boundary and UPA. The changes are based on internal service area discussions within the City and discussions with the neighboring wastewater utilities as highlighted below in Section 3.3.

There are two wastewater treatment plants in the Loveland service area, as shown in **Figure 3-1**: one major plant operated by the City of Loveland near the Big Thompson River in the center of the service area, and one privately owned and operated minor plant (a lagoon serving eight customers) near Highway 34 and I-25. Other nearby treatment plants include one major plant to the north in the South Fort Collins service area and one minor plant to the east in the Johnstown Service area.

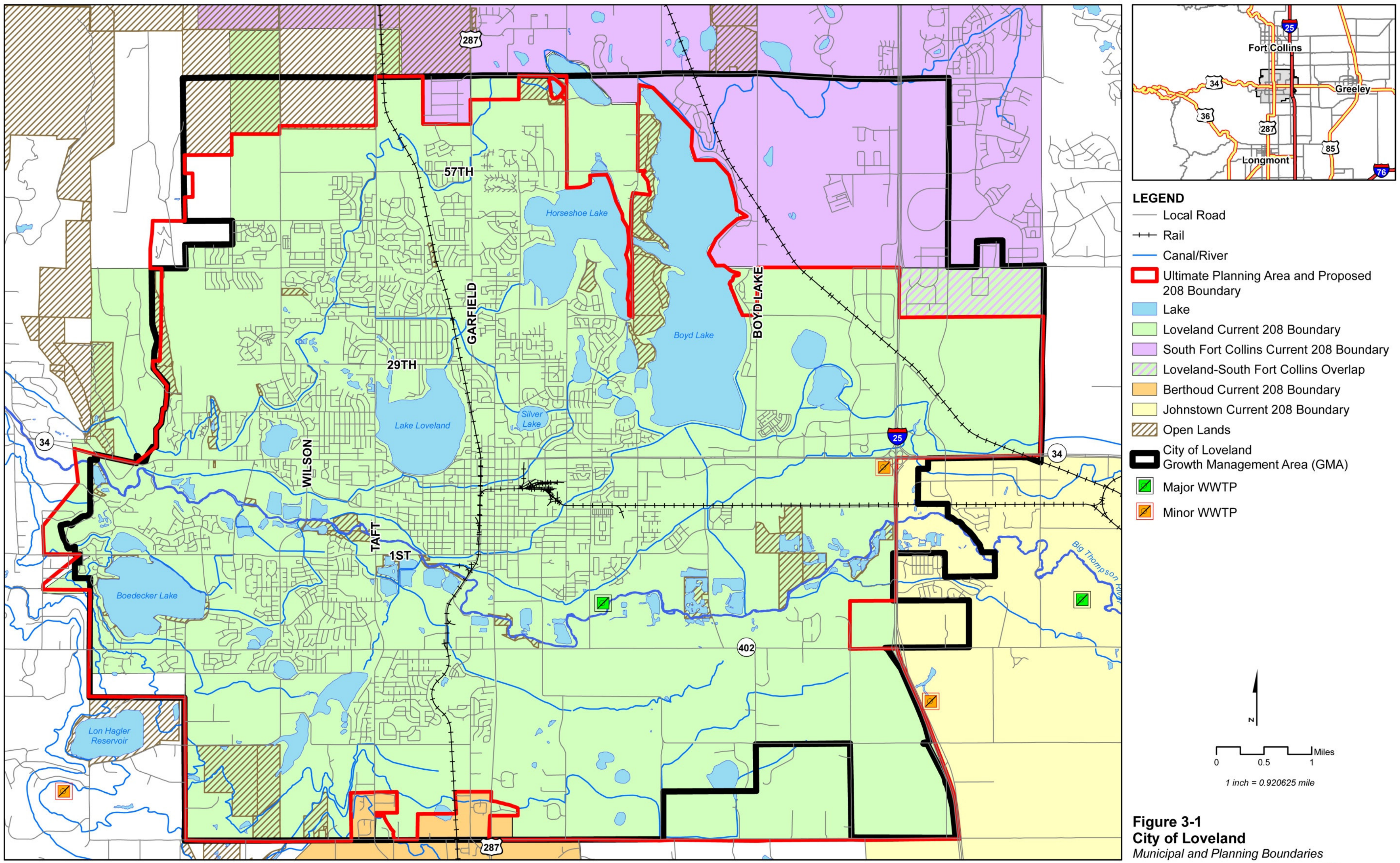


Figure 3-1
City of Loveland
Municipal and Planning Boundaries

\\COBRA\GIS\PROJECTS\LOVELAND\MAPFILES\UTILITY_PLAN.MXD ZVALCHAR 1/20/2010 10:38:41

CH2MHILL

3.2 Land Use and Zoning

The guiding document for future development within the Growth Management Area (GMA) is the Loveland Comprehensive Plan, which includes the Land Use Plan. The purpose of the land use plan is to guide the general distribution and character of land uses within the GMA. The Land Use Plan is not a zoning document, but is one of the tools used to implement zoning throughout the City. **Figure 3-2** is the City's most recent Land Use Plan and **Figure 3-3** is the City's most recent Zoning Map.

3.3 Feasibility of Consolidation of Facilities

It is the long-term intention of the City of Loveland to own and operate its own wastewater utility for collection and treatment. In addition, there are no foreseeable plans for the City to assume control or operation of another existing neighboring wastewater utility. During this utility planning effort, the City has met with each existing neighboring wastewater utility to discuss minor service boundary issues. Summaries of these meetings are presented below.

3.3.1 Town of Berthoud Service Area Changes

On November 17, 2009, Engineering Staff from the City of Loveland and the Town of Berthoud met to discuss service area topics and boundary adjustments. Minor adjustments to existing service areas were identified to more accurately reflect current sanitary sewer service to areas served by the Town. Minor adjustments to areas affected by specific development project areas were also made. These adjustments in service areas are shown in **Figure 3-1** and are acceptable to both the Town and City. Topics also discussed included potential future transitions of areas currently served by the Town via sewage lift station to the City, which may be able to better serve these areas by gravity flow. While no specific commitments were made, the City expressed the need for any future transitions of service areas with existing sewer taps to also include provisions for payment of System Impact Fees, and any other related cost appropriations.

3.3.2 South Fort Collins Sanitation District (SFCSD) Service Area Changes

On May 21st, 2009 Engineering Staff from the City of Loveland and the South Fort Collins Sanitation District met to discuss service area topics and boundary adjustments. Minor corrections to existing service areas were identified to more accurately reflect current sanitary sewer service to areas served by the District. Areas of overlap between the Service Area boundaries for the two entities were also discussed. Some of these overlap areas are regions which are currently served by the District via a sewage lift station, however may potentially be served by the City in the future by gravity as City infrastructure is extended through future development efforts. Other areas of overlap are undeveloped regions between the City and District service areas currently not served. These latter areas of overlap may be served in the future by either the District or City depending on timing of wastewater utility extensions from either entity related to private development efforts. As has historically occurred, the District and City will discuss which entity can most-sensibly serve the area as development interest increases for these areas.

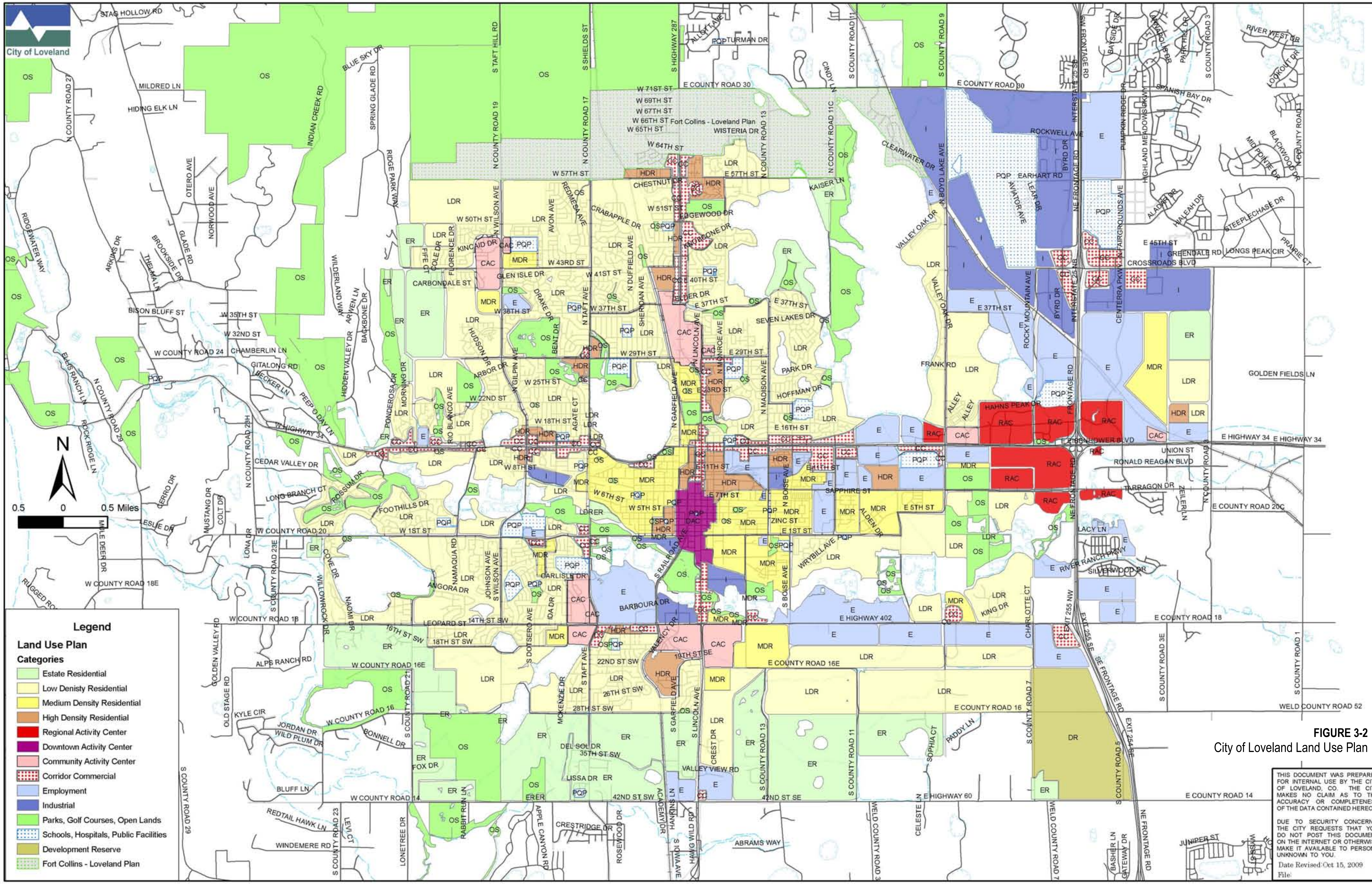


FIGURE 3-2
City of Loveland Land Use Plan

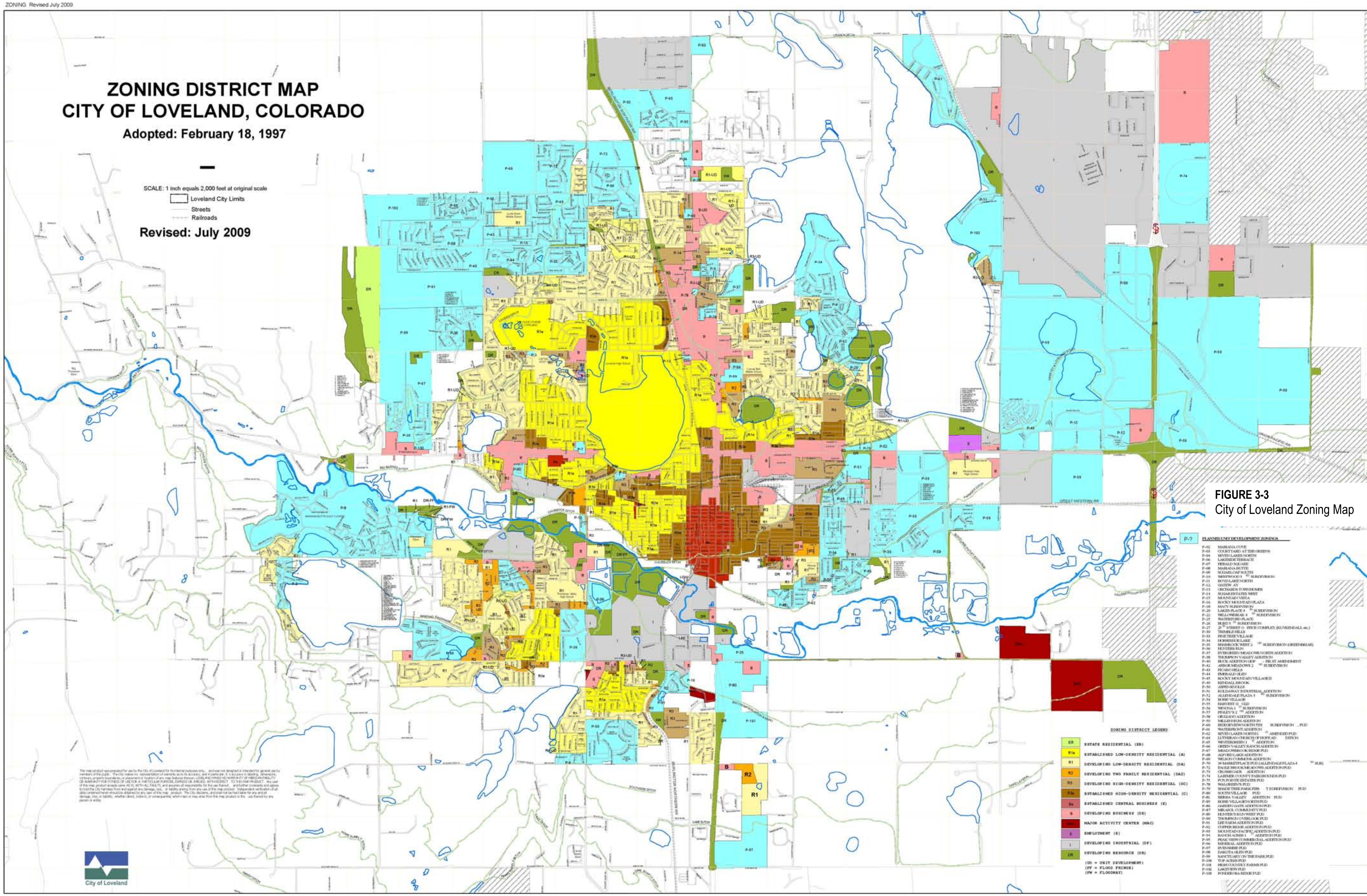


FIGURE 3-3
City of Loveland Zoning Map

3.3.3 Town of Windsor Service Area Coordination

On October 9, 2009, Engineering Staff from the City of Loveland and the Town of Windsor met to discuss service area coordination. The proposed boundary for the City of Loveland was discussed and no areas of overlap or concern were identified. Discussions also included clarification for "areas of overlap" between the City and the South Fort Collins Sanitation District. The City clarified these areas as discussed in the preceding section. No outstanding areas of concern were identified in this coordination meeting.

3.3.4 Town of Johnstown Consolidation Discussion

Correspondence and meeting agendas pertaining to the recent discussions between the City of Loveland and the Town of Johnstown can be found in **Appendix 8.T**. On December 17, 2008, representatives from the City of Loveland and the Town of Johnstown met to discuss consolidation and regionalization options for wastewater treatment and infrastructure, specifically related to the vicinity of Interstate 25 and Highway 402. The Town has recently annexed a portion of the land near this interchange. The City has also recently annexed portions of land near this interchange. While no wastewater service currently exists in this interchange area, the City and Town discussed how this area will be provided wastewater service from one or both entities. At this meeting, the Town expressed their interest in providing only annexed areas with sanitary sewer service and treatment. At this time, both parties are in agreement that each entity will provide wastewater service to their respective annexed area. On February 23, 2009, a joint study session was held between representatives of the Town of Johnstown Council and the City of Loveland City Council to discuss regional growth related coordination issues. As illustrated in the agenda (shown in **Appendix 8.T**), sewer service was discussed as an item of regional concern.

3.4 Population Data Sets and Forecasts

Service area population and land use projections are important components of utility planning and provide the foundation for projecting wastewater treatment flows and loads, and ultimately the timeframe for phasing construction to meet treatment requirements. Historical and projected population for the City of Loveland from the City's Planning Department is shown in **Table 3-1** and **Figure 3-4**. The City's Planning Department periodically reviews demographic information and provides future projections as found in the City's Data and Assumptions Report which is enclosed in Appendix 8.R.

For planning purposes, it is assumed that the City's population projections represent the wastewater service area population. Given the inherent uncertainty with population projections, the effort to try to accurately adjust these to reflect the small areas that are within the City limits, but not in the service area, would not provide appreciable value to the planning process. Assuming the City's population projections are equivalent to those of the service area adds additional conservatism to the planning process. A second conservative planning measure involves recent trends in the residential and commercial construction industry including low-flow, high-efficiency water use fixtures and design. This, coupled with the City's efforts to reduce infiltration and inflow, will likely result in lower per capita flow projections for the planning horizon than have been historically measured.

TABLE 3-1
Historical (2000 to 2008) and Projected (2009 to 2029) Population

Year	Population	Percent Change from Previous	Year	Population	Percent Change from Previous
2000	***51,303***	***-***	2015	76,168	2.78
2001	***54,242***	***5.73***	2016	78,183	2.64
2002	***56,159***	***3.53***	2017	80,296	2.70
2003	***57,355***	***2.13***	2018	82,396	2.61
2004	***59,198***	***3.21***	2019	84,509	2.57
2005	***60,407***	***2.04***	2020	86,766	2.67
2006	***62,114***	***2.83***	2021	89,135	2.73
2007	***64,166***	***3.30***	2022	91,601	2.77
2008	***64,807***	***1.00***	2023	94,055	2.68
2009	65,802	1.54	2024	96,650	2.76
2010	67,006	1.83	2025	99,354	2.80
2011	68,460	2.17	2026	101,732	2.39
2012	70,181	2.51	2027	103,993	2.22
2013	72,045	2.66	2028	105,956	1.89
2014	74,111	2.87	2029	108,042	1.97

Notes:

2000: Base year U.S. Census.
2001-2006: Estimates of population are from the State Demographer's Office; based on building permits issued in each preceding year, multiplied by assumptions about the overall vacancy rate and average persons per household.
2007-2008 estimates and 2009-2010 projections: Based on the State Demographer's methodology and assumptions for 2007.
2011-2029: Projections are based on the North Front Range Metropolitan Planning Organization (NFRMPO) projection created in 2005, and adjusted downward based on actual and projected building activity through 2010.

The average annual percent growth during the historical period 2001 to 2008 was 2.89 percent. The average annual growth rate is expected to decrease slightly for the period 2009 to 2029, to 2.46 percent. Projections to 2029 were compared with an estimate of Loveland's portion of the Larimer County population projections and were found to be consistent. Loveland's projected population in 2029 is 108,042, which is 67 percent greater than the 2008 population of 64,807. **Figure 3-5** presents recent and projected population for the City of Loveland, as well as recent and projected housing units.

According to the City's Planning Department, the buildout population for the City of Loveland is expected to be 136,000 people, based on 58,857 dwelling units and 2.31 persons per dwelling unit.

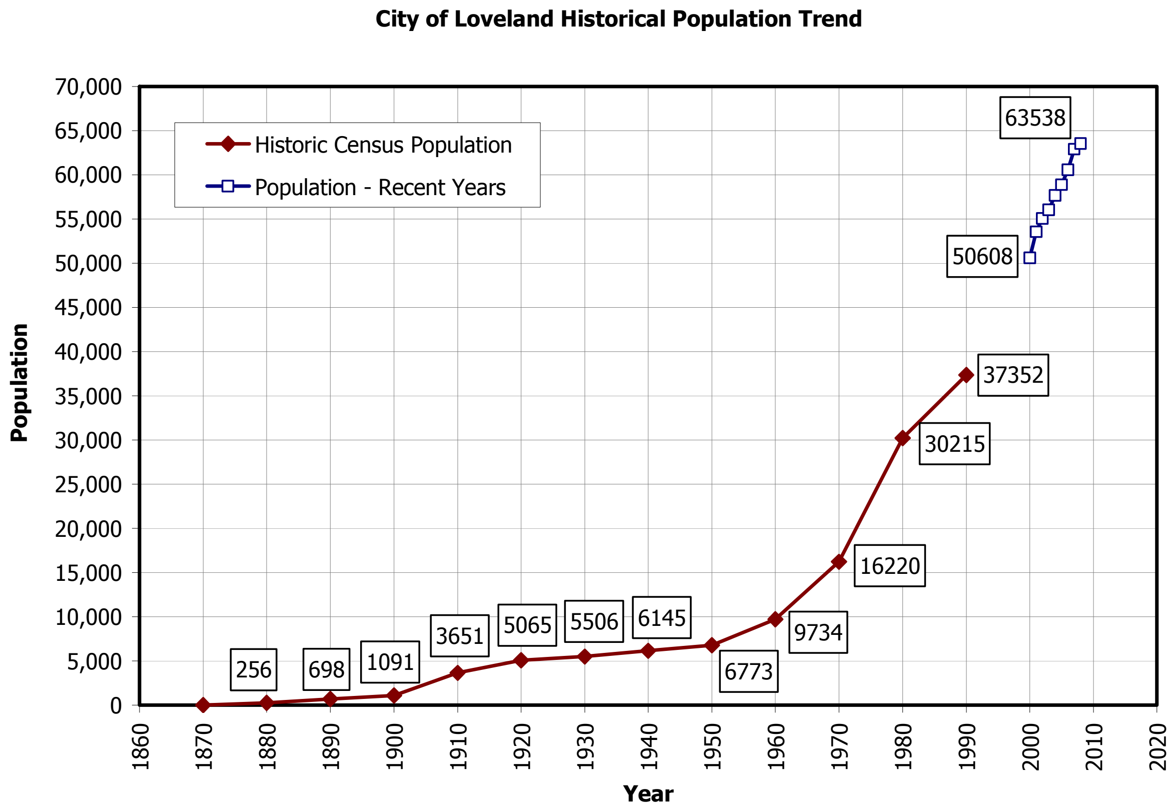


FIGURE 3-4
Loveland Population Record Since Incorporation in 1881

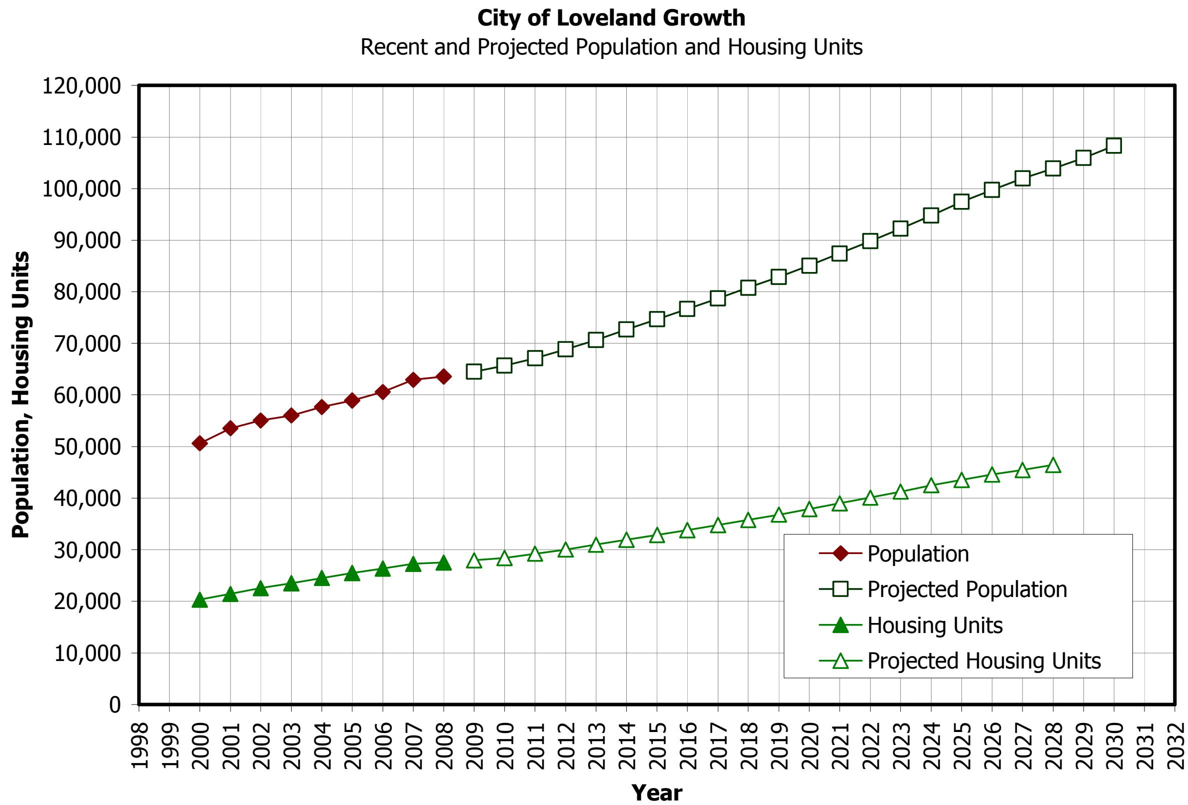


FIGURE 3-5
Loveland Recent and Projected Population and Housing Units

3.5 Wastewater Reuse

Currently, the City of Loveland does not have a reclaimed water reuse (second use) system. The City completed a *Second Use Water Program Development Report* in July 2004. The report compared several different sources of second use water for irrigation, including raw surface water, groundwater, reclaimed domestic wastewater, and stormwater capture. Surface water available downstream of the existing WWTP is the most viable source of reuse water. Groundwater was not considered a feasible option as a source for irrigation water due to limited water rights available and the required acquisition of land for access to the groundwater. Direct reuse of treated wastewater was considered less viable than diverting surface water downstream of the existing WWTP due to the additional treatment (coagulation, sedimentation, disinfection) that would be required to meet the CDPHE Regulation No. 84, *Reclaimed Domestic Wastewater Control*, for unrestricted use. Stormwater capture was not considered an option due to the variability in storm events and water quality.

Estimated costs to construct a second use water system, at the time of the report were approximately 8 percent less than providing a potable water system for the same irrigation demand. Given the error in order-of-magnitude estimates, the recommendation at the time was that the cost savings may not materialize and the plan should be reviewed again at a later time. City staff has reviewed the report periodically since 2004 and has concluded that the original assumptions and findings are still valid and that a second use water system is still not economically feasible.

3.6 Environmental Components and Environmental Information

There are several environmental requirements for construction of new wastewater treatment facilities, including National Environmental Policy Act (NEPA) requirements for projects funded through the SRF. NEPA requires that environmental values be addressed in the decision-making process for any major federal action and mandates the development of environmental documentation, up to and including an Environmental Impact Statement (EIS), for review by the U.S. Environmental Protection Agency (EPA). NEPA requirements extend to the funding of wastewater projects through the SRF loan system, to which the EPA contributes. At this time, the City is not applying for funding through the SRF and therefore does not need to meet NEPA requirements. Other potential NEPA-triggering future circumstances would include the requirement of federal permitting or federal land management interaction, or other interpretation of federal NEXUS.

The existing WWTP operates under a Colorado Discharge Permit System (CDPS) No. CO-0026701. The permit was issued in 2002 by CDPHE and has been administratively extended until such time as the State reviews the February 2007 Permit Application. The permit is included as **Appendix 8.G.**

Larimer County has recently made changes to its 1041 review process. The changes make sewerline projects located outside of city boundaries in new permanent easements subject to County Planning Department approval. Wastewater treatment plant projects are not currently included in this review process.

4.0 Water Quality and Regulatory Issues

4.1 Water Quality of Receiving Water

Lakes and flowing water bodies in the Big Thompson Watershed provide water for wildlife habitat and recreation, as well as drinking water for the Cities of Loveland, Greeley, Fort Collins, and others. As such, the water quality is closely monitored by several entities and provides a good data set for evaluating the data. Water quality and flow are monitored by the Big Thompson Watershed Forum and the U.S. Geological Survey (USGS). A map of monitoring locations along the Big Thompson Watershed is provided in **Figure 4-1**, courtesy of the Big Thompson Watershed Forum.

In calculating the effluent limits for the City of Loveland WWTP, it is necessary to evaluate the upstream ambient water quality. To determine the water quality upstream of the WWTP, data collected from the Big Thompson River at the Loveland monitoring point as part of the Big Thompson Watershed Forum (BTWF) was evaluated for parameters that are of concern to this Utility Plan. The BTWF refers to the sampling location as M130, and it coincides with the location of a USGS flow gage (06741510) on the Big Thompson River immediately downstream of where it crosses St. Louis Avenue. These parameters are summarized in **Table 4-1** below, along with the number of samples, minimum, maximum, average, 85th and 95th percentiles, and the acute and chronic water quality standards. Acute standards are typically a 1-day maximum no single sample can exceed. Chronic standards are typically a 30-day average.

TABLE 4-1
Big Thompson River Water Quality Above the Loveland WWTP Discharge at Sampling Location M130 (period of record is March 2001 through May 2007)

Parameter	Units	Number of Samples	Min.	Max.	Ave.	85th percent	95th percent	Acute Standard	Chronic Standard
Dissolved Oxygen	mg/L	81	6.1	14.2	9.6	11.4	12.2	5.0 (Min)	NA[a]
E. coli	cfu/100 mLs	99	0	1800	122	160	492	NA	126[b]
Temperature	degrees C	83	0.5	23	12.4	19.5	22.0	29/12.1[c]	24.2/14.5[c]
Ammonia	mg/L as N	113	0.002	0.753	0.105	0.213	0.503		
Copper[d]	µg/L	45	1	10.4	2.6	3.5	5.6	50	29.0
Lead[d]	µg/L	76	0.04	1	0.23	0.48	1	281	11
Manganese[d]	µg/L	76	6.9	159	34.9	66.2	96.9	4,738	2,618
Nickel[d]	µg/L	76	0.25	10.9	3.10	5.55	7.11	1,513	168
Selenium[d]	µg/L	3	0.77	1.5	1.22	1.47	1.49	18	5
Silver[d]	µg/L	76	0.1	1	0.3	0.2	1	1	3

[a] NA means that the standard does not apply
[b] Because the standard is a geometric mean, it is not comparable to the 85th or 95th percentile.
[c] The values listed are March through November and December through February.
[d] Dissolved.

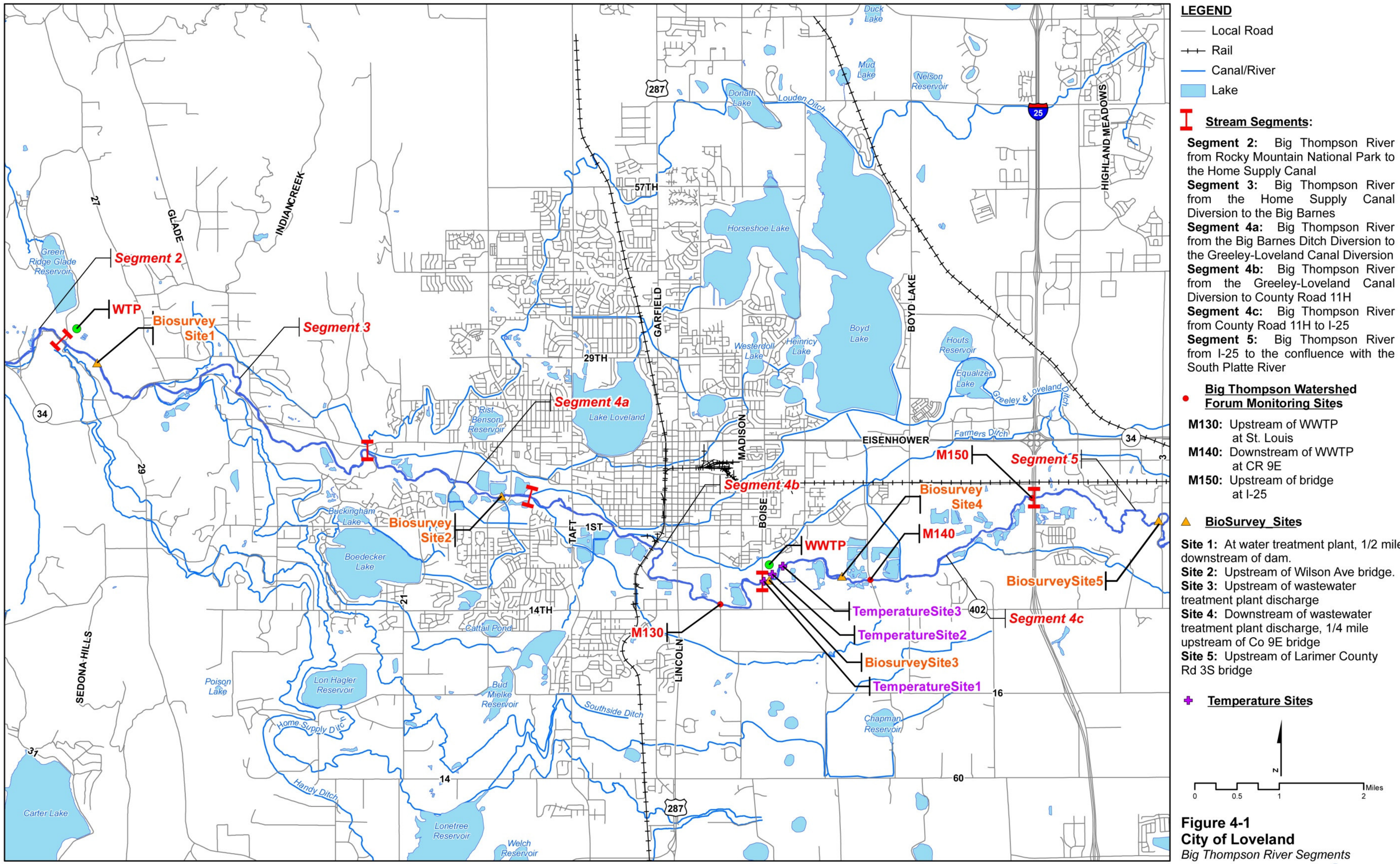


Figure 4-1
City of Loveland
Big Thompson River Segments

\\COBRA\GIS\PROJECTS\LOVELAND\MAPFILES\IRRIGATION.MXD ZVALCHAR 10/16/2009 13:15:03

CH2MHILL

Based on the data in **Table 4-1**, it appears that the Big Thompson at Sampling Location M130 is in compliance with the stream standards and supports all of its uses including recreational activities. There are many competing uses and activities along the Big Thompson River. Some of these competing uses can change the river's flow and character. Several potential contaminant sources exist along the river, both upstream and downstream of Sampling Location M130, including natural tributaries such as Buckhorn Creek and other anthropogenic (derived from human activity) sources such as the Mariano Exchange Ditch, wastewater treatment plant effluent, sand and gravel operations, and numerous nonpoint sources (such as stormwater runoff and agriculture).

4.2 Total Maximum Daily Loads and Wasteload Allocations

Section 303(d) of the Federal Clean Water Act requires that, every 2 years, states identify those water bodies that are not meeting the water quality standards. For those water bodies on the list, a total maximum daily load (TMDL) must be established. The purpose of the TMDL is to allocate the load capacity of the stream to both the point and nonpoint sources that contribute the pollutant of concern. The TMDL may look at sources just within the segment that are impaired, but could also include upstream sources if they are considered significant in contributing to the downstream impairment.

The Water Quality Control Division (Division) of CDPHE is responsible for the development of the 303(d) list and TMDLs. The most recent list is from 2010. Segments meeting the 303(d) listing criteria are included in Regulation 93, titled *Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List* (Regulation 93). Segments that need more data to evaluate whether a stream is impaired or not are also included in Regulation 93. **Table 4-2** lists those segments in the area of the Loveland WWTP that are included in Regulation 93. Segment 4c, into which the City's WWTP discharges, is not included on either the 303(d) list or on the Monitoring and Evaluation list. The location of the impaired segments is shown in **Figure 4-2.**

TABLE 4-2
303(d) Listed Segments and Monitoring and Evaluation Segments

Segment of the Big Thompson	List	Parameters	Comments
Segment 2 – Big Thompson River and tribs, RMNP to Home Supply Canal Diversion (Fish Creek below Mary's Lake)	Section 303(d)	pH	Applied to Fish Creek below Mary's Lake only
Segment 2 – Big Thompson River and tribs, RMNP to Home Supply Canal Diversion	Monitoring and Evaluation Section 303(d)	Sulfide Copper, Cadmium, Zinc, Temperature	Temporary modification for D.O., *E. coli*, NH_3, NO_3, B, Cd, Cu, Pb, Hg, Ni, Se, Ag, Zn for Wapiti Meadow Wetland until December 31, 2015[a] Temporary modification for chronic copper in mainstem of Big Thompson River until December 31, 2015
Segment 3 – Big Thompson River, Home Supply Canal Diversion to Big Barnes Ditch Diversion	Section 303(d)	Copper	
Segment 4a – Big Thompson River, Big Barnes Ditch Diversion to Greeley-Loveland Canal Diversion	Section 303(d)	Selenium	
Segment 4b – Big Thompson River, Greeley-Loveland Canal Diversion to CR 11H	Section 303(d)	Selenium	A temporary modification has been included in the standard for selenium of 5.5 µg/L. It expires December 31, 2015[b]
Segment 5 – I-25 to the South Platte River	Section 303(d)	Selenium	Temporary modification in place for ammonia until December 31, 2011.[c] A temporary modification has been included in the standard for selenium of 5.7 µg/L. It expires December 31, 2015

[a] Temporary modification applies to Wapti Meadow. The Upper Thompson Sanitation District made the request.
[b] The temporary modification is in place to provide time for sand and gravel dischargers to work with the Division to determine the most appropriate way to progress toward attainment.
[c] Temporary modifications the Division initiated as part of the implementation of the ammonia standards statewide.

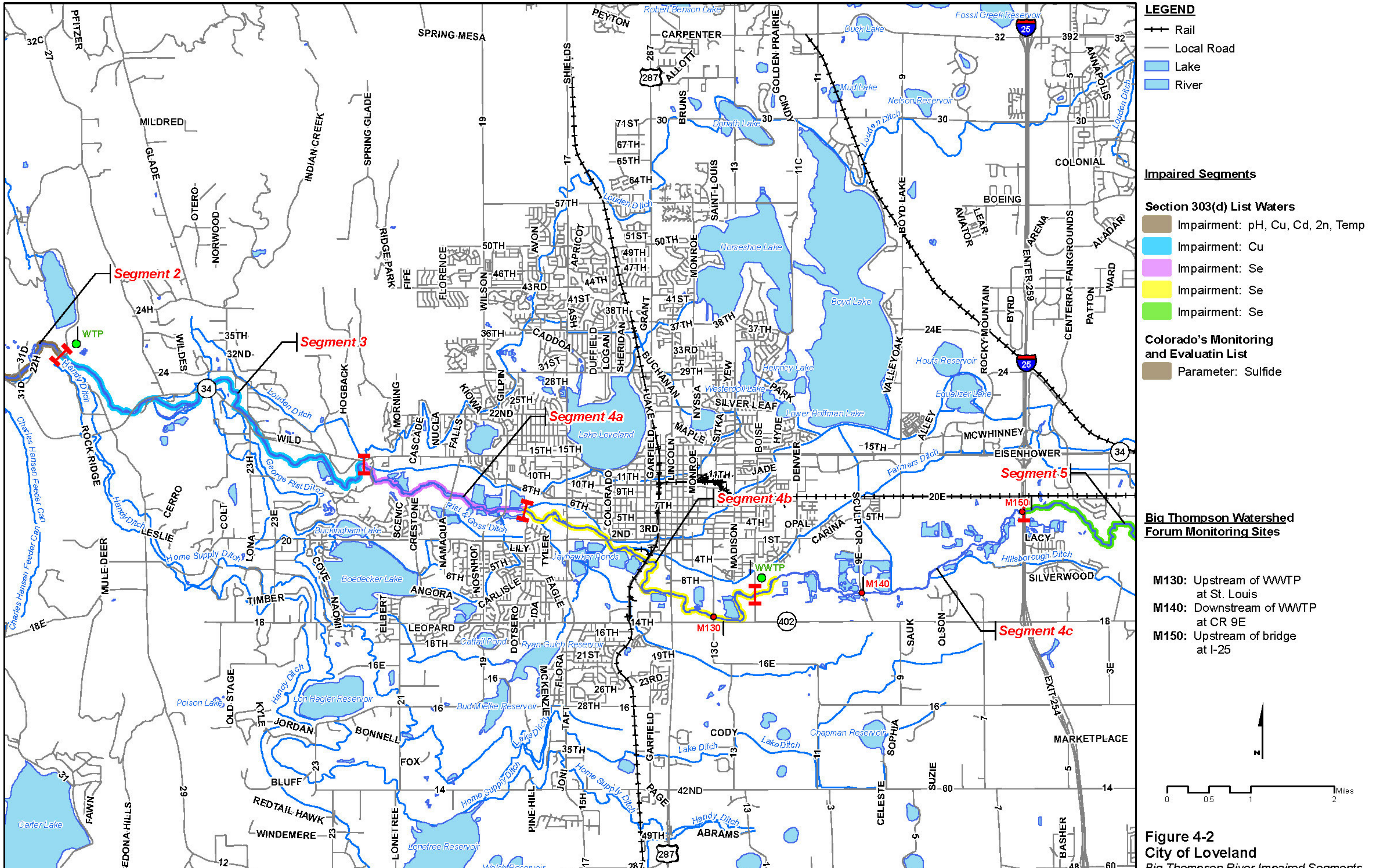


Figure 4-2
City of Loveland
Big Thompson River Impaired Segments

CH2MHILL

There have been no TMDLs developed for the Big Thompson River. The only segment in **Table 4-2** with a potential to impact the discharge from the WWTP is segment 5, which is listed for selenium. It is doubtful that the WWTP is the source of the exceedances because it discharges to an upstream segment that is not exceeding any standards. However, it is possible that the TMDL may look at upstream segments. It is also possible that even if the TMDL does not include upstream segments, discharges to the upstream segments could be limited based on assumptions made in the TMDL. Depending on the source of the selenium exceedances, a TMDL could require additional treatment at the WWTP.

4.3 Watershed and Receiving Waters

Loveland's WWTP discharges into the Big Thompson River, Segment 4c as defined by Colorado Stream Segment Classifications. Stream segments along the Big Thompson River as it flows through Loveland are shown in **Figure 4-1.** Monitoring and maintaining water quality along the Big Thompson River are priorities for the City and many other stakeholders.

The BTWF, established in 1996, is an organized effort to maintain water quality by fostering communication and cooperation with stakeholders and providing education about water quality issues impacting the watershed. Over the past decade, the forum has established a network of monitoring sites that extend from west of Estes Park to as far east as Johnstown. The result is an extensive database of information that quantifies water quality parameters in the Big Thompson watershed as they are impacted flowing from the mountains through more developed areas. In addition, on September 10, 2007, the BTWF released a draft report summarizing an analysis of water quality in the watershed, titled *Retrospective Analysis of Water Quality Data in the Big Thompson Watershed*, *2001-2006*, referred to as BTWF Draft Report 2007 (available at http://www.btwatershed.org/2008/Reports/BTWF%202007%20Data%20Analysis%20Report%20Text.pdf). Monitoring locations along the Big Thompson Watershed by the forum are identified in **Figure 4-3.**

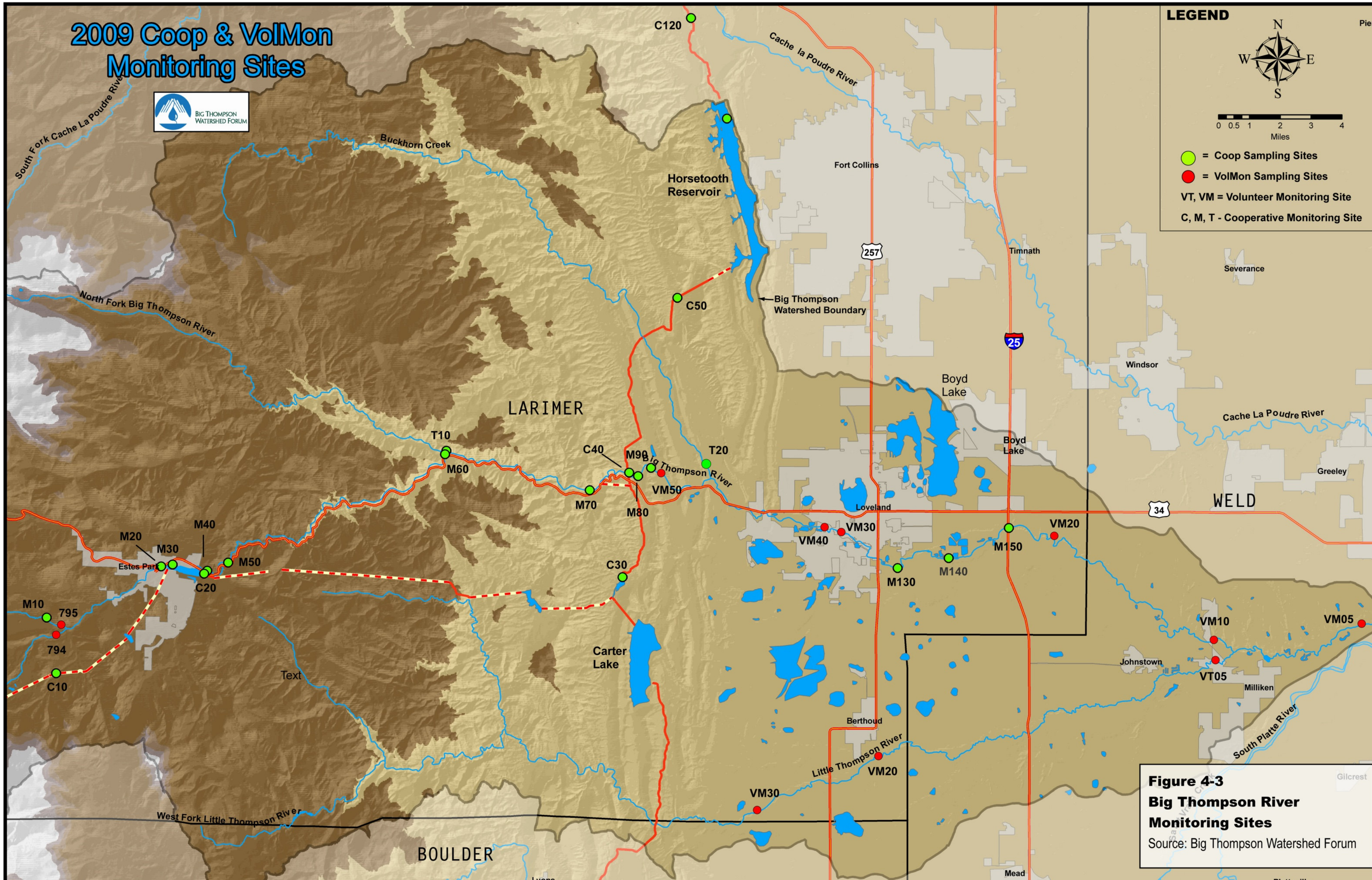


Figure 4-3
Big Thompson River Monitoring Sites
Source: Big Thompson Watershed Forum

In order to sample such a broad range of locations, the BTWF has several different types of monitoring programs with varying levels of reliability. The monitoring programs are briefly summarized here:

- Cooperative Monitoring Program involves water quality sampling and analysis by the USGS, Fort Collins Water Quality Lab, and Loveland Water Quality Lab. This is the most credible monitoring program of the BTWF due to quality control measures in place.
- Volunteer Monitoring Program sites are intended to fill in gaps in the USGS monitoring data. There are 11 sites sampled through this program. Samples are collected by volunteers trained by the BTWF and EPA, and results are analyzed by EPA and River Watch Labs.
- Small Lakes Focus Group program was developed in 1998 to assess water quality of Houts, Equalizer, and Silver Lakes located in Loveland, Colorado.
- United States Bureau of Reclamation maintains flow data at various locations along the Colorado-Big Thompson (C-BT) system and is summarized by the BTWF to correlate with sampling locations.

As mentioned above, the City of Loveland participates in the Cooperative Monitoring Program by contributing dollars (approximately $60,000 in 2008) toward the monitoring effort and by analyzing some of the water quality samples in their Water Quality Laboratory. The data gathered as part of the above efforts also benefits the City of Loveland by its use of the data to ensure that future development of the City complies with the current water quality of the Big Thompson River.

In addition, the City of Loveland financially participates cooperatively with the USGS to maintain flow monitoring at the USGS Flow Gage 06741500 (St. Louis Avenue).

The CDPHE is developing a Colorado Source Water Assessment and Protection (SWAP) program to provide consumers with information about drinking water, and provide communities with a mechanism to get involved with protecting the quality of their drinking water. The program encourages community-based protection and preventive management strategies to ensure that all public drinking water resources are kept safe from future contamination.

This program was developed as part of the 1996 Safe Drinking Water Act Amendments, which directed that each state develop a SWAP Program. Colorado developed a SWAP Program Plan outlining how the state will conduct an assessment of all its public water supplies. Because SWAP is a community-based program, involving the public in development and implementation is a very high priority. Among other things, the state of Colorado has enlisted the aid of three citizen teams to help design the SWAP Program, and has held many public meetings to provide opportunities for public comment. The City has met with the CDPHE SWAP manager and CDPHE has also completed an assessment summary report for the City of Loveland dated November 8, 2004, and posted it on the internet at http://www.ci.loveland.co.us/WP/water/Water_Quality/waterqual06.pdf.

4.4 Level of Treatment

The City of Loveland's WWTP discharges into segment 4c of the Big Thompson River basin. The use classifications for this segment are:

- Aquatic Life Class 2 Warm Water
- Agriculture
- Recreation E – May 1 to October 15
- Recreation N – October 16 to April 30

These uses translate into water quality standards as listed in **Table 4-3**. This segment was Use Protected, which means that antidegradation requirements are not applicable to the segment. However, during the 2009 Rulemaking Hearing for Regulation 38 – *Classifications and Numeric Standards for South Platte River Basin, Laramie River Basin, Republican River Basin, Smoky Hill River Basin* (Regulation 38), the Use Protection designation was removed for Segment 4c of the Big Thompson River basin and now antidegradation requirements are applicable to that segment. Fish Ingestion standards apply to the segment.

TABLE 4-3
Segment 4c Water Quality Standards

Parameter[a]	Chronic	Acute	Comments/ Temporary Modification[b]
Dissolved Oxygen, mg/L		5.0	
pH, standard units	NA	6.5 to 9.0	
E. coli, org/100 ml	5/1-10/15: 126 10/16-4/30: 630	NA	
Temperature, ºC	Mar-Nov: 24.2 Dec-Feb: 12.1	Mar-Nov: 29.0 Dec-Feb: 14.5	
Unionized Ammonia, mg/L	TVS[c, d]	TVS	In order to provide time for POTWs to come into compliance with new ammonia standards, CDPHE applied statewide temporary modifications to warm water segments with POTW discharges. Segment 4c did not receive this temporary modification. The statewide temporary modification expires on December 31, 2011.
Total Residual Chlorine, mg/L	0.011	0.019	
Free Cyanide, mg/L	NA	0.005	
Total Sulfide, mg/L	0.002	NA	
Total Boron, mg/L	0.75	NA	
Nitrite, mg/L	0.5	NA	
Nitrate, mg/L	100	NA	
Total Recoverable Arsenic, µg/L	7.6	NA	
Dissolved Arsenic, µg/L	NA	340	
Dissolved Cadmium, µg/L	TVS	TVS	
Dissolved Trivalent Chromium, µg/L	TVS	TVS	
Dissolved Hexavalent Chromium, µg/L	11	16	
Dissolved Copper, µg/L	TVS	TVS	

TABLE 4-3
Segment 4c Water Quality Standards

Parameter[a]	Chronic	Acute	Comments/ Temporary Modification[b]
Total Recoverable Iron, µg/L	1000	NA	
Dissolved Lead, µg/L	TVS	TVS	
Dissolved Manganese, µg/L	TVS	TVS	
Total Mercury, µg/L	0.01	NA	
Dissolved Nickel, µg/L	TVS	TVS	
Dissolved Selenium, µg/L	TVS	TVS	
Dissolved Silver, µg/L	TVS	TVS	
Dissolved Zinc, µg/L	TVS	TVS	

[a] Units of measure: mg/L = milligrams per liter; org = number of organisms; ml = milliliters; µg/L = micrograms per liter; NA = No standard is applicable.

[b] Temporary modification means there is a temporary modification of a water quality standard being applied to the segment. Typically, temporary modifications will have an expiration date.

[c] TVS = Table Value Standards, as referred to in Regulation 38.6 (3), are the numerical criteria set forth in the Basic Standards and Methodologies for Surface Water, Regulation 31. For metal parameters, the TVS are calculated based on hardness data for the stream. For ammonia, the TVS is calculated using pH and temperature data for the stream.

[d] The TVS standards for ammonia are the same for Segments 4c and 5. Therefore, even if the discharge were to affect the Segment 5 downstream, the limits would not change.

The Loveland WWTP discharges treated wastewater under their Colorado Discharge Permit System (CDPS) Permit, No CO-0026701. The permit was last issued in June 2002 and was due to expire in July 2007. The City submitted a renewal application, but has not yet received a new permit. During revisions of this document, CDPHE put out for public notice a draft of the new permit. The City submitted comments on the publicly noticed permit, but the final permit has not been issued. The current permit contains those limits included in **Table 4-4**. The current permit and a letter from CDPHE acknowledging receipt of the permit renewal application are included in **Appendix 8.G**. The acknowledgement letter states that the requirements of the current permit remain in effect until the new permit is issued.

TABLE 4-4
Current Permit Limitations

Parameter[a]	30-Day Average[b]	7-Day Average[c]	Daily Maximum
Flow, mgd	10.0	NA	Report
BOD_5, mg/L	30	45	NA
TSS, mg/L	30	45	NA
Fecal Coliform May 1 to October 15 October 16 to April 30	 221 2254	 442 4508	NA
pH, s.u.			6.5 – 9.0
Oil and Grease, mg/L			10
Total Ammonia as N, mg/L	Monthly limit range: 6.2 to 7.8	NA	Daily limit range: 8.2 to 20
WAD Cyanide, µg/L	NA	NA	5.5
Hexavalent Chromium, µg/L	12		17
Total Mercury, µg/L	Report	NA	NA
Potentially Dissolved Copper, µg/L	Report	NA	NA
Potentially Dissolved Selenium, µg/L	Report	NA	NA
Whole Effluent Toxicity, Chronic	NA	NA	Statistical Difference

[a] Units of measure: mg/L = milligrams per liter; org = number of organisms; ml = milliliters; µg/L = micrograms per liter; NA = No standard is applicable
[b] 30-Day Average is the sum of all samples taken in a 30-day period
[c] 7-Day Average is the sum of all samples taken in a 7-day period.

The new permit will most likely be issued in 2010 and will include additional requirements based on water quality standard changes adopted during the June 2009 Regulation 38 Rulemaking Hearing. The purpose of this Rulemaking Hearing was to take all water quality basic standards developed and apply them to specific stream segments.

4.4.1 Potential Effluent Limitations

The following sections discuss standards that were put in place based on the results of the June 2009 Regulation 38 Rulemaking Hearing and are likely to be in the next CDPS permit. This means these standards have already been adopted into both Regulation No. 31 – Basic Standards and Methodologies for Surface Water (Basic Standards) and Regulation No. 38.

New Ammonia Criteria

The 1999 Ammonia Criteria were adopted by the state as part of the 2005 review of the Basic Standards. (They are referred to as the "1999" criteria because they were published by EPA in 1999.) The 1999 Ammonia Criteria were also adopted into Regulation 38 at the same time they were adopted into the Basic Standards. However, at the time that the new standards[1] were adopted into Regulation 38, temporary modifications to the standard were also adopted for segment 4b of the Big Thompson River to allow time for the City to make improvements to their plant to meet the new standards. The state provided the temporary modification to the wrong segment in error; however, the City felt that it could meet the standards and did not need a temporary modification or compliance schedule. These new

[1] The terms "criteria" and "standard" are often used interchangeably. In general, EPA proposes "water quality criteria." When the state adopts these criteria and applies them to specific water bodies, they become water quality standards.

standards will be included in the permit renewal. **Table 4-5** lists the possible ammonia limits that could apply. These were developed in February 2007 by CH2M HILL using the Colorado AMMTOX model for determining ammonia permit limits (Technical Memorandum included in **Appendix 8.S**).

TABLE 4-5
Possible Ammonia Limits Based on the 1999 Criteria[1]

Month	30-Day Average Limits, mg/L	Daily Maximum, mg/L
January	7.6	11.0
February	7.6	12.0
March	4.7	12.0
April	5.7	15.4
May	6.2	20.2
June	6.2	24.7
July	8.3	30.6
August	6.5	34.8
September	5.5	28.8
October	6.0	25.2
November	7.0	17.9
December	7.9	16.2

It should be noted that the EPA is currently reviewing the 1999 criteria for the possible inclusion of a more sensitive species. Were these species to be included in the calculations, the resulting ammonia standards could become much more stringent. At this point, EPA does not have any schedule for the issuance of new criteria.

Temperature

In June 2009, the Water Quality Control Commission (WQCC) adopted new temperature standards in Regulation 38. The standards are based on the existence of various species in the receiving waters. The standards were evaluated and imposed on the Big Thompson River as appropriate based on the fish species present. The chronic temperature criterion is compared to the maximum weekly average temperature (MWAT) of the water body to determine whether the water quality standard is being met. The acute temperature criterion is compared to the daily maximum temperature of a water body. **Table 4-6** lists the warm water standards and the fish species they are to protect.

TABLE 4-6
Temperature Standards for Warm Water Streams

Season	Standards (degrees C)	
March through November	Tier I (WS-I) cs, Jd, od [a]	24.2(ch), 29.0 (ac)
	Tier II (WS-II) other ss [b]	27.5(ch), 28.6(ac)
	Tier III (WS-III) rs [c]	27.7 (ch), 31.3 (ac)
	Tier IV (WS-IV) other warm water species	28.7 (ch), 31.3 (ac)
December through February	Tier I (WS-I) cs, Jd, od [a]	12.1(ch), 14.5(ac)
	Tier II (WS-II) other ss [b]	13.7 (ch), 14.3 (ac)
	Tier III (WS-III) rs [c]	13.9 (ch), 15.2 (ac)
	Tier IV (WS-IV) other warm water species	14.3 (ch), 15.2 (ac)

[a] cs, Jd, od = common shiner, Johnny darter, and orangethroat darter, respectively. These temperature standards are to be applied only where any of these species are expected to occur at the site.
[b] ss = brook stickleback, central stoneroller, creek chub, longnose dace, Northern redbelly dace, finescale dace, and white sucker. These temperature standards are to be applied only where any of these species are expected to occur at the site.
[c] rs = razorback sucker. These temperature standards are to be applied only where this species is expected to occur at the site.

During the June 2009 Regulation 38 Rulemaking Hearing, the WQCC adopted the Warm Stream Temperature Tier 1 (WS-I) standards for Segment 4c of the Big Thompson River. This is the coolest of the warm stream tiers and it is based on the common shiner, Johnny darter, or orangethroat darter fish species being present or having the potential to be present. As indicated in the Colorado State University Biosurvey summarized below, the Johnny darter was found to be present in the vicinity of the WWTF discharge.

These standards could be applicable during the City's next permit renewal if there is sufficient data to develop the limit. Most likely, the new permit will require effluent monitoring. Ambient monitoring will also be necessary to develop the permit limit. The chronic temperature limit will be a 7-day limit, and the acute limit will be a daily maximum limit (based on 2-hour averages).

The applicable standards are:

- March through November: chronic standard (MWAT) of 24.2 degrees C with an acute (daily max) of 29.0 degrees C
- December through February: chronic standard (MWAT) of 12.1 degrees C and an acute (daily max) and of 14.5 degrees C.

Colorado State University has been performing an ongoing biosurvey of the Big Thompson River that includes both benthic and fish surveys. Recent results of the fish surveys are summarized in this plan as they relate to the new temperature standards being implemented. The fish survey included collecting data on the number of fish species present in the Big Thompson above the WWTP, at the plant's outfall, and below the plant in 2003, 2004, 2006, and 2008[2]. They found the presence of central stonerollers, Johnny darters, longnose daces, and white suckers, as well as a significant number of brown trout. These data are summarized in **Figures 4-4**, **4-5**, **4-6,** and **4-7**. These fish species are significant

[2] It is currently unknown why there are no sampling results for 2005 or 2007. Additional data may exist, but were not available at the time of the development of this document.

because their presence dictates more stringent temperature standards than the general "warm water standards." The presence of Johnny darter indicates that the Warm Stream Temperature Tier 1 (WS-I) standards for Segment 4c of the Big Thompson River is warranted.

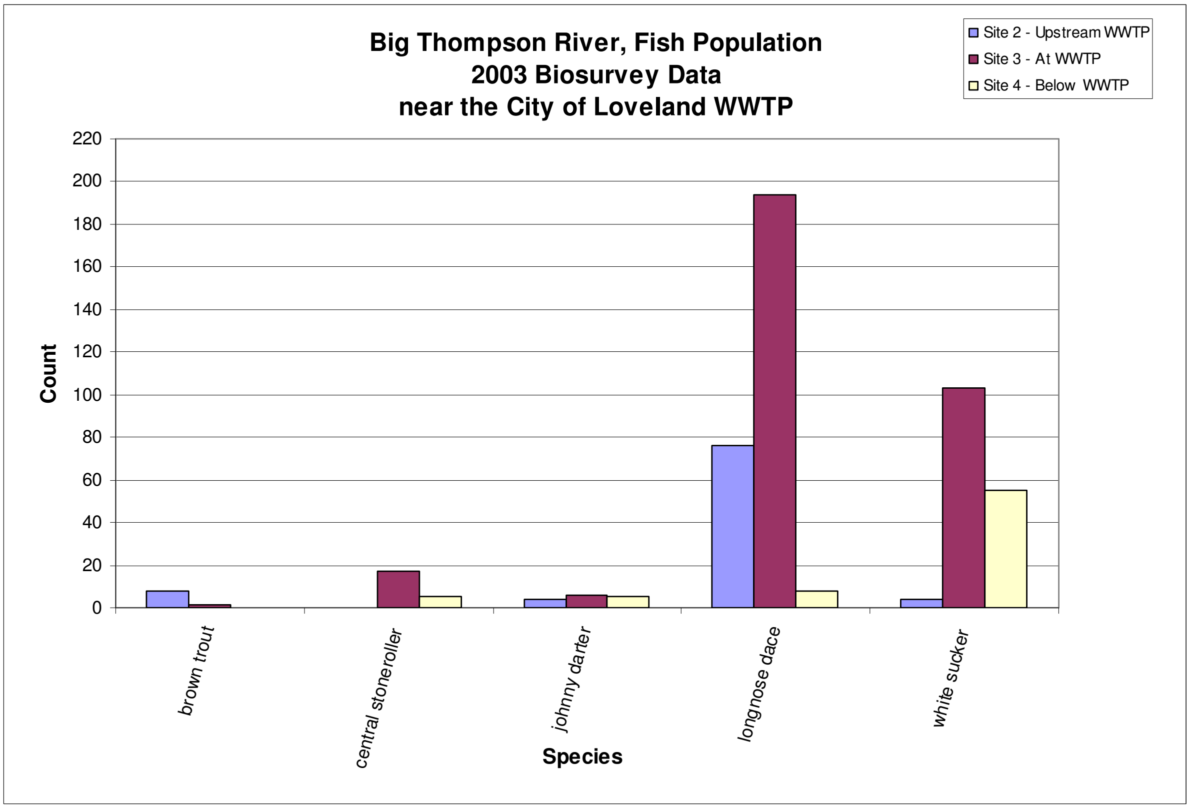


FIGURE 4-4
2003 Biosurvey Data

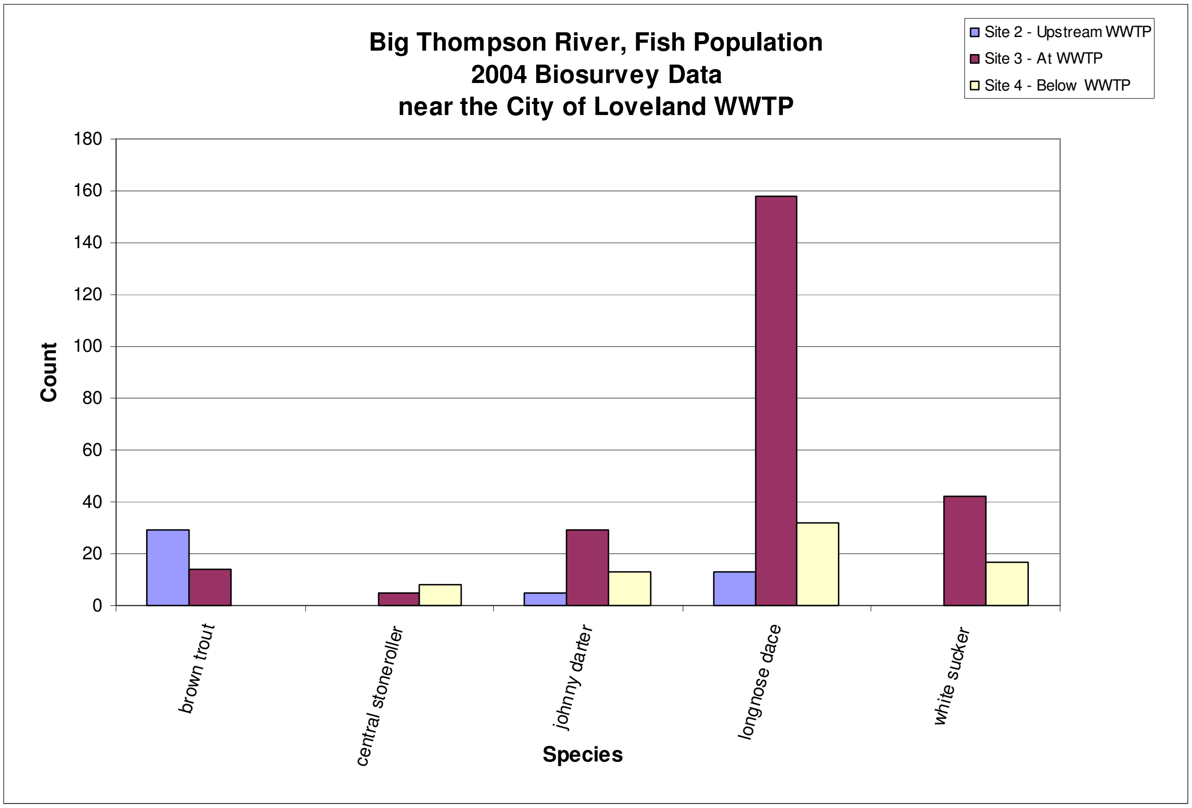


FIGURE 4-5
2004 Biosurvey Data

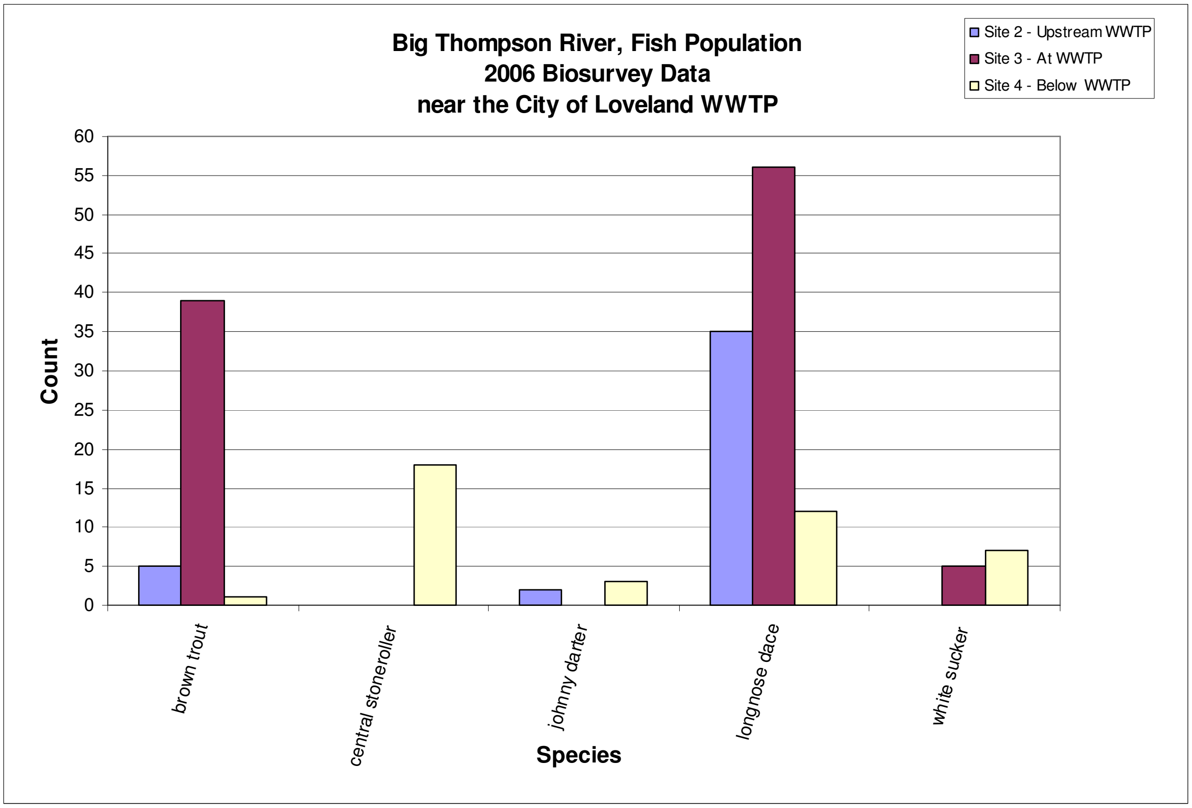


FIGURE 4-6
2006 Biosurvey Data

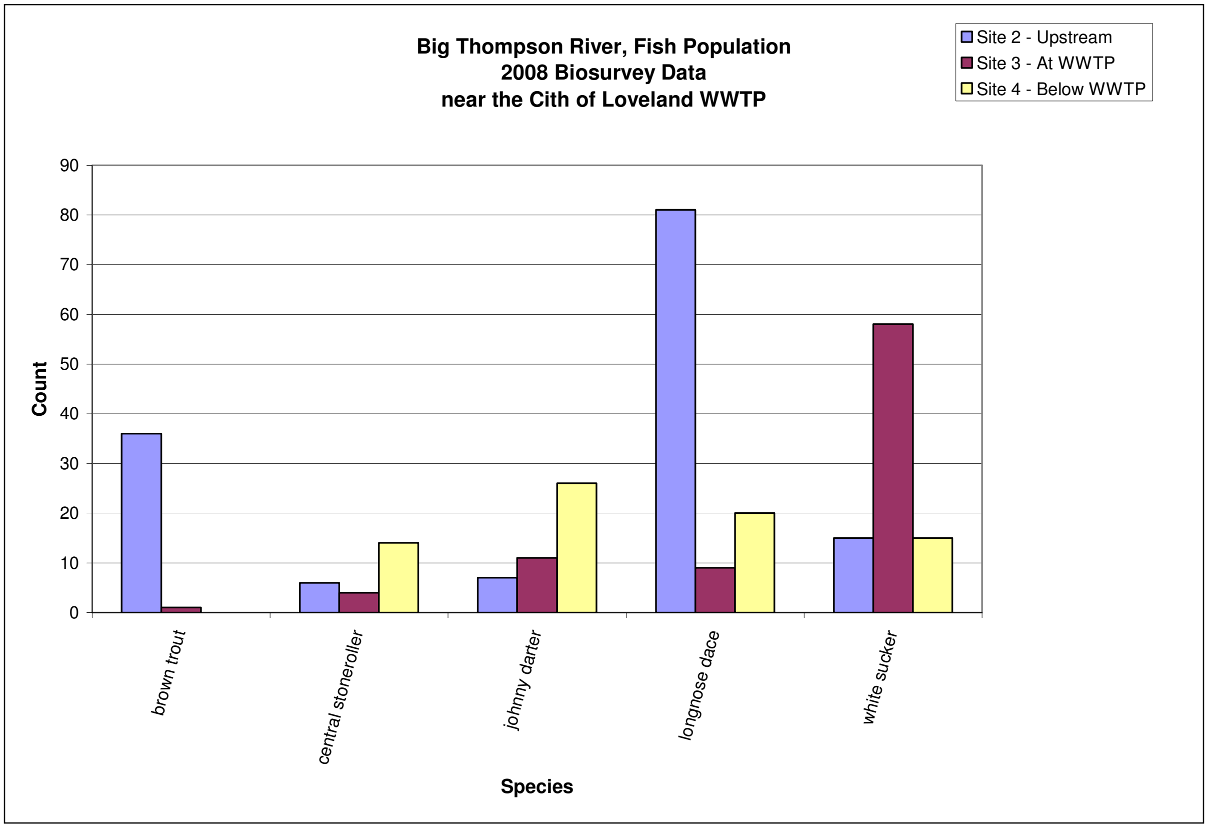


FIGURE 4-7
2008 Biosurvey Data

Beginning in 2008, the City installed temperature probes upstream and downstream of the WWTP effluent, in addition to monitoring the effluent directly. The new probes measure and record temperature every 30 minutes. Temperature results from these instruments are presented in **Figures 4-8 and 4-9** for data available from 2008. At times, the instruments were offline, and data were not collected.

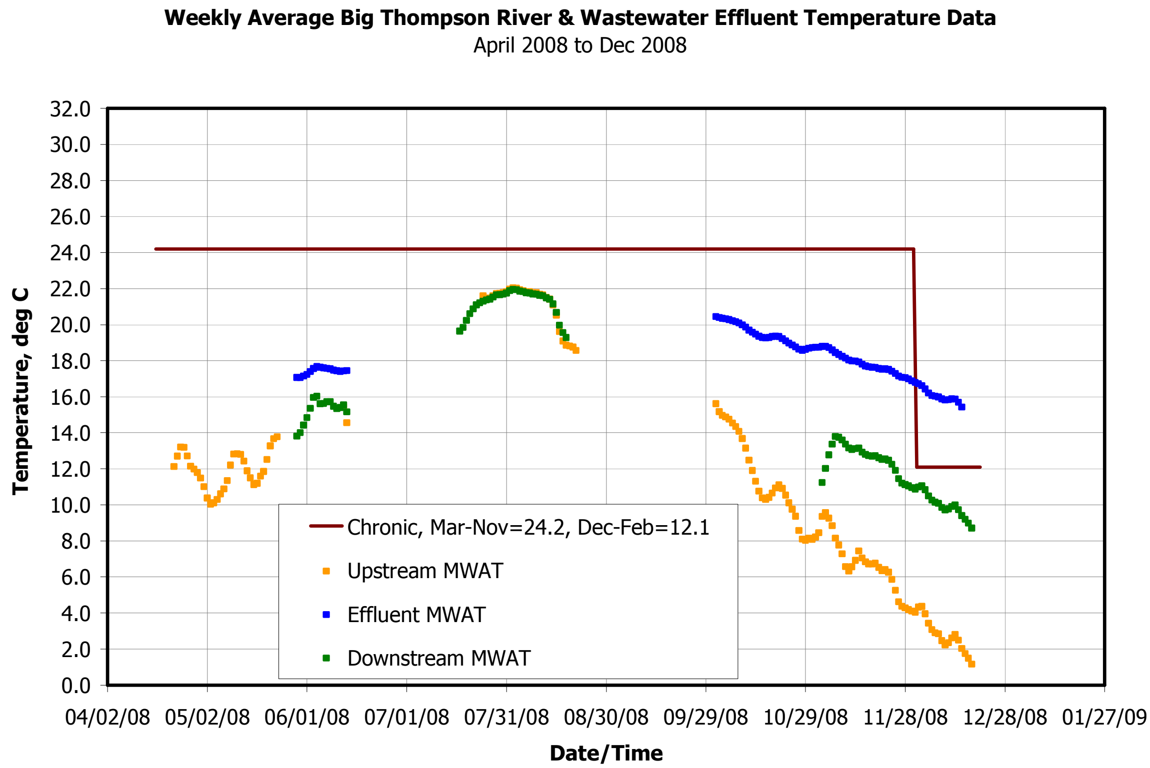


FIGURE 4-8
2008 Weekly Average Temperature Data

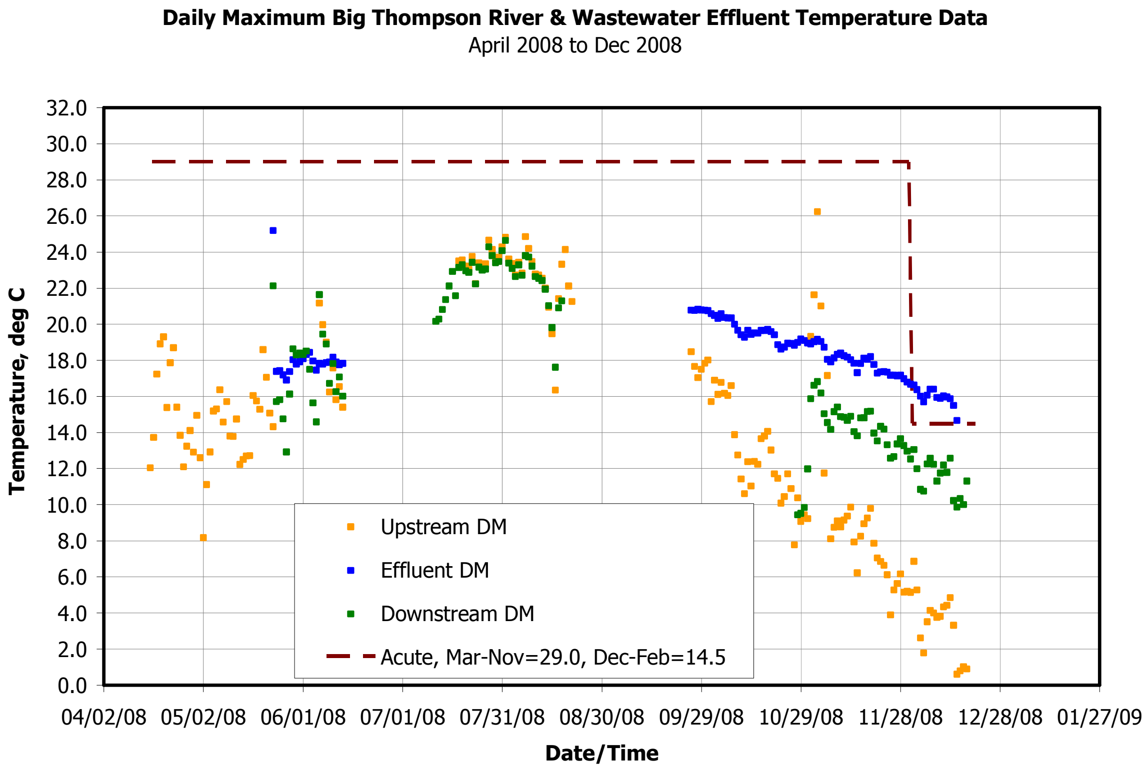


FIGURE 4-9
2008 Daily Maximum Temperature Data

As indicated in **Figures 4-8 and 4-9**, the downstream temperature does not exceed the chronic or acute standards. However, the effluent temperature does exceed both the chronic and acute standards during the winter season. It is important to note that this is a comparison of the effluent temperature to the in-stream standard and it is not a comparison to an effluent limitation. It will depend on the amount of dilution and the upstream temperature, to determine if compliance with temperature effluent limitations will be an issue for the facility.

Metals

As a result of the changes to Regulation 38 during the June 2009 Rulemaking Hearing, there will likely be some changes in the effluent limits for several metals during the next permit renewal. These include cadmium, arsenic, and zinc. For cadmium and zinc, the equations included in Regulation 38 to protect aquatic life uses were modified based on more recent studies or data. For arsenic, the applicable chronic standard changed from a total recoverable standard of 100 µg/L to a total recoverable standard of 7.6 µg/L. Additionally, an acute, dissolved arsenic standard of 340 µg/L was also applied. The new chronic arsenic standard is a human health standard based on fish ingestion and the acute arsenic standard is to protect aquatic life. Using data from the last permit renewal, estimates of the future limits for cadmium, zinc and arsenic are shown in **Table 4-7**. The current permit does not include any limits for these parameters.

TABLE 4-7
Changes in the Cadmium, Zinc and Arsenic Standards and Effects of Changes

	Dissolved Cadmium, µg/L	Dissolved Zinc, µg/L	Arsenic[a] µg/L
Old 30-Day Average Standard [b]	6.2	382	100
New 30-Day Average Standard	1	405	7.6
Old 30-Day Average Effluent Limit	7.2	446	113
New 30-Day Average Effluent Limit	1.2	472	8.9
Old Daily Maximum Standard [a]	19	379	NA
New Daily Maximum Standard	9	467	340
Old Daily Maximum Effluent Limit	21	423	NA
New Daily Maximum Effluent Limit	9.9	521	380

[a] The 30-day average standard and effluent limit are total recoverable, and the daily maximum standard and effluent limit are dissolved.

[b] Effluent limits based on chronic water quality standards are generally applied as 30 Day Averages. Effluent limits based on acute water quality standard are generally applied in permits as Daily Maximums.

Table 4-7 suggests that while the zinc limits are becoming less stringent, the cadmium limits will be much more stringent. It is possible that a cadmium limit may be included in the future. Based on data from the City, the highest cadmium level measured was 1.9 µg/L, which would comply with the potential acute or daily maximum effluent limit. This data point was measured in September 2004, and all other analyses have been reported as less than detection. Prior to December 2004, the City was using a method with a detection level of 1 µg/L. However, since December 2004 and including the most recent data, the City has been using an analytical method with a detection limit of 10 µg/L. Because this is higher than the potential effluent limit it is not possible to determine whether the new cadmium limit can be met based on the current data. The detection limit for arsenic is 50 µg/L, which is also above the new chronic limit so it cannot be determined if the new chronic limit can be met. All arsenic data were below detect.

4.4.2 Selenium

Selenium has been found in many different stream segments throughout Colorado. Its source is generally the shales. As waters percolate through the ground, they leach out the selenium. In some locations, selenium-laden groundwater finds its way to a water body. The Table Value Standards for selenium are 18.4 µg/L for acute and 4.6 µg/L for chronic. Where these limits cannot be met, a temporary modification has been developed, such as for segments 4b and 5 of the Big Thompson River.

The EPA is currently developing national selenium criteria. A proposed new standard was published on December 17, 2004. It was based on fish tissue concentrations. The tissue-based value of 7.9 ug/kg was proposed. There is much controversy over the published draft criteria, with some entities, such as the U.S. Fish and Wildlife Service, suggesting more stringent criteria. There is also the concern of naturally occurring selenium in water bodies. Thus, EPA is re-examining the draft criteria. At this time, it is unknown when the new criteria will be finalized; however, it is expected that it could be as soon as within the next 6 months to a year. The Division is not planning to propose a new standard before EPA finalizes its criteria. The next Basic Standards Rulemaking Hearing will not be until 2016.

4.4.3 *E. coli*

The City currently has a fecal coliform limit to ensure that the receiving water is protective for primary contact. At the time of the drafting of the permit, Regulation 38 allowed dischargers to make a decision as to whether to incorporate fecal coliform or *E. coli* limits in a permit. In 2009, the WQCC revised the Recreational Use Classification and removed fecal coliform as an indicator organism for recreation uses from Regulation 38. As a result, the Recreation Use Classification for segment 4c of the Big Thompson River was changed from the previous classifications of Recreation 1a and Recreation 2 to Recreation E and Recreation N, respectively. Recreation E is applicable from May 1 to October 15 and Recreation N is applicable from October 16 to April 30. Definitions of Recreation E and Recreation N are provided below. These changes in the Recreation Use Classification impact the *E. coli* standards that is applicable to Segment 4c of the Big Thompson River.

Class E – Existing Primary Contact Use: These surface waters are used for primary contact recreation or have been used for such activities since November 28, 1975.

Class N – Not Primary Contact Use: These surface waters are not suitable or intended to become suitable for primary contact recreation uses. This classification shall be applied only where a use attainability analysis demonstrates that there is not a reasonable likelihood that primary contact uses will occur in the water segment(s) in question within the next 20-year period.

As a result of these regulatory changes, an *E. coli* limit will apply in the next permit. The *E. coli* standard for the Recreation E classification from May 1 to October 15 is 126/100 ml while for the Recreation N classification from October 16 to April 30 the *E. coli* standard is 630/100 ml. Based on the data in **Table 4-1**, which show an average *E. coli* of 122 cfu/ 100 mL, it is likely that the limit will be close to the standard.

In addition, EPA is currently in the process of evaluation of a potential change in indicator species than *E. coli* or fecal coliform. On October 10, 2000, the Beaches Environmental Assessment and Coastal Health Act (BEACH Act) was signed into law. The BEACH Act requires EPA to conduct studies associated with pathogens and human health and to publish new or revised recreational water quality criteria for pathogens and pathogen indicators based on those studies. EPA has conducted a significant amount of research since the BEACH Act was enacted and is now in the process of defining what additional studies EPA will conduct in order to issue new or revised CWA criteria by 2012. If new criteria are developed, these would need to first be included in the Basic Standards in 2016, and would then be applicable to the Regulation 38 in 2020. They would be included in the City's permit renewal after this date.

4.4.4 Antidegradation Regulations

As part of the 2000 Basic Standard changes, the WQCC modified the antidegradation requirements. Antidegradation is a program to maintain existing water quality of a stream. Prior to the 2009 Regulation 38 Rulemaking Hearing, the Big Thompson was designated

"Use Protected" and antidegradation did not apply. As a result of the 2009 Regulation 38 Rulemaking Hearing, the use-protected designation for Segment 4c of the Big Thompson River was removed and the segment will be considered undesignated (also referred to as reviewable). This means that the segment will now be subject to antidegradation review provisions set forth in the *Basic Standards and Methodologies for Surface Waters* (31.8(3)). These provisions allow for antidegradation-based effluent limits (ADBEL) to be included in discharge permits. This has the potential to significantly impact the City of Loveland WWTP's discharge permit.

ADBELs can be much lower than the water quality-based effluent limits (WQBEL) that are currently in the City's discharge permit for parameters such as ammonia and metals. The ADBELs are included in permits as a 2-year rolling average and are in addition to the acute and chronic WQBELs. ADBELs are calculated based on the baseline water quality of the receiving water as of September 30, 2000, and allow for no more than a 15 percent increase above this baseline.

An option that the permittee has is to accept a non-impact limit (NIL) instead of having ADBELs. NILs are based on the discharge water quality as of September 30, 2000. If there was a chronic WQBEL at that time, then the NIL would be equal to that chronic WQBEL modified based on changes in design flow. If there was not a WQBEL, then the NIL is based on the maximum concentration that has been discharged in the 5 years prior to September 30, 2000, modified for any changes in design flow.

The Division's current practice is to include NILs in all permits unless otherwise requested. They adopted this practice because it is faster and easier to calculate NILs than ADBELs, and dischargers typically prefer NILs because they are less stringent. They will only calculate ADBELs at the permittee's request.

The Division's rationale for changing the antidegradation designation has to do with the presumptive basis for applying the Use Protected designation to segments with a Class 2 Aquatic Life Warm Water Use Classification. In 2005, the WQCC determined that this presumption could be overcome if water quality data show that the water is of high quality. Water quality data collected by the Division show that the water quality in Segment 4c is better than the table value standards for the key parameters identified in the regulation, and supports the removal of the Use Protected designation. Of the 12 key parameters, the data show that no standards were exceeded. **Table 4-8** below is a summary of the data the Division presented.

TABLE 4-8
Water Quality Data – Segment 4c of the Middle Big Thompson River

Parameter	Table Value Standard	WQCD/USGS Data All Sites (2003-2008)	Number of Samples
pH, s.u.	6.5-9.0	7.8-8.39	75
D.O., mg/L	5	7.4	75
E. coli, #/100 mL	126	14	5
Cd-D, µg/L	1.07	0.00	5
Cu-D, µg/L	25.55	5.42	74
Pb-D, µg/L	9.29	0.51	74
Mn-D, µg/L	2482.4	62.1	74
Se-D, µg/L	4.60	3.14	12
Ag-D, µg/L	2.64	0.00	74
Zn-D, µg/L	353.8	51.0	5
NH3, mg/L	TVS	0.102	75
NO3, mg/L	100	9.540	5

4.4.5 Future Changes to Effluent Requirements

Regulations are constantly changing, and EPA issues or proposes new regulations on an ongoing basis. However, only a small number of these regulations impact the water quality requirements for WWTPs and or the operation of the collection system. There are several regulations that have a potential to impact the City's permit limits in the future, likely beyond the next permit renewal. The most recent changes include changes in the aquatic life classification, and criteria to control nutrients and endocrine disruptors may be developed in the near future.

Nutrient Criteria

The first of the EPA nutrient criteria based on ecoregions was published in January 2001. However, the criteria for Ecoregion V, which includes the South Platte River Basin, was not published until December 2001. This document established criteria values for Ecoregion V and Sub-Ecoregion 25. The criteria were set equal to the 25th percentile of the data reviewed by EPA. The EPA-suggested criteria are listed in **Table 4-9**.

TABLE 4-9
EPA Published Reference Conditions/Nutrient Criteria for Ecoregion V

Parameter	Total Ecoregion V[a]	Range of Values for Ecoregion V	Sub Ecoregion 25[a, b]
Total Phosphorus, µg/L	67	41 – 90	60
Total Nitrogen, mg/L	0.88	0.84 – 1.07	1.07
Chlorophyll *a*, µg/L	3	2.51 – 3.2	3
Turbidity, FTU	7.83	3 – 9.01	4.36

[a] The values are equal to the 25 percent of the data reviewed by EPA.

[b] Values from Table 3a Reference Conditions for level III ecoregion 40, from "Ambient Water Quality Criteria Recommendations, Information Supporting the Development of State and Tribal Nutrient Criteria for Rivers and Streams in Nutrient Ecoregion V."

In addition to publishing the nutrient criteria, EPA provided guidance to states on its expectations for the adoption of nutrient criteria in a memorandum titled, "Development and Adoption of Nutrient Criteria into Water Quality Standards," dated November 14, 2001. Under this guidance, the state is required to either adopt the EPA criteria or develop its own criteria. EPA requested that each state develop a Nutrient Criteria Plan that outlines the specific strategy, milestones, and schedule for developing and adopting nutrient criteria, taking into consideration specific situations and needs. The Division submitted a plan to EPA for the development of nutrient criteria. The schedule calls for such standards to be proposed as part of the Basic Standards. Depending on how the standards are adopted, it could be incorporated into Regulation 38 during the 2015 Rulemaking Hearing. It is likely that the standards established by the WQCC will be different than those established in **Table 4-9**. The values in the table should be viewed as conservative values.

The Division has been actively working on the development of standards. They presented their initial draft numeric standards for rivers and streams in February 2010; however, these numbers are expected to be refined The approach the Division is pursuing for developing nutrient standards for rivers and streams is based on their efforts for the Refined Aquatic Life Use Classification (see description for New Aquatic Life Criteria below). The objective is to link aquatic life use support with nutrient levels using predictive index models.

The Division is proposing to advance nutrient criteria to the WQCC for adoption into the Basic Standards in 2011. This will be a separate hearing from the 2010 Basic Standards Rulemaking Hearing. As a result of deferring the nutrient criteria to 2011, the individual Basin Hearings (including the next Regulation 38 Rulemaking Hearing) will be pushed back 1 year. Thus, the hearing for Regulation 38 will be in 2015 instead of 2014, at which time the nutrient criteria will be adopted into segments of the Big Thompson River.

The Division's current draft of the numeric standards for rivers and streams are listed in **Table 4-10**.

TABLE 4-10
Division's First Draft of Proposed Nutrient Criteria for Rivers and Streams

Water Body	Total Phosphorus, µg/L	Total Nitrogen, µg/L
Cold Water Streams	90	824
Warm Water Streams	135	1316

It should be noted that the criteria in **Table 4-10** have not been proposed and are subject to change. In addition, the total nitrogen values are below detection limits at this point in time.

For the purposes of planning future WWTP capital needs, assumptions have been made for future nutrient permit limits. These assumptions are based on the EPA nutrient criteria as noted above, CH2M HILL's discussions and involvement with CDPHE in various rulemaking forums, and regulatory developments in other states across the country. Future permit limit assumptions for this utility plan are presented in **Table 4-11** by permit year.

TABLE 4-11
Future Permit Limit Assumptions

Permit Year	Total Nitrogen	Total Phosphorus
2014	10 mg/L	1.5 mg/L
2019	10 mg/L	0.5 mg/L
2024	3 mg/L	0.075 mg/L

Endocrine Disrupters and Other Emerging Contaminants

Synthetic compounds that tend to interfere with the human body's endocrine system (termed "endocrine disrupters") have the potential of being regulated at extremely low levels in the future. Endocrine disruptors are typically organic compounds. Examples of some organic compounds that are endocrine disruptors include phthalates, organochlorine pesticides such as atrazine, alkyphenols that are found industrial and domestic detergents, and polychlorinated biphenyls (PCB). In addition, pharmaceuticals are also being found in the discharges from WWTPs. Recent studies are suggesting that there are in-stream impacts to fish from these substances. EPA is currently studying these compounds and their affect on aquatic life. However, it is anticipated that regulation of the compounds could be years away. It is unclear at this point if any of these compounds would be found in the Big Thompson River or in the discharge from the City of Loveland's WWTP, though the Northern Colorado Water Conservancy District has begun a sampling program along the Big Thompson River. In the interim, several communities across the country have taken measures to reduce the number of pharmaceuticals that enter the WWTP from their disposal into the sewer system. This has included public education brochures and working with pharmacies and others to develop a process for their disposal. At the time of this writing, EPA and the Drug Enforcement Agency are working on streamlining regulations on pharmaceutical disposal.

New Aquatic Life Criteria

The Water Quality Control Division is in the process of revising the aquatic life classifications to better reflect uses and types of aquatic life. As part of this process, the Division is developing expected biological conditions for the various classifications. To evaluate the expected condition and biological impairment, multimetric and multivariate predictive indexes are being developed for the bioassessment of streams. This process may eventually lead to the development of biocriteria. In the future, therefore, it is possible that the City, in addition to having numeric effluent limits, may also need to evaluate the status of aquatic life.

4.4.6 Sanitary Sewer Overflow Regulations

EPA has long been working on the development of Sanitary Sewer Overflow (SSO) Regulations. EPA estimates that between 23,000 and 75,000 SSO events occur per year in the United States (excluding basement backups). Overflows of untreated wastewater may present serious risks of human exposure when released to certain areas, such as streets, private property, basements, and receiving waters used for drinking water, fishing and shell fishing, or contact recreation.

SSO Regulations were set to be published in the *Federal Register* in January 2000; however, they were withdrawn by the Bush Administration. No regulations have since been published. Although, just recently EPA took initial steps to revisit the SSO Regulations.

Over the last 10 years, states and EPA Regions have taken it upon themselves to address these issues on a city-by-city basis, with some Regions being more proactive than others. For the most part, EPA and the states have required the development and implementation of SSO programs, particularly Capacity, Management, Operations and Maintenance (CMOM) programs through the use of enforcement actions. This has resulted in inconsistent implementation of the program on a nation-wide basis.

There has been a push by communities for EPA to publish regulations that address SSOs to ensure that programs are consistent. It is also hoped that a regulation would clarify those instances where an overflow is beyond the ability of a community to control. The State of Colorado, like other states in EPA Region VIII, has used enforcement actions to require such programs. This could be the result of either SSOs or facility inspections.

On March 1, 2008, CDPHE issued Policy No. WQE-10 titled "Guidance for Reporting Spills under the Colorado Water Control Act and Colorado Discharge Permits." WQE-10 provides guidance on applicable Colorado reporting requirements that pertains to spills or discharges that may cause pollution of State waters. This policy applies to SSOs, but generally not to basement backups of sanitary sewer lines. The City of Loveland has reduced the frequency of basement backups by increasing the frequency of jetting the entire collection system to 2 years.

4.5 Industrial Pretreatment Program

Under the Clean Water Act of 1977, the EPA was required to develop regulations controlling industrial pollutants that may adversely affect publicly owned treatment works (POTW). EPA developed General Pretreatment Regulations in 1978 that require POTWs with a total design flow of greater than 5 mgd to develop pretreatment programs. The City of

Loveland's Pretreatment Program was approved by the EPA on September 9, 1985. Subsequent revisions are submitted to EPA for approval. The most recent version of the City's pretreatment regulations is found in the City's Municipal Code, Chapter 13.10 and can be found on the City's website at www.c2.loveland.co.us/cityclerks/municipalcode/title13.pdf.

The City's Pretreatment Program includes requirements for industrial users of the City's sewer system. All industrial users must provide wastewater treatment as necessary to comply with the Code. The objectives of the City's Pretreatment Program are as follows:

- Protect City employees from potentially harmful discharges.
- Protect the City of Loveland's sewer system from non-domestic pollutants that could interfere with the collection system or WWTP processes.
- Protect the Big Thompson River from non-domestic pollutants that could pass through the WWTP untreated, and ensure that the plant's biosolids can be used as a soil conditioner and fertilizer.

Industrial users classified as a significant industrial user (SIU) are required to obtain a wastewater discharge permit. A discharge permit contains specific conditions, sampling requirements, and pollutant limitations that the SIU must comply with in order to discharge their wastewater to the POTW.

The term Significant Industrial User as defined by the EPA means:

- All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR chapter I, subchapter N;
- Any other industrial user that discharges an average of 25,000 gallons per day or more of process wastewater; contributes a process waste stream which makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the treatment plant; or
- Is designated as a SIU by the City on the basis that the industrial user has a reasonable potential for adversely affecting the operation of the City's wastewater treatment plant.

Currently, the City has two SIUs: Super Vacuum Manufacturing Company and Woodward Governor Company. The Pretreatment Program uses other control mechanisms to regulate the wastewater discharged from facilities not classified as SIU. The Pretreatment Program also maintains a high-strength sewer surcharge program. There are currently 292 customers that pay a surcharge as part of the program.

There has not been much recent discussion from EPA on future pretreatment regulations. There are no current indications that EPA will be instituting any new pretreatment programs in the foreseeable future.

4.6 Air Quality Permit

The Colorado Air Quality Control Commission (CAQCC), in Regulation 3, 5 CCR 1001-5 requires, unless specifically exempted, that an entity that owns or operates a stationary source from which air pollutants are to be emitted file an Air Pollution Emission Notice (APEN) and obtain a construction permit. The City's WWTP is required to follow the two-step process per CAQCC. The first step is to report anticipated air emissions through the submission of an APEN for each emission source. The second step, if necessary, is to submit an application for a construction permit for existing and new air emission sources.

Previously, the plant was below the threshold limits that require construction permits for air emission sources located at the facility. However, in late 2007 the area in which the plant is located was designated by EPA to be a non-attainment area for the 8-hour ozone national ambient air quality standard (NAAQS), and emission levels of NOx and VOCs that would trigger the need for a construction permit were reduced to 5 tons per year (tpy) and 2 tpy, for NOx and VOC, respectively. As a result, the estimated emissions from the plant, flare, and engine generators now exceed the new construction permit threshold limits for VOCs and for NOx. A construction permit for the plant was applied for in early 2009.

The following is a list of equipment at the WWTP that are affected by the APEN process and the current status of each.

- **Process Boilers –** The process boilers for the anaerobic digesters are categorically APEN exempt per Regulation 3, Part A, Section II.D.1.k. Since they are APEN exempt, they are also permit exempt.
- **Emergency Generators –** The plant currently has two emergency generators. The generators are APEN and permit-required sources. APENs for both the older generator (600 kW) and the newer generator (1,000 kW) were submitted to CDPHE in early 2009. A construction permit application for the new generator was submitted in early 2009. Note that the generators' secondary purpose is for electric demand peak shaving. The City is expecting to attain "synthetic user" status for both emergency generators which allows for the limited use of the generators for purposes other than emergency power (e.g., peak shaving), but may not result in an air permit.
- **Anaerobic Digester Flare –** This is an APEN required source. The City submitted a new APEN in 2007. With the new permitting thresholds, this source will also require a construction permit. A permit application for the flare was submitted in early 2009.
- **Wastewater Treatment –** The WWTP itself is also an APEN required source, however it is categorically permit exempt under Regulation No. 3, Part B, Section II.D.1.d.

In late 2008, the 8-hour ozone standard was lowered from 0.08 micrograms per cubic meter ($\mu g/m^3$) to 0.075 $\mu g/m^3$. The current non-attainment area will be officially designated as non-attainment for this new standard as well. This may result in tighter controls and permitting requirements in the future for emission sources located in the non-attainment area.

In addition, CDPHE has been mandated through an executive order written by Governor Bill Ritter to develop greenhouse gas reporting regulations for Colorado by the end of 2010. The requirements and affected facilities from these future regulations are not known at this time; however, they may require the City to report greenhouse gas emissions associated with its operations as early as 2012 for the 2011 calendar year.

Other federal regulations concerning greenhouse gas reporting and permitting are assumed to be put in place in the near future. Again, the nature of those regulations is not completely known at this point, but the City could potentially be affected by these regulations.

4.7 Stormwater Management Plan

Colorado Regulation 61.3(2)(e)(iii)(I) requires permits for stormwater discharges associated with industrial activity, of which wastewater treatment facilities are considered part. In accordance with the WWTP's general discharge permit for stormwater, the City has developed a Stormwater Management Plan. The current City of Loveland WWTP Stormwater Management Plan and stormwater permit is shown in **Appendix 8.M**. The last update of the plan was in January 2008. The Plan requires semi-annual City inspections of the stormwater-related facilities, but no routine monitoring of stormwater discharge is currently required. **Figure 4-10** shows the WWTP site with stormwater drainage features.

Stormwater from the plant site is discharged to the Big Thompson River. There are no detention ponds on the site. The Plan includes source specific controls to prevent pollutants from entering stormwater. In addition, the plant staff practices control strategies for housekeeping and preventative maintenance to limit the potential for spills to enter stormwater. Spill response and notification procedures are also detailed in the Plan.

Recent EPA stormwater regulations have focused on the management of runoff from construction sites. Future regulatory focus may stay on construction site issues including possible effluent guidelines. It is anticipated that as EPA and the State of Colorado begin the development of bacteria based TMDLs (either fecal coliform or *E. coli*) that additional focus will be put on the stormwater program as a tool for reducing levels. In addition, some states have started to put language into stormwater permits that suggest water quality based limits may be imposed should best management practices be shown not to be sufficient to achieve in-stream standards. In Colorado, it is anticipated that such a move is not likely to occur for the next 10 years.

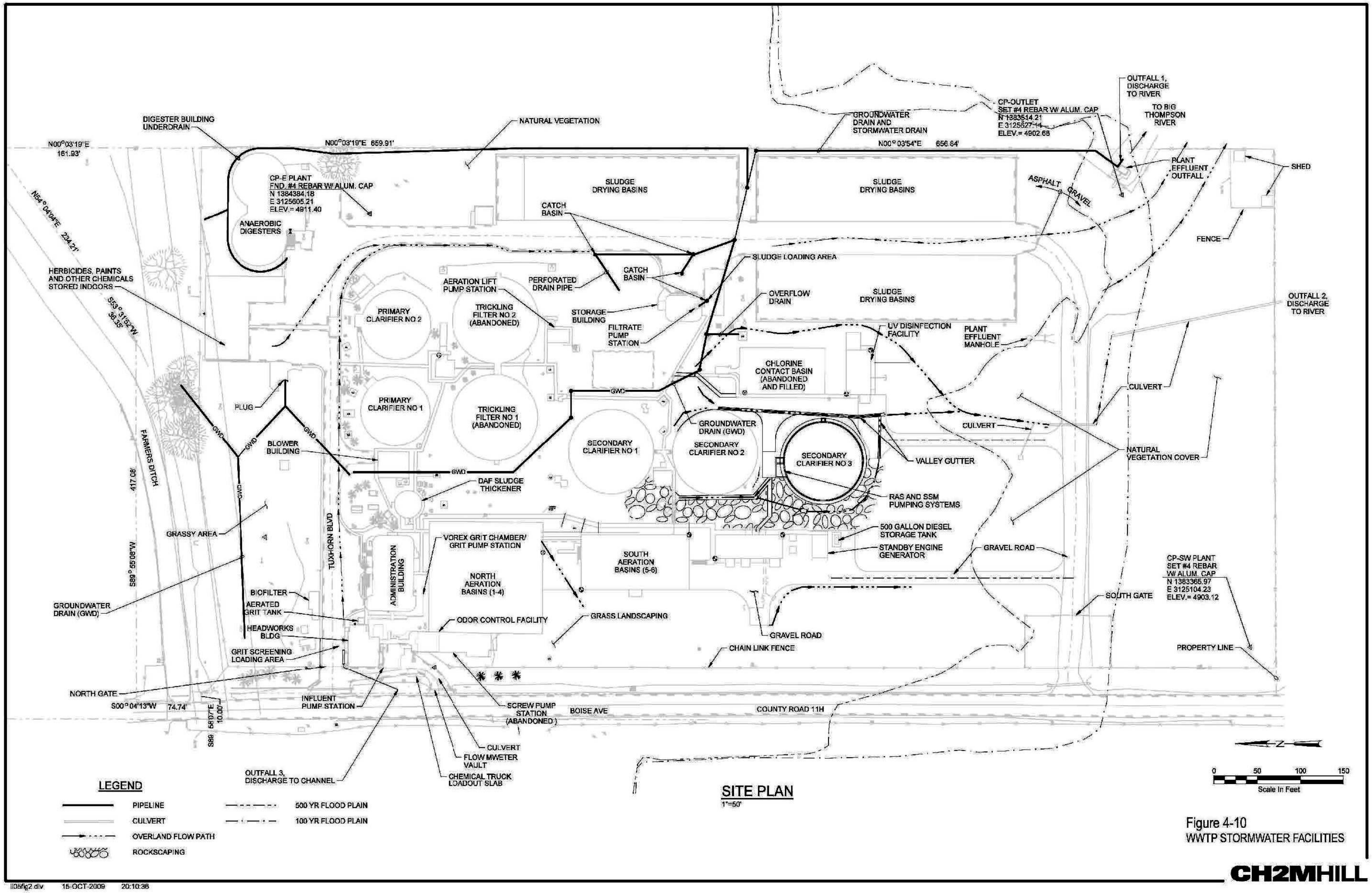


Figure 4-10
WWTP STORMWATER FACILITIES

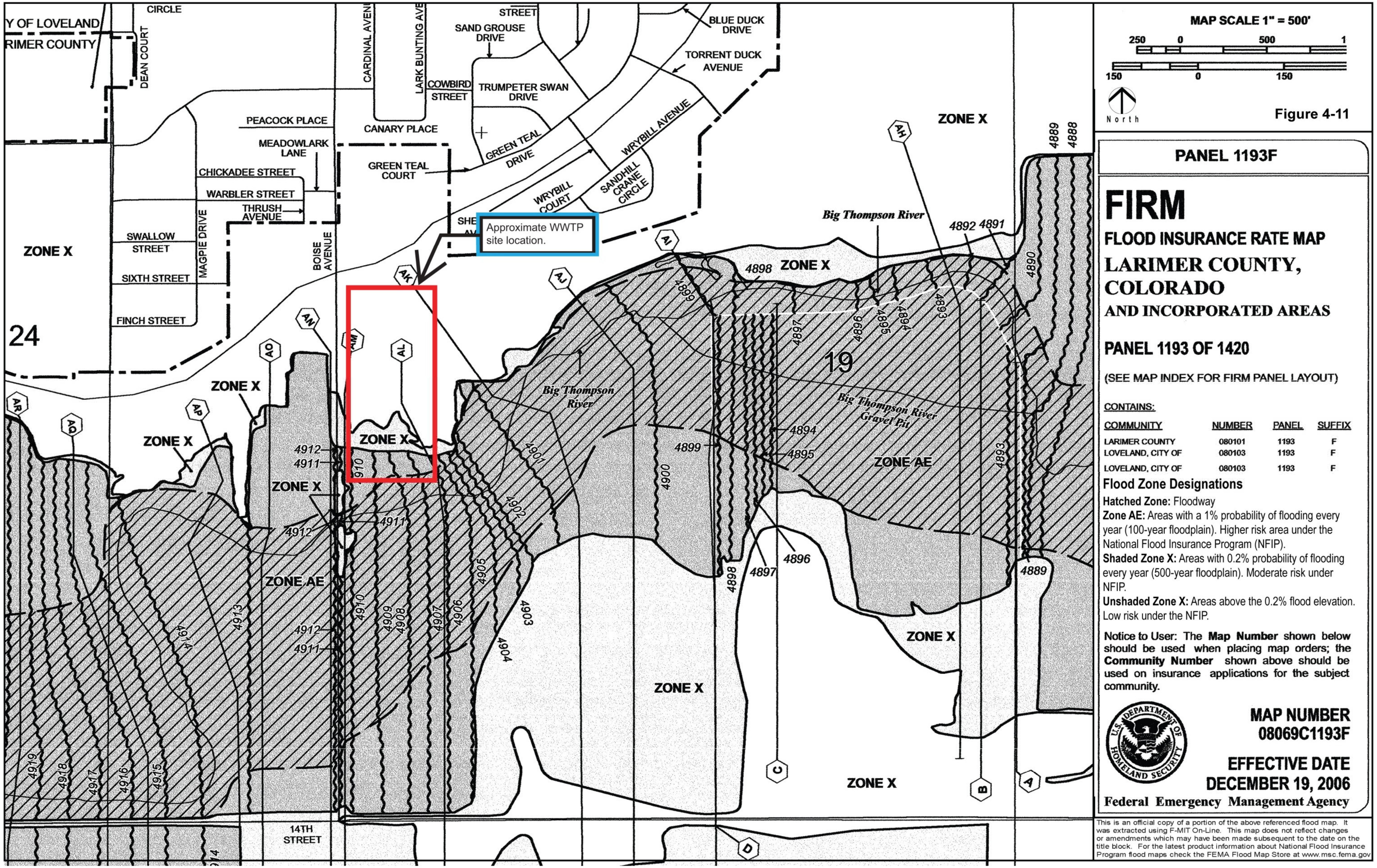
4.8 Site Characterization Report

The most current Federal Emergency Management Agency (FEMA) map for the Big Thompson River in the vicinity of the WWTP is shown in **Figure 4-11**. The last update for the map was December 19, 2006. The WWTP site with the floodplain information is shown in **Figure 4-10** and includes the floodway, the 100-year floodplain, and the 500-year floodplain. According to FEMA, the floodway is that portion of the available flow cross section that cannot be obstructed without causing an increase in the water-surface elevations resulting from a flood with a 100-year average return period of more than a given amount. The given amount by FEMA is 1 foot, but States can adopt their own criteria. The 100-year floodplain is the area of the channel and adjacent land that is subject to a certain size flood event that has a one percent probability of occurring any year, and is indicated as Zone AE on the FEMA map in **Figure 4-11**.

A portion of the WWTP property extends into the floodway, since the property includes two outfalls from the plant site: one for plant effluent and one for stormwater. The plant effluent outfall is above the 100-year floodplain elevation, but below the 500-year floodplain elevation. All plant facilities, including the South entrance and access road, are above the elevation of the 100-year floodplain. The south entrance and a portion of the access road on the south are below the 500-year floodplain elevation. The 500-year floodplain is indicated as the shaded Zone X in **Figure 4-11**.

The WWTP's hydraulic profile provides for discharges of treated wastewater up to the current peak hourly flow of 20.7 mgd during a 100-year flood event of the Big Thompson River. Future plant facilities are planned for areas of the site that are above the current 100-year flood plain. Any changes in the floodplain at the WWTP site will be monitored for impacts to existing and future facilities.

Since the WWTP is on an existing site and a new site is not being considered, no new soil testing report has been included in the Utility Plan. The most recent geotechnical report for the WWTP site is shown in Appendix 8.D.



MAP SCALE 1" = 500'
250
0
500
1
150
0
150
North
Figure 4-11
PANEL 1193F
FIRM
FLOOD INSURANCE RATE MAP
LARIMER COUNTY, COLORADO
AND INCORPORATED AREAS
PANEL 1193 OF 1420
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
LARIMER COUNTY 080101 1193 F
LOVELAND, CITY OF 080103 1193 F
LOVELAND, CITY OF 080103 1193 F
Flood Zone Designations
Hatched Zone: Floodway
Zone AE: Areas with a 1% probability of flooding every year (100-year floodplain). Higher risk area under the National Flood Insurance Program (NFIP).
Shaded Zone X: Areas with 0.2% probability of flooding every year (500-year floodplain). Moderate risk under NFIP.
Unshaded Zone X: Areas above the 0.2% flood elevation. Low risk under the NFIP.
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.
MAP NUMBER
08069C1193F
EFFECTIVE DATE
DECEMBER 19, 2006
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov
Approximate WWTP site location.
Y OF LOVELAND
RIMER COUNTY
CIRCLE
DEAN COURT
CARDINAL AVENUE
LARK BUNTING AVE
STREET
SAND GROUSE DRIVE
BLUE DUCK DRIVE
TORRENT DUCK AVENUE
COWBIRD STREET
TRUMPETER SWAN DRIVE
PEACOCK PLACE
CANARY PLACE
MEADOWLARK LANE
GREEN TEAL COURT
GREEN TEAL DRIVE
WRYBILL AVENUE
CHICKADEE STREET
WARBLER STREET
THRUSH AVENUE
WRYBILL COURT
SANDHILL CRANE CIRCLE
SWALLOW STREET
MAGPIE DRIVE
BOISE AVENUE
SIXTH STREET
FINCH STREET
14TH STREET
ZONE X
ZONE AE
24
19
Big Thompson River
Big Thompson River Gravel Pit

5.0 Wastewater Characterization

5.1 Influent Flow and Load Characterization

Influent water quality data to the WWTP was evaluated from January 2005 to June 2009 and is summarized in **Table 5-1** and **Figure 5-1**.

TABLE 5-1
Influent Water Quality Data (January 2005 to June 2009)

Parameter	Daily Average	Daily Maximum
BOD Loading	14,245 ppd	17,774 ppd[a]
BOD Concentration	295 mg/L	374 mg/L
TSS Loading	14,005 ppd	19,993 ppd
TSS Concentration	289 mg/L	414 mg/L
Flowrate	5.8 mgd	6.9 mgd[b]

[a] Design organic capacity is 20,236 ppd, and 80 percent of the design capacity is 16,189 ppd.
[b] Permitted flowrate capacity is 10.0 mgd, and 80 percent of the permitted flowrate is 8.0 mgd.

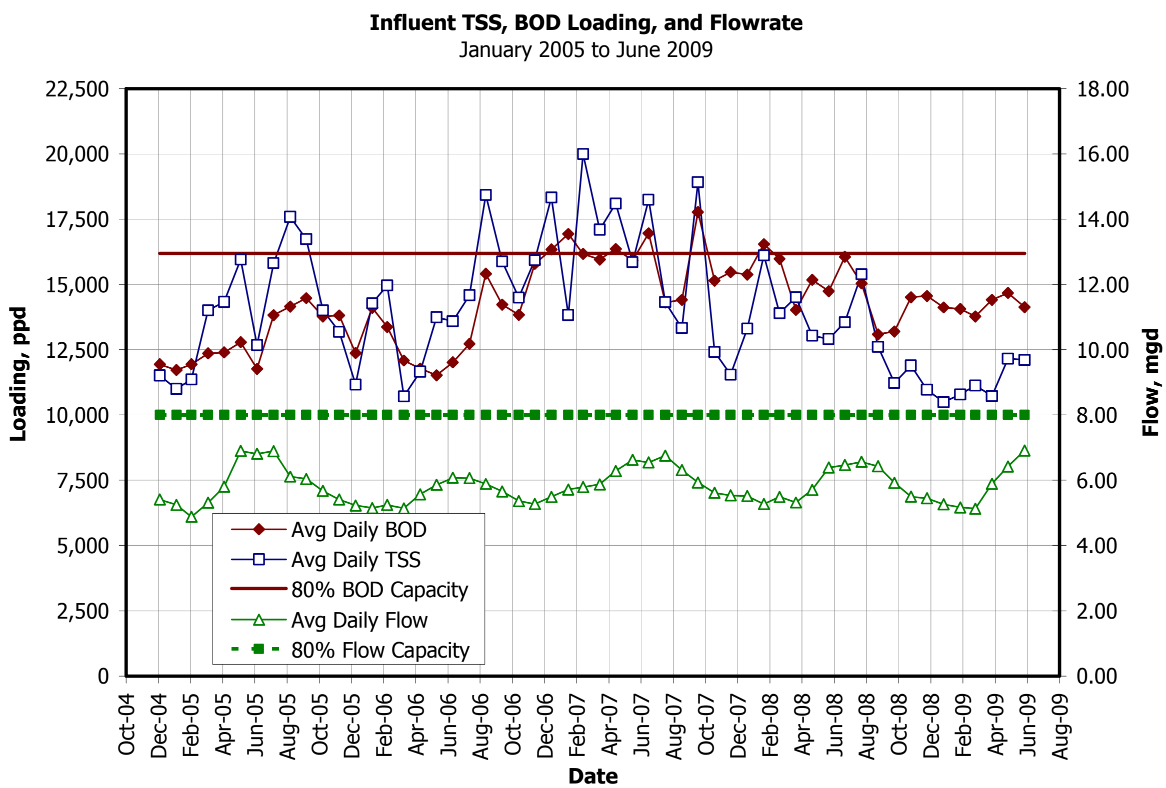


FIGURE 5-1
Plant Loading and Flowrate (January 2005 to June 2009)

The design organic loading capacity of the current plant is 20,236 pounds per day (ppd) biochemical oxygen demand (BOD). CDPHE typically requires WWTPs to initiate design of improvements once the loading has achieved 80 percent of the design capacity, which would be anything greater than 16,189 ppd for Loveland's current plant. From January 2005 to June 2009, the average daily BOD loading was 14,245 ppd. However, a review of peak month data showed the influent BOD loading exceeded 80 percent of the design capacity during 6 months: January, February, March, June, and October 2007, and February 2008. The sudden increase in loading was unexpected and has not been above 80-percent design capacity since February 2008. However, the City accelerated its planning efforts as a result of the loading exceeding the 80-percent threshold, and since has not exceeded the threshold. Refer to **Appendix 8.P** for correspondence from the City to CDPHE regarding these excursions.

The current permitted flowrate associated with the organic design capacity is 10.0 mgd, and 80 percent of this value is 8.0 mgd. Plant flowrate was well below this value, averaging 5.8 mgd with a maximum monthly average value of 6.9 mgd. The proportion of BOD to flow has increased over the years, presumably due to customer water conservation and rehabilitation of the collection system to address infiltration, and inflow. Customers are using less water, resulting in a more concentrated organic loading.

Influent BOD and TSS concentrations in milligrams per liter (mg/L) for the same time period are shown in **Figure 5-2**.

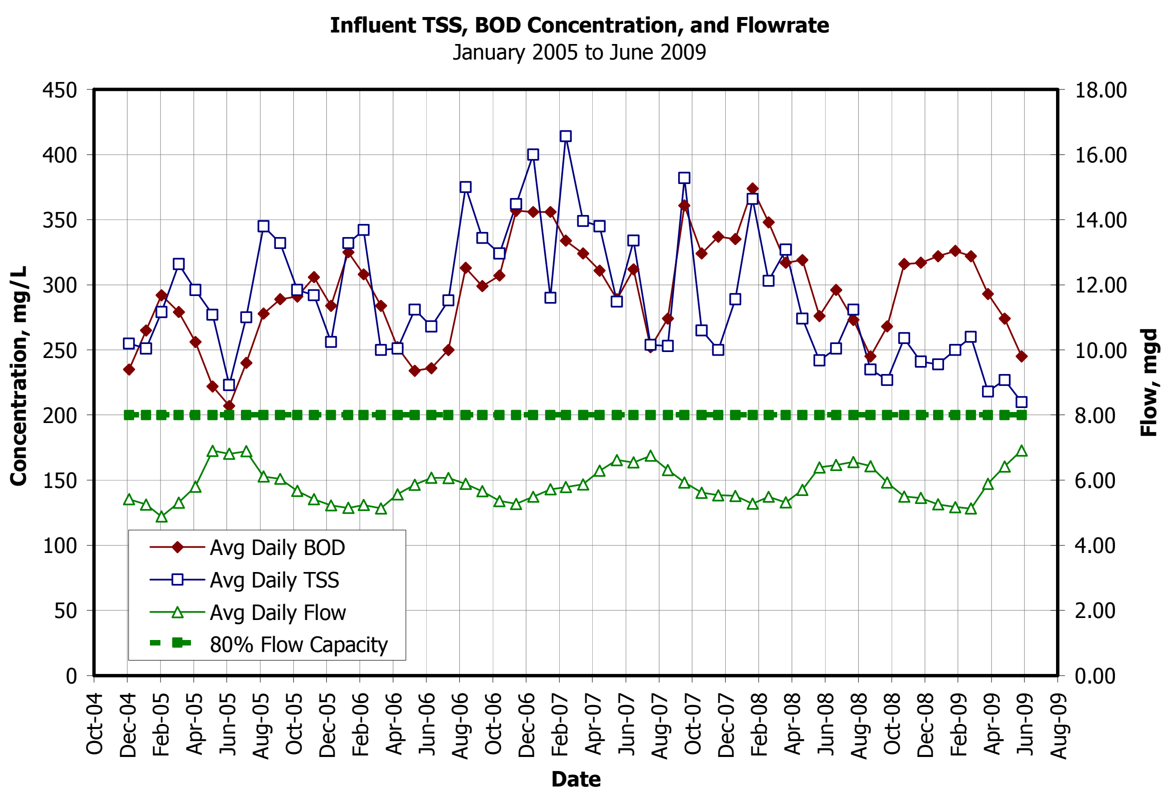


FIGURE 5-2
Influent Concentration and Flowrate (January 2005 to June 2009)

5.1.1 Per Capita/Housing Unit Influent Flow and Load

Flow and BOD loading to a WWTP are often characterized as per capita and per housing unit. Therefore, influent flow and load data from January 2005 to December 2009 were evaluated in terms of per capita and per housing unit contributions. Population and housing unit information from Section 3.3, Population Data Sets and Forecasts, were used for the calculation. Flows and loads per capita and housing unit from 2005 to 2009 are summarized in **Table 5-2**.

TABLE 5-2
Per Capita and Per Housing Unit Flows and Loads[1]

Year	Population	Housing Units	Per Capita BOD (ppd/capita)	Per Capita Flow gpd/capita)	Per Housing Unit BOD (ppd/unit)	Per Housing Unit Flow (gpd/unit)
2005	60,407	25,775	0.22	100	0.51	231
2006	62,114	26,647	0.22	92	0.50	210
2007	64,166	27,377	0.25	96	0.59	222
2008	64,807	27,651	0.23	92	0.54	212
2009	**65,802**	**27,876**	**0.22**	**95**	**0.51**	**223**
Ave.	**-**	**-**	**0.23**	**95**	**0.53**	**220**

[1] Per capita flows and loads include all water customer classes (residential, commercial, industrial, etc.)

The average BOD loading from 2005 to 2009 was 0.23 ppd per capita and 0.53 ppd per housing unit. Typical values for per capita BOD loading range from 0.11 to 0.26 ppd, with the higher end typical of wastes with ground-up kitchen waste.

Per capita BOD loading to the Loveland WWTP is at the higher end of the typical range. This value is highly variable and there are several circumstances that would shift a community to the higher end of the range: indoor water conservation practices, industrial customers that discharge highly concentrated streams at low flow rates, or the absence of a large industrial user with a high discharge flow that would dilute the wastewater. For comparison, the City of Greeley reports an identical per capita BOD loading rate of 0.23 lb/d for 2005-2007. The City of Fort Collins reports a per capita BOD loading rate of 0.34 for the same period.

The average flow rate from 2005 to 2009 was 95 gpd per capita and 220 gpd per housing unit. Typical values for per capita flow rate range from 40 to 130 gpd. Per capita flow rate to the Loveland WWTP is within mid-range compared to typical. For comparison, the City of Greeley reports an average per capita wastewater flow of 88 gpd.

5.2 Effluent Water Quality Characterization

Effluent data for several parameters is collected daily at the Loveland WWTP for monitoring operations and comply with regulations. The monthly averages of effluent BOD and TSS are presented in **Figure 5-3**.

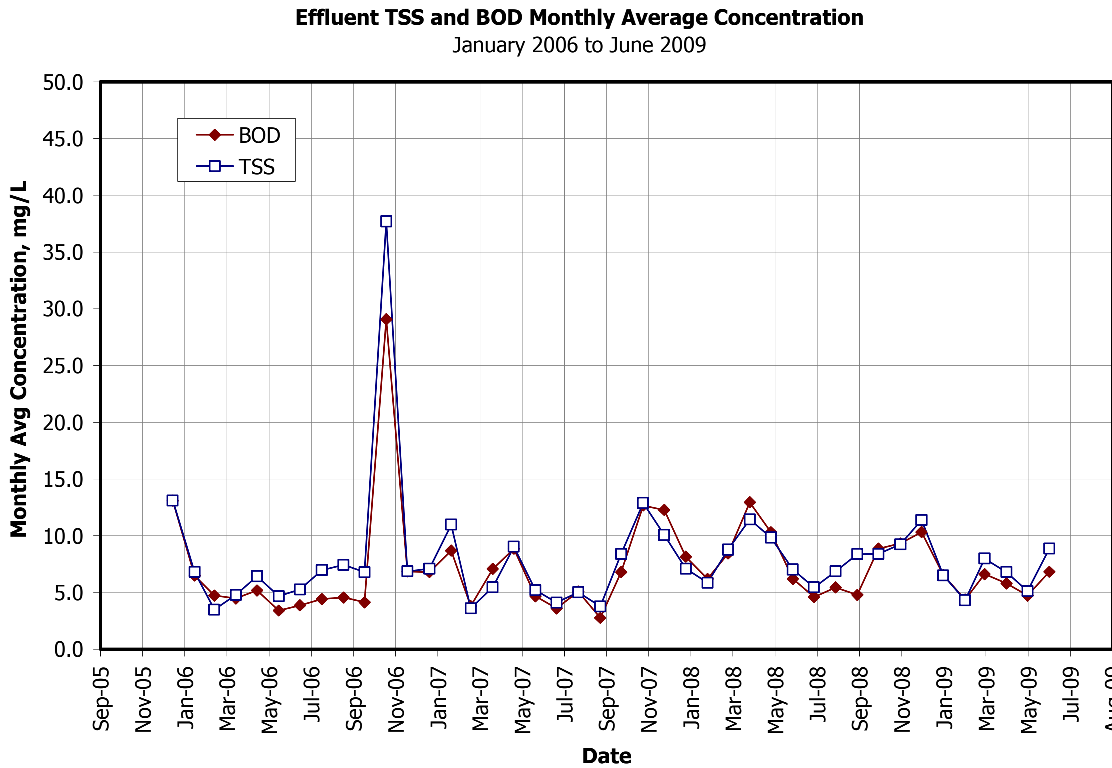


FIGURE 5-3
Effluent TSS and BOD Concentration (January 2006 to June 2009)

Based on data from January 2006 to June 2009, the monthly average effluent BOD at the plant was 7.2 mg/L and the average effluent TSS was 7.9 mg/L. The existing effluent permit limits for BOD include a 30-day average of 30 mg/L BOD and 30 mg/L TSS. There was a filamentous bulking problem documented with the State that occurred in November 2006 and caused excursions in both effluent BOD and TSS above the normal range.

Effluent ammonia and nitrate data is presented in **Figure 5-4**. The average effluent ammonia concentration from January 2006 to June 2009 was 0.28 mg/L, and the average effluent nitrate (NO_3) concentration for January 2006 to December 2008 was 15.4 mg/L. The existing effluent permit limits for ammonia vary on a monthly average basis between 6.2 and 7.8 mg/L. There is no current effluent limit for nitrate.

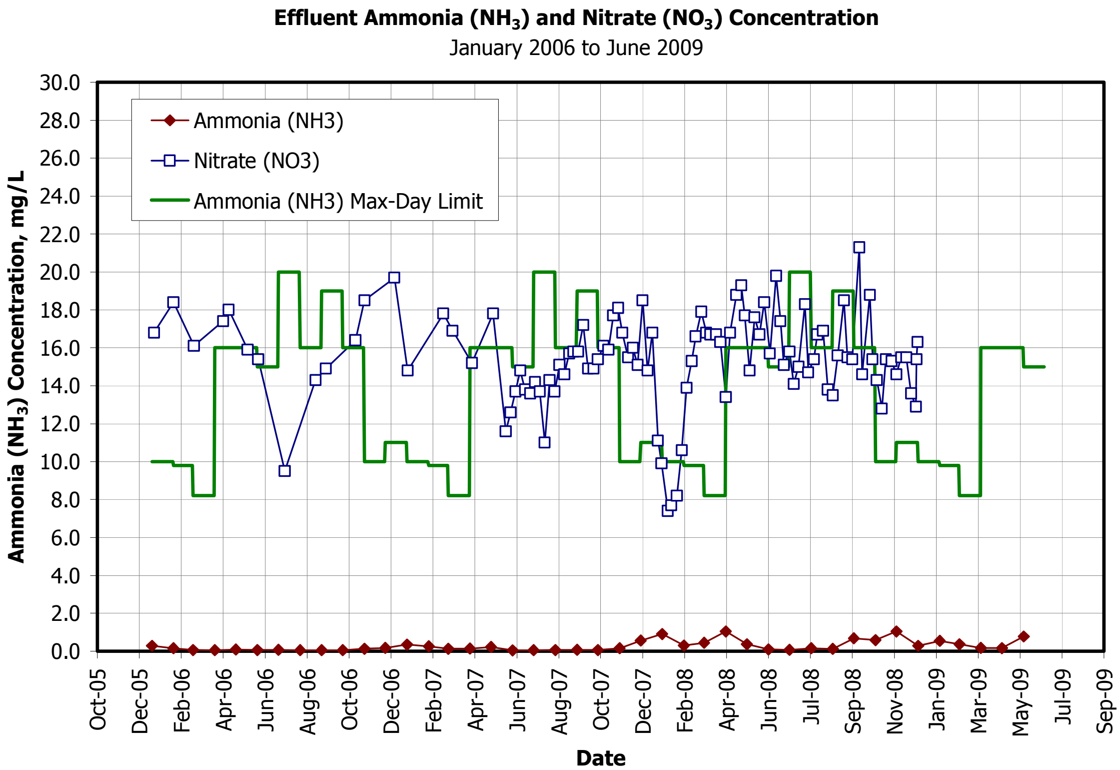


FIGURE 5-4
Effluent Ammonia (NH_3) and Nitrate (NO_3) Concentration (January 2006 to June 2009)

5.3 Wastewater Flow and Load Projections

Each year, the City updates its CIP for all City departments to assist in planning, prioritizing, and budgeting. Flow and load projects are critical components for determining the schedule of wastewater system projects. Projections are evaluated against patterns of historical data and their trends into the future. The City participates in extensive planning and flow-monitoring efforts to ensure projections are based on sound measurements, detailed studies, and reasonable engineering judgments. Given the extensive level of effort invested in research and planning, the additional safety factor of 20 percent recommended in the NFRWQPA guidance document can be economized to better estimate the utilities capital needs.

The projected annual rate of increase for flow and BOD has been conservatively estimated as equivalent to the projected increase in population as determined by the City's Planning Department (see Section 3.4). The following sections provide a summary of the forecasting methodology used to develop information presented in **Figures 5-5** and **5-6**. The methodology described is relevant for 2009 projections. For clarity, each line presented on the graphs is summarized.

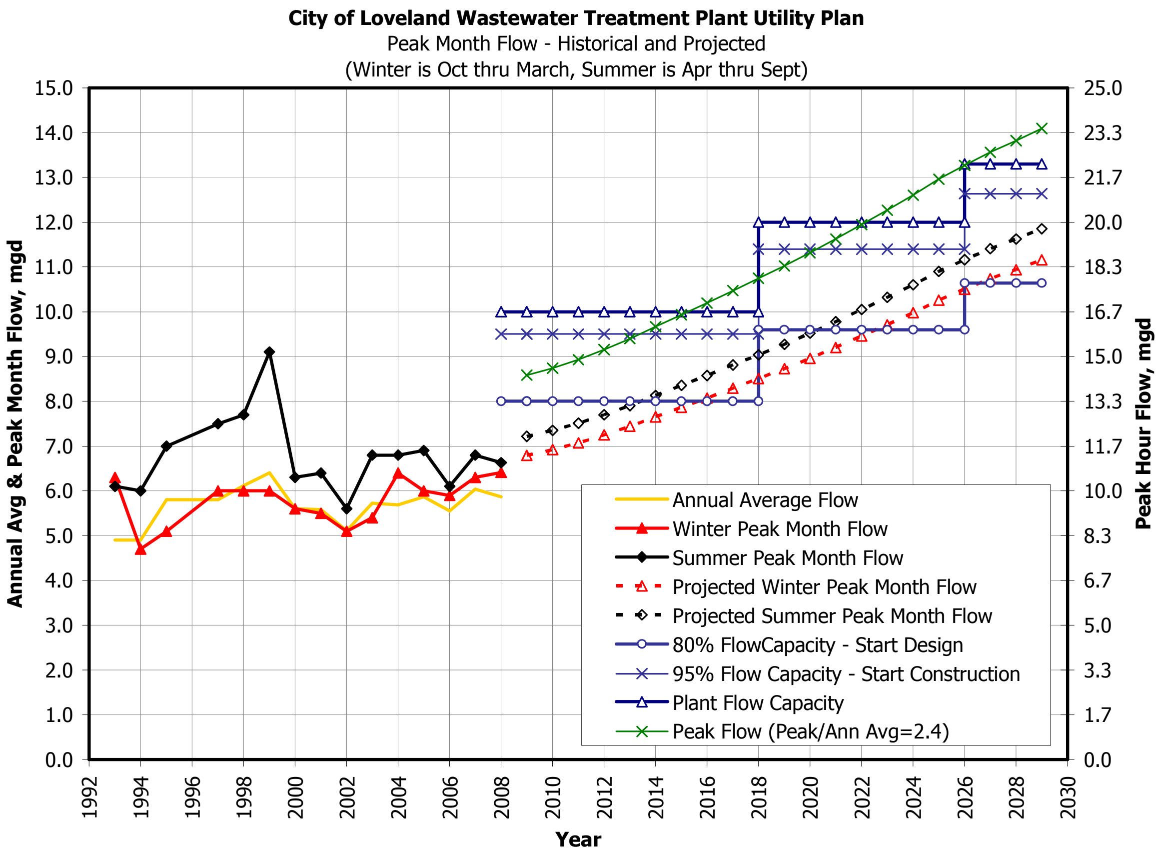


FIGURE 5-5
Peak Month Flow Historical and Projected and Future Capacity Increases

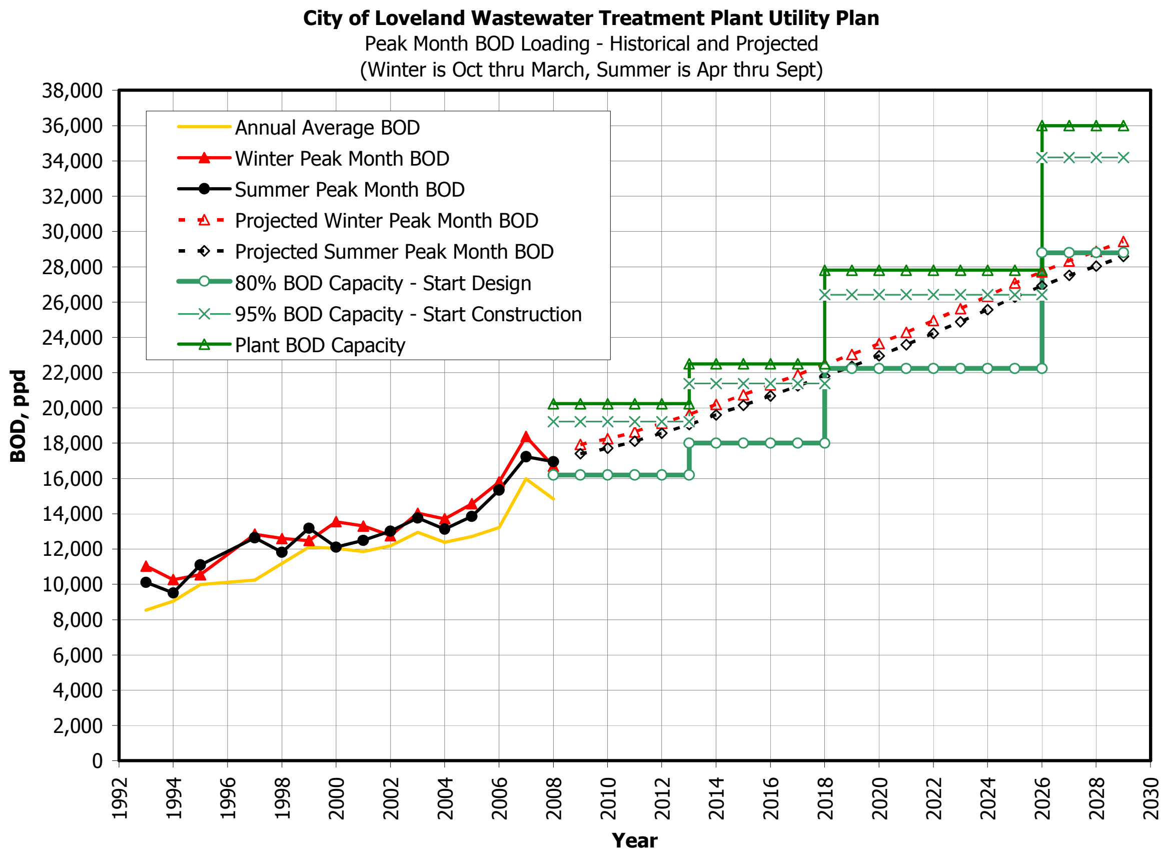


FIGURE 5-6
Peak Month BOD Loading Historical and Projected and Future Capacity Increases

Historical winter and summer peak-month flows from 1993 to 2008 are shown in **Figure 5-5**, along with projected flow and plant capacity to 2029. Historical winter and summer peak-month BOD loadings from 1993 to 2008 are shown in **Figure 5-6**, along with projected BOD loading and plant capacity to 2029.

5.3.1 Annual Average Flow

The annual average flow represents the average of the daily volume of water treated for the entire calendar year. Annual average flow is not used as a design basis for determining process sizing requirements. Average annual flow is an indicator of growth in the system from the previous years and is used to predict the maximum month flow, which is the basis for design.

5.3.2 Historical Seasonal Peak Month BOD and Flow

Historical data of flow and loads is separated into winter and summer seasons because these variations are important for the biological systems in wastewater treatment. Colder winter temperatures limit biological process capacity compared to warmer summer temperatures. Seasons are defined as follows:

- Winter – January to March, October to December
- Summer – April to September

Prior to 2006, the historical winter and summer peak-month flow and BOD were determined from the maximum value for that season based on the calendar month. Beginning in 2006, daily data from the WWTP were provided, and the methodology for determining peak month was adjusted to be based on a 30-day average instead of the calendar month. The 30-day average of flow and BOD is calculated for the entire year, and does not include the previous year's data from December. The maximum 30-day average for each season is recorded as the peak month for BOD and flow, respectively.

5.3.3 Projected Seasonal Peak Month Flow

The basis for flow projections is the linear regression line of annual average flow based on historical data from 1993 to 2008. The linear regression value for 2008 is the starting point. The annual average flow for 2009 to 2029 is then projected from the 2008 linear regression value by multiplying by the annual percentage growth from population projections presented in **Table 3-1**. Once the annual average flow is established for each year from 2009 to 2029, the peak winter (or summer) month is calculated by multiplying the annual average flow by a peak-month-to-annual-average flow factor. This factor is the maximum value of the ratio of peak-month to annual-average flow for the last 7 years of winter (or summer) data.

5.3.4 Projected Seasonal Peak Month BOD

The basis for BOD projections is the actual data from 2008. The annual average BOD for 2008 is the starting point. The annual average BOD for 2009 to 2029 is projected from the actual 2008 value using the percentage growth from population projections. Once the annual average BOD is established for each year from 2009 to 2029, the peak winter (or summer) month is calculated. The maximum factor of peak-month to annual-average flow for the last 7 years of winter (or summer) data is applied to the annual average BOD from 2009 to 2029 to get the projected winter (or summer) peak-month BOD.

5.3.5 Projected Peak Flow

Peak flows are typically used to size several wastewater treatment processes, including pump stations and ultraviolet (UV) disinfection. In order to determine when these facilities need to increase in capacity, the peak influent flow was evaluated. The peak instantaneous flow and minimum flow was recorded each day. The ratio of peak instantaneous to annual average, also called the peak instantaneous factor, was evaluated based on daily data from 2006 to 2008. Some of the maximum data points were removed after review by treatment staff if it was determined the peak event was not caused by natural flow patterns, but rather a man-made event. One example from July 2008 was due to a jammed grinder backing up flow. Results are summarized in **Table 5-3** below.

TABLE 5-3
Peaking Factor Summary

Year	Annual Average Flow (mgd)	Maximum Flow (mgd)	Peaking Factor
2006	5.6	13.2	2.36
2007	6.0	14.2	2.37
2008	5.8	13.8	2.38

Based on the data from the past 3 years a reasonable estimate for the ratio of peak-instantaneous to annual-average flow is 2.37. For purposes of planning, the value has been rounded up to 2.4 and has been used to evaluate capacity of wastewater treatment processes that depend on peak instantaneous flow for sizing or compliance.

Peaking factors will change based on collection system factors and diurnal flow patterns. Typically, a densely populated development near the WWTP will tend to increase peaking factors, and developed areas further from the plant will tend to dampen the peak flow and reduce the peaking factor. The peaking factor will be evaluated annually to ensure hydraulic capacity is maintained.

5.3.6 Projected Flow and Load Summary

Table 5-4 provides a summary of flow projections from **Figure 5-5**.

TABLE 5-4
Projected Peak Month (30-Day Average) Flows

Year	Peak Month Winter Flow (mgd)	Peak Month Summer Flow (mgd)	Peak Instantaneous Flow (mgd)
2009	6.8	7.2	14.3
2014	7.7	8.1	16.1
2019	8.7	9.3	18.4
2024	10.0	10.6	21.0
2029	11.2	11.9	23.5

The following **Table 5-5** provides a summary of BOD projections from **Figure 5-6**. Future plant capacity increases for hydraulic and BOD capacity are noted on **Figures 5-5 and 5-6.** The methodology for determining the projected timing for the capacity increases is discussed in the following section. Descriptions of the individual capital improvement projects are found in Section 5.6.5.

TABLE 5-5
Projected Peak Month (30-Day Average) BOD

Year	Peak Month Winter Flow (ppd)	Peak Month Summer Flow (ppd)
2009	17,925	17,404
2014	20,189	19,602
2019	23,021	22,352
2024	26,328	25,564
2029	29,431	28,577

5.3.7 Expansion Requirements

Included in the terms of the existing discharge permit is the requirement that if, during the previous calendar year, the monthly organic loading or flow in the maximum month exceeds 80 or 95 percent of the plant capacity, the permittee must submit a report by March 31 of the following year that includes one of the following:

- Schedule for planning for a facility expansion if 80 percent of the organic capacity was exceeded,
- Schedule for construction of a facility if 95 percent of the organic capacity was exceeded, or
- An analysis that the exceedance was an anomaly and is not expected to occur during the current calendar year.

The City was issued a permit in June 2002 with a design capacity of 8.0 mgd (30-day average) and 12,500 ppd of organic loading (30-day average). Since this permit was issued, the WWTP has been expanded to a capacity of 10 mgd and 20,236 ppd of organic loading and a permit amendment was issued to reflect these capacities. An organic loading of 16,189 ppd is equivalent to 80 percent of the plant's organic design capacity, according to the permit renewal.

Influent BOD loading exceeded 80 percent of the design capacity for 6 months: January, February, March, June, and October 2007, and February 2008. The increased loading was unexpected and loadings have not been above 80-percent design capacity since February 2008. The City's Interim Wastewater Treatment Plant Manager sent a letter to the State on April 16, 2008, included in **Appendix 8.P**, indicating the exceedances and their unexpected occurrence. There has been no response yet from the State, but the City is diligently evaluating its CIP and budget to adjust scheduled projects in response to the increase. The City also initiated sampling of the collection system to locate the source, but the loadings went down before any conclusions could be found.

The City is beginning the planning process with this WWUP and intends to proceed with preliminary and final design of WWTP improvements once the Plan is approved. The City intends to be under construction by the time the 95 percent threshold is reached in order to meet the condition of the permit. The City is monitoring its anticipated development and will accelerate projects as necessary to meet permit conditions in a fiscally responsible manner.

5.4 Wastewater Solids Projections

Primary and waste activated sludge projections were recently evaluated in the *Wastewater Treatment Plant Solids Processing Evaluation* (2007 Solids Report) completed in November 2007 by CH2M HILL. Actual sludge production quantities from 2006 through 2008 were obtained and compared against the sludge projections that were presented in Figure 8 of the 2007 Solids Report for primary sludge, and Figure 9 for waste activated sludge. These figures, updated with actual data from 2006 through 2008, are provided below in **Figure 5-7** for primary sludge and **Figure 5-8** for waste activated sludge.

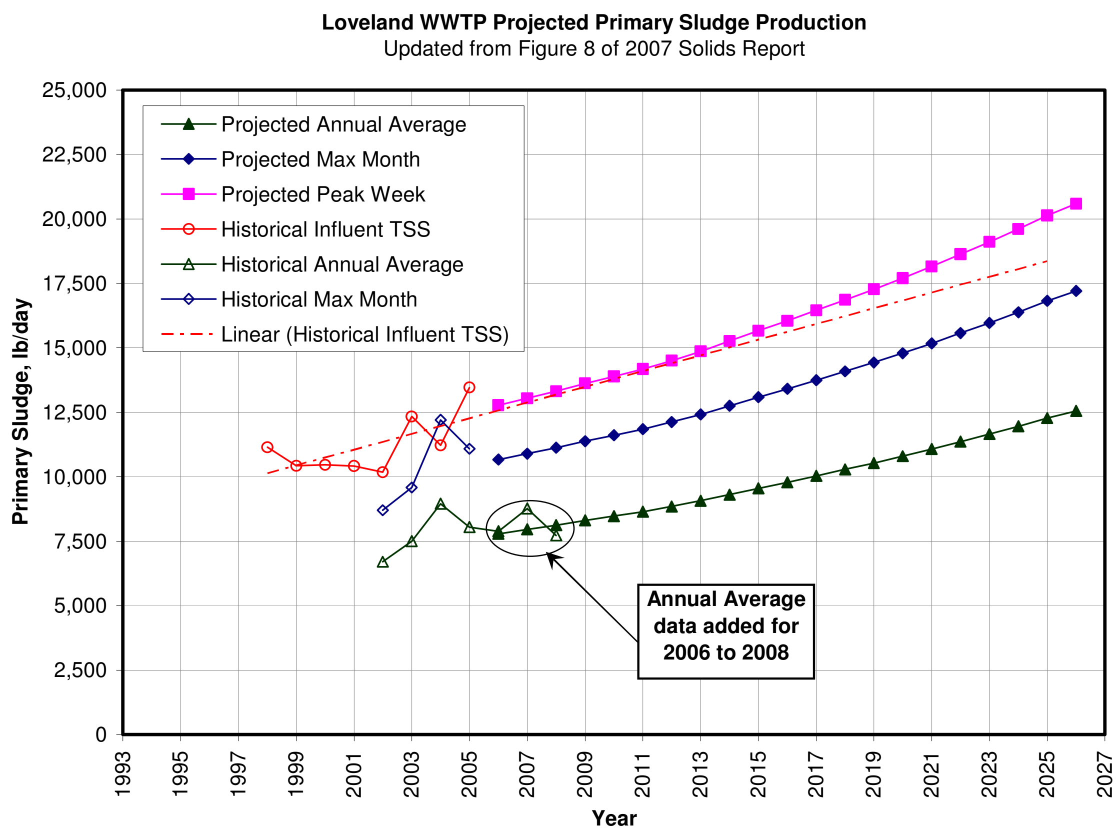


FIGURE 5-7
Projected Primary Sludge Production (Update of Figure 8 from 2007 Solids Report)

Actual primary sludge production during each year 2006, 2007, and 2008 was 7,886, 8,763, and 7,723 pounds per day, respectively. Projected primary sludge production from the 2007 Solids Report during each year of 2006, 2007, and 2008 was 7,788, 7,955, and 8,119 pounds per day, respectively. Overall, the pattern of increase is consistent with that from the 2007

Solids Report, and these primary sludge projections have been considered valid for the Utility Plan.

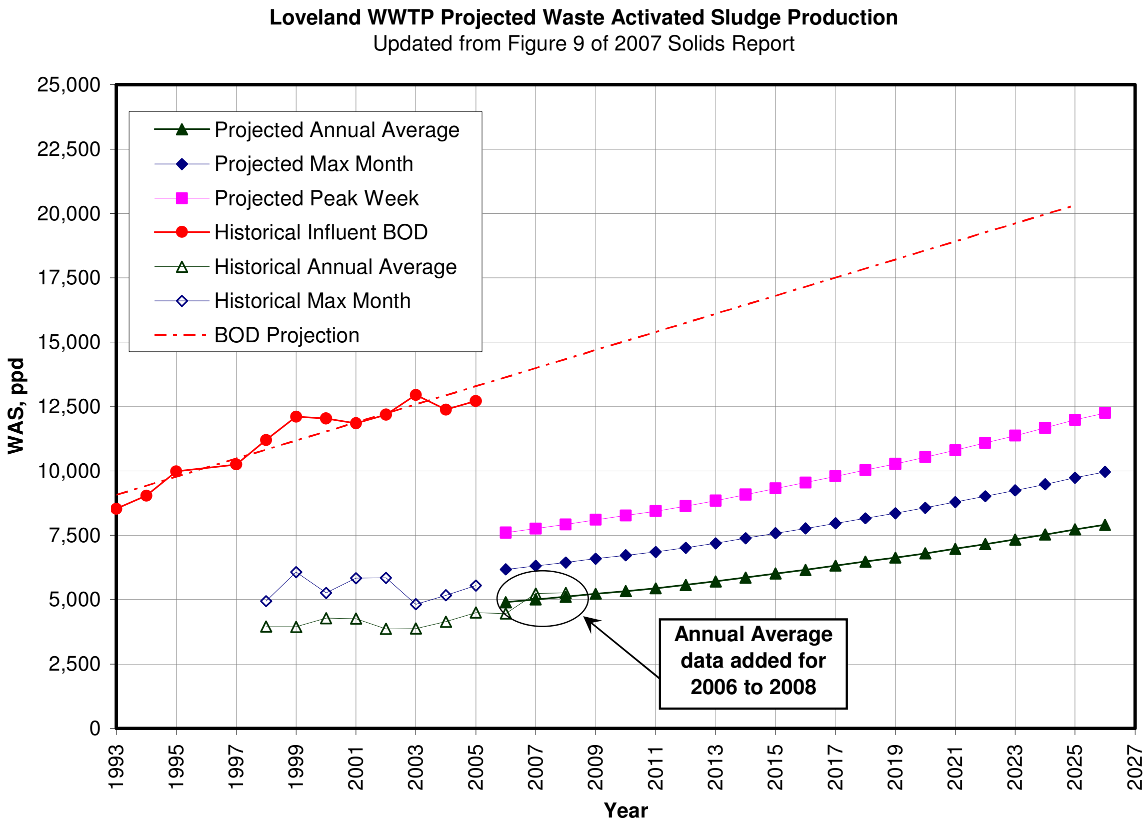


FIGURE 5-8
Projected Waste Activated Sludge Production (Update of Figure 9 from 2007 Solids Report)

Actual waste activated sludge production during each year 2006, 2007, and 2008 was 4,458, 5,235, and 5,260 pounds per day, respectively. Projected waste activated sludge production from the 2007 Solids Report during each year of 2006, 2007, and 2008 was 4,903, 5,008, and 5,111 pounds per day, respectively. Similar to the primary sludge, the pattern of increase is consistent with that from the 2007 Solids Report, and these waste activated sludge projections have been considered valid for the Utility Plan.

5.5 Collection System

The City of Loveland has begun wastewater flow monitoring of the City's collection system and from that data is developing a real-world wastewater collection system computer hydraulic model. This model is currently 17 percent complete based on the final analysis of the 2008 flow data. It should be noted that many areas of the City are not yet included in the collection system model, and therefore hydraulic capacity information may not be available for all areas of the City. However, from areas that have been studied, there do not seem to be hydraulic capacity problems, with a few exceptions noted in the following text. This model is being developed using actual water meter data and calibrated against sewer flow data to provide an accurate assessment of actual flows in the collection system. It provides the City with a high level of confidence that the hydraulic model represents reality, and can be used as a tool for collection system planning, to the extent that the model is extended to the portion of the City in question. **Figure 5-9** shows the current extent of active wastewater model as well as the flow monitor locations throughout the City.

A previous model of the collection system was developed in 1997 using the Stormwater Management Model (SWMM). This model analyzed 12-inch diameter pipes and larger, thus focusing on the main trunk lines and interceptors. The SWMM model was based on water meter data, WWTP data and limited flow monitoring data around the WWTP.

The following section describes the City's wastewater collection system infrastructure including interceptors, lift stations, and an analysis of infiltration and inflow.

5.5.1 Interceptors

NFRWQPA identifies interceptors as any sewer pipe with an internal diameter equal to or greater than 24 inches that meets one of the four following criteria: (1) it intercepts domestic wastewater from a final point in a collection system and conveys such waste directly to a treatment plant, the interceptor sewer may also collect wastes from a limited number (fewer than 5 connections per mile of sewer) of building services and sewer laterals along its route to the wastewater treatment plant; (2) it serves in place of a treatment plant and transports the collected domestic wastes to an adjoining collection system or interceptor sewer for treatment; (3) it transports the domestic wastes from one or more municipal collection systems to another municipality or to a regional treatment plant; or (4) it intercepts an existing major discharge of raw or inadequately treated wastewater for transport to another interceptor or to a treatment plant.

The interceptors in the City of Loveland typically extend from the downstream end of major collection system tributary basins to the wastewater treatment plant. However, because they are routed through developed areas, they may also have lateral connections where local collector sewers tie in. In addition, the City of Loveland has one sewer ("the Boise line") that functions like an interceptor in that it intercepts flow from several major basins and conveys it directly to the treatment plant, but is only 18 inches in diameter. For this discussion, the Boise line will be considered a large collector line and not identified as an interceptor. The remaining interceptors are discussed below. The sanitary sewer interceptors are presented in **Figure 5-10. Figure 5-11** shows the sewer basins within the City.

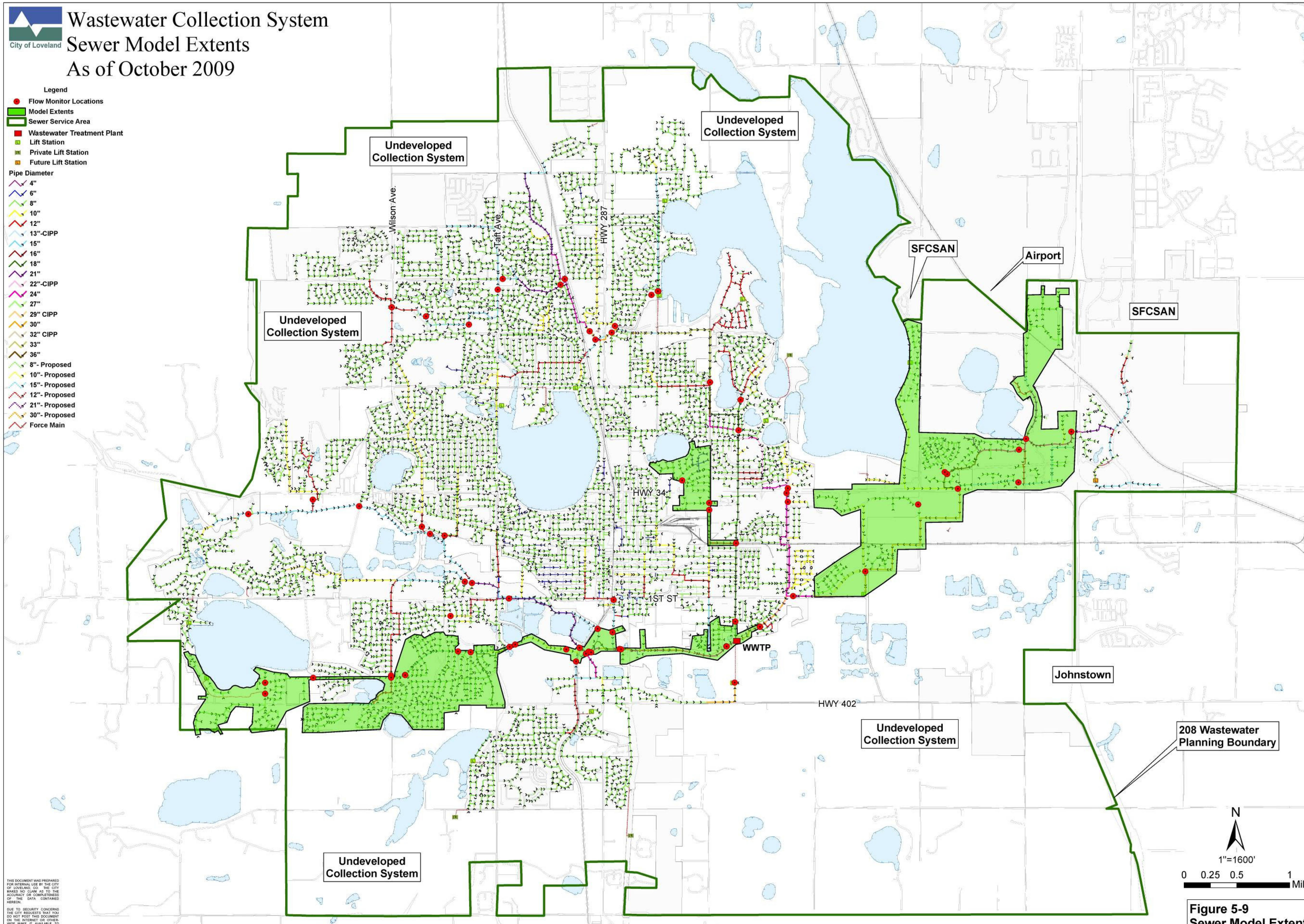


Figure 5-9
Sewer Model Extents

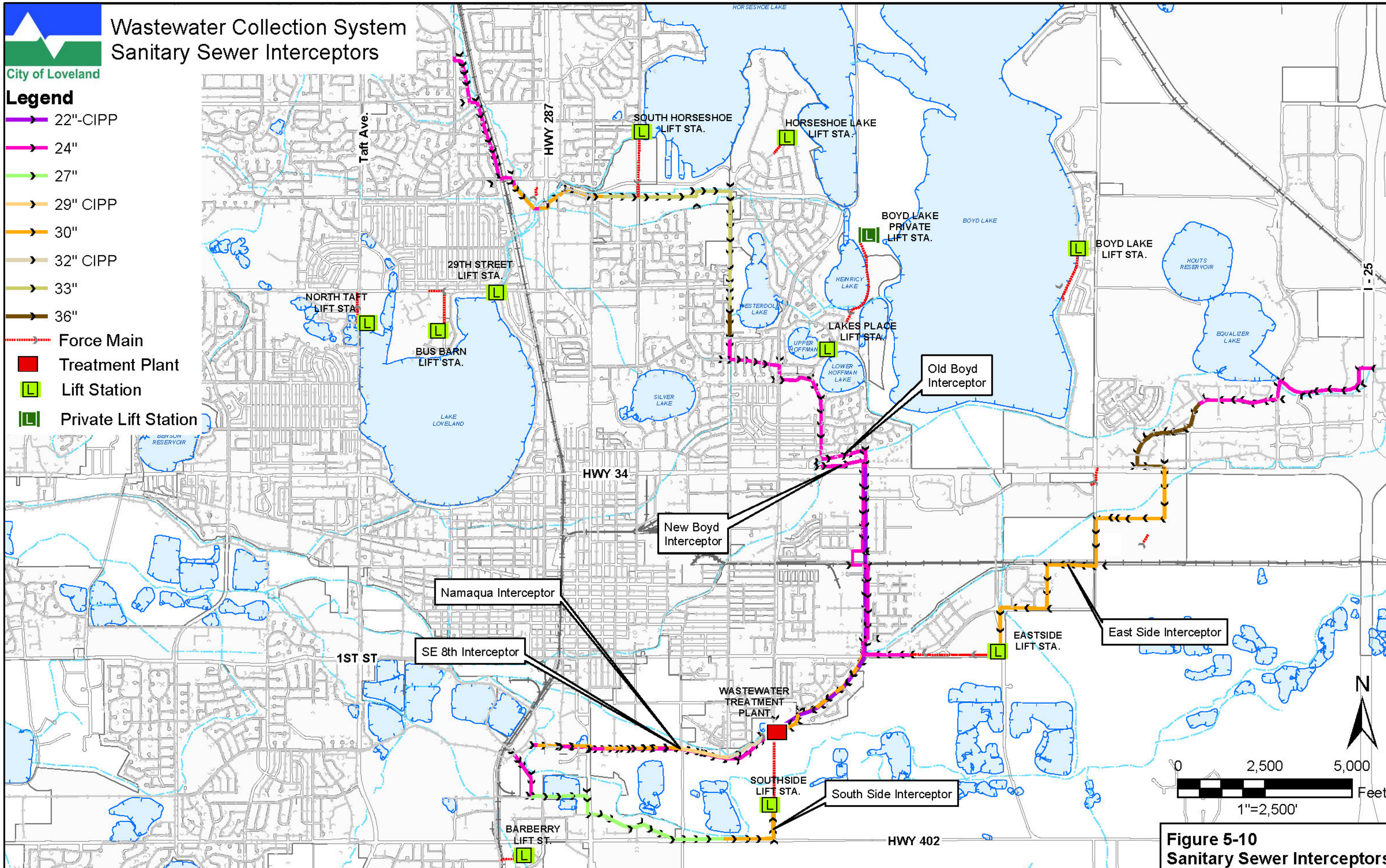


Figure 5-10
Sanitary Sewer Interceptors

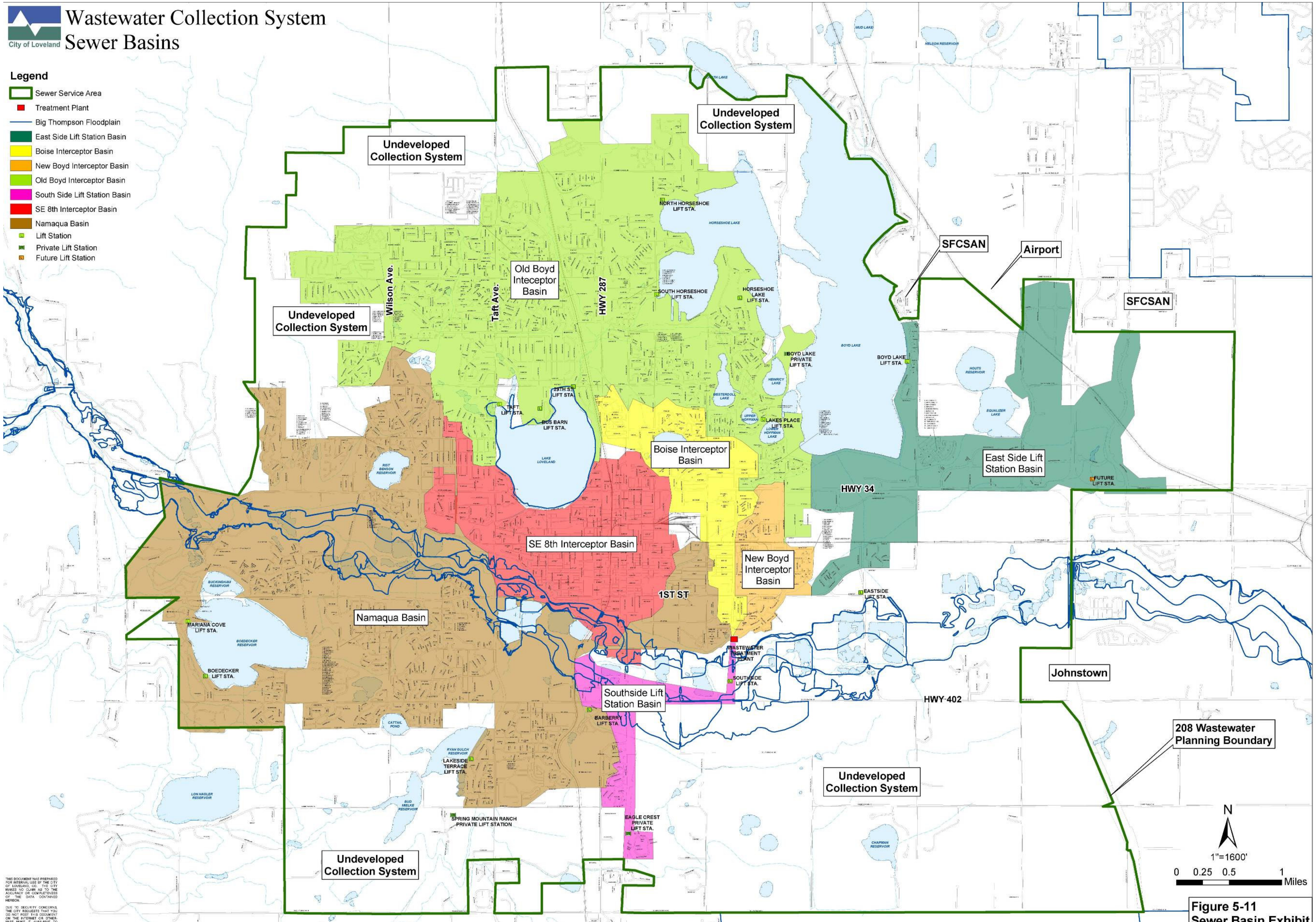


Figure 5-11
Sewer Basin Exhibit

Southeast 8th Interceptor

The Southeast 8th Interceptor runs from the east side of the Old Fairgrounds Park (MH 1979) east 6,546 feet to the WWTP. It is a 24-inch diameter, VCP line.

Namaqua Interceptor

The Namaqua Interceptor runs from the west side of the Old Fairgrounds Park, under the Big Thompson River and east 7,422 feet to the WWTP. The section that crosses the river is 151 feet long and is 24-inch Ductile Iron pipe. The next 4,179 feet of interceptor are 30-inch diameter RCP. The next 2,958 feet of interceptor have been lined with CIPP because of corrosion. The diameter of this section of line ranges from 29 to 32 inches.

New Boyd Interceptor

The New Boyd Interceptor runs from just north of Eisenhower Blvd. south along Denver Avenue to the WWTP. The interceptor is 11,241 feet long and ranges from 24- to 30-inch-diameter PVC pipe.

Old Boyd Interceptor at MH-3607

Old Boyd Interceptor

The Old Boyd Interceptor runs from the north side of the City generally south to the WWTP. The Old Boyd Interceptor parallels the New Boyd Interceptor from Denver Avenue to the WWTP. The interceptor is 32,383 feet long and ranges from 22- to 36-inch-diameter pipe. The first 8,900 feet from the WWTP are lined with CIPP. In 2008, an addition 4,000 feet of 24-inch RCP pipe was slip-lined with CIPP. The 2008 slip-lining was completed from north of Eisenhower Blvd. (MH 7134) to the intersection of Silverleaf Dr. and Bismark Avenue.

East Side Interceptor

The pipes are RCP, CIPP, and PVC. The East Side Interceptor begins on the east side of Interstate 25 at the Promenade Shops and generally heads southwest to the East Side Lift Station. The lift station pumps the flow into a 24-inch PVC line that drains to the New Boyd Interceptor. The interceptor is 21,409 feet long and ranges from 24- to 36-inch-diameter PVC pipe. Additionally, there is the East Side Lift Station that lies in the middle of the interceptor. The lift station pumps flow into a 2,659-foot-long, 8-inch-diameter force main.

Southside Interceptor

The Southside Interceptor begins near the west end of the Old Fairgrounds Park and runs east to the Southside Lift Station. The lift station pumps the effluent underneath the Big Thompson River and into the WWTP in a 20-inch-diameter, 2,098-foot-long, ductile iron force main. The interceptor is 10,108 feet long and ranges from 24- to 30-inch-diameter RCP pipe. There is one section of PVC pipe, 27 inches in diameter and 133 feet long.

5.5.2 Lift Stations

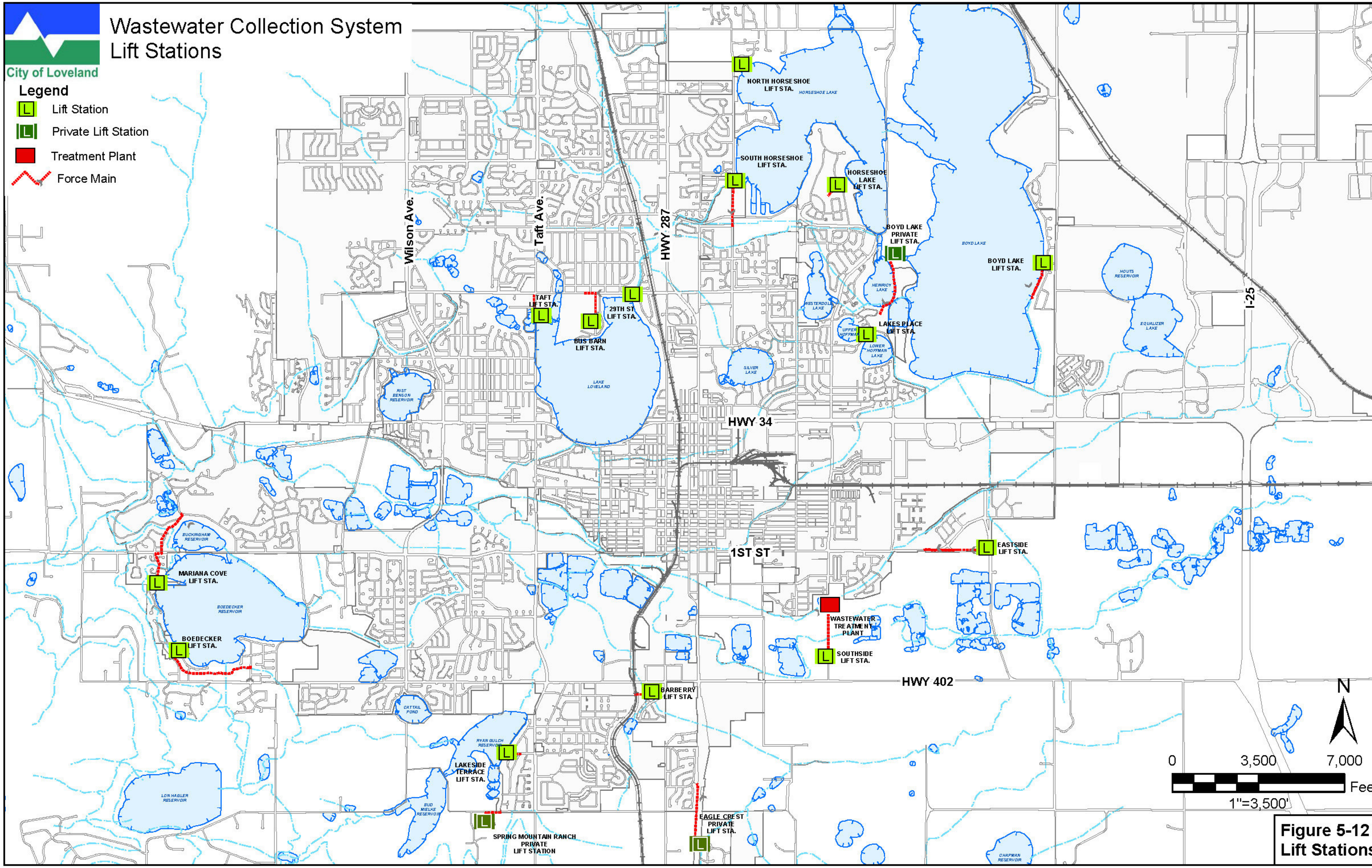
Fourteen lift stations are currently in operation throughout the City's wastewater system and are shown on **Figure 5-12**. Since the 1998 Wastewater Master Plan Report (prepared by CH2M HILL), Jellystone Lift Station has been abandoned, and three lift stations have been put into service: East Side and Horseshoe Lake. The following sections provide brief descriptions of each lift station within the City as of December 2009. **Table 5-6** summarizes force main and wet well data for each lift station maintained by the City, while **Table 5-7** provides a detailed summary of the pumping characteristics at each site.

TABLE 5-6
Force Main and Wet Well Data

Lift Station	Wet Well Volume, gallons	Pump Qty. & Capacity, qty @ hp (gpm)	Current Peak Daily Flow[a], mgd (gpm)	Force Main Diameter (inches), Length (feet)
Taft	9,675	2 @ 10 (600)	0.20 (139)	6 (1,144)
Barberry	4,441	2 @ 5 (125)	0.0036 (3)	4 (748)
Lakeside Terrace	5,830	2 @ 1.5 (100)	0.032 (22)	4 (670)
Bus Barn	7,640	2 @ 5 (125)	0.032 (22)	4 (1,640)
29th Street	8,395	2 @ 5 (100)	0.028 (19)	6 (70)
North Horseshoe	7,520	2 @ 5 (384)	0.087 (60)	8 (360)
South Horseshoe	19,825	2 @ 20 (1,100)	0.23 (160)	12 (1,890)
Horseshoe Lake	1,100	2 @ 5 (300)	0.021 (15)	6 (560)
Southside	31,050	3 @ 40 (1850)	0.11 (76)[b]	20 (2,230)
Boyd Lake	4,335	2 @ 5 (150)	0.016 (11)	4 (1,604)
East Side	10,000	2 @ 100 (2,761)	1.3 (903)	8 and 18 (2,660)
Boedecker	3,085	2 @ 5 (80)	0.011 (8)	4 (4,020)
Mariana Cove	7,520	2 @ 10 (42)	0.0056 (4)	6 (3,491)
Lakes Place	9,960	2 @ 5 (390)	0.022 (15)	6 (150)

[a] Reported are the current estimated daily discharges for a peak day as calculated based on run time and pump capacity. Pump capacity is based on the rated capacity for the lift station. For duplex stations, only a single pump is in service.
[b] Southside Lift Station is operated at 60 percent speed (1,100 gpm).

All City lift stations must be constructed to current standards, which include provisions for power, pump and wet well monitoring and SCADA alarm notification. SCADA alarms for high wet well level and power failure notify utility employees of potential problems 24 hours per day to ensure response times are met and sanitary sewer overflows are avoided. Off-hours duty personnel are notified of alarm conditions through automatic dialing systems to maximize the Utility's awareness and response to unanticipated failures. The City's goal for response time to alarm situations is two hours or less. In addition, backup generators provide power to ensure redundancy at critical lift stations.



City of Loveland
Wastewater Collection System
Lift Stations
Legend
Lift Station
Private Lift Station
Treatment Plant
Force Main
Wilson Ave.
Taft Ave.
HWY 287
HWY 34
1ST ST
HWY 402
I-25
NORTH HORSESHOE LIFT STA.
SOUTH HORSESHOE LIFT STA.
HORSESHOE LAKE LIFT STA.
BOYD LAKE PRIVATE LIFT STA.
BOYD LAKE LIFT STA.
LAKES PLACE LIFT STA.
TAFT LIFT STA.
29TH ST LIFT STA.
BUS BARN LIFT STA.
EASTSIDE LIFT STA.
MARIANA COVE LIFT STA.
BOEDECKER LIFT STA.
WASTEWATER TREATMENT PLANT
SOUTHSIDE LIFT STA.
BARBERRY LIFT STA.
LAKESIDE TERRACE LIFT STA.
SPRING MOUNTAIN RANCH PRIVATE LIFT STATION
EAGLE CREST PRIVATE LIFT STA.
N
0
3,500
7,000
Feet
1"=3,500'
Figure 5-12
Lift Stations

Table 5-7 Lift Station Pumping Characteristics

Pump #	Manufacturer	Model Number	Pump Type	Impeller Size (in)	Rated Capacity (gpm)	Motor Size (hp)	Motor Speed (rpm)	Voltage	Phase
North Horseshoe								**Max. Pumps:**	**1**
1	Hydromatic	S4M500M3-6	submersible	8.75	384	5	1150	230	3
2	Hydromatic	S4M500M3-6	submersible	8.75	384	5	1150	230	3
South Horseshoe								**Max. Pumps:**	**1**
1	Fairbanks-Morse	B5434	centrifugal	14.65	1100	20	880	480	3
2	Fairbanks-Morse	B5434	centrifugal	14.65	1100	20	880	480	3
Lakes Place								**Max. Pumps:**	**1**
1	Hydromatic	S4M500M6-6	centrifugal	11.00	390	5	1150	208	3
2	Hydromatic	S4M500M6-6	centrifugal	11.00	390	5	1150	208	3
Taft								**Max. Pumps:**	**1**
1	Hydromatic	S4L100M6-6	centrifugal	11.00	600	10	1000	220	3
2	Hydromatic	S4L100M6-6	centrifugal	11.00	600	10	1000	220	3
Bus Barn								**Max. Pumps:**	**1**
1	Hydromatic	S4NRC00M3-4	submersible	6.50	125	5	1750	230	3
2	Hydromatic	S4NRC00M3-4	submersible	6.50	125	5	1750	230	3
29th Street								**Max. Pumps:**	**1**
1	Hydromatic	SH200M3-4	submersible	6.25	100	5	1150	230	3
2	Hydromatic	SH200M3-4	submersible	6.25	100	5	1150	230	3
Boyd Lake								**Max. Pumps:**	**1**
1	Hydromatic	S4NRC500M2-4-88	submersible	7.20	150	5	1750	230	1
2	Hydromatic	S4NRC500M2-4-88	submersible	7.20	150	5	1750	230	1
Boedecker								**Max. Pumps:**	**1**
1	Hydromatic	S4N500M4-4	submersible	7.65	80	5	1750	230	3
2	Hydromatic	S4N500M4-4	submersible	7.65	80	5	1750	230	3
Lakeside Terrace								**Max. Pumps:**	**1**
1	Hydromatic	S4MRC750M3-4	submersible	8.00	100	7.5	1750	230	3
2	Hydromatic	S4MRC750M3-4	submersible	8.00	100	7.5	1750	230	3
Barberry								**Max. Pumps:**	**1**
1	Hydromatic	S4NRC500M3	submersible	6.50	125	5	1750	230	3
2	Hydromatic	S4NRC500M3	submersible	6.50	125	5	1750	230	3
South Side								**Max. Pumps:**	**3**
1	Allis-Chalmers	250 8x8x14	centrifugal	13.25	185	40	1175	460	3
2	Allis-Chalmers	250 8x8x14	centrifugal	13.25	185	40	1175	460	3
3	Allis-Chalmers	250 8x8x14	centrifugal	13.25	185	40	1175	460	3
Mariana Cove								**Max. Pumps:**	**1**
1	Hydromatic	S4P1000M6-4	submersible	5.25	42	10	3450	200	3
2	Hydromatic	S4P1000M6-4	submersible	5.25	42	10	3450	200	3
Horseshoe Lake								**Max. Pumps:**	**1**
1	Hydromatic	S4M500M3-4	submersible	8.25	300	5	1750	208	3
2	Hydromatic	S4M500M3-4	submersible	8.25	300	5	1750	208	3
East Side								**Max. Pumps:**	**1**
1	Hydromatic	S8L10000 M4-4	submersible	13x12	2761	100	1750	480	3
2	Hydromatic	S8L10000 M4-4	submersible	13x12	2761	100	1750	480	3

Areas not currently served by gravity sewer may be served through private ejector systems, incorporating single lots or multiple lots, but in no case exceeding the definition of a sewage lift station currently defined as 2,000 gal/day. These ejector systems will be owned, operated, and maintained by the private developers, lot owners, or business owners served by the facilities. These private systems will be reviewed by the City through the City's development and building permit review processes on a case-by-case basis and will not be routed through the NFRWQPA or state site application review processes.

Below a brief description of each of the City's lift stations is included. Each section includes pumping capacity, force main information and emergency power provisions.

North Horseshoe Lift Station

In 1991, the North Horseshoe Lift Station was modified to accommodate growth throughout northern Loveland. Situated along the northwest edge of Horseshoe Lake, this pumping facility houses duplicate five horsepower submersible pumps with a rated capacity of 384 gallons per minute (gpm) each. Wastewater from the northern part of the old Horseshoe Lake Sanitation District is pumped 360 feet to the west through an 8-inch PVC force main where it discharges to a 15-inch gravity sewer. Then this wastewater is eventually conveyed to the South Horseshoe Lift Station. Due to topographical limitations, it is impossible to eliminate this station by constructing a gravity relief line and as a result, modifications to accommodate growth may again be necessary in the future. Currently, a single 35-kW natural-gas-powered generator provides emergency power to this facility.

South Horseshoe Lift Station

The 1981 B&V Master Plan indicated severely overloaded conditions at the South Horseshoe Lift Station. A significant upgrade in 1982, however, has since alleviated the problem. The South Horseshoe Lift Station is constructed adjacent to the west end of Horseshoe Lake where it receives wastewater from the old Horseshoe Lake Sanitation District, including areas tributary to the North Horseshoe Lift Station. The wetwell/drywell facility houses two centrifugal pumps, each with a rated capacity of 1,100 gpm, which pump wastewater through a 12-inch diameter force main and into an 18-inch gravity sewer approximately 1890 feet south of the station. As with the North Horseshoe Lift Station, it is not possible to eliminate this station by constructing a gravity relief line. Currently, a single 90-kW Caterpillar diesel powered generator provides emergency power to this facility.

Taft Lift Station

The Taft Lift Station is a wetwell/drywell facility upgraded in 1995. The prefabricated steel drywell presently houses duplicate 10 horsepower pumps and is located on the east side of Taft Avenue near Fire Station No. 2. Wastewater is pumped through an 8-inch-diameter force main approximately 1,144 feet north to a 10-inch gravity sewer at the intersection of Taft Avenue and West 29th Street. Due to topographical limitations, no gravity solution exists for this lift station and, therefore, should be considered a permanent facility. Each of the two existing pumping units has a rated capacity of 600 gpm. Emergency power is provided by a 125-kW Onan natural gas generator, which is located at the Fire Station across the street.

Bus Barn Lift Station

The Bus Barn Lift Station is located immediately east of the Loveland High School and services two small subdivisions on the north shore of Lake Loveland. The station houses two 5-horsepower submersible pumps that convey wastewater approximately 1,400 feet north through a 4-inch PVC force main and into an 8-inch gravity sewer located in West 29th Street. The current lift station capacity is expected to accommodate future flows and development. This station, last upgraded in 1991, is considered a permanent facility due to topographic limitations that prohibit the extension of a gravity sewer to this site. A 35-kW Generac natural gas generator provides emergency power to this lift station.

29th Street Lift Station

The 29th Street Lift Station was originally constructed in 1983 and has not been upgraded. At present, the station contains duplicate submersible 5-horsepower pumps housed in a deep precast concrete vault buried immediately south of West 29th Street in the vicinity of the Lake Loveland outlet. Each pump has a rated capacity of 100 gpm and is designed to pump sewage 70 feet to the north side of 29th Street, where a 10-inch gravity sewer serves as the outfall. The lift station force main is constructed of 6-inch-diameter cast iron piping. Due to topographical constraints, this station is a permanent facility of Loveland, as it cannot be replaced with a gravity line. The emergency power for this facility is provided by a 35-kW Generac natural gas generator.

It was identified in the 1981 B&V Master Plan that this lift station became overloaded on occasion as a result of excessive infiltration. This assessment, made prior to upgrades, which have superseded the B&V Master Plan, was based on residential sewage ejector pump usage, which was reported to be significantly less during winter months when irrigation and lake levels were at a minimum. The station has been upgraded prior to 1998 to alleviate these concerns and currently, based on pump run times, infiltration is not a significant concern.

Boyd Lake Lift Station

The Boyd Lake Station was installed in 1989 to provide sewer service to the development occurring along the east side of Boyd Lake. The lift station houses duplicate 5-horsepower submersible pumps within a precast concrete wetwell that was upgraded with a fiberglass liner. Due to topographical constraints, this station is a permanent facility of Loveland, as it cannot be replaced with a gravity line. Each pump has a rated capacity of 150 gpm, and the force main is constructed of 4-inch-diameter PVC. Wastewater is pumped from the Boyd Lake Station approximately 1,600 feet south to an 8-inch gravity sewer. In 2001, a fiberglass liner was installed in the wet well. The lift station has a 30-kW Onan natural gas generator to provide emergency power.

Boedecker Lift Station

Boedecker Lift Station

The Boedecker Lift Station was placed in operation on February 15, 1990. It was initially constructed in the County and then transferred to the City. The lift station provides service to development south of Boedecker Lake and north of Colorado Highway 402. Flows are pumped south, and then east, a total distance of 4,020 feet. The force main is constructed of 4-inch diameter PVC and outfalls to an 8-inch gravity sewer. Due to topographical constraints, this station is a permanent facility of Loveland, as it cannot be replaced with a gravity line. This station houses duplicate 5-horsepower submersible pumps with rated capacities of 80 gpm. Currently, a Generac 35-kW natural-gas-generator provides backup power to this facility.

Lakeside Terrace Lift Station

The Lakeside Terrace Lift Station was installed in 1985. This lift station is located on the east side of Ryans Gulch Lake and serves the Lakeside Terrace Subdivision. The precast concrete wetwell supports two submersible 7.5-horsepower pumps, each with a rated capacity of 100 gpm. Wastewater is pumped up a steep hill through a 4-inch cast iron force main and then discharged to an 8-inch gravity sewer approximately 670 feet east of the station. According to the 1981 B&V Master Plan, this station was scheduled for elimination by a proposed gravity sewer (M-15) prior to 1985. The proposed interceptor has not been constructed and as a result, the Lakeside Terrace Lift Station continues to be necessary. Currently, a Waukesha 30-kW diesel generator provides emergency power to this facility.

Barberry Lift Station

The Barberry Lift Station was originally constructed in 1976. Located immediately south of Colorado Highway 402 near the Collins Cashway's Lumber Yard. The Barberry Lift Station contains duplicate 5-horsepower submersible pumps that are mounted on rails in a 6-foot-diameter concrete manhole. The rated capacity of each pumping unit is 125 gpm. Sewage is discharged through a 4-inch PVC force main to a 12-inch sewer approximately 750 feet west across the Colorado and Southern Railroad tracks. In 1981, this station served only the Cashway's store and was very lightly loaded with substantial reserve capacity. According to the 1981 B&V Master Plan, this station was to be eliminated and replaced by a gravity relief sewer prior to 1985. Today, however, this lift station is still in operation and no changes have been made since the B&V Master Plan was submitted in 1981. The City has engineered plans for the elimination of this lift station and has budgeted for this project to be constructed in the future. Currently, there is no emergency power to this facility.

Southside Lift Station

The Southside Lift Station was constructed in 1983 and is located north of Colorado Highway 402 on South Boise Avenue. This station consists of both a precast concrete drywell and wet well. The drywell houses three 40-horsepower centrifugal pumps which pump wastewater due north 2230 feet to the Wastewater Treatment Plant. The force main is the largest maintained by the City of Loveland, constructed of 20-inch cast iron piping. Due to topographical constraints, no gravity solution exists for this lift station, and therefore, it is considered a permanent facility.

Although the Southside Lift Station is not itself overloaded, it has presented operational problems at the WWTP in the past. City of Loveland personnel have indicated that during periods of high flow, three pumps were necessary to convey wastewater north to the plant headworks. Considering each pump is rated at 1,850 gpm, the total flow delivered to the WWTP during these periods is estimated to be 5,550 gpm. The current maximum peak dry flow recorded at the WWTP is 6.3 mgd, which translates to 4,375 gpm, whereas existing peak wet flows at the WWTP have been estimated to be 8.3 mgd, or 5,765 gpm. The recognition that these flows were being delivered during a short period of time may present hydraulic loading problems at the WWTP. Furthermore, it has been reported that the pumped flow exceeds the capacity of the plant's intake structures, causing flows to surcharge into the upstream collection system.

To alleviate this situation, a number of upstream diversions have been instituted to convey flows away from the Southside Lift Station in hopes of minimizing the occurrence of multiple pump activations at this site. The pumps have also been adjusted to run at 60 percent of capacity. These changes have made the desired effect, and the lift station is currently operating smoothly with the WWTP. Other options that may be implemented to reduce the impacts the Southside lift station is having on the WWTP include but are not limited to the following:

- Smaller diameter forcemain,
- Smaller pumps, and
- Flow equalization at the WWTP.

Currently, there are two sources of direct power to Southside Lift Station: Public Service and Loveland Power.

Mariana Cove Lift Station

The Mariana Cove Lift Station was placed in service in 1995 and provides service to residential development west and north of Boedecker Lake. Wastewater is pumped approximately 3,490 feet north through a 6-inch-diameter force main to a location in the vicinity of West 1st Street. At this point, the flows are gravity fed to the east through the Namaqua Interceptor. The precast concrete lift station houses two 3-horsepower submersible pumps, each with a rated capacity of 42 gpm. Due to topographical limitations, no gravity solution exists for this lift station and, therefore, it should be considered a permanent facility. Currently, a 35-kW Oran natural gas generator provides backup power to this facility.

Lakes Place 4th Lift Station

The Lakes Place 4th Lift Station was constructed in 1996 and is located near the southeast end of Blanca Court. This lift station accommodates flow from 82 single-family dwelling units within the Lakes Place 4th subdivision as well as discharges from Boyd Lake State Park. Wastewater is conveyed by gravity to this facility through an 8-inch PVC line. The Lakes Place 4th Lift Station has two wet wells. The first, which accommodates flow from the Lakes Place 4th subdivision, is an 8.0-foot-inside-diameter, cylindrical wet well, 11.2 feet deep beneath the invert of the incoming sewer line. The size of this wet well has been estimated to be approximately 537 cubic feet. The second wet well accommodates flow from Boyd Lake State Park. This cylindrical wet well is 6 feet in diameter and 8.55 feet deep beneath the invert of the incoming sewer line to the larger wet well. Each wetwell is constructed of a cast-in-place concrete floor with precast concrete sides.

Two 3-horsepower centrifugal pumps, each capable of pumping 390 gpm at 20 feet total dynamic head (TDH), have been installed at this facility. Sewage is conveyed approximately 150 feet through a 6-inch PVC forcemain where it is discharged into an 8-inch gravity sewer near the northeast corner of Silver Leaf Drive. Due to topographical limitations, no gravity solution exists for this lift station and, therefore, it should be considered a permanent facility. Currently, a 35-kW, gas-powered generator provides emergency power to this facility.

East Side Lift Station

The East Side Lift Station provides service to commercial, residential, and mixed-use development north and east of the intersection of 1st and Sculptor. It was placed in service in 2005. Wastewater is pumped 2,660 feet west to a 24-inch gravity line along 1st Street. There are two forcemains from this lift station, one 8 inches in diameter and the other 18 inches in diameter. Currently the valves are arranged to use the 18-inch forcemain. The precast concrete lift station houses two 100-horsepower submersible pumps, each with a rated capacity of 2,761 gpm. Due to topographical constraints, this station is a permanent facility of Loveland, as it cannot be replaced with a gravity line. A 300-kW Onan diesel generator provides emergency power to this lift station.

Horseshoe Lake Lift Station

The Horseshoe Lake Lift Station provides service to residential development on the peninsula in Horseshoe Lake. It was placed in service in 1998. Wastewater is pumped 560 feet southwest through a 6-inch-diameter force main to a 12-inch gravity line, which flows to North Madison Ave. and eventually down to the WWTP. Due to topographical limitations, no gravity solution exists for this lift station and, therefore, it should be considered a permanent facility. The lift station houses two 5-horsepower submersible pumps, each with a rated capacity of 100 gpm. A 35-kW Generac natural gas generator provides emergency power to this lift station.

5.5.3 Infiltration & Inflow Analysis

Infiltration Analysis

In 1982, Black and Veatch completed an Infiltration and Inflow (I/I) Analysis of Loveland's wastewater collection system. This analysis started by determining the average wastewater production rate per capita day (referred to as the "theoretical" wastewater flow) based on standard water usage assumptions. The analysis assumed that the difference between the flow recorded at the plant and the theoretical wastewater flow is the I/I. The estimated Infiltration contribution from this study was 1.2 mgd.

In 1998 CH2M Hill did an I/I study which compared metered customer data to the average WWTP flows for the months of January, February and March. This approach estimated between 1.2 and 1.3 mgd of infiltration.

The City has been conducting renewed flow monitoring efforts since October 2007. To measure the flow rate in the sanitary sewer, an area-velocity (AV) sensor is placed into the flow. A pressure transducer detects the depth of flow, while the average velocity is measured by ultrasonic sound waves and the Doppler Effect. These measured values allow the flow rate to be calculated. Most often flow monitors are deployed for 3 months at a time spanning from a dry season to a wet season (irrigation season) or vice versa. This is done to see how seasonal changes affect the infiltration rate.

For this I/I analysis, the smallest flow rate recorded over the period of record is assumed to be the infiltration rate in the line. It is understood that there is a component of customer flow 24-hours a day; however, by taking the lowest value over a period of many months, we are choosing a value with the least amount of customer flow.

During fall 2008 (September 25 to December 4), flow monitors were deployed in the six trunk lines that convey flow to the WWTP. Although the flow monitoring was not able to capture a transition from a wet season to a dry season, the data allowed for a base infiltration value to be determined for each trunk line. There were no major rainstorms or snowmelts during that time. The flow data show that up to 1.28 mgd of infiltration reach the WWTP, which is 24 percent of the total flow to the WWTP. **Figure 5-13** shows the percentage of infiltration in each of the trunk lines.

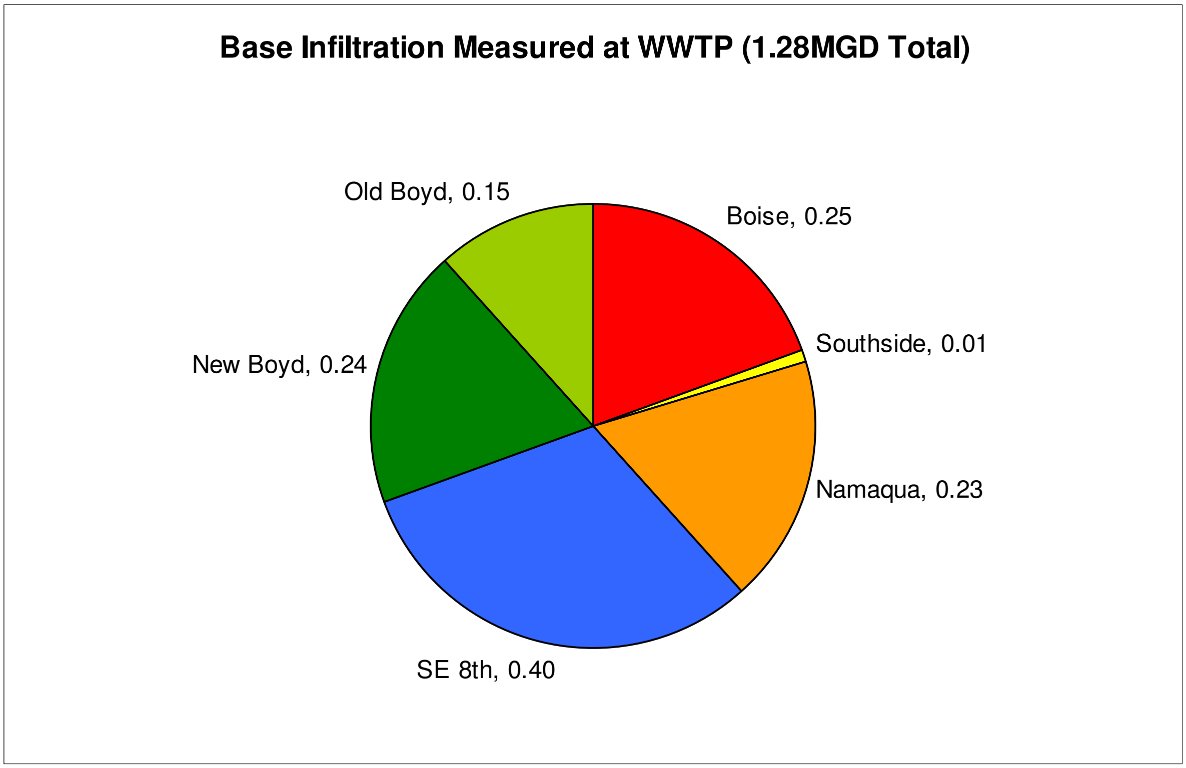


FIGURE 5-13
Base Infiltration Flow into the Wastewater Treatment Plant

Inflow Analysis

Two significant thunderstorms have hit Loveland since the beginning of flow monitoring in 2007. The first storm was on October 13, 2007. At 2:55 pm, an intense rainfall started and within the first hour, 0.45 inches of rain had fallen. The rain stopped for the rest of the day. Shortly after midnight on October 14, a light, steady drizzle dropped another 0.7 inch of rainfall over the next 24 hours.

At the time of the storm, flow monitors were deployed across the Carlisle Basin in the southwest quadrant of Loveland. The flow monitor at the downstream end of that basin was analyzed to determine the magnitude of rainfall-derived inflow and infiltration (RDII).

The 10-inch trunk line had an increase of approximately 40 gpm during the heaviest rain. This increase can be attributed to rainfall-derived inflow. For the next couple of days the line was flowing about 20 gpm higher than normal due to infiltration.

The second storm, on September 11, 2008, dropped about 0.5 inches of rain in 3 hours (6:00 to 9:00 pm). Over the next 14 hours, a steady rain dropped an additional 0.6 inches of rain. At the time of the rainstorm, 10 flow monitors were deployed in and around the Old Fairgrounds Park.

Five trunk lines flow into the park and two interceptors flow out. Each of the incoming lines shows an abrupt jump in the typical flow due to rainfall-derived Inflow. Over the next couple of days, rainfall-derived Infiltration can be seen in these lines as well.

The RDII values are summarized in the **Table 5-8** below. The graphs and figures that support these numbers can be found in **Appendix 8.Q.**

TABLE 5-8
Inflow Values

MH#	Trunk Line	Storm	Inflow (gpm)	Infiltration (gpm)
2001	SE 8th 30" Int.	2008	250	45
1998	Namaqua 24" Int.	2008	200	100
1868	Calisle 10"	2007	35	20
1868	Calisle 10"	2008	60	45
1866	RR S. 15"	2008	40	60
1917	Namaqua 21"	2008	145	45
1930	Taft 15"	2008	110	15
1982	Barnes 15"	2008	155	0

Source: 2007 and 2008 flow monitoring data.

The City of Loveland's wastewater collection system consists of nearly 332.4 miles of pipe from 4 inches to 36 inches in diameter. The system contains six interceptors conveying flow to the WWTP.

- Southeast 8th Interceptor: 24-inch VCP
- Namaqua Interceptor: 32-inch CIPP
- New Boyd Interceptor: 30-inch PVC
- Old Boyd Interceptor: 22-inch CIPP
- East Side Interceptor: 30-inch PVC
- Southside Interceptor: 30-inch RCP

Flow monitoring was done on these interceptors from September 25, 2008, to December 5, 2008. Over this period, flow monitors were placed in the six lines conveying flow to the WWTP. To verify the accuracy of the flow monitors, the total daily flow from each site was added together and compared to the plant's daily influent volume. On average, the summed flows were 5 percent below the plant daily volumes, which is an acceptable amount of error based on the technology of the flow monitors. The flow monitors came up with an average plant flow of 5.43 mgd. **Figure 5-14** shows the volume of flow each interceptor delivers to the WWTP. It should be noted that the East Side Interceptor conveys flow to the New Boyd line, not all the way to the WWTP. The East Side Interceptor averages a flow of 0.367 mgd, which is 24 percent of the flow in the New Boyd Interceptor. In addition, the Boise trunk line is an 18-inch-diameter line that conveys flow directly to the WWTP, but due to its diameter is not classified as an interceptor.

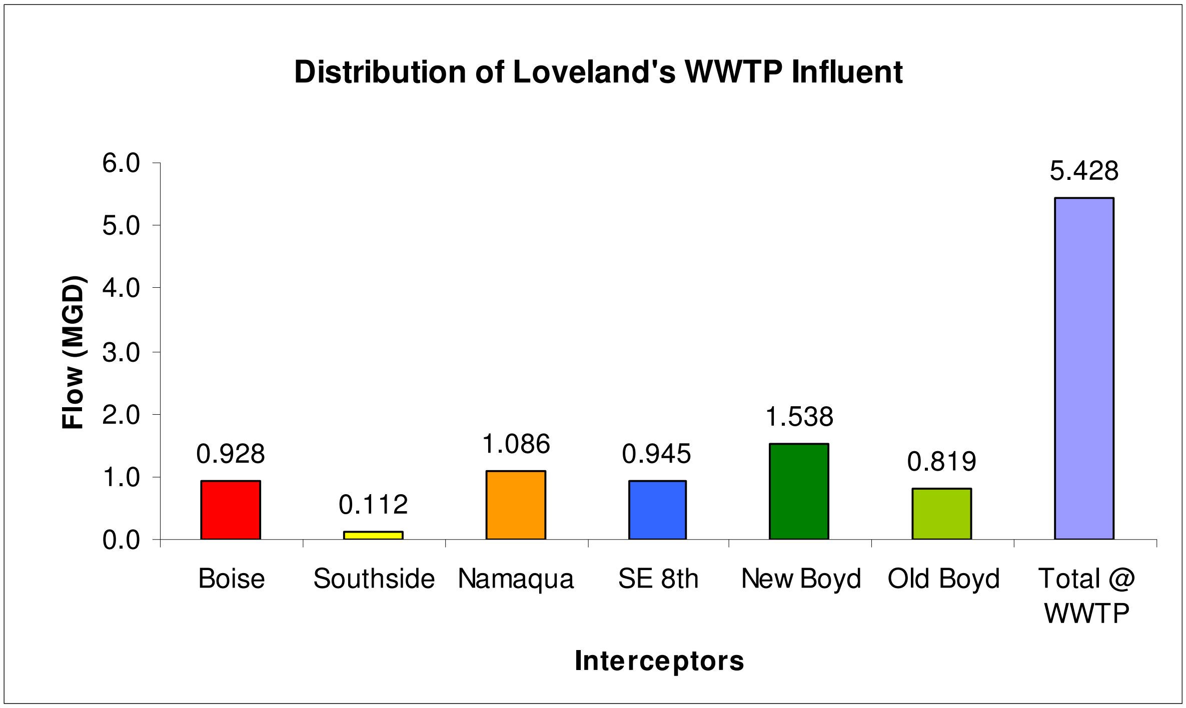


FIGURE 5-14
Flow into the Wastewater Treatment Plant

Overlaying the interceptors over the floodplain 34 sanitary sewer manholes have been identified within the floodplain. **Table 5-9** lists the interceptor manholes that are within the floodplain.

TABLE 5-9
Interceptor Manholes in the Floodplain

#	Interceptor	MH#	#	Interceptor	MH#
1	Southside	1916	18	Southside	1968
2	Southside	4556	19	Southside	1972
3	Southside	1915	20	Southside	1973
4	Southside	4555	21	Southside	1974
5	Southside	1909	22	Southside	1975
6	Southside	1907	23	Southside	3373
7	Southside	1912	24	Southside	2802
8	Southside	1911	25	Southside	3616
9	Southside	1953	26	Southside	3578
10	Southside	1954	27	Southeast 8th	1979
11	Southside	1965	28	Southeast 8th	2001
12	Southside	1966	29	Southeast 8th	2002
13	Southside	1964	30	Southeast 8th	2003
14	Southside	1958	31	Namaqua	1924
15	Southside	1959	32	Namaqua	1978
16	Southside	1960	33	Namaqua	1998
17	Southside	1971	34	Namaqua	2004

5.5.4 Wastewater Collection Infrastructure Sizing and Staging (10-yr CIP list)

The City's 20-year CIP budget is provided in **Table 5-10**. The following text describes the projects and expenses that will occur from 2010 to 2019.

In House Labor/Fleet Charges

The Capital Improvements Program benefits from various general overhead items including vehicle, equipment, and manpower required to operate the wastewater Utility. This budget line item ensures that the Capital Improvements Program bears a proportionate share of these costs.

ROW Utility Relocate

These funds are used to pay for relocating existing water and wastewater utilities within existing road rights-of-way. These relocations are typically due to other City, County, or State public works projects that create a conflict for the water utility and the proposed improvements.

20-Year Wastewater CIP Project Projection (2010-2029)

UNRESTRICTED FUNDS (General)

Project	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	TOTAL
In House Labor/Fleet Charges	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$60,000	$1,200,000
ROW Utility Relocate	$0	$0	$10,000	$10,000	$20,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000	$490,000
Manhole Rehab Phase 1	$50,000	$50,000																			$100,000
CMOM Initial Audit		$125,000																			$125,000
Fairgrounds/Namaqua Intcp. Rehab-St. Louis to Lincoln (PH 2) / Construction		$412,000																			$412,000
4th & Cleveland Sewer Line Repair			$160,000																		$160,000
West 2nd St Sewer Line Replacement			$160,000																		$160,000
Boyd Interceptor Phase V - Construct	$250,000	$265,000																			$515,000
Boyd Interceptor Phase VI			$400,000																		$400,000
Boyd Interceptor Phase VII				$425,000																	$425,000
Design/Rehab/Replace Misc. Sewer, 2.5 miles/year (0.75 of 320 miles, assume 140 year life)					$500,000	$500,000	$500,000	$500,000	$901,250	$901,250	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$500,000	$8,802,500
Recurring 8" VCP Sewerline Rehab					$50,000	$50,000					$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$600,000
South Horseshoe Lift Station Design (43% Gen Portion)					$43,000																$43,000
South Horseshoe Lift Station Construct (43% Gen Portion)						$242,523															$242,523
South Horseshoe Lift Station SDC's (43% Gen Portion)						$31,003															$31,003
Barberry Place Lift Station Abandonment								$265,740													$265,740
Miscellaneous Wastewater Capital Projects (General Funds)											$750,000	$772,500	$795,675	$819,545	$844,132	$869,456	$895,539	$922,405	$950,078	$978,580	$8,597,909
GEN SUBTOTAL	$360,000	$912,000	$790,000	$495,000	$673,000	$913,526	$590,000	$855,740	$991,250	$991,250	$1,390,000	$1,412,500	$1,435,675	$1,459,545	$1,484,132	$1,509,456	$1,535,539	$1,562,405	$1,590,078	$1,618,580	$22,569,676

Wastewater CIP Projects 2010-2029

RESTRICTED FUNDS (SIF's)

Project	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	TOTAL
Oversizing & Extensions Agreement	$0	$0	$30,000	$75,000	$75,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$100,000	$1,680,000
Consultant Hire for DRT				$30,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$830,000
Geotechnical Testing for Development Trenches	$2,000	$2,000	$3,000	$5,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$10,000	$172,000
Wastewater Master Model incl Software / Three Stages 2008-2010	$164,800																				$164,800
Wastewater Development Modeling Assistance		$5,000	$5,000	$10,000	$15,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$335,000
Carlisle Phase IV (Taft to Railroad) - Parallel 15" Sewer line / Easements and Design	$60,000																				$60,000
SDC		$50,000																			$50,000
Construct		$460,000																			$460,000
*Boyd SL Intcp. Relief - Hwy 34 to Hoffman (PH 2) / Easements and Design			$30,000	$80,000																	$110,000
SDC					$48,410																$48,410
Construct					$741,600																$741,600
South Horseshoe Lift Station Design (57% SIF Portion)					$57,000																$57,000
SDC						$41,097															$41,097
Construct						$321,485															$321,485
*Boyd SL Intcp. Relief - Hoffman to 29th St. (PH 3) / Easements and Design						$30,000	$80,000														$110,000
SDC								$31,930													$31,930
Construct								$530,450													$530,450
*Boyd SL Intcp. Relief - 29th St. to 37th St. (PH 4) / Easements and Design									$30,000	$80,000											$110,000
SDC																					$0
Construct																					$0
North Horseshoe Lift Station Upgrades / Design									$75,190												$75,190
SDC										$31,930											$31,930
Construct										$530,450											$530,450
East Side Lift Station Upgrades / Design										$75,000											$75,000
SDC (value of $75,000)																					$0
Construct (value of $500,000)																					$0
East Side Discharge Trunk to WWTP / Design $125,000 value)										$125,000											$125,000
SDC (value of $100,000)																					$0
Construct (value of $1,000,000)																					$0
SIF Capital Expenditure – 402 Sewer Line			$255,000	$2,345,000																	$2,600,000
Miscellaneous Wastewater Capital Projects (Restricted Funds)											$750,000	$772,500	$795,675	$819,545	$844,132	$869,456	$895,539	$922,405	$950,078	$978,580	$8,597,909
SIF SUBTOTAL	$226,800	$517,000	$323,000	$2,545,000	$997,010	$572,582	$260,000	$742,380	$285,190	$1,022,380	$930,000	$952,500	$975,675	$999,545	$1,024,132	$1,049,456	$1,075,539	$1,102,405	$1,130,078	$1,158,580	$17,889,251
Yearly Total =	$586,800	$1,429,000	$1,113,000	$3,040,000	$1,670,010	$1,486,108	$850,000	$1,598,120	$1,276,440	$2,013,630	$2,320,000	$2,365,000	$2,411,350	$2,459,091	$2,508,263	$2,558,911	$2,611,078	$2,664,811	$2,720,155	$2,777,160	$40,458,927
Cumulative Total =	$586,800	$2,015,800	$3,128,800	$6,168,800	$7,838,810	$9,324,918	$10,174,918	$11,773,038	$13,049,478	$15,063,108	$17,383,108	$19,748,108	$22,159,458	$24,618,549	$27,126,812	$29,685,723	$32,296,801	$34,961,612	$37,681,767	$40,458,927	

TABLE 5-10
20-Year Wastewater CIP Project Projection (2010-2029)

Manhole Rehabilitation

This funding source will identify manholes in the wastewater collection system in need of rehabilitation to extend their service life and reduce potential complications and Sanitary Sewer Overflows (SSOs) related to structural failure. The City is currently investigating several coating systems that, once applied and cured, protect the existing manhole structure from further deterioration due to hydrogen sulfide as well as provide additional structural support.

CMOM Initial Audit

The City has identified CMOM requirements that will be included in an initial audit. This effort will ensure the City is prepared for any future CMOM tracking and reporting requirements.

Fairgrounds/Namaqua Interceptor Rehab

This aging concrete sewerline is showing signs of deterioration and needs to be rehabilitated to ensure adequate service and reliability.

4th and Cleveland Sewer Line Repair

This project will address localized sewer line problems to ensure reliable service for surrounding neighborhoods and customers for future years.

West 2nd Street Sewer Line Replacement

This project will address localized sewer line problems to ensure reliable service for surrounding neighborhoods and customers for future years.

Boyd Interceptor

This aging concrete sewerline is showing signs of deterioration and needs to be rehabilitated to ensure adequate service and reliability for future years. This project will be installed from Boise Avenue to 29th Street.

Rehab/Replacement of Existing Miscellaneous Sewer

Replacing aging infrastructure is a growing need within the utility. After decades, sewer pipes and manholes reach the end of their service life and require increasing maintenance and rehabilitation costs. In some cases, these costs can become unacceptably high and the utility is best served by replacing the facilities. Typically, most communities face increasing replacement costs as the age of installed infrastructure advances.

South Horseshoe Lift Station Upgrade

As northern portions of the City grow in population the existing South Horseshoe Lift Station will need to be replaced with a new, larger facility. This replacement project will also include provisions for emergency sewage overflow storage under extended power failure to further protect the adjacent Horseshoe Reservoir from potential overflows. The City has studied the feasibility of increasing the emergency overflow volume of this site and determined that recommended 2-hours' worth of peak flow cannot be accommodated with the existing limited site and high groundwater concerns. While the future expansion of this facility will include an increase overflow volume with underground storage, or above ground storage, or a combination thereof, it will be likely be significantly less than the above criteria. In light of this less-than-standard emergency storage volume, the City will need to rely on our maintenance and emergency response personnel to ensure that sewer backups and overflows due to power or mechanical failure at the pump station are minimized.

Barberry Place Lift Station Abandonment

Design and installation of gravity sewerline facilities will allow the Utility to abandon an existing lift station. This will reduce long-term operation and maintenance costs associated with the Barberry Place Lift Station.

Oversizing and Extensions Agreement

As development on the fringes of the City occurs, private developers design and install wastewater infrastructure to serve their specific project. When the City anticipates that additional capacity is desired to serve needs above and beyond that which is related to the proposed development, the Utility may require a larger facility to be installed by the Developer. The Utility reimburses the Developer for these increased costs through the Extension and Oversizing program.

Consultant Hire for DRT

During periods of increased land development and construction activity, the City's development review and coordination workload increases. To ensure that the City can meet review responsibilities, these funds are used to procure consultant services.

Geotechnical Testing for Development Trenches

To ensure that trench subgrade and backfill materials are compacted sufficiently, the City performs independent testing using these funds.

Wastewater Master Model and Software

The City has retained a consulting engineering firm to construct a wastewater model of the existing wastewater infrastructure using record drawings and survey information. Once this multi-year effort is complete, the City will analyze proposed developments to estimate the impact to existing downstream collection systems. This tool will better allow the City to assess additional infrastructure requirements for proposed development projects.

Carlisle Parallel Sewer Line

Existing sewer transmisstion lines near the Big Thompson River are currently nearing capacity. To ensure adequate service for future popuuation growth, this project will feature a parallel sewer line to augment the existing system capacity.

Boyd Sewer Line Interceptor Relief

A new sewer line will be be installed parallel to an existing facility nearing its capacity. This project will be broken into future phases:

- Highway 34 to Hoffman
- Hoffman to 29th Street
- 29th Street to 37th Street

North Horseshoe Lift Station Upgrade

Upgrades to an existing lift station will increase pumping capacity to provide adequate sewer service to potential development and population growth in areas north of Horseshoe Reservoir.

East Side Lift Station and Trunk Sewerline to Wastewater Treatment Plant

As future growth occurs in the east region of the City's wastewater service area, increased pumping capacity will be required at the existing East Side Lift Station.

Highway 402 Corridor Sewer Line

Future sewerlines and lift stations will be required to serve recently-annexed properties along highway 402 in the southern portion of the City.

5.5.5 10-20 Year Capital Improvement Projects

The following discussion consists of capital improvement projects that will need to be constructed to provide sewer service to the undeveloped land remaining within the 208 Boundary. Due to the unpredictability of development, it is unknown when certain portions of the City will develop. No effort was made in this analysis to predict how and when this development will occur. The following analysis was done to determine the sewer infrastructure needed to service the fully developed areas and the cost associated with each project.

Figure 5-15 shows an overview of the City's future growth areas within the 208 Boundary. Based on current zoning, densities were applied to the land and maximum sewer flows and necessary pipe diameters were determined for each area (see **Appendix 8.U** for calculations). **Appendix 8.U** also contains the calculations used to determine the cost estimates of each project described below. The cost of the projects will not fall on the City but rather on the developer. However, the City may need to foot a portion of the construction bill to oversize pipes for future development.

West Houts Reservoir Trunk

There are 470 acres of developable land east of N. Boyd Lake Avenue, south of County Road (CR) 26, and west of Houts Reservoir and Equalizer Lake (see **Figure 5-16**). The land is proposed as Low Density Residential (LDR). A 21-inch diameter stub has been built underneath Equalizer Ditch, southwest of Equalizer Lake. From the provided stub, up to an 18-inch diameter sewer line may need to be built approximately 4,500 feet north, paralleling Equalizer Lake and Houts Reservoir. Estimated construction cost: $398,317.

East Houts Reservoir Trunk

There are 163 acres of developable land west of Rocky Mountain Avenue, south of CR 26, and east of Houts Reservoir (see **Figure 5-16**). The land is proposed as Employment (E). A 12-inch diameter stub exists north of Equalizer Lake. From this stub, up to an 18-inch diameter sewer line may be required. The new trunk will need to extend approximately 3,000 feet in order to service this area. The line will parallel Houts Reservoir. Estimated construction cost: $264,367.

County Road 3 Trunk

There are 793 acres of developable land west of Kendall Parkway, north of Highway 34, and east of CR 3 (see **Figure 5-16**). The land is broken up into four land use plans: Employment (E), Medium Density Residential (MDR), Low Density Residential (LDR) and Estate Residential (ER). In general, the land slopes to the southeast. To service this area, a lift

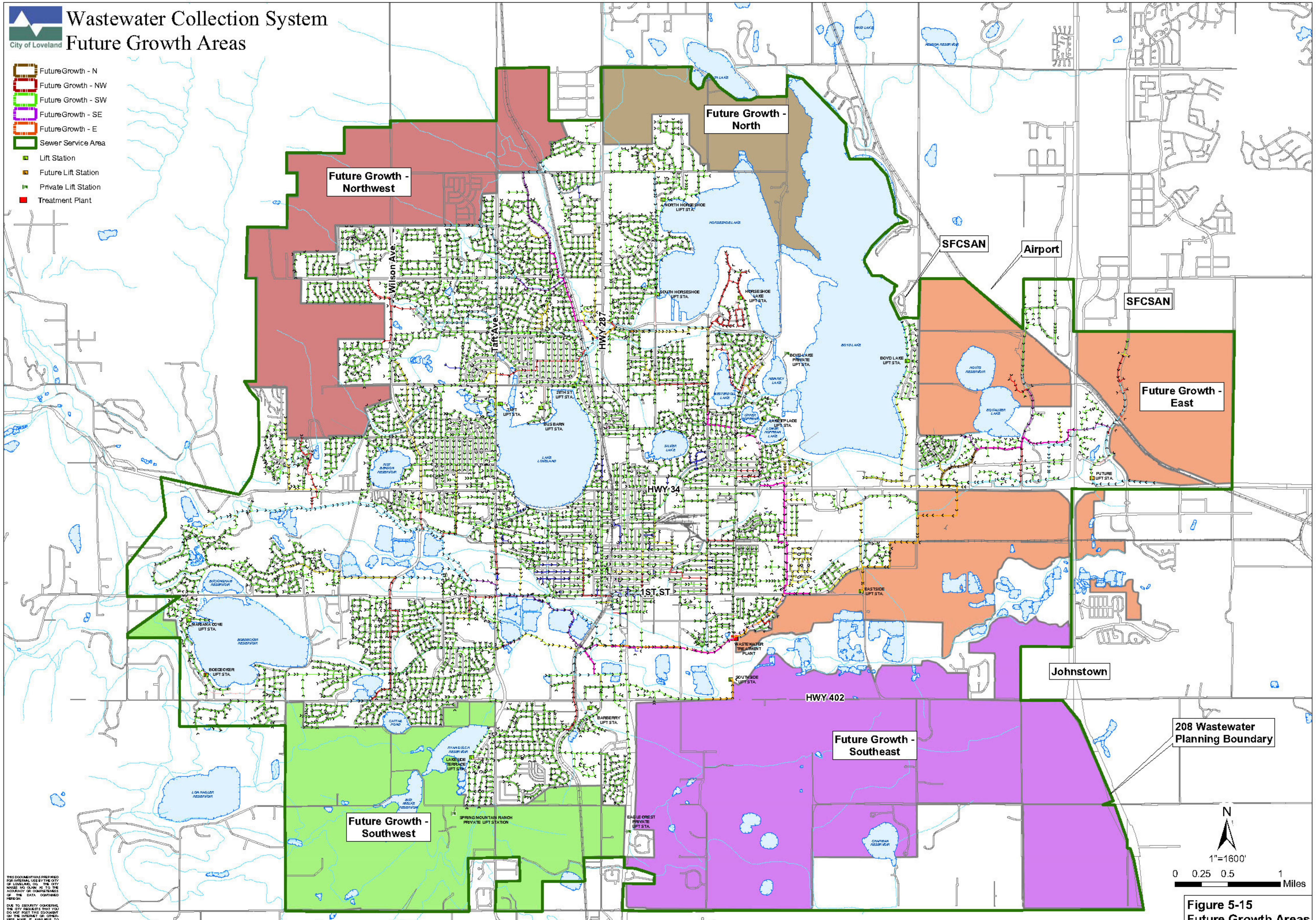


Figure 5-15
Future Growth Areas

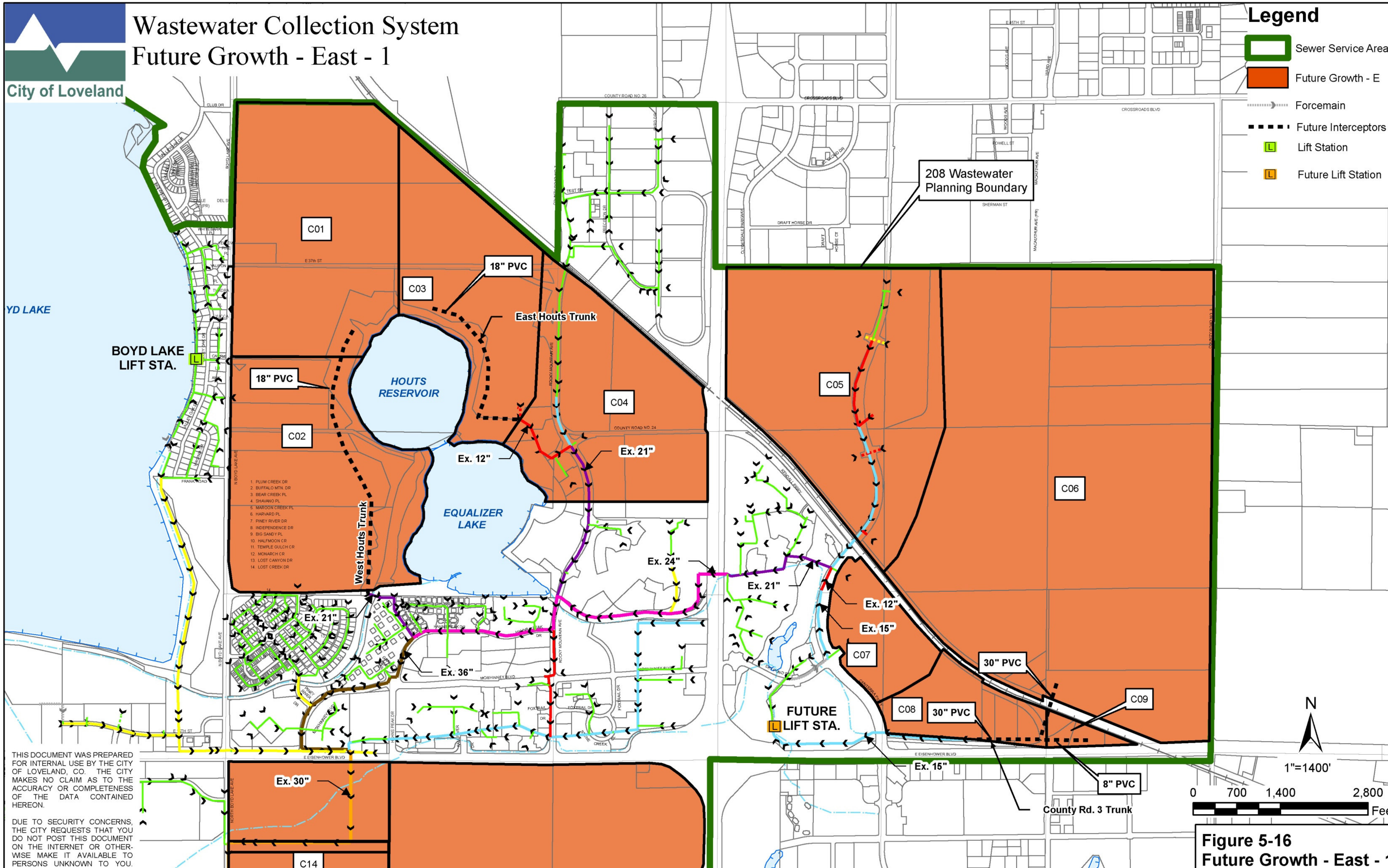


Figure 5-16
Future Growth - East - 1

station will need to be built at the northeast corner of I-25 and Hwy 34 to pump flow back into the gravity system that flows to the WWTP. A trunk line will need to be built to the east from the lift station that parallels Hwy 34. The trunk may need to be up to a 30-inch diameter sewer from the lift station up to and beneath the railroad tracks. The line will need to be bored underneath the railroad tracks to service the area north of the tracks. In addition, an 8-inch line will need to be built off the trunk line to service the 10-acre, triangular parcel of land south of the railroad tracks and north of HWY 34. Estimated construction cost: $597,220.

Centerra South Trunk

At the southwest corner of Interstate 25 and Highway 34 and north of the Great Western railroad tracks are 282 acres of land zoned as Regional Activity Center (RAC) (see **Figure 5-15**). In order to service this area, up to a 21-inch diameter sewer line may need to be extended approximately 2,600 feet east, through the Youth Sports Park, from the existing 30-inch interceptor in Boyd Lake Avenue. Estimated construction cost: $263,148.

Big Thompson Trunk

There is a large swath of developable land east of the WWTP, north of the Big Thompson River flood plain and generally south of the Great Western Railroad tracks (see **Figure 5-17**). However, the approximately 730 acres of land is south, and downhill, of any possible sewer line connection. The topography of this land generally slopes to east. Much of the land is currently zoned as Low Density Residential (LDR), but it also includes RAC and open space. To provide sewer service to this land a lift station will need to be built near I-25 with a force main that runs approximately 3.8 miles back to the WWTP. A trunk line up to 18 inches in diameter will need to be built from the lift station to the west approximately 2.5 miles. Estimated construction cost: $2,504,105.

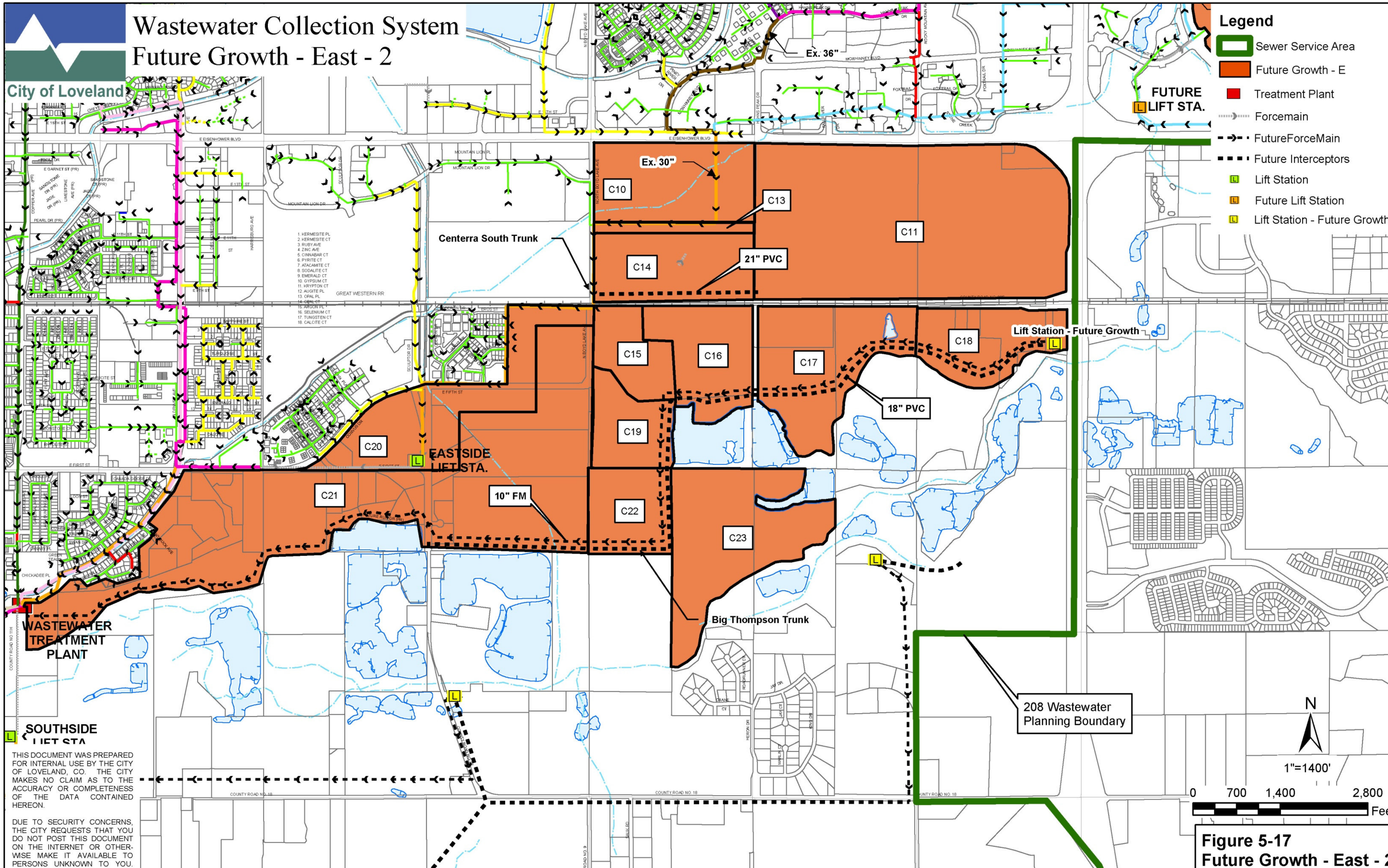
402 Interceptor

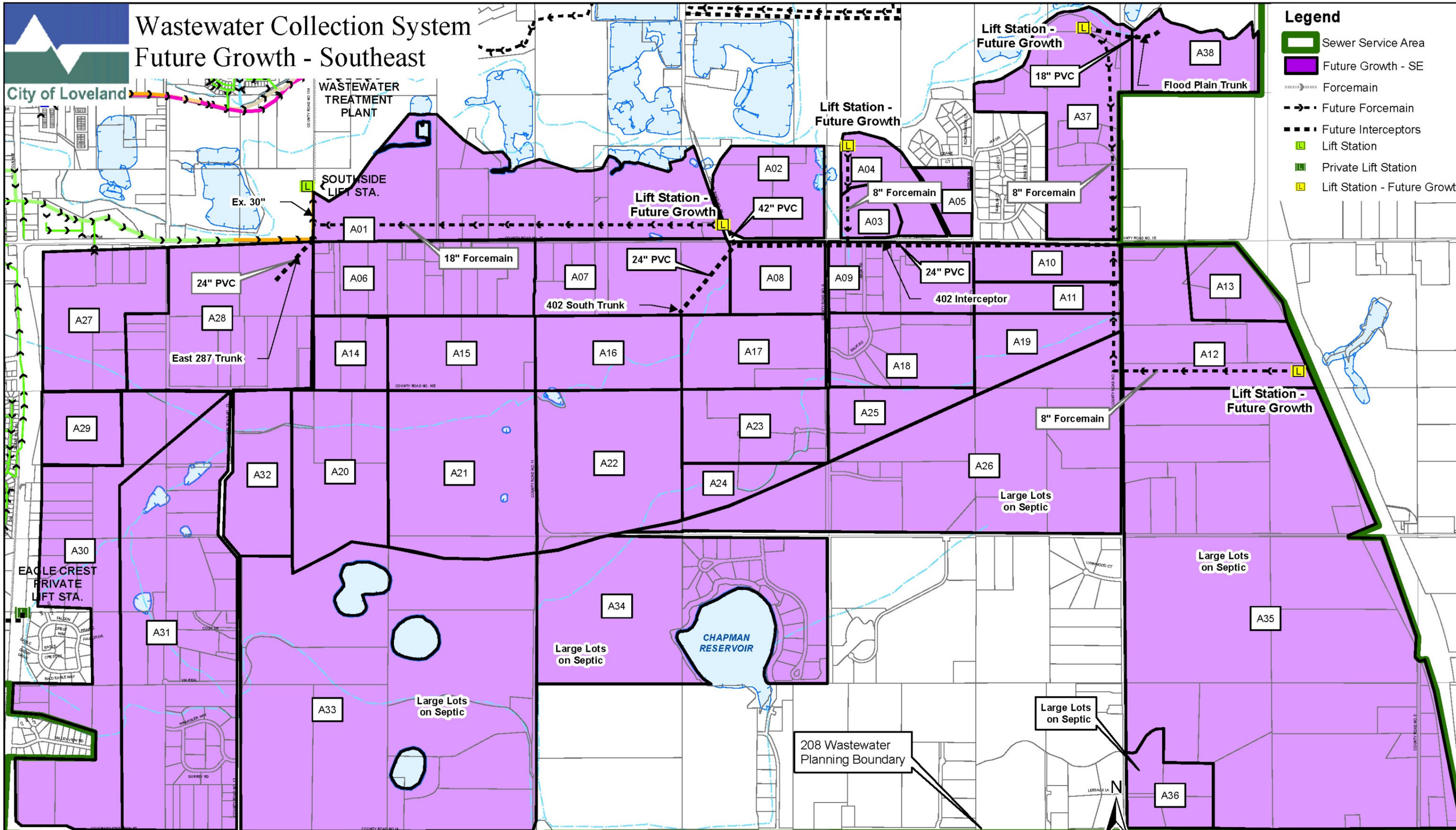
Large tracts of land along Highway 402 are planned as Employment (E) and Low Density Residential (LDR). This area cannot be served by gravity and, therefore, a lift station will need to constructed in conjunction with the interceptor. The lift station will be positioned on County Road 9E near the Big Thompson River flood plain boundary. A 24-inch diameter gravity line will flow from CR 7 west along Hwy 402 and then north into the lift station for a total distance of 1.6 miles (see **Figure 5-18**).

An 18-inch force main will convey flow further west to the Southside Lift Station. To allow for commercial development along the Hwy 402, the forcemain easement will be constructed parallel to the highway, but likely offset to the north. Estimated construction cost: $2,223,039.

Floodplain Trunk

The northwest corner of Interstate 25 and Highway 402 contains land within the Effective Service Area (see **Figure 5-18**). There is approximately 212 acres of land currently zoned for Employment (E) or Low Density Residential (LDR). To service this area, a sewer line will need to be constructed along the north boundary of this development, along the Big Thompson River flood plain. A lift station will need to be constructed along with an approximately 4,000 foot long, 8-inch diameter force main. The force main will discharge into the 402 Interceptor. Estimated construction cost: $595,480.


Wastewater Collection System
Future Growth - East - 2
City of Loveland
Legend
Sewer Service Area
Future Growth - E
Treatment Plant
Forcemain
FutureForceMain
Future Interceptors
Lift Station
Future Lift Station
Lift Station - Future Growth
FUTURE LIFT STA.
Ex. 36"
Ex. 30"
C10
C11
C13
C14
21" PVC
Centerra South Trunk
C15
C16
C17
C18
Lift Station - Future Growth
18" PVC
C19
C20
EASTSIDE LIFT STA.
C21
10" FM
C22
C23
Big Thompson Trunk
WASTEWATER TREATMENT PLANT
SOUTHSIDE LIFT STA.
208 Wastewater Planning Boundary
N
1"=1400'
0 700 1,400 2,800 Feet
THIS DOCUMENT WAS PREPARED FOR INTERNAL USE BY THE CITY OF LOVELAND, CO. THE CITY MAKES NO CLAIM AS TO THE ACCURACY OR COMPLETENESS OF THE DATA CONTAINED HEREON.
DUE TO SECURITY CONCERNS, THE CITY REQUESTS THAT YOU DO NOT POST THIS DOCUMENT ON THE INTERNET OR OTHERWISE MAKE IT AVAILABLE TO PERSONS UNKNOWN TO YOU.
Figure 5-17
Future Growth - East - 2



THIS DOCUMENT WAS PREPARED FOR INTERNAL USE BY THE CITY OF LOVELAND, CO. THE CITY MAKES NO CLAIM AS TO THE ACCURACY OR COMPLETENESS OF THE DATA CONTAINED HEREON.

DUE TO SECURITY CONCERNS, THE CITY REQUESTS THAT YOU DO NOT POST THIS DOCUMENT ON THE INTERNET OR OTHERWISE MAKE IT AVAILABLE TO PERSONS UNKNOWN TO YOU.

Figure 5-18
Future Growth - Southeast

402 South

To provide sewer service to the developable land south of Hwy 402, west of CR 9, north of CR 16 and generally east of an extended Boise Avenue a 24-inch sewer line will need to be constructed from the intersection of Hwy 402 and CR 9E (see **Figure 5-18**). The area consists of approximately 233 Employment acres and 844 LDR acres. This project cannot be built until the 402 Interceptor and pump station are operational. Estimated construction cost: $172,110. As illustrated in Figure 5-18, various interceptors, force mains, and lift stations will be necessary to service these areas. These facilities are conceptually located on the figure, however depending on future private development, these locations and sizes may change.

East 287 Trunk

There are approximately 946 acres of developable land east of Highway 287 and south of Hwy 402. The land is bounded by Highway 60 to the south and, in general, land west of an extended Boise Avenue (see **Figure 5-18**). Most of the land is proposed as Low Density Residential (LDR), Medium Density Residential (MDR) or Estate Residential (ER). A small portion of the property (106 acres) is designated as Community Activity Center (CAC). To provide service to this area, a sewer line will need to be constructed from the intersection of HWY 402 and Boise Avenue and eventually extended south and east toward Hwy 60. The sewer will need to be a 24-inch diameter line at the downstream end where it will connect to the existing 30-inch line in Hwy 402. The line will be constructed based on development along Hwy 287, presumably from north to south. All flow from this trunk will flow to the Southside Lift Station. Estimated construction cost: $112,602.

Area Tributary to Eagle Crest Private Lift Station

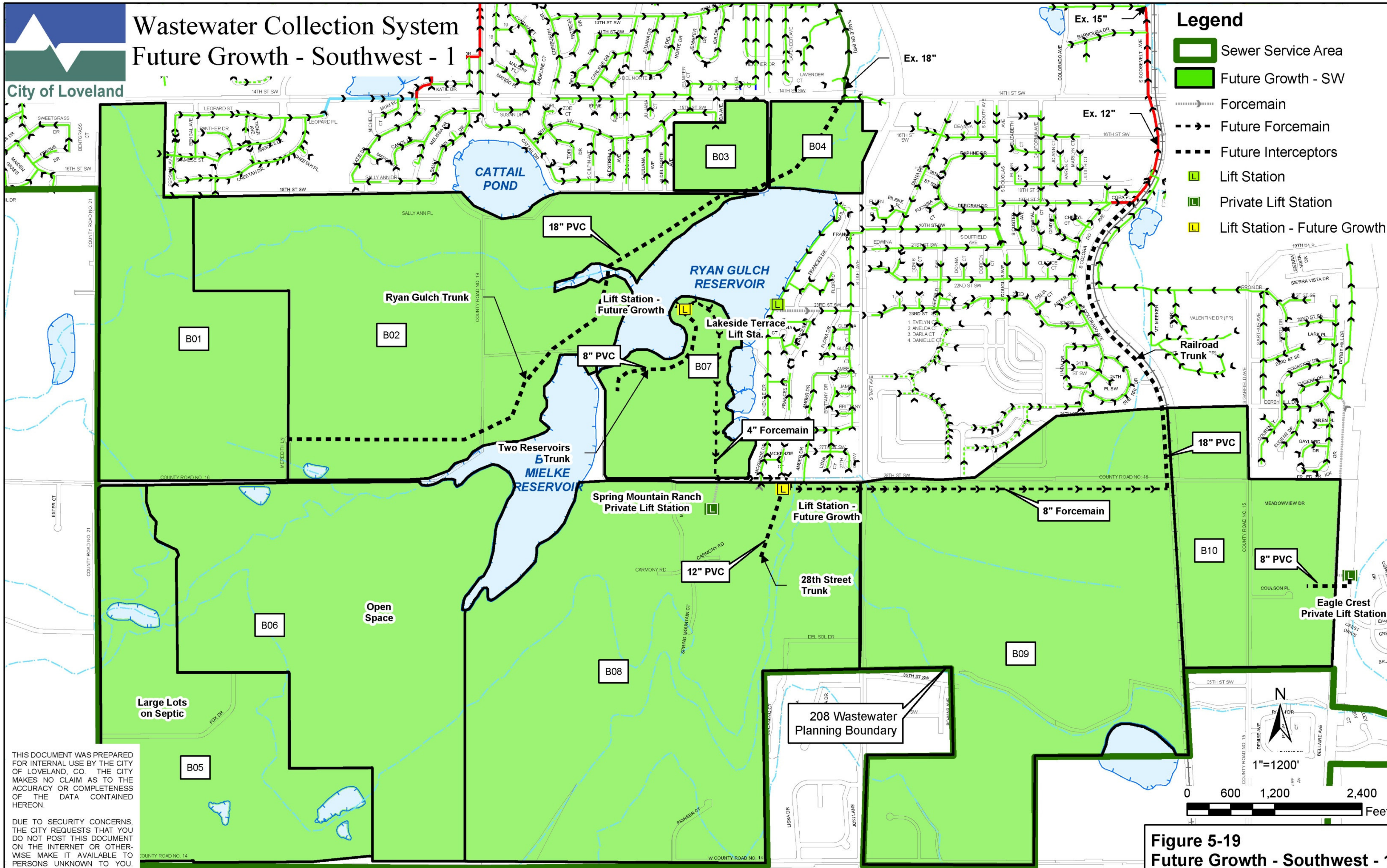
There are approximately 154 acres of land to be developed west of Hwy 287, east of the BNSF Railroad tracks, north of the 208 service boundary and generally south of CR 16 that naturally will flow toward the Eagle Crest Private Lift Station (see **Figure 5-19**). An 8-inch pipe will be sufficient to convey flow to the lift station. Additional flow to this lift station will likely trigger buyout of the private station and future City maintenance. As an alternative, once the East 287 Trunk is constructed, a gravity sewer option may also exist for the flows tributary to Eagle Crest Lift Station. Estimated construction cost: $46,409.

Railroad Trunk

To provide sewer service to the area east of S. Taft Ave., west of Hwy 287, south of CR 14 and generally north of 28th Street W. (CR 16), as well as areas further west (see below), an 18-inch diameter sewer line will need to be built paralleling the BNSF Railroad tracks. This line will provide service to the area proposed as Estate Residential (ER) to flow by gravity to Loveland's WWTP. Estimated construction cost: $399,809.

28th Street Trunk

Approximately 530 acres of land is planned as Estate Residential (ER) west of S. Taft Ave., south of 28th Street W. and north of W. CR 14 (see **Figure 5-19**). Currently the Spring Mountain Ranch Private Lift Station receives sewer flow from residences along Spring Mountain Ct. and lifts it into the City's gravity system. The flow is discharged into an 8-inch line in McKenzie Dr. Once this area is developed, the 8-inch receiving line will be too small


Wastewater Collection System
Future Growth - Southwest - 1
City of Loveland
Legend
Sewer Service Area
Future Growth - SW
Forcemain
Future Forcemain
Future Interceptors
Lift Station
Private Lift Station
Lift Station - Future Growth
Ex. 15"
Ex. 18"
Ex. 12"
CATTAIL POND
RYAN GULCH RESERVOIR
MIELKE RESERVOIR
B01
B02
B03
B04
B05
B06
B07
B08
B09
B10
18" PVC
Ryan Gulch Trunk
Lift Station - Future Growth
Lakeside Terrace Lift Sta.
8" PVC
4" Forcemain
Two Reservoirs Trunk
Spring Mountain Ranch Private Lift Station
Lift Station - Future Growth
8" Forcemain
18" PVC
Railroad Trunk
12" PVC
28th Street Trunk
Open Space
Large Lots on Septic
208 Wastewater Planning Boundary
8" PVC
Eagle Crest Private Lift Station
N
1"=1200'
0 600 1,200 2,400
Feet
THIS DOCUMENT WAS PREPARED FOR INTERNAL USE BY THE CITY OF LOVELAND, CO. THE CITY MAKES NO CLAIM AS TO THE ACCURACY OR COMPLETENESS OF THE DATA CONTAINED HEREON.
DUE TO SECURITY CONCERNS, THE CITY REQUESTS THAT YOU DO NOT POST THIS DOCUMENT ON THE INTERNET OR OTHERWISE MAKE IT AVAILABLE TO PERSONS UNKNOWN TO YOU.
Figure 5-19
Future Growth - Southwest - 1

to handle the expected sewer flows. A 12-inch gravity line will be adequate to convey flow to a future lift station adjacent to 28th Street W. The force main, which will lift flow directly east approximately 1,000 feet, will discharge into the Railroad Trunk. Estimated construction cost: $593,739.

Two Reservoirs

Approximately 83 acres of land is planned as LDR south of Ryan Gulch Reservoir and east of Bud Mielke Reservoir (see **Figure 5-19**). No gravity sewer option exists for this tract. Once development begins in this area, an 8-inch sewer line will be sufficient to convey flow to a future lift station on the peninsula of land in Ryan Gulch Reservoir. A 4-inch force main will be needed to convey flow south to 28th Street W. and then east to the future lift station associated with the 28th Street Trunk. Estimated construction cost: $537,500.

Ryan Gulch Trunk

There is approximately 700 acres of developable land west of Ryan Gulch and Bud Mielke Reservoirs (see **Figure 5-19**). There are four different planned zonings within this area. Just south of 14th Street SW and west of S. Taft Ave. is 37 acres planned as Civic Activity Center (CAC). Immediately west of that tract is 32 acres of land planned as Medium Density residential. The remainder, and the majority of the developable land, are planned as LDR and ER. An 18-inch sewer line has been stubbed underneath 14th Street SW at Eagle Drive. A trunk line of 18-inches will need to be built from that stub towards the southwest, generally paralleling the shore of the two reservoirs. The trunk will eventually need to be about 9,800 ft long. Estimated construction cost: $870,102.

Marianna Cove West

A 154-acre tract of developable land remains west of Boedecker Reservoir, east of CR 23E and south of W. 1st Street (see **Figure 5-20**). The land is shaped like a triangle within the 208 wastewater Planning boundary. An 8-inch PVC pipe will be sufficient to service the predicted sewer loading. The new 8-inch line will connect into existing 8-inch sewer line and flow into the Mariana Cove Lift Station. Estimated construction cost: $49,255.

Cascade Trunk

A 561-acre strip of land lies east of Morning Drive north of W. 22nd Street and south of W. 50th Street (see **Figure 5-19**). The land generally follows a small drainage from north to south. The land has been planned as LDR and ER. Up to a 15-inch pipe may be needed to convey flow to the existing 12-inch pipe at W. 22nd St. and Monte Vista Circle. Estimated construction cost: $396,620.

Developments West of Wilson Avenue

Multiple tracts west of Wilson Avenue have yet to be developed (see **Figure 5-21**). Sewer infrastructure is close to each of these areas so sewer connections will be the responsibility of the developer. Below is a short description of each area.

South of 29th Street and north 22nd Street is 153 acres of land that is planned for LDR. Sewer lines will not need to be greater than 8-inches in diameter. New sewer lines will be able to tie into existing 8-inch pipes at the following locations: W. 22nd St. at Rio Blanco Ave., Durango Ct., Kiowa Dr., and Mehaffey Drive.

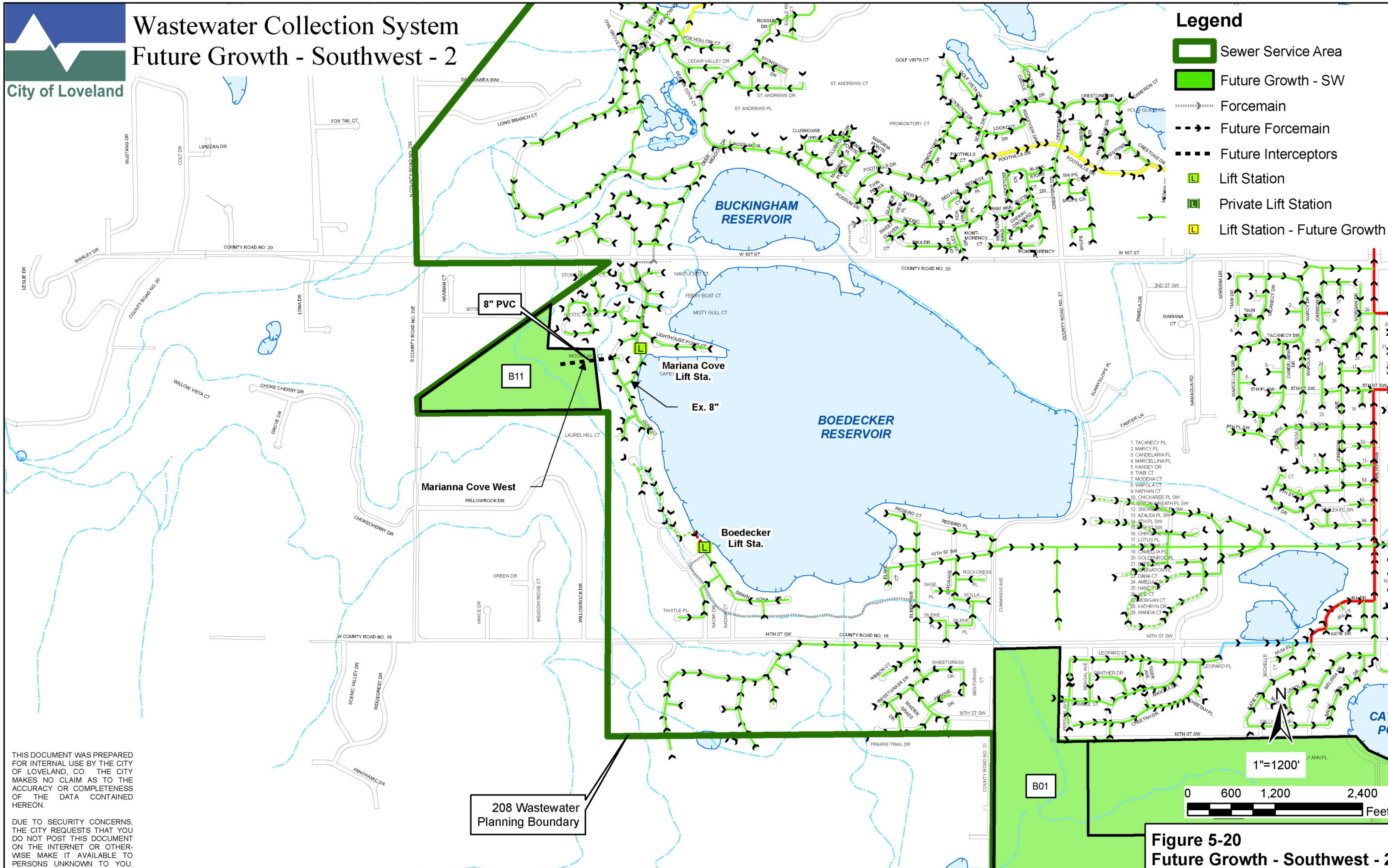


Figure 5-20
Future Growth - Southwest - 2

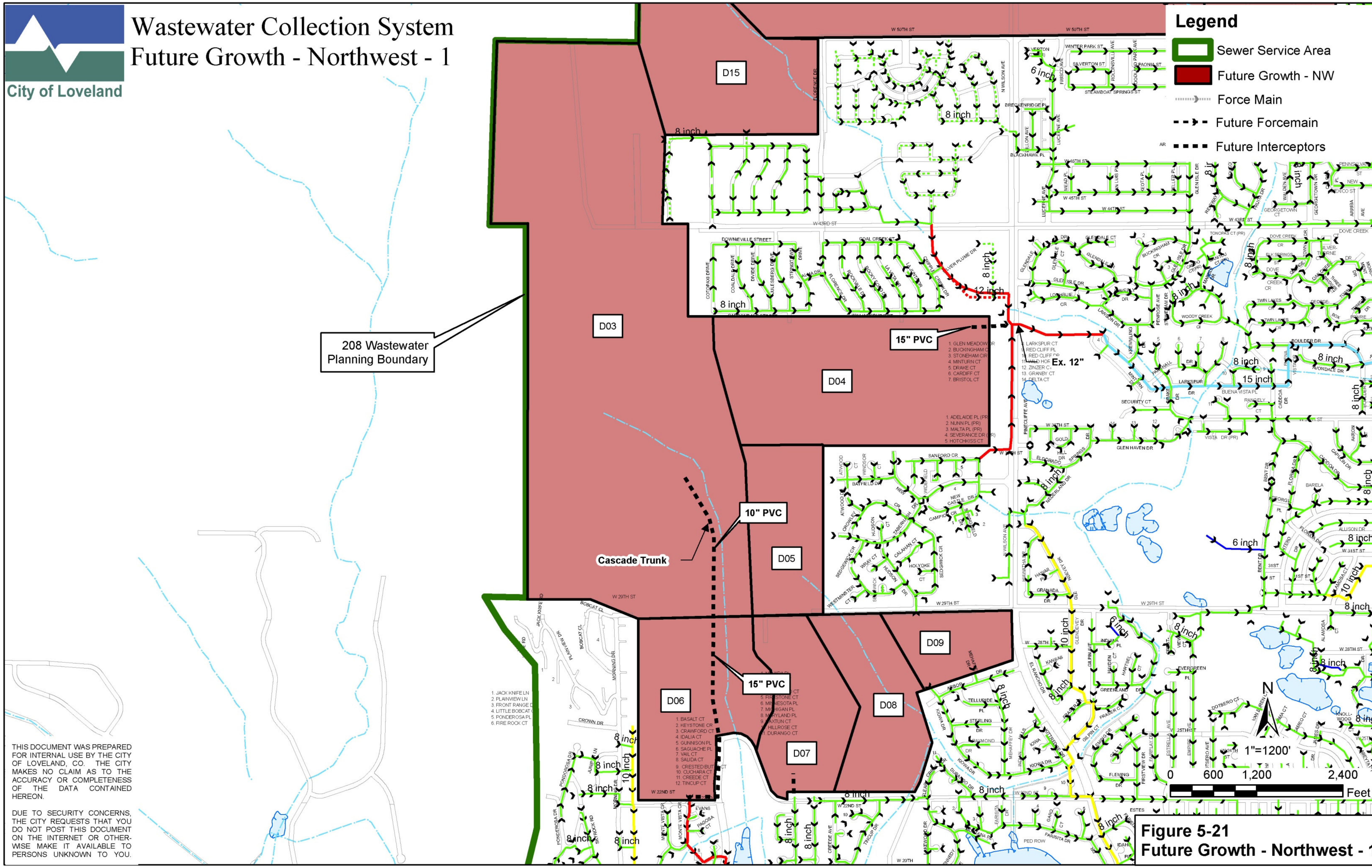


Figure 5-21
Future Growth - Northwest - 1

Directly west of the Hunter's Run Subdivision is an area approximately 57 acres that is to be developed as LDR. To service this area, the 8-inch sewer lines in Tabernash Dr. and Bayfield Dr. can be extended as needed.

North of Hunter's Run and west of Wilson Ave. is 152 acres of land that is planned for LDR. A 15-inch pipe is expected to handle the future sewer loads once this tract of land is developed. The new pipe can tie into the 12-inch pipe in Wilson Avenue.

W. 50th Trunk

North of W. 50th Street, south of W. 57th Street and west of N. Taft Avenue is 619 acres of land planned as LDR (see **Figure 5-22**). Up to an 18-inch trunk may be needed to convey flow from this area to the existing 15-inch line in W. 50th Avenue. Estimated construction cost: $444,326.

W. 57th Trunk

North of W. 57th Street, west of N. Taft Avenue and south of the effective sewer service boundary lies 445 acres of developable land (see **Figure 5-22**). The land falls into an area that is guided by the document "Plan for the Region Between Fort Collins and Loveland." This document was considered for future development densities; however, a density of two dwelling units per acre was used. This density may be an overestimation but can always be adjusted to the actual proposed density. An 18-inch trunk will be sufficient to convey flow from this area to the existing 21-inch line in N. Duffield Avenue. Estimated construction cost: $609,799.

N. BNSF Trunk

On the northwest corner of the intersection of W. 57th Street and N. Taft Avenue are 300-acres of land within the 208 Service boundary (see **Figure 5-22**). The land falls into an area that is guided by the document "Plan for the Region Between Fort Collins and Loveland." This document was considered for future development densities; however, a density of two dwelling units per acre was used. This density may be an overestimation but can always be adjusted to the actual proposed density. The land is also divided by the Burlington Northern Santa Fe railroad tracks. A 15-inch trunk will be sufficient to convey flow from this area on the east side of the railroad tracks. An existing 15-inch line north of 57th Street along the RR tracks will be the point of connection.

The tract of land on the west side of the tracks has wetlands at its south end. Due to the wetlands, and associated environmental implications, development is not practical. To get sewer service to the north end of this tract, an 8-inch line will need to cross under the RR tracks at the upstream end of the 15-inch line on the east side of the tracks. Estimated construction cost: $262,583.

N. Monroe Trunk

At the terminus of N. Monroe Avenue, north of E. 57th Street, are 236 acres of undeveloped land (see **Figure 5-23**). The land falls into an area that is guided by the document "Plan for

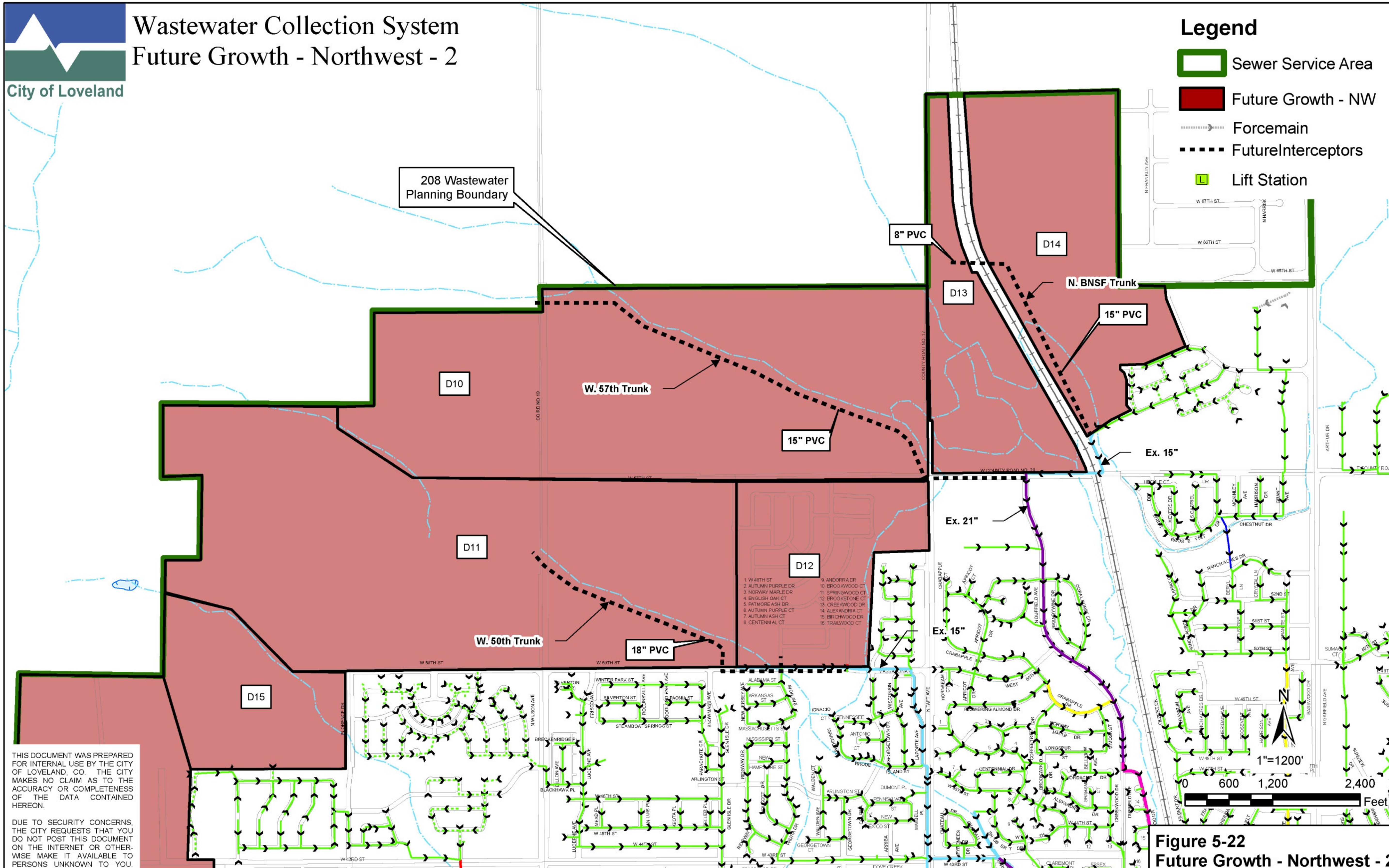
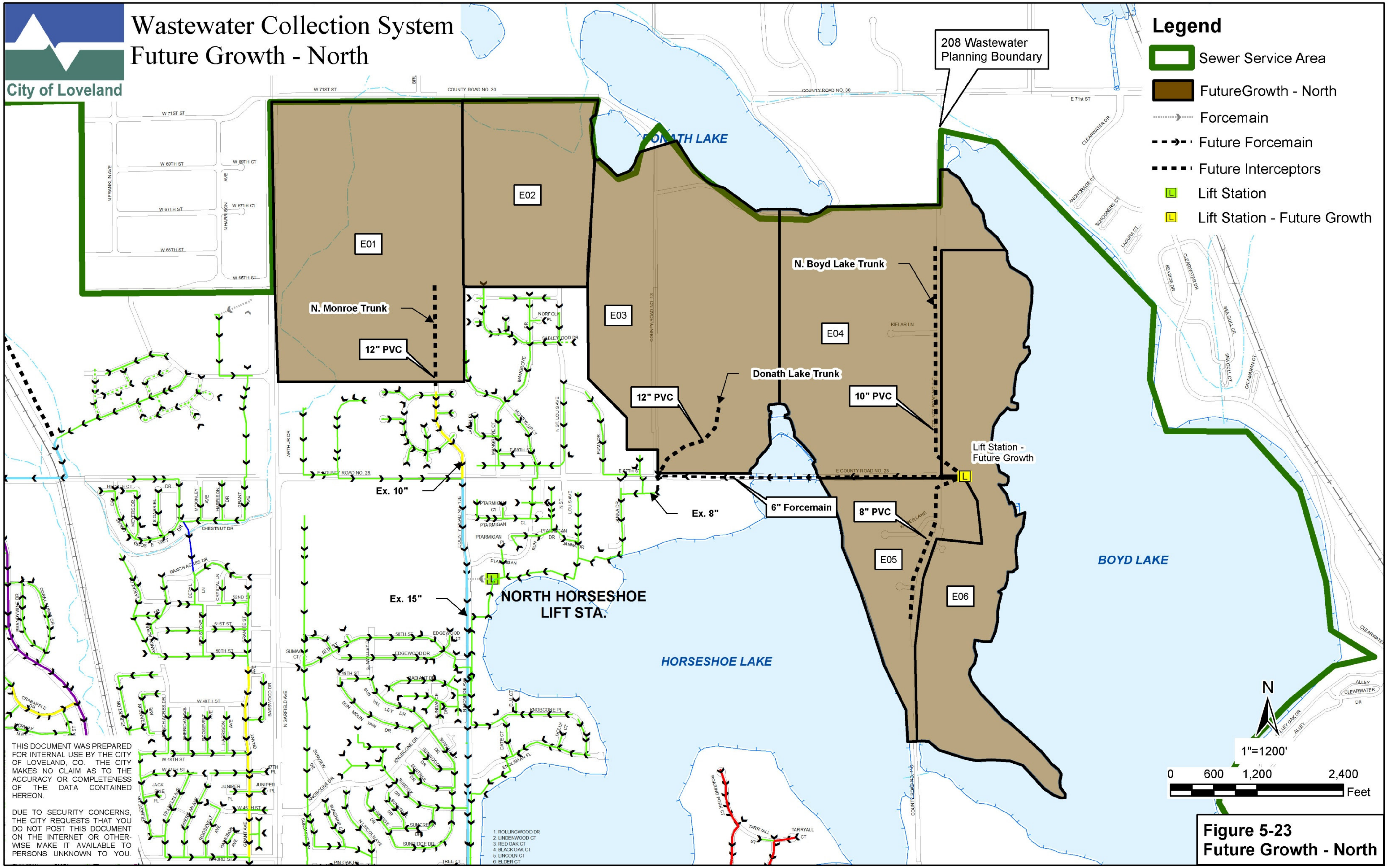


Figure 5-22
Future Growth - Northwest - 2


Wastewater Collection System
Future Growth - North
City of Loveland
Legend
Sewer Service Area
FutureGrowth - North
Forcemain
Future Forcemain
Future Interceptors
Lift Station
Lift Station - Future Growth
208 Wastewater Planning Boundary
DONATH LAKE
E01
E02
E03
E04
E05
E06
N. Monroe Trunk
12" PVC
N. Boyd Lake Trunk
Donath Lake Trunk
12" PVC
10" PVC
Lift Station - Future Growth
Ex. 10"
Ex. 8"
6" Forcemain
8" PVC
Ex. 15"
NORTH HORSESHOE LIFT STA.
HORSESHOE LAKE
BOYD LAKE
N
1"=1200'
0 600 1,200 2,400 Feet
THIS DOCUMENT WAS PREPARED FOR INTERNAL USE BY THE CITY OF LOVELAND, CO. THE CITY MAKES NO CLAIM AS TO THE ACCURACY OR COMPLETENESS OF THE DATA CONTAINED HEREON.
DUE TO SECURITY CONCERNS, THE CITY REQUESTS THAT YOU DO NOT POST THIS DOCUMENT ON THE INTERNET OR OTHERWISE MAKE IT AVAILABLE TO PERSONS UNKNOWN TO YOU.
Figure 5-23
Future Growth - North

the Region Between Fort Collins and Loveland." This document was considered for future development densities; however, a density of two dwelling units per acre was used. This density may be an overestimation but can always be adjusted to the actual proposed density. A 12-inch sewer line will be sufficient to convey flow to the existing 10-inch line in N. Monroe Avenue. Estimated construction cost: $112,112.

Sablewood Trunk

North of Wisteria Drive and south of CR 30 are approximately 107 acres of undeveloped land (see **Figure 5-23**). The land falls into an area that is guided by the document "Plan for the Region Between Fort Collins and Loveland." This document was considered for future development densities; however, a density of two dwelling units per acres was used. This density may be an overestimation but can always be adjusted to the actual proposed density. An 8-inch sewer line will be sufficient to convey flow to the existing 8-inch line in Sablewood Drive.

Donath Lake Trunk

South of Donath Lake, north of Horseshoe Lake and on either side of CR 13 are approximately 232 acres of undeveloped land (see **Figure 5-23**). The land falls into an area that is guided by the document "Plan for the Region Between Fort Collins and Loveland." This document was considered for future development densities; however, a density of two dwelling units per acres was used. This density may be an overestimation but can always be adjusted to the actual proposed density. A 12-inch sewer line will be sufficient to convey flow from this area to the existing 8-inch line north of Horseshoe Lake (at MH 4464). However, if the area develops to the planned density the existing 8-inch line leading to North Horseshoe Lift Station would need to be replaced with a larger pipe. Estimated construction cost: $108,134.

North Boyd Lake Trunk and Lift Station

South of Donath Lake, north of Horseshoe Lake and west of CR 11c is approximately 279 acres of undeveloped land (see **Figure 5-23**). A total of 202 acres of this land is north of CR 28. This land falls into an area that is guided by the document "Plan for the Region Between Fort Collins and Loveland." This document was considered for future development densities; however, a density of two dwelling units per acres was used. This density may be an overestimation but can always be adjusted to the actual proposed density. A 10-inch sewer line will be sufficient to convey flow from this area to a future lift station at the east end of CR 28. The 77 acres of land south of CR 28 is zoned as, Estate Residential (ER). An 8-inch line will be sufficient to convey projected flow north to the future lift station. The lift station would require a 6-inch force main to convey flow to the west. The force main will discharge at the same location the Donath Lake Trunk connects to the existing system and would add to the need to upsize the existing 8-inch pipe. Estimated construction cost: $847,497.

5.6 Wastewater Treatment

5.6.1 Existing Facilities – General

The existing WWTP is located in the southern portion of the City at 920 South Boise Avenue. The plant began operating in 1963. The general layout of the site is shown in **Figure 5-24.** **Figure 5-25** is a process flow schematic of the existing treatment system. The plant uses a step feed aeration process for biological treatment and anaerobic digestion for solids stabilization. The WWTP discharges to the Big Thompson River. The City's CDPS permit is discussed in Section 4.

5.6.2 Existing Process System – Liquid Processes

A description of the existing liquid processes and associated equipment at the plant is provided in **Table 5-11**.

TABLE 5-11
Liquid Process Summary

Unit Process	Process Features
Preliminary Treatment	2 Grinders and Auger, w/ 1/4-inch dia. Openings 1 Screenings Compactor Channel Width – 4 feet each Channel Depth – 5.83 feet each
	Vortex Grit Separator – 1 unit Diameter = 16 ft. Grit Concentrator = 1 cyclone unit Grit Washing = 1 classifier unit Grit Storage Hopper – 1 unit @ 620 cu. ft.
Odor Control	1 Carbon Filter Air Flow Rate = 6,000 scfm FRP Tank Dimensions = 12-foot Diameter x 7.5-foot height
	1 Biofilter Media = synthetic with woodchips Loading Rate = 9 cfm/sf Air Flow Rate = 900 scfm
	1 Packed Tower System 2 Towers in series @ 5 ft. dia. and 10 ft. packing depth each Air Flow Rate = 7,200 scfm Sodium Hydroxide Tank Volume = 4,500 gal. Sodium Hypochlorite Tank Volume = 3,000 gal.
Influent Pump Station	3 Influent Pumps Pump Type = submersible centrifugal Capacity = 7,260 gpm @ 10 ft TDH individually ea. Horsepower = 60 ea.

TABLE 5-11
Liquid Process Summary

Unit Process	Process Features
Primary Treatment Facilities	2 Primary Clarifiers 78 foot diameter Volume = 0.39 MG each SWD = 11 ft Surface Area = 4,778 sq. ft. each Overflow Rate = 1,046 gpd/sq. ft. at Peak Flow (10.0 mgd) Weir Loading Rate = 11,710 gpd/Lft at Peak Flow (10.0 mgd)
Aeration Pump Station	3 Aeration Lift Pumps Pump Type = submersible centrifugal Capacity = 7,725 gpm @ 31 ft TDH individually ea. Horsepower = 85 ea.
Secondary Treatment	Activated Sludge Process – Step Aeration 6 Cells @ 0.47 MG each Total Volume = 2.83 MG Detention Time = 6.8 hrs. @ 10.0 mgd Organic Loading = 54 lbs/1000 cu. ft/d. Horsepower = 900 HP (Blowers w/ fine bubble diffusers) Firm Capacity = 10,200 scfm 3 Secondary Clarifiers Diameter = 90 feet Volume = 0.76 MG each SWD = 16 ft Surface Area = 6,362 sq. ft. each Overflow Rate = 524 gpd/sq. ft at Peak Flow (10.0 mgd) Weir Loading Rate = 11,792 gpd/Lft at Peak Flow (10.0 mgd)
Disinfection	Ultraviolet Light Disinfection – Low-pressure, high-output type two parallel disinfection channels Volume = 1,396 gallons Detention Time = 6.9 sec. @ Peak Flow Dose = 30 mJ/sq cm UV Transmittance @ 254 nm: 65 percent/cm

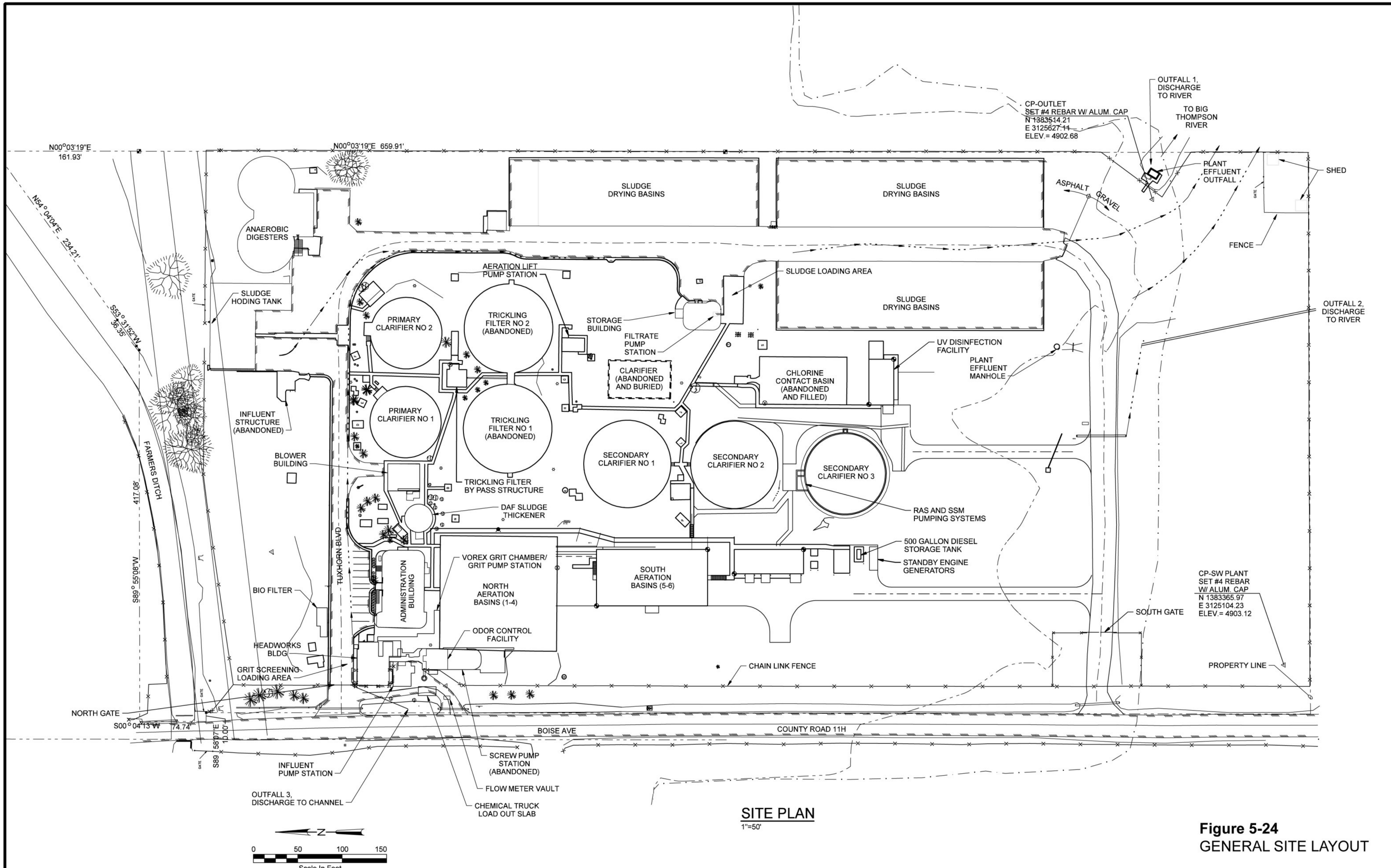


Figure 5-24
GENERAL SITE LAYOUT

CH2MHILL

ll05fig2.dlv 15-OCT-2009 20:13:16

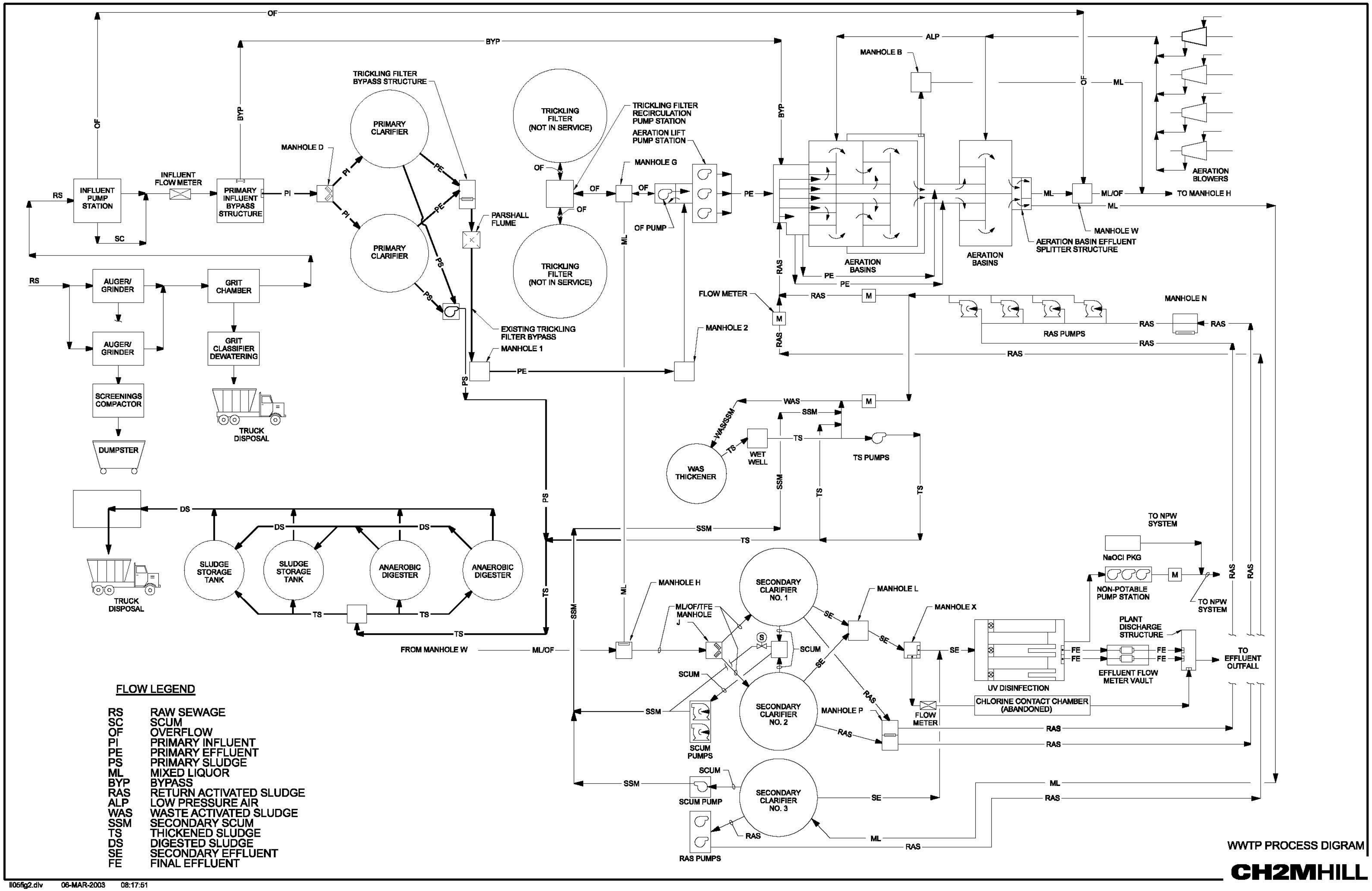


FIGURE 5-25
Process Flow Schematic

Preliminary Treatment

As depicted in the process schematic, flow enters the WWTP at the Influent Junction Box Manhole A and flows by gravity to the Headworks Building. The influent grinder/screen/screenings press units (Channel Monsters) remove course inorganic screenings from the waste stream. Immediately downstream of the Channel Monsters is the Grit Separator (vortex-type), located outdoors immediately south of the Headworks Building, which removes grit and heavy inorganics that have passed through the screening process. The grit is removed from the bottom of the Grit Separator by the Grit Pump, which conveys the grit slurry to the Grit Cyclone and Classifier. The Grit Cyclone and Classifier units are located in the upper level of the Headworks Building and wash the grit to return organic material back into the liquid waste stream. The washed grit is then discharged by the screw conveyor within the Grit Classifier to the Grit Hopper for ultimate landfill disposal along with the influent screenings.

Secondary Clarifier No. 3

Primary and Secondary Treatment

Following grit removal, the liquid wastewater stream passes through the Influent Pump Station wet well and a magnetic flowmeter measures the discharge. The Influent Pumps convey the wastewater to the two primary clarifiers. Primary effluent is pumped via the Aeration Lift Station to two parallel step-feed aeration trains. The step-feed process is depicted in **Figure 5-26**. Each aeration train contains three parallel aeration basins. Primary effluent is added at three locations within each of the two aeration trains. The blowers for the aeration process are located in the Blower Building. Mixed liquor from the aeration basins flows by gravity to the three Secondary Clarifiers.

Disinfection and Discharge

Secondary effluent flows by gravity to the UV disinfection system. The UV system contains two parallel channels with 224 low-pressure, high-output UV lamps. Following disinfection, final plant effluent flows through the outfall pipe to the Big Thompson River. The outfall pipes contain two parallel magnetic flowmeters for flow measurement of the plant discharge and flow pacing of UV dose.

Emergency Power

The plant has two diesel emergency generators to provide backup power to critical plant processes. As noted in Section 4.6, the plant has a 600-kW and a 1,000-kW generator. In addition to emergency power, the generators' secondary purpose is for electric demand peak shaving.

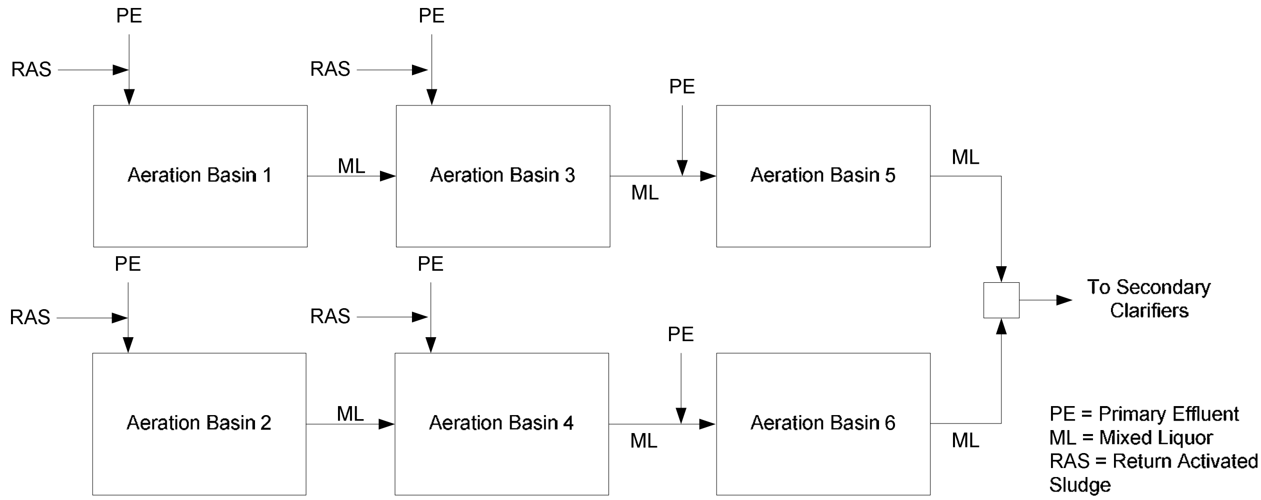


FIGURE 5-26
Step Feed Schematic

A liquid process capacity bar chart is shown in **Figure 5-27**. From a hydraulic standpoint, the secondary treatment process (aeration and secondary clarification) is limiting. However, as noted previously, the plant is projected to reach biological treatment limits before hydraulic limits. Therefore, the true limiting liquid treatment process currently is aeration.

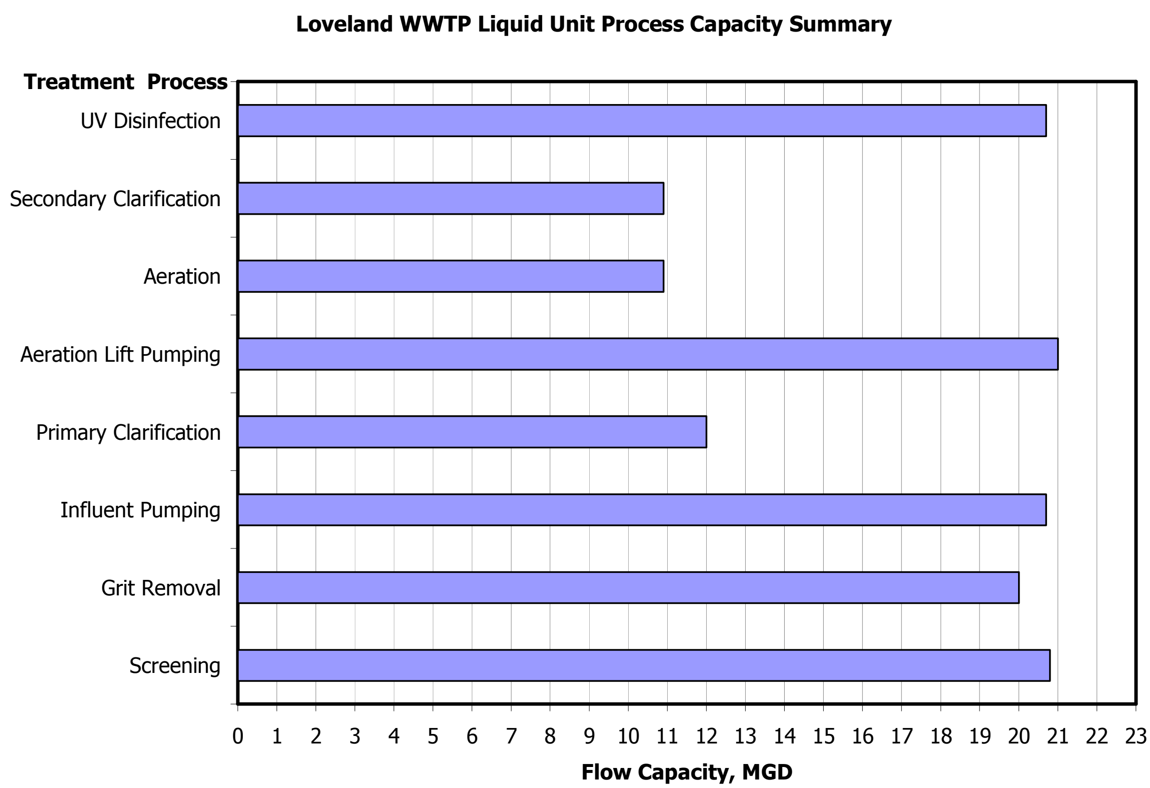


FIGURE 5-27
Loveland WWTP Liquid Unit Process Capacity Summary

5.6.3 Existing Biosolids Handling

A description of the existing solids handling system unit processes and associated equipment at the plant is provided in **Table 5-12**. A schematic of the solids handling system is shown below in **Figure 5-28**.

TABLE 5-12
Solids Handling Process Summary

Parameter	Description
Primary Sludge and Scum Pumps	
Number	2
Type	Screw centrifugal
Capacity at Listed Total Design Head (TDH)	150 gpm
Motor	7.5 hp
WAS Control	
Valve	6-inch Plug Valve
Flow Measurement	6-inch magnetic flowmeter
Secondary Scum Pumps	
Number	2
Type	Self-Priming Centrifugal
Capacity at Listed Total Design Head (TDH)	100 gpm
Motor	7.5 hp
Secondary Scum Pumps	
Number	2 – one shelf
Type	Wet Pit Chopper
Capacity at Listed Total Design Head (TDH)	365 gpm
Motor	5 hp
DAFT Process Tank	
Number Diameter	1
Surface Area	490 ft^2
Side Water Depth	25 feet
Capacity at 10 lbs/sf/day (recommended by previous reports)	4,900 lbs/day solids
Capacity at 0.92 lb/sf/hr (original design loading)	10,800 lbs/day solids
Drive Motor Size	3/4 hp
DAFT Air System	
Air Compressors	
Number	2
Capacity	130 scfm @ 110 psi
Motor Size	25 hp
Air Cooler	After-cooler type
Dryers	2 regenerative dryers
Air Receiver	1 – 3 ft diameter 9 ft long
DAFT Recycle Pump	
Number	1
Type	Non-clog centrifugal
Capacity at Listed Total Design Head (TDH)	300 gpm @ 32 ft
Motor Size	25 hp
Air Saturation Tank	3 ft diameter

TABLE 5-12
Solids Handling Process Summary

Parameter	Description
Thickened Sludge Pumps	
Number	2
Type	Diaphragm air actuated
Capacity at Listed Total Design Head (TDH)	152 gpm @ 50 psi
Anaerobic Digesters	
Number	2
Diameter	60 ft
Volume	77,750 ft^3
Side Water Depth	28 ft
Capacity at 0.1 $lb/ft^3/day$	15,550 lb/day solids
Hydraulic Detention Time	15 days minimum (design)
Sludge Recirculation Pumps	
Number	2
Type	Screw centrifugal
Capacity at Listed Total Design Head (TDH)	350 gpm @ 17 ft
Motor Size	3 hp
Digester Sludge Transfer Pumps	
Number	2
Type	Screw centrifugal
Capacity at Listed Total Design Head (TDH)	400 gpm @ 14 ft
Motor Size	7.5 hp
Hot Water Boiler	
Number	2
Output Capacity, each	1,200,000 Btu/hr
Fuel	Digester gas or natural gas
Expansion Tank	380 gallon
Heat Exchanger	
Number	2
Output Capacity, each	1,200,000 Btu/hr
Hot Water Recirculation Pumps	
Number	2
Type	End-suction centrifugal
Capacity at Listed Total Design Head (TDH)	150 gpm @ 17 ft
Motor Size	1.5 hp
Digester Gas Compressors	
Number	2
Type	Rotary liquid ring
Capacity, each	60 scfm @ 12.4 psig
Motor Size	7.5 hp
Mixing guns	4 per digester

TABLE 5-12
Solids Handling Process Summary

Parameter	Description
Sludge Drying Beds	
Number	44
Surface Area	66,000 ft^2
Maximum Depth	1 ft
Maximum Storage Volume	66,000 ft^3
Filtrate Removal Pumps	
Number	2
Type	Non-clog submersible
Capacity at Listed Total Design Head (TDH)	200 gpm @ 29 ft
Motor Size	3 hp
Sludge Storage Tanks	
Number	2
Diameter	35 ft
Sidewater Depth	21 ft
Volume, each	151,100 gallons

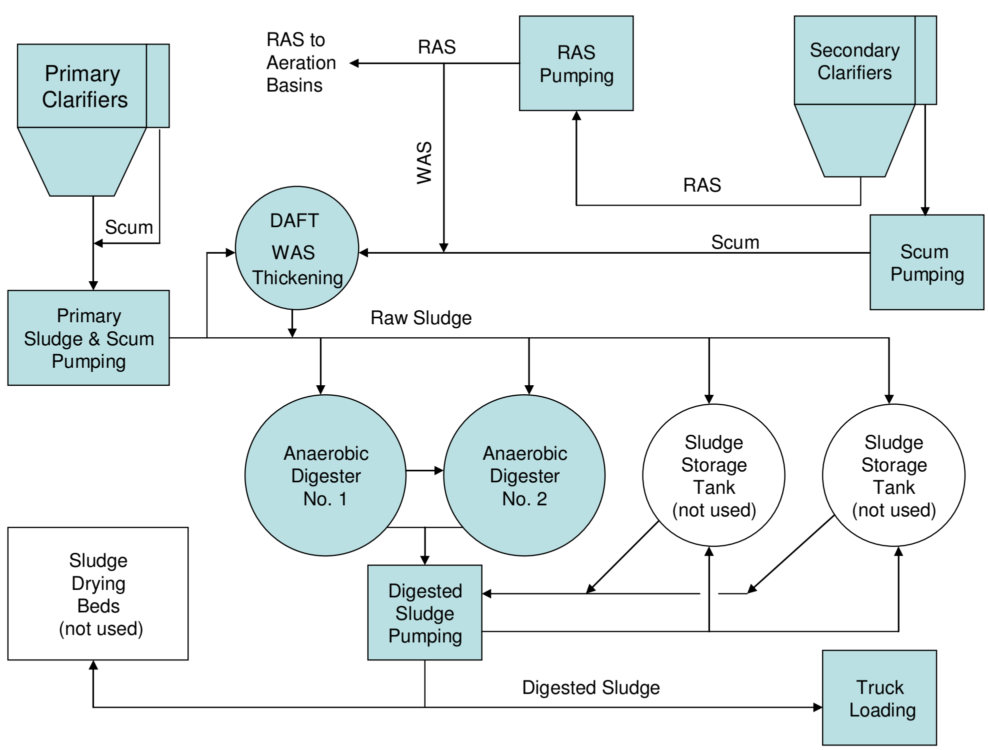


FIGURE 5-28
Loveland Wastewater Treatment Plant Solids Processing Schematic

As depicted in the process schematic, the Return Activated Sludge (RAS) pumps convey settled solids to the head end of the aeration process on a continuous basis. The RAS Pumps convey a portion of the settled solids (waste activated sludge or WAS) to the Dissolved Air Flotation Thickener (DAFT). The secondary scum pumps convey secondary scum to the DAFT. The DAFT thickens the sludge and scum to approximately 3.0 percent. Thickened sludge is conveyed from the Thickened Sludge Wetwell to the anaerobic digesters via the Thickened Sludge Pumps. Liquid decant from the DAFT is returned to the liquid stream just downstream of the Influent Pump Station.

The two anaerobic digesters operate in series. The Primary Digester provides stabilization for pathogen and vector attraction reduction. The Primary Sludge Pumps convey primary sludge and primary scum from the primary clarifiers to the Primary Digester. The Primary Digester is heated from boilers fueled by methane produced in the Primary Digester. Sludge is recirculated via the Recirculation Pumps through the boilers and back to the Primary Digester to maintain a temperature of 98 degrees F.

The Secondary Digester is filled via overflow sludge from the Primary Digester when the Primary Digester receives new sludge. The Secondary Digester is also mixed and heated and provides storage for digested sludge in times when land application sites cannot accept the final biosolids product.

The biosolids are hauled from the plant site in liquid form (<2 percent solids) in 6,000 gallon tanker trucks to be land applied by a contract hauler. Two biosolids transfer pumps are used to convey solids to the transfer station. Tanker trucks may also be filled by gravity but at a lower flow rate. The old aerobic digester basins and drying beds onsite are available for emergency storage of biosolids. A solids mass balance for current and future plant loadings is provided in **Tables 5-13** and **5-14**.

The City of Loveland believes in beneficial reuse of biosolids and prefers land application as a disposal alternative. The City of Loveland performs all monitoring and certification of the biosolids as it leaves the WWTP. The contract hauler performs all land applicationsite permitting, monitoring, and certification. The City's biosolids product is considered Class B per EPA and CDPHE regulations.

The City completed a focused assessment for future required modifications and expansions of the plant solids processing facilities. This report, the 2007 Solids Evaluation, provided recommendations on future improvements, which are summarized later in this section. Centrifuge technology was chosen for future solids thickening and dewatering.

TABLE 5-13
City of Loveland WWTP
Solids Mass Balance for Average Flow Conditions for 2010 Projected Loads per CH2M HILL's Pro2D Process Model

Constituent	Raw Wastewater (RW)	WAS Thickening Recycle (TWASR)	Plant Effluent (PLE)	Primary Sludge (PSD)	WAS	WAS Thickener Influent (TWASI)	Thickened WAS (TWAS)	Sludge Combined Discharge	Meso Anaerobic Digester Influent (AnDI)	Meso Anaerobic Digester Effluent (AnDE)	Biosolids to Disposal
Flow (gallons/day)	8,100,000	149,398	8,034,081	48,552	166,765	166,765	17,367	65,919	65,919	65,919	65,919
Carbonaceous BOD5 (lbs/day)	22,501	198	464	6,712	3,956	3,956	3,758	10,470	10,470	1,953	1,953
COD (lbs/day)	45,232	534	2,512	13,893	10,199	10,199	9,664	23,557	23,557	11,011	11,011
TSS (lbs/day)	19,802	458	1,006	12,156	9,154	9,154	8,696	20,852	20,852	11,107	11,107
VSS (lbs/day)	15,842	374	823	9,699	7,488	7,488	7,114	16,813	16,813	8,531	8,531
TKN (lbs/day)	2,880	30	221	370	551	551	520	890	890	783	783
NH3-N (lbs-N/day)	1,890	1	80	11	2	2	0	11	11	414	414
NO3-N (lbs-N/day)	0	6	315	0	7	7	1	1	1	0	0
TP (lbs-P/day)	406	13	40	122	257	257	244	366	366	366	366
Alkalinity (lbs/day as CaCO3)	10,139	89	4,790	60	99	99	10	71	71	1,995	1,995
BOD5 (mg/L)	333	159	7	16,564	2,843	2,843	25,928	19,031	19,031	3,550	3,550
COD (mg/L)	669	429	37	34,287	7,328	7,328	66,679	42,821	42,821	20,015	20,015
TSS (mg/L)	293	367	15	30,000	6,577	6,577	60,000	37,904	37,904	20,191	20,191
VSS (mg/L)	234	300	12	23,937	5,380	5,380	49,082	30,562	30,562	15,508	15,508
TKN (mg-N/L)	42.61	24	3.3	913	396	396	3,591	1,619	1,619	1,423	1,423
NH3-N (mg-N/L)	27.96	1	1.2	27	1	1	1	21	21	752	752
NO3-N (mg-N/L)	0.00	5	4.7	0	5	5	5	1	1	0	0
TP (mg-P/L)	6.00	10	0.6	301	185	185	1,684	665	665	665	665
Alkalinity (mg/L as CaCO3)	150	71	71	149	71	71	71	128	128	3,627	3,627

TABLE 5-14
City of Loveland WWTP
Solids Mass Balance for Average Flow Conditions for 2024 Projected Loads per CH2M HILL's Pro2D Process Model

Constituent	Raw Wastewater (RW)	Plant Effluent (PLE)	Primary Sludge (PSD)	WAS	WAS Thickener Influent (TWASI)	Thickened WAS (TWAS)	Sludge Combined Discharge	Meso Anaerobic Digester Influent (AnDI)	Meso Anaerobic Digester Effluent (AnDE)	BFP Dewatering Influent (DWI)	BFP Dewatered Sludge (DWE)	Biosolids to Disposal	GBT WAS Thickening Recycle (TWASR)	BFP Dewatering Recycle (DWR)	Recy Combined Discharge
Flow (gallons/day)	11,000,000	10,991,882	44,278	195,460	195,460	22,737	67,015	67,015	67,015	67,015	8,121	8,121	172,724	58,895	231,618
Carbonaceous BOD5 (lbs/day)	30,001	480	9,024	3,768	3,768	3,579	12,603	12,603	2,539	2,539	2,342	2,342	189	196	386
COD (lbs/day)	60,309	3,491	18,761	11,027	11,027	10,442	29,204	29,204	12,973	12,973	11,878	11,878	584	1,095	1,679
TSS (lbs/day)	26,402	1,376	16,629	11,984	11,984	11,385	28,014	28,014	14,268	14,268	13,554	13,554	599	713	1,313
VSS (lbs/day)	21,122	942	13,178	8,203	8,203	7,793	20,971	20,971	9,996	9,996	9,496	9,496	410	500	910
TKN (lbs/day)	3,840	302	500	575	575	543	1,042	1,042	968	968	549	549	32	419	451
NH3-N (lbs-N/day)	2,520	110	11	2	2	0	12	12	427	427	52	52	2	375	377
NO3-N (lbs-N/day)	0	225	0	4	4	0	0	0	0	0	0	0	4	0	4
TP (lbs-P/day)	551	105	191	826	826	784	975	975	975	975	448	448	41	527	568
Alkalinity (lbs/day as CaCO3)	13,769	9,029	65	161	161	19	84	84	3,016	3,016	365	365	142	2,650	2,792
BOD5 (mg/L)	327	5	24,421	2,310	2,310	18,863	22,535	22,535	4,539	4,539	34,561	34,561	131	400	199
COD (mg/L)	657	38	50,772	6,760	6,760	55,031	52,217	52,217	23,196	23,196	175,274	175,274	405	2,227	869
TSS (mg/L)	288	15	45,000	7,347	7,347	60,000	50,089	50,089	25,511	25,511	200,000	200,000	416	1,451	679
VSS (mg/L)	230	10.3	35,661	5,029	5,029	41,071	37,496	37,496	17,872	17,872	140,116	140,116	285	1,017	471
TKN (mg-N/L)	41.83	3.3	1,352	352	352	2,859	1,863	1,863	1,730	1,730	8,099	8,099	22	852	233
NH3-N (mg-N/L)	27.45	1.2	31	1	1	1	21	21	764	764	764	764	1	764	195
NO3-N (mg-N/L)	0.00	2.5	0	2	2	2	1	1	0	0	0	0	2	0	2
TP (mg-P/L)	6.00	1.1	516	506	506	4,134	1,743	1,743	1,743	1,743	6,614	6,614	29	1,072	294
Alkalinity (mg/L as CaCO3)	150	98.4	177	98	98	98	150	150	5,392	5,392	5,392	5,392	98	5,392	1,444

5.6.4 Odor Control Consideration

The City of Loveland completed a comprehensive *Wastewater Treatment Plant Odor Management Phase 2 Final Report* in 2005 (2005 Odor Report). The 2005 Odor Report is found in **Appendix 8.L.** The report presented the results of an odor impact assessment to determine the WWTP's baseline odor impacts to the surrounding community and to evaluate potential odor control improvements.

The baseline assessment was obtained from two odor sampling events conducted at the WWTP. The first sampling event was conducted with a Jerome 631-X hydrogen sulfide (H_2S) analyzer. The second sampling event was conducted using an EPA-approved flux chamber to capture odor emissions from plant processes. Laboratory measurements of ammonia, reduced sulfur compounds, and odor (with analysis by an odor panel) were obtained. As part of both sampling events, additional sampling was conducted at the WWTP fence line with the use of a Nasal Ranger Field Olfactometer to measure odor strength. The results of the sampling indicated that odor from the WWTP was caused by more than just H_2S, and thus odor was modeled for the study instead of just H_2S.

Based on the odor dispersion modeling performed, recommended improvements were developed to allow the City to comply with CDPHE Regulation, No. 2, Odor Emissions. A cost summary of the recommended improvements is shown in **Table 5-15** below (Table ES-3 of the 2005 Odor Report). In its commitment to reducing odors at the WWTP, The City of Loveland has implemented projects for Stages 1 through 4, as listed in **Table 5-15,** with the exception of the liquid phase treatment pilot test and implementation, which will not be completed. Although liquid phase treatment is a viable technology, there is insufficient contact time within the WWTP facilities to operate and maintain the chemical facilities all within the plant site. The Stage 5 project is also not scheduled to be completed since the dissolved air flotation thickener (DAFT) is not projected to be a long-term facility at the WWTP and will ultimately be removed.

With the implementation of Stages 1 through 4, the City has met its planning goals for reducing odors at the WWTP. The City plans on additional monitoring to confirm odor reductions and reprioritize remaining projects after the headworks system is operating. Currently scheduled expenditures are limited to replacement of odor control scrubber media. A housing area that was not present during the 2005 odor report has now been developed on the northeast corner of the plant. A section of this development is in close proximity to the anaerobic digesters on the plant site and odor complaints have recently been received from some residents of this development. Additional efforts to address odor control may be options for the City to investigate in the future.

TABLE 5-15
Summary of Odor Control Recommendations from 2005 Odor Control Study

Stage	Odor Control Recommendation	Capital Cost	Annual Cost	Schedule
1	Discontinue use of trickling filters.	$10,000	$0	2005
2	Rearrange digester boiler vent HVAC system.	$236,000	$0	2005-2006
3	Cover aerated grit chamber and vent to a carbon scrubber.	$93,000	$6,000	2005-2006
4	Provide odor control for modified headworks processes, vent air from headworks building, polish with biofilter or carbon scrubber.	$892,000	$87,000	2007-2008
5	Vent air from DAFT in a new carbon scrubber.	$84,000	$18,000	2008
6	Cover primary clarifiers and vent to new chemical scrubbers.	$1,614,000	TBD	TBD
7	Cover aeration basins and vent to new chemical scrubbers. Replace digester covers with fixed roof covers.	$3,353,000	TBD	TBD

Note: Additional stages identified may be implemented in the future based on odor level reduction goals.

5.6.5 Wastewater Treatment Alternative Analysis, Infrastructure Sizing, and Infrastructure Staging

Wastewater Treatment Alternative Analysis

The City of Loveland is anticipating that all of its wastewater treatment needs over the next 20 years will be met on the current WWTP site. Thus, a formal site alternatives analysis is not included with the Utility Plan.

Over the 20-year planning horizon, both hydraulic and organic capacity improvements will be required at the WWTP. However, the largest project impact to the secondary treatment process will be to address nutrient removal requirements for discharge to the Big Thompson River are expected to affect the plant's discharge permit limits during the 20-year planning period. Different treatment process alternatives are available to meet these future limits. For planning purposes, it is assumed that the current step-feed aeration process, modified for biological removal of both nitrogen and phosphorus, will be employed. For plant layout of future facilities, the step-feed process provides a conservative approach to determine whether the current site is large enough for the 20-year planning horizon. When nutrient limits do appear in future permits, other state-of-the-art technologies with smaller footprints may be considered to maximize the benefit to cost of selected alternatives. These alternative technologies may include the following:

- Anoxic and anaerobic basins for biological nutrient removal,
- Membrane technologies for solids separation and phosphorus removal,
- Integrated fixed film activated sludge (IFAS) for aeration and ammonia removal,
- Chemical precipitation for phosphorus removal, and
- Denitrifying filters for nitrogen removal.

Specific permit limits in the future and the evolving performance and cost of the listed technologies, as well as new technologies, will help to determine which specific processes are utilized in the future for the WWTP.

Preliminary Effluent Limits (PELs) have not been applied for in association with this Utility Plan for the following reasons:

- This Utility Plan is not being submitted in association with any single WWTP improvement.
- The next plant improvement that would result in an increase in plant hydraulic or influent load capacity is currently scheduled for construction in 2014 (Project # 12.1 – New Blower and Aeration Basin Diffusers as noted in the next section).

During the preliminary design of Project #12.1, design parameters will be determined and the projected increase in plant capacity will be verified. Following this verification, PELs will be requested based on the preliminary design information, which is beyond the scope of this report.

WWTP Infrastructure Sizing and Staging

The exact staging of the future plant improvements will depend upon future growth and permit limits. One potential plant expansion scenario would be to create a separate new treatment train on the east side of the plant site for plant improvements beyond 2020. A supplemental headworks facility will ultimately be required when peak flows exceed the current capacity. The supplemental headworks could be situated so that wastewater could flow by gravity to the future primary clarifier (projected for 2017) and then onto new aeration basins and secondary clarifier (projected for 2026). The timing of these improvements may have to shift for constructibility and regulatory purposes, but this possible expansion layout scenario is shown in **Figure 5-29**.

The City has undertaken numerous planning studies and unit process evaluations over the past decade to assist in preparing for and implementing capital improvements. The largest of these studies are listed in Section 7.0. Capital improvements have been implemented over the past decade involving the following processes: influent screening, grit removal, influent pumping, odor control, addition replacement, primary and secondary clarifiers' mechanism replacement, aeration conversion to step feed, secondary clarifier expansion, UV disinfection conversion, sludge pumping replacement, and miscellaneous digester improvements.

Using the projected flow and loads from Section 5.1 above, and the projected nutrient removal effluent limits in Section 4.0, a CIP for the 20-year planning horizon was developed. Increases in plant hydraulic and influent load capacity resulting from a project are noted if appropriate. A timeline of the costs is shown in **Table 5-16**. A brief summary follows of each project currently foreseen. **Figure 5-29** shows a site plan of the WWTP site with future projects highlighted.

Item 1 – Odor Control

1.1 Influent Collection Wetwell Biofilter Media Replacement (Manhole A): The Manhole A biofilter synthetic media will require periodic replacement every 10 to 20 years. It is assumed that the City will outsource the media and installation. **Schedule 2017**.

1.2 Replacement of Carbon for Existing Odor Scrubber: The carbon in the existing scrubber was replaced in 2004 and should last approximately 5 to 10 years before it needs replacing. Prior to scheduling replacement, the City should regenerate the carbon in place based on H2S monitoring. **Schedule: 2010 and 2020**.

Item 2 – Utility Plan Update

2.1 Utility Plan Update: The City's Wastewater Utility Plan will require both major and minor updates over time to document changes in the system. **Schedule: Updates every 3 years**.

Item 3 – Update Annual Capital Improvements Program

3.1 Update CIP: Update the City's capital improvement program. **Schedule: Annually**.

Item 4 – National Pollutant Discharge Application

4.1 NPDES Permit Application: A permit renewal application is required every 5 years by CDPHE. **Schedule: 2015, 2020, and 2025, assuming permit is re-issued in 2010**.

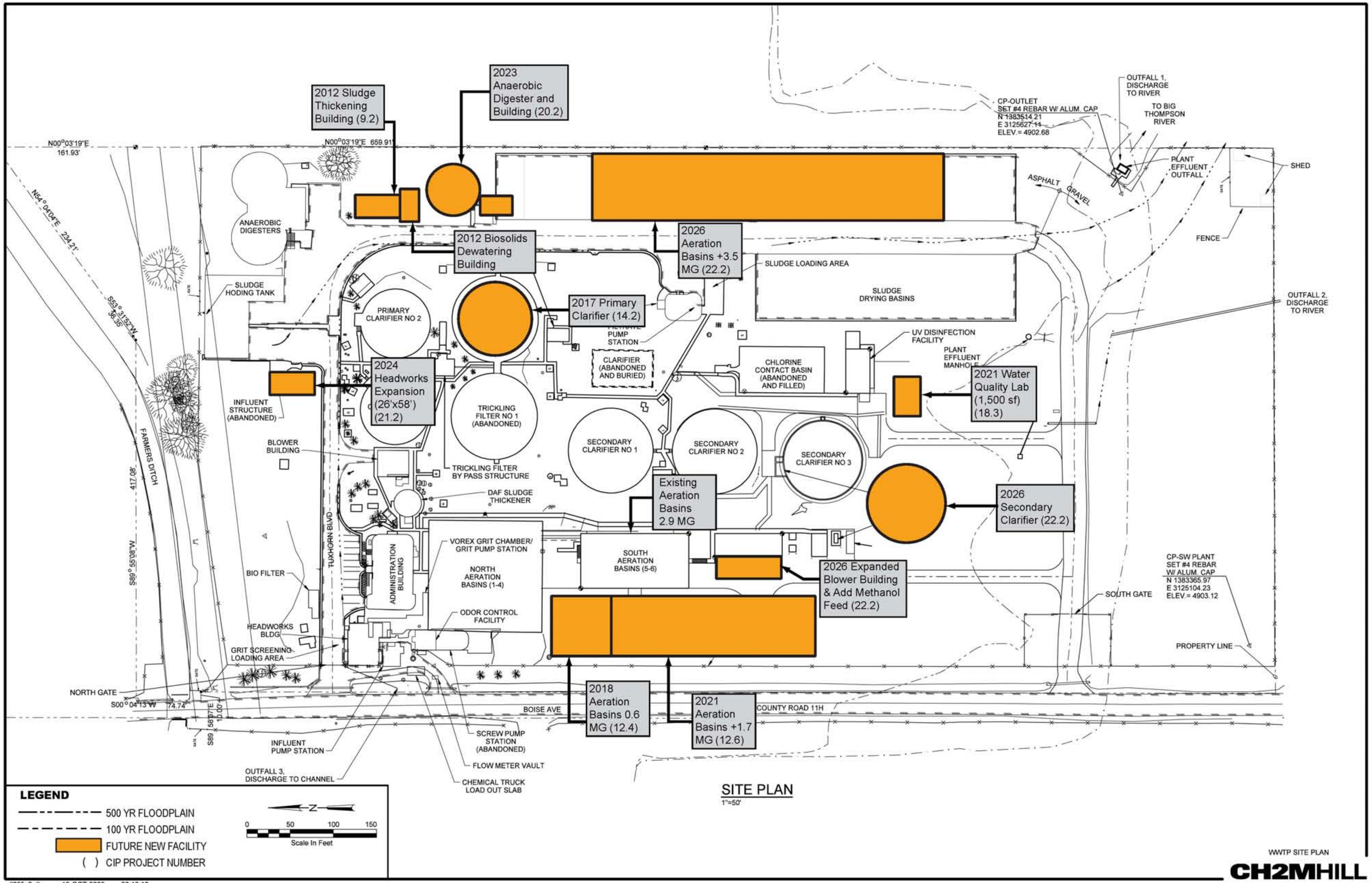


FIGURE 5-29
WWTP Site Plan

No.	Project	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Notes
1.1	Influent Collection Wetwell (Periodic Manhole A Media Replacement)									$20,500													Every 10 to 20 years
1.2	Replacement of Carbon for Existing Odor Scrubber		$55,800										$55,800										Every 5 to 10 years
2.1	Utility Plan Update			$10,000			$10,000			$10,000			$100,000			$10,000			$10,000			$10,000	Minor updates every 3 years
3.1	Update CIP	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	$11,300	annual cost
4.1	NPDES Permit Application							$22,800					$22,800					$22,800				$22,800	Every 5 years
5.1	Vulnerability Assessment				$85,200																		
6.1	River Monitoring for Bio Criteria Standard Development							$12,500															
7.1	River Monitoring for Nutrient Standard Development								$59,800	$59,800	$59,800												
7.2	Basic Standards Hearing Assistance			$10,700					$10,700														
7.3	South Platte Basin Hearings Assistance	$5,000						$10,900				$0					$0					$0	Every 5 years
8.1	Asbestos Abatement of Admin Building Floor												$32,700										
9.1	Design & SDC, WAS Thickening		$560,000	$254,200	$254,200																		
9.2	Construction, WAS Thickening			$2,572,000	$2,572,000																		
10.1	Inspection and Interior Coating of Digester Roofs					$560,400																	
10.2	Clean Digesters (prior to renovation)					$53,300																	
10.3	Design & SDC, Digester Flare Modifications				$30,700	$15,900																	
10.4	Construction, Digester Flare Modifications					$90,000																	
10.5	Design & SDC, Digester Compressor Modifications					$10,000																	
10.6	Construction, Digester Compressor Modifications						$200,000																
10.7	Design & SDC, Digester Complex Mixing System & Boiler Replacement								$125,000	$125,000													
10.8	Construction, Digester Complex Mixing System & Boiler Replacement								$245,500	$1,000,000													
11.1	Provide Soft Starts For Blowers 1-4	$50,000	$50,000																				
12.1	Design & SDC, New Blower & Aeration Basin Diffusers					$85,000	$50,000																
12.2	Construction, New Blower & Aeration Basin Diffusers						$760,000																
12.3	Design & SDC, Aeration Basin									$297,000	$150,000												
12.4	Construction, Aeration Basin										$2,810,000												
12.5	Design & SDC, Nutrient Removal Facilities - Phase 1											$490,000	$220,000	$215,000									
12.6	Construction, Nutrient Removal Facilities - Phase 1												$2,200,000	$2,200,000									
13.1	Headworks and Odor Control Facilities - Warranty Services	$30,000	$10,000																				

TABLE 5-16
City of Loveland WWUP
WWTP CIP, 2010-2029

No.	Project	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Notes
14.1	Design & SDC, Primary Clarifier								$250,000	$230,500													
14.2	Construction, Primary Clarifier									$1,820,000													
14.3	Design & SDC, Demo of Trickling Filters								$43,000	$43,000													
14.4	Construction, Demo of Trickling Filters									$418,900													
15.1	Design & SDC, Automated Data Acquisition, Process Control & Monitoring System											$37,000	$10,200	$10,200									
15.2	Construction, Automated Data Acquisition, Process Control & Monitoring System												$143,900	$143,900									
16.1	Design & SDC, Heating, Ventilation, & Lighting System Upgrades									$30,700	$30,700												
16.2	Construction, Heating, Ventilation, & Lighting System Upgrades										$233,500												
17.1	Design & SDC, Digested Sludge Dewatering									$439,000	$439,000												
17.2	Construction, Digested Sludge Dewatering										$4,286,000												
18.1	Evaluate Laboratory Options											$47,700											
18.2	Design & SDC, New Laboratory Building												$166,000	$166,000									
18.3	Construction, New Laboratory Building													$1,660,300									
19.1	Modifications to Existing Chlorine Building Electrical & Controls			$125,000	$125,000																		
20.1	Design & SDC, Additional Primary Anaerobic Digester														$410,000	$410,000							
20.2	Construction, Additional Primary Anaerobic Digester															$4,166,000							
21.1	Design & SDC, Headworks, Influent Pump Station, Aeration Lift Pump Station, and UV Expansion															$717,300	$717,300						
21.2	Construction, Headworks, Influent Pump Station, Aeration Lift Pump Station, and UV Expansion																$7,173,400						
22.1	Design & SDC, Nutrient Removal Facilities Phase 2 and Secondary #4																	$1,085,000	$1,085,000				
22.2	Construction, Nutrient Removal Facilities Phase 2 and Secondary #4																		$10,850,000				
23.1	Greenhouse Gas Evaluation				$50,000																		
	Yearly Total =	$98,309	$689,110	$2,985,211	$3,130,412	$827,913	$1,033,314	$59,515	$747,316	$4,507,717	$8,022,318	$588,019	$2,964,720	$4,408,721	$423,322	$5,316,623	$7,904,024	$1,121,125	$11,958,326	$13,327	$13,328	$46,129	
	Cumulative Total =	$98,309	$787,419	$3,772,630	$6,903,042	$7,730,955	$8,764,269	$8,823,784	$9,571,100	$14,078,817	$22,101,135	$22,689,154	$25,653,874	$30,062,595	$30,485,917	$35,802,540	$43,706,564	$44,827,689	$56,786,015	$56,799,342	$56,812,670	$56,858,799	

TABLE 5-16
City of Loveland WWUP
WWTP CIP, 2010-2029

Item 5 – Vulnerability Assessment

<u>5.1 Vulnerability Assessment</u>: Required to comply with anticipated EPA or Homeland Security Regulation and recommendations. The requirement for completion of vulnerability assessments was delayed due to other over-riding national security concerns, which has resulted in the Congress not acting on specific legislation related to WWTP vulnerability assessments. Each wastewater utility is encouraged to perform the assessment based on their specific community risk and threat levels. **Schedule: 2012**.

Item 6 – Biocriteria and Monitoring

<u>6.1 River Monitoring for Biocriteria Standard Development</u>: Conduct monitoring of the Big Thompson River to work with the State to develop appropriate biocriteria for river. The State is in the process of development of biocriteria that may lead to additional requirements on the WWTPs, specifically to ensure that the stream meets "expected condition" for similar type streams. Monitoring should be performed before the State develops biocriteria. These data may be used to determine whether the river meets State-developed criteria or to establish site-specific criteria. City may consider working on a regional effort for this program. **Schedule: 2015**.

Item 7 – Regulatory Monitoring and Assistance

<u>7.1 River Monitoring for Nutrient Standard Development</u>: Conduct monitoring of the Big Thompson River to work with State to develop appropriate nutrient standard for river. Monitoring should be performed before the State develops nutrient criteria. The City may consider working on a regional effort for this program. **Schedule: Starting in 2016**.

<u>7.2 Basic Standards Hearing Regulatory Assistance</u>: The basic standards hearing scheduled for 2016 is anticipated to pertain to both aquatic life and nutrient criteria. It is anticipated that the City will require some regulatory assistance to address concerns regarding the proposed changes. **Schedule: 2016**.

<u>7.3 South Platte River Basin Hearing Regulatory Assistance</u>: The 2014 South Platte River Basin Hearing is now scheduled for 2015 and presumably every 5 years after the original 2014 date. It is anticipated that the City will require some regulatory assistance to address concerns regarding the proposed changes. **Schedule: 2015, 2019, 2024, and 2029**.

Item 8 – Administration

<u>8.1 Asbestos Abatement of Admin Building Floor</u>: The existing Administration Building floor has asbestos and should be abated. Asbestos in the floor tile mastic was identified by Stewart Environmental on February 3, 2003. It is recommended the work be incorporated into future construction projects. **Schedule: 2020**.

Item 9 – WAS Thickening

9.1 <u>Design and SDC, Project C Pre-Digestion Solids Thickening:</u> The City of Loveland Biosolids facilities and disposal practices are designed to meet the Class B designation for land application. For Class B designation to be achieved, the following pathogen destruction criteria must be met:

- The geometric mean of the density of fecal coliform in seven individual samples shall be less than either 2,000,000 Most Probable Number (MPN) per gram of total solids (dry weight basis); or
- Biosolids are anaerobically digested for a mean cell residence time (or solids residence time, SRT) at a temperature within a time-temperature function having as an end point 15 days at 95 to 131 degrees F.

Loveland typically demonstrates Class B compliance by achieving the required pathogen destruction through fecal coliform testing. Currently, Loveland does not always meet the 15-day SRT requirement, even with two digesters in service. Because SRT is a function of solids loading and concentration of the sludge, pre-thickening of the sludge entering the digester is necessary. The 2007 Solids Processing Evaluation performed by CH2M HILL recommended that WAS and primary sludge be thickened to meet the 15-day SRT design guideline. By meeting the 15-day SRT at the current digester volume available and proposed thickening facility, the City will defer the need for new digesters in the future.

The design provisions of CDPHE Policy 96-1 outline the design criteria considered during the review of Wastewater Treatment Facilities. The WWTP cannot currently demonstrate compliance with the recommended 15-day SRT design criteria at the current and proposed loadings and concentration without increasing the solids concentration. Should the City fail to meet the fecal coliform standard, it is likely that CDPHE would require the digestion facilities to be brought into compliance with its design policy.

The following factors must be considered when assessing the need for the pre-digestion solids thickening:

1. The existing DAFT is inefficient and does not capture and thicken WAS solids effectively,
2. The existing DAFT facility is at the end of its useful life and in need of refurbishment or replacement,
3. The existing DAFT facility is a significant odor source.
4. Liquid Waste Management has had a difficult time scheduling the withdrawal of sludge from the facility due to seasonal issues (rain, snow, and land availability), requiring more of the secondary digester volume to be used for storage rather than SRT volume,
5. Boiler maintenance and condenser tube failure have resulted in low digester operating temperatures, and
6. Compressor failure resulted in no mixing with the stage 2 digester.

The above factors decrease the reliability of the existing digester and DAF thickening facilities. Should the City fail to produce a Class B biosolids product, land application by Liquid Waste Management (LWM) will not be allowed. The City is required to produce Class B biosolids per its contract with LWM. If Class B biosolids pathogen removal designation is not achieved, land application under the biosolids beneficial use provisions will not be allowed. Landfill disposal, offsite composting, or lime stabilization will be required to dispose of the sludge.

The cost for handling and disposal of non-Class B biosolids on an emergency basis will be significant. LWM has indicated that the costs for dewatering and disposal of a non-Class B product would be roughly double the current cost of the current hauling contract. Additionally, landfill disposal of any biosolids product, Class B or non-Class B, can be a less reliable disposal option since the individual County or private landfill owner has jurisdiction and can change requirements or deny disposal at any time. A primary consideration is odor, which would be prominent both in an outdoor dewatering operation at the WWTP and at a disposal facility, especially for biosolids that are not fully digested. Provisions for disposal of non-Class B sludge are not currently in place. Temporary storage of the liquid solids in the existing drying beds or abandoned aerobic digesters is not practical even for temporary emergency storage, due to the condition and volume limitations. In addition, the odor would be significant.

If Class B standards are not met, the City would have to contract with LWM or Parker Ag to dewater the sludge for landfill application or transport sludge offsite for additional composting at an approved facility. Given the current solids loading rate, concentrations, and condition of the WWTP thickening and digestion facilities, it is recommended that the design of the predigestion thickening facilities begin in 2010.

In addition to maintaining the ability of the digesters to produce Class B biosolids, pre-digestion thickening will provide the following benefits:

- Reduce the number of sludge hauling trucks,
- Reduce hauling cost,
- Reduce volume of sludge holding within the secondary digester
- Postpone or eliminate future digester facility construction, and
- Improve reliability of solids facilities.

A detailed description of the existing solids facilities, regulations, future loadings, and recommendations are included in the Technical Memorandums prepared for the Wastewater Treatment Plant Solids Processing Evaluation by CH2M HILL dated November 2007.

Schedule: Design 2010-SDC 2011-2012.

9.2 Construction, Project C WAS Thickening: Constructs the WAS Thickening project and decommissions the existing DAFT based on the 2007 Solids Study. **Schedule: 2011 through 2012**.

Item 10 – Digester Complex Improvements

10.1 Interior Coating of Existing Digesters: The interior surfaces of the covers were determined to be in good condition, and recoating was not assessed to be an immediate need. In the future project, each digester will be taken down one at a time, emptied and cleaned, the cover inspected to confirm extent of repairs (if any) necessary prior to recoating, the cover removed from the digester and recoated, and then the cover reinstalled and the digester returned to service. Based on the inspection findings in 2006 and 2007, this project is recommended to occur in 2010, but is now scheduled to be performed following with the pre-digestion solids thickening project. **Schedule: 2013.**

10.2 Clean Digesters: Project to clean digesters is to be performed with the interior digester coating project. **Schedule: 2013.**

10.3 Design and SDC, Digester Flare Modifications: The City has identified digester flare modifications as critical maintenance items. The flare improvements need to be developed further with the City staff. **Schedule: 2012 thru 2013.**

10.4 Construction of Digester Flare Modifications: Schedule: 2013.

10.5 Design and SDC, Digester Gas Compressor Modifications: The City identified the digester gas compressors as critical maintenance items. The existing compressors have reached the end of their useful life and this model is no longer manufactured for replacement. The design consists of preparing replacement plans for two compressors, piping and electrical improvement. CH2M HILL prepared a brief technical memorandum in May of 2007 for the City to identify the problem and evaluate alternatives. **Schedule: 2013.**

10.6 Construction of Digester Gas Compressors: Schedule: 2014.

10.7 Design and SDC, Digester Complex Mixing System and Boiler Replacement: The existing digester mixing system and boiler will eventually reach the end of their useful life and require replacement. The digester mixing guns in Digester No. 1 were replaced in 2006, although the condition of the existing guns would not have warranted replacement. Due to construction sequencing, it had been decided to assume replacement of the guns in Digester No. 1, and then decide on replacement for guns in Digester No. 2 depending on the observed condition of the Digester No. 1 guns. It was decided not to replace the Digester No. 2 guns at that time and the replacement was delayed. The replacement guns for Digester No. 2 on this project will be new stainless steel mixing guns. The mixers in Digester No. 2 will be replaced in 2013, while the boiler will be replaced in 2014. The mixers and any required modifications in gas piping could be timed for replacement when Digester No. 2 is taken down for cleaning and roof inspection. **Schedule: 2016 through 2017**.

10.8 Construction, Digester Complex Mixing System and Boiler Replacement: The existing digester mixing system and boiler will eventually reach the end of their useful life and require replacement. **Schedule: 2016 through 2017.**

Item 11 – Process Air Blowers

11.1 Soft Start for Process Air Blowers 1-4: The existing blowers were not provided with soft starts as part of the Step Feed Aeration project. Spencer blowers did not require the soft starts as part of their blower system package. The City's Technical Services group would prefer the soft starts to minimize motor slippage and wear on the starters due to frequent starts. It is also believed that soft starts will prolong the couplings life. **Schedule: Installation in 2009 and 2010**.

Item 12 – Nutrient Removal and Aeration Basin

12.1. Design and SDC, New Blower and Diffuser Modifications: Increasing influent plant loads will necessitate this project to provide BOD capacity increase of secondary treatment system to increase current capacity. Required to be under design when plant capacity is at 80 percent current capacity (16,200 lb/d or 8 mgd) and under construction when plant is at 95 percent current capacity (19,300 lb/d or 9.5 mgd). Blower and diffuser modifications will utilize existing aeration basins and blower building. Plant influent load capacity will increase to 22,500 lb/d. **Schedule: 2013 through 2014**.

12.2. Construction, New Blower and Diffuser Modifications: Constructs blower and diffuser modifications. **Schedule: 2014**.

12.3. Design and SDC, Aeration Basin: Continued increases in influent loadings will require another increase in BOD capacity of secondary treatment system to meet projected growth. Project to include the construction of new aeration basin in conjunction with Project 12.2. Plant influent load capacity will increase to 27,800 lb/d and maximum month hydraulic capacity will increase to 12 mgd. **Schedule: 2017 through 2018**.

12.4. Design and SDC, Aeration Basin: Construct aeration basin expansion. **Schedule: 2016**.

12.5. Design and SDC, Nutrient Removal Facilities Phase 1: Provide additional treatment to remove nutrients and meet anticipated nutrient criteria. Additional nutrient treatment facilities should be on line by 2016 to meet anticipated upcoming nutrient criteria. An aeration basin expansion is projected to be required. **Schedule: 2019 through 2021**.

12.6. Construction, Nutrient Removal Facilities Phase 1: Constructs the Nutrient Removal Facilities. **Schedule: 2020 through 2021**.

Item 13 – Headworks and Odor Control Facilities

13.1 Headworks and Odor Control Facilities – Warranty Services: This project provides for warranty services to the newly completed facilities. **Schedule: 2010.**

Item 14 – Primary Clarifier

14.1. Design and SDC, Project K Primary Clarifier: Provide capacity increase of primary treatment system to provide additional plant capacity for City growth. **Schedule: 2014-2015**.

14.2. Construction, Project K Primary Clarifier: Constructs additional primary clarifier. **Schedule: 2017**.

14.3. Design and SDC, Trickling Filter Demolition: Demolish existing facility to make room for new primary clarifier. **Schedule: 2016 through 2017**.

14.4. Construction, Trickling Filter Demolition: Demolish existing facility to make room for new primary clarifier. **Schedule: 2017**.

Item 15 – Automated Data Acquisition, Process Control, and Monitoring System

15.1. Design and SDC, Automated Data Acquisition, Process Control and Monitoring System: Design new computer system, instrumentation, control panels, and PLCs to improve efficiency and provide for easier regulatory reporting. Remove old Annunciator Panel and automate remaining plant facilities. **Schedule: 2019 through 2021**.

15.2. Construction, Automated Data Acquisition, Process Control and Monitoring System: Construction of new computer system, instrumentation, control panels, and PLCs to improve efficiency and provide for easier regulatory reporting. Remove old Annunciator Panel and automate remaining plant facilities. **Schedule: 2020 through 2021**.

Item 16 – Heating, Ventilation, and Lighting System Upgrades

16.1. Design and SDC, Heating, Ventilation, and Lighting System Upgrades: Provide upgrades or replace existing HVAC and lighting that is nearing the end of its useful life. **Schedule: 2014-2015**.

16.2. Construction, Heating, Ventilation, and Lighting System Upgrades: Constructs upgrades or replacement of existing HVAC and lighting that is nearing the end of its useful life. **Schedule: 2015**.

Item 17 – Digested Sludge Dewatering

17.1. Design and SDC, Digested Sludge Dewatering: Recommended project based on the 2007 Solids Study. Provide onsite dewatering capability to reduce the volume of digested sludge hauled off site and reduce dependence on liquid waste hauling. **Schedule: 2017-2018**.

17.2. Construction, Digested Sludge Dewatering: Constructs sludge dewatering improvements. **Schedule: 2018**.

Item 18 – Laboratory

18.1. Evaluate Laboratory Options: The existing laboratory at the wastewater treatment plants in need of modification and expansion. There may be physical limitations to expanding at the present location. This project will evaluate the options of expanding the laboratory at the current location versus providing a new laboratory. The outcome of this study will result in the need for design and construction of modified or new laboratory facilities. **Schedule: 2019**.

18.2. Design and SDC, New Laboratory Building: The existing laboratory at the wastewater treatment plant is in need of modification and expansion. There may be physical limitations to expanding at the present location. The design requirement for these facilities will be affected by the outcome of the Laboratory Evaluation. **Schedule: 2020 and 2021**.

18.3. Construction, New Laboratory Building: Constructs the New Laboratory Building. **Schedule: 2021**.

Item 19 – Modifications to Existing Chlorine Building Electrical and Controls

19.1 Modifications to Existing Chlorine Building Electrical and Controls. The existing MCC and control panel are at the end of their useful life and in need of replacement. **Schedule: 2011 to 2012.**

Item 20 – Additional Primary Anaerobic Digester

20.1. Design and SDC, Additional Primary Anaerobic Digester: The 2007 Solids Study recommended WAS thickening in lieu of the construction of a third anaerobic digester. **Schedule: 2022-2023**.

20.2. Construction of Anaerobic Digester: Constructs additional primary anaerobic digester. **Schedule: 2023**.

Item 21 – Headworks, Influent Pump Station, Aeration Lift Station, and UV Disinfection Expansion

<u>21.1. Design and SDC of Headworks, Influent Pump Station, Aeration Lift Pump Station, and UV Disinfection Expansion</u>: Based on a projection of peak instantaneous flows to the plant, an expansion of several facilities will be necessary by 2024. A new Headworks and Influent Pump Station structure is assumed to handle the incremental increase in flow only. It is assumed that larger pumps can be installed within the existing Aeration Lift Pump Station. Additional UV disinfection equipment can be installed within a currently empty channel in the UV Disinfection Building. Plant peak hydraulic capacity will increase to 28 mgd. **Schedule: 2023-2024**.

<u>21.2. Construction of Headworks, Influent Pump Station, Aeration Lift Station, and UV Disinfection Expansion</u>: Constructs the peak flow related facilities. **Schedule: 2024**.

Item 22 – Nutrient Removal Facilities Phase 2

<u>22.1. Design and SDC, Nutrient Removal Facilities Phase 2</u>: Provide additional treatment to remove nutrients and meet anticipated nutrient criteria projected for the 2024 discharge permit. An aeration basin expansion is projected to be required for increased plant loading as part of the upgrade also. In addition, a fourth secondary clarifier will need to be constructed for future flows. Plant influent load capacity will increase to 36,000 lb/d and maximum month hydraulic capacity will increase to 13.3 mgd. **Schedule: 2025-2026**.

<u>22.2. Construction, Nutrient Removal Facilities Phase 2</u>: Constructs the Nutrient Removal Facilities. **Schedule: 2026**.

Item 23 – Greenhouse Gas

<u>23.1 Greenhouse Gas Evaluation</u>: Perform a greenhouse gas evaluation, and review potential regulatory requirements and their impacts. **Schedule: 2012**.

Operational and Maintenance Cost Impact

Operational and maintenance (O&M) costs for the WWTP have been projected for the 20-year planning horizon.

O&M cost projections are shown in **Figure 5-30** below for seven major cost categories. The most striking change projected over time is for sludge hauling. The projected significant reductions in the City's annual costs follow the construction of the WAS Thickening (in 2012) and Digested Sludge Dewatering (in 2018) projects. A second item of note is the cost of chemicals for the WWTP, which begins in 2009 with the new odor control facilities and increases over time as additional processes which use chemicals are constructed (e.g., WAS Thickening in 2012).

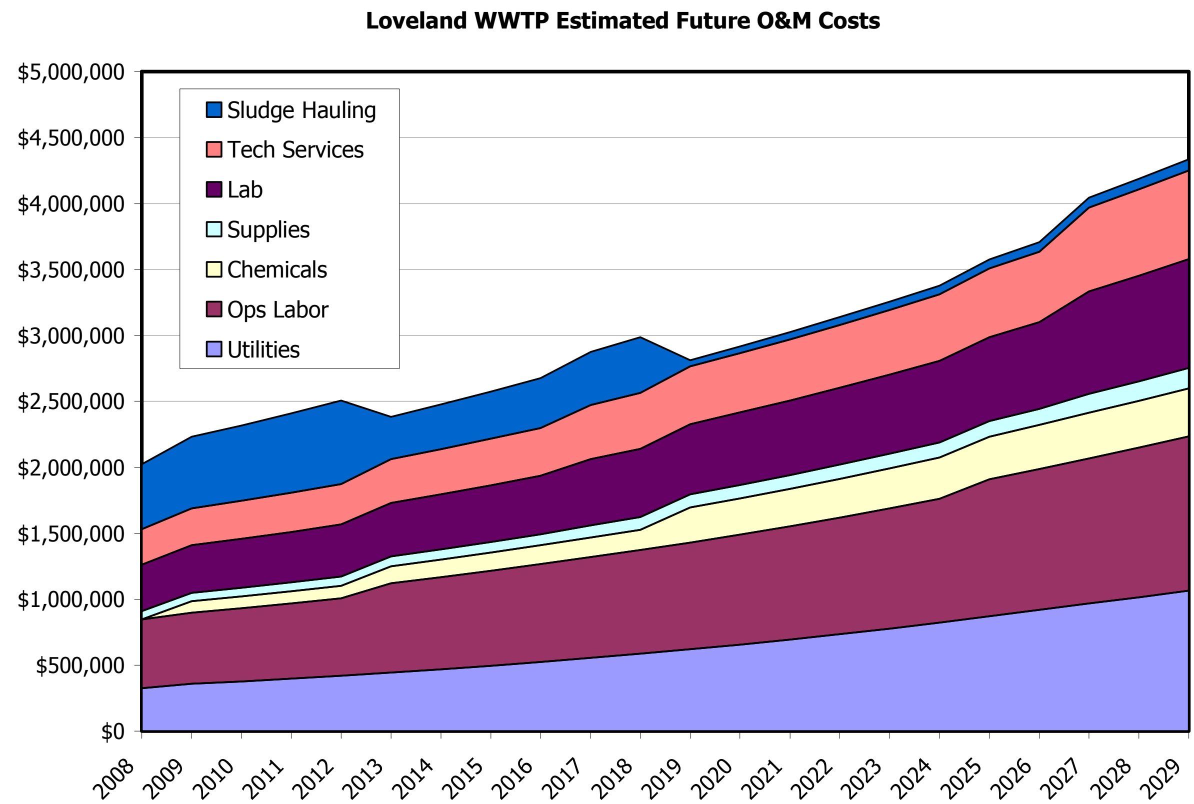


FIGURE 5-30
Loveland WWTP Estimated Future O&M Costs

Current costs for sludge hauling, supplies, chemicals, operations labor, and utilities are taken from the City's 2009 budget. Current costs for Technical Services and laboratory are the approximate portions of the City's 2009 budget for those items that are attributable to the WWTP. Future cost projections for the cost categories are affected by projections of future inflation, plant flow, and load increases, and the construction of specific projects as noted below in **Table 5-17**. Specific projects that will affect future costs are identified by the project numbers from **Table 5-16**.

TABLE 5-17
Factors Affecting Projections in O&M Cost Categories

Cost Category	Inflation	Plant Load	Specific Projects
Sludge Hauling	X	X	9, 17
Technical Services	X		9, 12.6, 22
Laboratory	X		12.6, 22
Supplies	X		9, 17, 22
Chemicals	X	X	9, 17, 22
Operations Labor	X		9, 21
Utilities	X	X	

Assumptions for the O&M cost projections are noted below:

- One additional mid-level operator will be added to the plant staff following Projects 9 and 21
- 2009 sodium hypochlorite cost of $1.25 per gallon
- 2009 sodium hydroxide cost of $3.70 per gallon
- 2009 thickening and dewatering polymer cost of $1.75 per gallon
- Average operator pay of $71,000 including burden
- Future inflation rate of 3 percent
- Future wage inflation rate of 3 percent

6.0 Management and Financial Plans

6.1 Management Structure and Agreements

The City of Loveland Water Utilities (Utilities) owns, operates, and manages its own wastewater treatment facilities as well as collection system. The purpose of the Utilities is to plan, design, acquire, finance, own, maintain, operate, and manage a wastewater treatment plant and other Utility facilities to treat and dispose of wastewater.

The Utilities have agreements with three privately owned wastewater collection systems to receive and treat their wastewater. Two of these systems lie outside of the City Limits. Eagle Crest is a residential development of approximately 30 homes served by a private lift station as illustrated previously in **Figures 5-12 and 5-19**. The lift station and local gravity collection infrastructure are owned and maintained by the residents via the governing HOA. In the future, once City gravity collection system is extended to this area, it may be possible to abandon this lift station and serve this neighborhood with entirely gravity service. This development was reviewed and approved by the City via construction drawings submitted and approved in 1996.

Similarly, Spring Mountain Ranch is another privately owned and maintained wastewater collection and pumping system. As illustrated previously in **Figures 5-12 and 5-19**, this system serves approximately 32 homes and is operated via a neighborhood HOA organization. The terms of the City's acceptance of this wastewater load is outlined in an Agreement dated 1985 and included in the **Appendix 8.V**.

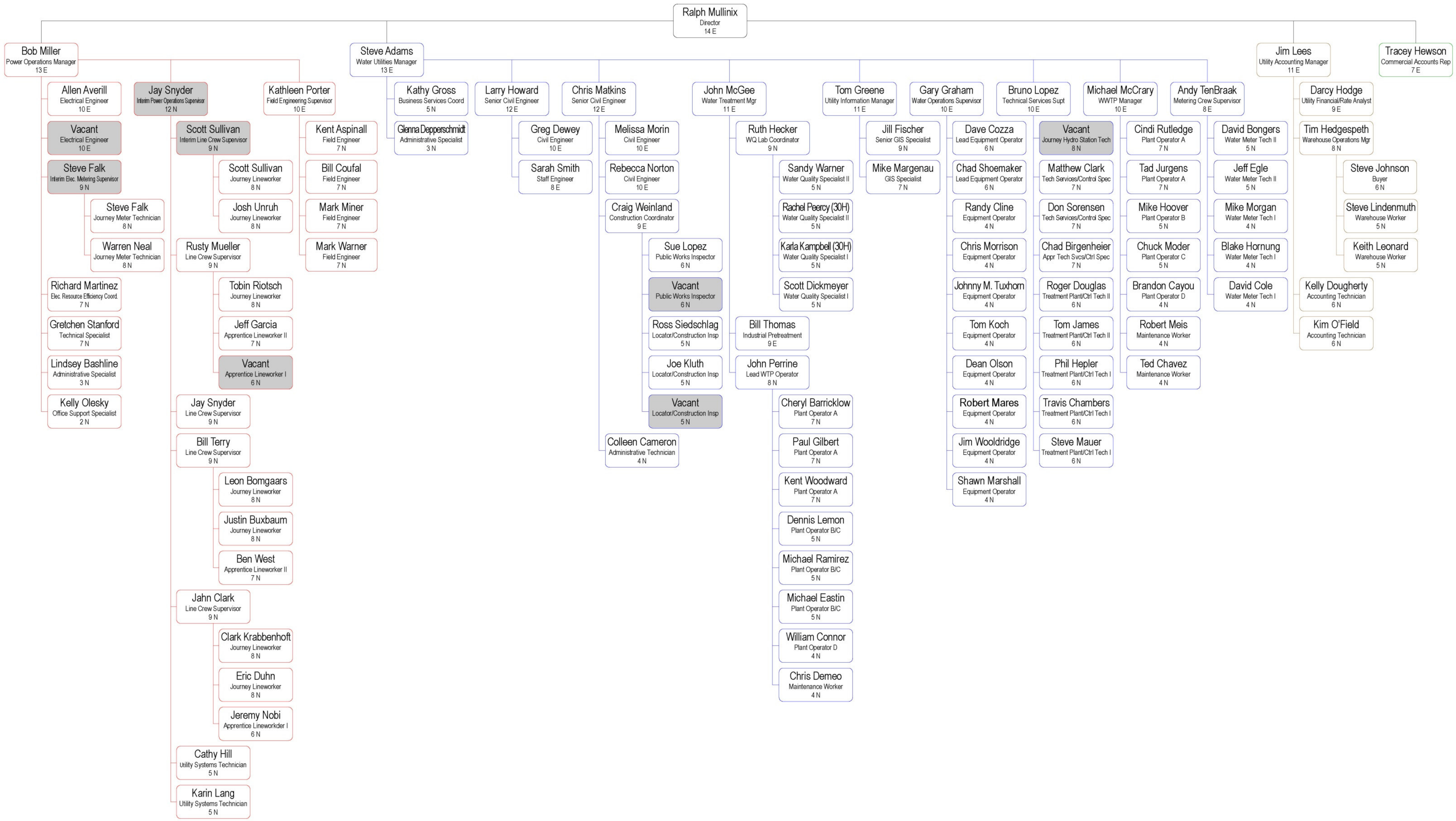
Lastly, Boyd Lake Lift Station (illustrated previously in **Figure 5-12**) serves a State Park with a small, private lift station and collection system. These systems are owned and maintained by the State of Colorado and serve very limited facilities including day picnic shelters and bathrooms. The terms of the City's acceptance of this wastewater load is outlined in an Agreement dated 1983 and included in the **Appendix 8.V**.

The designated management agency for the Big Thompson Watershed is the North Front Range Water Quality Planning Association (NFRWQPA). The Utilities wastewater treatment facilities discharge treated wastewater into the Big Thompson Watershed. The discharges are permitted by the State of Colorado. The Utilities are operating under an approved 208 Plan authorized by the NFRWQPA.

6.2 Wastewater Management Plan

The City of Loveland is a Home Rule City. Management of City functions is through its Home Rule Charter and the Code of the City of Loveland. The Utility is identified as an Enterprise Fund, which was established by Ordinance 4484 on November 2, 1999.

The Utility Management structure is shown in **Figure 6-1.**



City of Loveland

City of Loveland
Water & Power Department
August 2010

Year 2010 Budgeted
Water and Power Employees

Executive	1
Customer Relations	1
Accounting	8
Power	34
Water	69.5
Total Employees	113.5

FIGURE 6-1
Utility Management Structure

6.3 Financial Management Plan

The Wastewater Utility is an Enterprise Fund, which means it is self-sufficient and covers all of its operating and capital expenses from revenues generated from sales and user fees. The Utility is not dependent on any taxes or other revenue sources, and, therefore, distinguishes itself from the City's General Fund. The Utility's revenue and expense activities are booked in accordance with Generally Accepted Accounting Principles (GAAP). The revenues and expenses are divided into two categories: general (or unrestricted) and growth-related. The general expenses include operating and maintenance (O&M) expenses and capital expenditures that are not growth-related. Growth-related capital expenditures, such as new wastewater lines or increased capacity at the wastewater treatment plant, are funded by growth-related revenues known as System Impact Fees (SIF). SIFs are generated from new customer growth, either residential or commercial. The SIFs are updated annually by adjusting the value of our treatment plant and collection system up to current replacement cost, and also updating our customer count. We utilize the Equity-Buy-In methodology for charging our SIFs, where a new customer will pay to become a "shareholder" in our treatment and collection system to account for the added impact they will be putting on our system. General revenues can be used for either non-growth related or growth-related expenses, but SIF revenues are restricted to being used exclusively for growth-related expenses. The SIF program was initiated in the early 1980s to fulfill City Council's directive that growth pay its own way. We must be able to demonstrate that our SIF revenues are being used only for growth-related expenses. Even though general revenues can be used for growth-related expenditures, our practice has been to utilize them only for non-growth related expenses.

In developing our short- and long-range financial plans, we utilize a three-pronged approach. We have a 10 Year Financial Plan, a detailed 5 Year Capital Improvement Plan (CIP), which is incorporated into the first 5 years of the 10 Year Financial Plan, and our current year budget, which is presented to our City Council each October. A discussion of each of these three is included in the paragraphs that follow.

The tool we utilize most heavily in our strategic financial planning is the 10 Year Financial Plan. This financial plan is really our primary planning compass for revenues, operating and maintenance expenses and capital expenditures. Sales projections are developed based on historical trends and growth projections (which are discussed below). O&M expense projections are developed from input given by all division supervisors, and also take into account historical expense trends. The CIP is developed using the methodology described in the following paragraph. When all of these processes are completed, 10 years worth of revenue projections (both general and growth-related), O&M expenses, and a capital improvement program (both general and growth-related) are all integrated to develop the financial plan. For our Working Cash Balance (General Cash), we use a City-established principle of maintaining a balance of at least 15 percent of Operating Expenses, excluding depreciation, throughout the 10-year period. If, after assembling all of the inputs, the fund balance for a given year gets to an unacceptably low level, that is an indicator of a need to either 1) reduce capital expenditures; 2) reduce O&M expenses; or 3) assess the need to increase rates. Lowering capital expenditures by either reducing the scope of projects or delaying them is normally the first course of action taken. If we reach a point where capital projects are time critical and can no longer be delayed, and there is no room for reductions in the O&M expenses, we will look at rate increases as a last option, and determine at what point we would need to start increasing them. We receive growth projections for population and dwelling units each year from the City's Development Services Department, and these projections are incorporated into our revenue projections. It normally takes several iterations before an acceptable long-range financial plan is established. The 10 Year Financial Plan is normally a stand-alone document, but for purposes of avoiding duplication, the 10 Year Financial Plan appears in this utility plan as an extract of the 20 Year Financial Plan. The 10 Year Financial Plan is comprised of the first 10 years of the 20 Year Financial Plan shown in **Table 6-1.**

The second leg of our three-pronged approach is the 5-Year CIP. Our CIP is broken into three components: 1) wastewater treatment plant projects; 2) collection system projects (lines and lift stations); and 3) general plant equipment. The wastewater treatment plant and collection system CIPs are developed through a collaborative process between staff and our engineering consultants. Great diligence is put into separating the CIP expenses between general and growth-related expenditures in order to ensure the proper funding source is paying for the appropriate expenditure. In some cases, projects are split in their funding – part general and part growth-related. This occurs in cases where the capital project will accomplish both increasing capacity of the system and rehabilitation, as well. The General Plant Equipment (e.g. trucks, tools, more expensive office equipment) portion of the CIP is developed based on needs from the different divisions. Our philosophy in developing the CIPs has consistently been conservative over the years. Rather than doing large-scale increases in capacity in one shot, whether talking about treatment plant capacity, wastewater lines or lift stations, the approach has been to add small increments of capacity just at the time they are needed. By doing this, we hope to avoid having excess capacity that we do not grow into for many years. This approach has served us well, as we have always had sufficient capacity to meet peak demand and, at the same time, we have also been able to cash fund all of our expenses and stay debt free since 1999. The 5-Year CIP is shown in **Table 6-2**.

The third leg of our three-pronged approach is the current year budget. The first year of the 5-Year CIP is what is implemented for the current year budget. The current year budget includes a high level of detail in both revenue and expenditure categories. We develop line item detail for each revenue account and each expenditure account within all of the wastewater utility divisions. For some of the larger expense accounts, there is itemized detail to support the total budget for that account. Monthly financial statements and revenue reports are generated to keep management updated on how the utility is faring in comparison to the budget throughout the year.

Negative projections of Total Available Funds (line 32 in **Table 6-1**) indicate a potential future need to either increase revenues and/or reduce expenses. Negative projections in the immediate future (years 1 through 5) indicate a need to take immediate action. Capital projects are re-evaluated to determine whether the scope can be reduced or the construction can be delayed. If this is not sufficient to address the pending negative funds projection, increases in rates and/or system impact fees are considered.

TABLE 6-1

LOVELAND WATER AND POWER
WASTEWATER UTILITY
FINANCIAL FORECAST

	Forecast 2009	Budget 2010	Projected 2011	Projected 2012	Projected 2013	Projected 2014	Projected 2015	Projected 2016	Projected 2017	Projected 2018	Projected 2019
Unrestricted Funds											
1 BEGINNING WORKING CASH BALANCE:	$5,367,684	$5,751,231	$6,622,321	$5,400,241	$4,087,761	$4,383,461	$5,563,401	$6,623,223	$7,544,004	$5,849,931	$1,732,486
REVENUES & SOURCES:											
2 Sanitary Sewer Charges	$6,769,700	$6,825,760	$6,962,300	$7,171,200	$7,386,300	$7,607,900	$7,836,100	$8,071,200	$8,313,300	$8,562,700	$8,819,600
3 Hi Strength Surcharge	252,500	203,500	207,600	213,800	220,200	226,800	233,600	240,600	247,800	255,200	262,900
4 Interest on investments	187,870	158,160	198,670	189,010	163,510	175,340	222,540	264,930	301,760	234,000	69,300
5 Other revenues	18,540	1,250	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
6 Year-end cash adjustments	0	0	0	0	0	0	0	0	0	0	0
7 **TOTAL REVENUES & SOURCES**	$7,228,610	$7,188,670	$7,369,870	$7,575,310	$7,771,310	$8,011,340	$8,293,540	$8,578,030	$8,864,160	$9,053,200	$9,153,100
OPERATING EXPENSES:											
8 Treatment	$2,009,690	$2,075,370	$2,116,900	$2,180,400	$2,245,800	$2,313,200	$2,382,600	$2,454,100	$2,527,700	$2,603,500	$2,681,600
9 Collection System Maintenance	1,028,850	1,018,930	1,039,300	1,070,500	1,102,600	1,135,700	1,169,800	1,204,900	1,241,000	1,278,200	1,316,500
10 Technical Services	561,720	548,260	559,200	576,000	593,300	611,100	629,400	648,300	667,700	687,700	708,300
11 Administrative and general	632,860	599,310	611,300	629,600	648,500	668,000	688,000	708,600	729,900	751,800	774,400
12 Payment in-lieu-of taxes	421,330	421,760	430,190	443,100	456,390	470,080	484,180	498,710	513,670	529,070	544,950
13 Repayment Loan from Raw Water (2004 Loan)	325,000	355,000	395,000	440,000	485,000	0	0	0	0	0	0
14 Services rendered-other depts.	340,660	424,630	433,100	446,100	459,500	473,300	487,500	502,100	517,200	532,700	548,700
15 **TOTAL OPERATING (excl depreciation)**	$5,320,110	$5,443,260	$5,584,990	$5,785,700	$5,991,090	$5,671,380	$5,841,480	$6,016,710	$6,197,170	$6,382,970	$6,574,450
16 **NET OPERATING REVENUE/(LOSS) (excl depn)**	$1,908,500	$1,745,410	$1,784,880	$1,789,610	$1,780,220	$2,339,960	$2,452,060	$2,561,320	$2,666,990	$2,670,230	$2,578,650
17 FOOTNOTE: Depreciation Expense	$1,845,820	$1,901,200	$1,939,200	$1,997,400	$2,057,300	$2,119,000	$2,182,600	$2,248,100	$2,315,500	$2,385,000	$2,456,600
18 CAPITAL EXPENDITURES	$1,524,953	$874,320	$3,006,960	$3,102,090	$1,484,520	$1,160,020	$1,392,238	$1,640,539	$4,361,064	$6,787,675	$2,563,402
19 **NET CHANGE IN WORKING CASH BALANCE**	$383,547	$871,090	($1,222,080)	($1,312,480)	$295,700	$1,179,940	$1,059,822	$920,781	($1,694,074)	($4,117,445)	$15,248
20 **ENDING WORKING CASH BALANCE**	$5,751,231	$6,622,321	$5,400,241	$4,087,761	$4,383,461	$5,563,401	$6,623,223	$7,544,004	$5,849,931	$1,732,486	$1,747,733
21 Desired Balance (15% of Oper Exp excl'g depn)	$798,017	$816,489	$837,749	$867,855	$898,664	$850,707	$876,222	$902,507	$929,576	$957,446	$986,168
22 Fav/(Unfav) to Desired Balance	$4,953,214	$5,805,832	$4,562,492	$3,219,906	$3,484,797	$4,712,694	$5,747,001	$6,641,498	$4,920,355	$775,040	$761,566
Restricted Funds (SIF)											
23 **BEGINNING BALANCE-SYSTEM IMPACT FEES**	$3,610,102	$3,171,475	$3,045,935	$2,159,375	$2,220,685	$1,700,555	$1,825,285	$3,343,105	$4,991,995	$2,853,345	($2,232,445)
24 SIF Collections	442,560	460,510	961,900	1,724,200	1,936,000	2,238,200	2,305,000	2,369,000	2,744,000	3,175,600	3,310,500
25 SIF Interest Income	126,350	87,220	91,380	75,580	88,830	68,020	73,010	133,720	199,680	114,130	0
26 SIF Capital Expenditures	(1,007,537)	(673,270)	(1,939,840)	(1,467,940)	(532,420)	(2,289,390)	(968,090)	(961,730)	(5,190,230)	(8,483,420)	(2,172,020)
27 SIF Capital Expenditure - 402 Sewer Line	0	0	0	(270,530)	(2,562,440)	0	0	0	0	0	0
28 Reimbursement from General Fund - 402 Sewer Line	0	0	0	0	442,000	0	0	0	0	0	0
29 Development Reimbursements - 402 Sewer Line	0	0	0	0	107,900	107,900	107,900	107,900	107,900	107,900	107,900
30 Year-end Cash Adjustment	0	0	0	0	0	0	0	0	0	0	0
31 **ENDING BALANCE-SYSTEM IMPACT FEES**	$3,171,475	$3,045,935	$2,159,375	$2,220,685	$1,700,555	$1,825,285	$3,343,105	$4,991,995	$2,853,345	($2,232,445)	($986,065)
32 **TOTAL AVAILABLE FUNDS**	$8,922,706	$9,668,256	$7,559,616	$6,308,446	$6,084,016	$7,388,686	$9,966,328	$12,535,999	$8,703,276	($499,959)	$761,668

	Projected 2020	Projected 2021	Projected 2022	Projected 2023	Projected 2024	Projected 2025	Projected 2026	Projected 2027	Projected 2028	Projected 2029
Unrestricted Funds										
1 BEGINNING WORKING CASH BALANCE:	$1,747,733	$1,659,252	$1,562,298	$1,456,663	$1,341,644	$1,216,892	$1,081,688	$935,354	$777,388	$607,292
REVENUES & SOURCES:										
2 Sanitary Sewer Charges	$9,084,200	$9,356,700	$9,637,400	$9,926,500	$10,224,300	$10,531,000	$10,846,900	$11,172,300	$11,507,500	$11,852,700
3 Hi Strength Surcharge	270,800	278,900	287,300	295,900	304,800	313,900	323,300	333,000	343,000	353,300
4 Interest on investments	69,910	66,370	62,490	58,270	53,670	48,680	43,270	37,410	31,100	24,290
5 Other revenues	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
6 Year-end cash adjustments	0	0	0	0	0	0	0	0	0	0
7 **TOTAL REVENUES & SOURCES**	$9,426,210	$9,703,270	$9,988,490	$10,281,970	$10,584,070	$10,894,880	$11,214,770	$11,544,010	$11,882,900	$12,231,590
OPERATING EXPENSES:										
8 Treatment	$2,762,000	$2,844,900	$2,930,200	$3,018,100	$3,108,600	$3,201,900	$3,298,000	$3,396,900	$3,498,800	$3,603,800
9 Collection System Maintenance	1,356,000	1,396,700	1,438,600	1,481,800	1,526,300	1,572,100	1,619,300	1,667,900	1,717,900	1,769,400
10 Technical Services	729,500	751,400	773,900	797,100	821,000	845,600	871,000	897,100	924,000	951,700
11 Administrative and general	797,600	821,500	846,100	871,500	897,600	924,500	952,200	980,800	1,010,200	1,040,500
12 Payment in-lieu-of taxes	561,300	578,140	595,480	613,340	631,750	650,690	670,210	690,320	711,030	732,360
13 Repayment Loan from Raw Water (2004 Loan)	0	0	0	0	0	0	0	0	0	0
14 Services rendered-other depts.	565,200	582,200	599,700	617,700	636,200	655,300	675,000	695,300	716,200	737,700
15 **TOTAL OPERATING (excl depreciation)**	$6,771,600	$6,974,840	$7,183,980	$7,399,540	$7,621,450	$7,850,090	$8,085,710	$8,328,320	$8,578,130	$8,835,460
16 **NET OPERATING REVENUE/(LOSS) (excl depn)**	$2,654,610	$2,728,430	$2,804,510	$2,882,430	$2,962,620	$3,044,790	$3,129,060	$3,215,690	$3,304,770	$3,396,130
17 FOOTNOTE: Depreciation Expense	$2,530,300	$2,606,200	$2,684,400	$2,764,900	$2,847,800	$2,933,200	$3,021,200	$3,111,800	$3,205,200	$3,301,400
18 CAPITAL EXPENDITURES	$2,743,091	$2,825,384	$2,910,145	$2,997,449	$3,087,372	$3,179,994	$3,275,394	$3,373,656	$3,474,866	$3,579,112
19 **NET CHANGE IN WORKING CASH BALANCE**	($88,481)	($96,954)	($105,635)	($115,019)	($124,752)	($135,204)	($146,334)	($157,966)	($170,096)	($182,982)
20 **ENDING WORKING CASH BALANCE**	$1,659,252	$1,562,298	$1,456,663	$1,341,644	$1,216,892	$1,081,688	$935,354	$777,388	$607,292	$424,310
21 Desired Balance (15% of Oper Exp excl'g depn)	$1,015,740	$1,046,226	$1,077,597	$1,109,931	$1,143,218	$1,177,514	$1,212,857	$1,249,248	$1,286,720	$1,325,319
22 Fav/(Unfav) to Desired Balance	$643,512	$516,072	$379,066	$231,713	$73,674	($95,826)	($277,503)	($471,860)	($679,428)	($901,009)
Restricted Funds (SIF)										
23 **BEGINNING BALANCE-SYSTEM IMPACT FEES**	($986,065)	$130,139	$1,290,905	$2,539,544	$3,881,780	$5,323,801	$6,872,162	$8,533,913	$10,316,600	$12,228,297
24 SIF Collections	3,418,072	3,529,717	3,645,622	3,765,975	3,891,067	4,021,093	4,156,350	4,297,138	4,443,759	4,596,520
25 SIF Interest Income	0	5,210	51,640	101,580	155,270	212,950	274,890	341,360	412,660	489,130
26 SIF Capital Expenditures	(2,409,768)	(2,482,061)	(2,556,523)	(2,633,219)	(2,712,216)	(2,793,582)	(2,877,389)	(2,963,711)	(3,052,622)	(3,144,201)
27 SIF Capital Expenditure - 402 Sewer Line	0	0	0	0	0	0	0	0	0	0
28 Reimbursement from General Fund - 402 Sewer Line	0	0	0	0	0	0	0	0	0	0
29 Development Reimbursements - 402 Sewer Line	107,900	107,900	107,900	107,900	107,900	107,900	107,900	107,900	107,900	107,900
30 Year-end Cash Adjustment	0	0	0	0	0	0	0	0	0	0
31 **ENDING BALANCE-SYSTEM IMPACT FEES**	$130,139	$1,290,905	$2,539,544	$3,881,780	$5,323,801	$6,872,162	$8,533,913	$10,316,600	$12,228,297	$14,277,646
32 **TOTAL AVAILABLE FUNDS**	$1,789,391	$2,853,203	$3,996,207	$5,223,424	$6,540,693	$7,953,850	$9,469,267	$11,093,988	$12,835,589	$14,701,956

TABLE 6-1
20-Year Financial Plan

TABLE 6-2
Wastewater Utility Capital Improvement Program Summary
2010 Five Year Capital Plan

Description	2009	2010	2011	2012	2013	2014	TOTAL
** SPECIFIC PROJECTS **							
LINE REPLACEMENTS	$755,100	$434,730	$1,016,330	$917,390	$622,560	$841,580	$3,832,590
WASTEWATER PLANT	$321,100	$418,950	$1,935,970	$2,107,090	$778,090	$200,960	$5,441,060
TOTAL SPECIFIC PROJECTS	$1,076,200	$853,680	$2,952,300	$3,024,480	$1,400,650	$1,042,540	$9,273,650
** SYSTEM IMPACT FEE PROJECTS **							
OVERSIZING / MAIN EXTENSIONS	$387,740	$400,220	$711,130	$526,650	$2,970,480	$1,317,340	$5,925,820
WASTEWATER PLANT	$278,500	$273,050	$1,228,710	$1,211,820	$124,380	$972,050	$3,810,010
TOTAL SIF PROJECTS	$666,240	$673,270	$1,939,840	$1,738,470	$3,094,860	$2,289,390	$9,735,830
** GENERAL PLANT **							
ADMINISTRATION/ENGINEERING	$13,280	$20,640	$0	$22,070	$0	$5,670	$48,380
OPERATIONS	$79,000		$54,660	$55,540	$83,870	$111,810	$305,880
TOTAL GENERAL PLANT	$92,280	$20,640	$54,660	$77,610	$83,870	$117,480	$354,260
TOTAL CAPITAL EXPENDITURES	$1,834,720	$1,547,590	$4,946,800	$4,840,560	$4,579,380	$3,449,410	$19,363,740

Negative projections in distant years (years 6 and following) are indications of possible looming challenges that the Utility closely monitors, but may not take immediate action to address. A single negative funds projection in a year in the distant future may not be significant enough to cause the utility to consider a rate increase in the immediate future, given the uncertainty of all of the utility's variables. However, a sustained multiyear projection of negative available funds in the distant years may signal a growing gap between revenues and expenses which the utility would address though its periodic rate study efforts.

We also have developed a 20 Year Financial Plan to incorporate into this Wastewater Utility Plan. We took our 10 Year Financial Plan and made assumptions in growth rates for our revenues, O&M expenses and capital expenditures to develop the projections for years 11-20.

The 20-Year Financial Plan is shown in **Table 6-1**.

We have made a commitment to our City Council to do cost-of-service rate studies at least every 5 years. In doing those rate studies, we look first to establish the revenue requirement, which is the total operating and capital costs the utility must recuperate from its rates to properly operate and maintain the infrastructure of the wastewater system. Second is the process of assigning these costs to the appropriate customer classes based on their demands. Finally, rates are developed by taking the costs assigned to a specific customer class and dividing those by the projected usage of that class. By doing the cost-of-service study, we aim to have each customer class paying the appropriate amount that it costs to serve them.

To summarize, our financial management plan is divided into two categories: General and Growth-Related. Our primary guiding document is our 10 Year Financial Plan, which is composed of revenue and expenditure projections for both the General and Growth-Related categories. Our missions are to 1) maintain adequate fund balances; 2) keep our rates and fees as low as possible; and 3) ensure that customers are paying the appropriate amount it costs to serve them. These three priorities are pursued with the overriding goal of sustaining the reliability of our wastewater system.

6.4 Revolving Loan Interest

The revolving loan program is presently not being considered for any wastewater capital improvements. However, it does remain an option for future projects.

6.5 User Charge Summary

User charges are evaluated annually and adjusted when necessary to remain fiscally sound. Charges are to be computed, made, imposed, and collected so that income collected will be at least sufficient to: pay for the requirements of the annual budget, and comply at all times in all respects with the terms and resolutions of the City Council.

6.6 Major Capital Facilities Costs

Major capital facilities costs include those required to support subsequent system upgrades and expansions. Attached at the end of this section and designated as **Table 6-3** is the Utilities projected 10-year plan (2010-2019) for system upgrades, improvements, replacements, and rehabilitations. Since the City operates on a 1-year budget process, only the current year will be presented to City Council for discussion and approval.

LOVELAND WATER AND POWER
WASTEWATER UTILITY
FINANCIAL FORECAST

		Actual 2008	Forecast 2009	Budget 2010	Projected 2011	Projected 2012	Projected 2013	Projected 2014	Projected 2015	Projected 2016	Projected 2017	Projected 2018	Projected 2019
	Unrestricted Funds												
1	BEGINNING WORKING CASH BALANCE:	**$6,507,399**	**$5,367,684**	**$5,751,231**	**$6,622,321**	**$5,400,241**	**$4,087,761**	**$4,383,461**	**$5,563,401**	**$6,623,223**	**$7,544,004**	**$5,849,931**	**$1,732,486**
	REVENUES & SOURCES:												
2	Sanitary Sewer Charges	$6,806,294	$6,769,700	$6,825,760	$6,962,300	$7,171,200	$7,386,300	$7,607,900	$7,836,100	$8,071,200	$8,313,300	$8,562,700	$8,819,600
3	Hi Strength Surcharge	241,629	252,500	203,500	207,600	213,800	220,200	226,800	233,600	240,600	247,800	255,200	262,900
4	Interest on investments	340,325	187,870	158,160	198,670	189,010	163,510	175,340	222,540	264,930	301,760	234,000	69,300
5	Other revenues	4,141	18,540	1,250	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
6	Year-end cash adjustments	7,262	0	0	0	0	0	0	0	0	0	0	0
7	**TOTAL REVENUES & SOURCES**	**$7,399,652**	**$7,228,610**	**$7,188,670**	**$7,369,870**	**$7,575,310**	**$7,771,310**	**$8,011,340**	**$8,293,540**	**$8,578,030**	**$8,864,160**	**$9,053,200**	**$9,153,100**
	OPERATING EXPENSES:												
8	Treatment	$1,902,074	$2,009,690	$2,075,370	$2,116,900	$2,180,400	$2,245,800	$2,313,200	$2,382,600	$2,454,100	$2,527,700	$2,603,500	$2,681,600
9	Collection System Maintenance	857,794	1,028,850	1,018,930	1,039,300	1,070,500	1,102,600	1,135,700	1,169,800	1,204,900	1,241,000	1,278,200	1,316,500
10	Technical Services	512,071	561,720	548,260	559,200	576,000	593,300	611,100	629,400	648,300	667,700	687,700	708,300
11	Administrative and general	591,218	632,860	599,310	611,300	629,600	648,500	668,000	688,000	708,600	729,900	751,800	774,400
12	Payment in-lieu-of taxes	422,762	421,330	421,760	430,190	443,100	456,390	470,080	484,180	498,710	513,670	529,070	544,950
13	Repayment Loan from Raw Water (2004 Loan)	0	325,000	355,000	395,000	440,000	485,000	0	0	0	0	0	0
14	Services rendered-other depts.	309,080	340,660	424,630	433,100	446,100	459,500	473,300	487,500	502,100	517,200	532,700	548,700
15	**TOTAL OPERATING (excl depreciation)**	**$4,594,999**	**$5,320,110**	**$5,443,260**	**$5,584,990**	**$5,785,700**	**$5,991,090**	**$5,671,380**	**$5,841,480**	**$6,016,710**	**$6,197,170**	**$6,382,970**	**$6,574,450**
16	**NET OPERATING REVENUE/(LOSS) (excl depn)**	**$2,804,652**	**$1,908,500**	**$1,745,410**	**$1,784,880**	**$1,789,610**	**$1,780,220**	**$2,339,960**	**$2,452,060**	**$2,561,320**	**$2,666,990**	**$2,670,230**	**$2,578,650**
17	FOOTNOTE: Depreciation Expense	$1,792,054	$1,845,820	$1,901,200	$1,939,200	$1,997,400	$2,057,300	$2,119,000	$2,182,600	$2,248,100	$2,315,500	$2,385,000	$2,456,600
18	CAPITAL EXPENDITURES	$3,944,367	$1,524,953	$874,320	$3,006,960	$3,102,090	$1,484,520	$1,160,020	$1,392,238	$1,640,539	$4,361,064	$6,787,675	$2,563,402
19	**NET CHANGE IN WORKING CASH BALANCE**	**($1,139,715)**	**$383,547**	**$871,090**	**($1,222,080)**	**($1,312,480)**	**$295,700**	**$1,179,940**	**$1,059,822**	**$920,781**	**($1,694,074)**	**($4,117,445)**	**$15,248**
20	**ENDING WORKING CASH BALANCE**	**$5,367,684**	**$5,751,231**	**$6,622,321**	**$5,400,241**	**$4,087,761**	**$4,383,461**	**$5,563,401**	**$6,623,223**	**$7,544,004**	**$5,849,931**	**$1,732,486**	**$1,747,733**
21	Desired Balance (15% of Oper Exp excl'g depn)	$689,250	$798,017	$816,489	$837,749	$867,855	$898,664	$850,707	$876,222	$902,507	$929,576	$957,446	$986,168
22	Fav/(Unfav) to Desired Balance	$4,678,434	$4,953,214	$5,805,832	$4,562,492	$3,219,906	$3,484,797	$4,712,694	$5,747,001	$6,641,498	$4,920,355	$775,040	$761,566
	Restricted Funds (SIF)												
23	**BEGINNING BALANCE-SYSTEM IMPACT FEES**	**$5,002,448**	**$3,610,102**	**$3,171,475**	**$3,045,935**	**$2,159,375**	**$2,220,685**	**$1,700,555**	**$1,825,285**	**$3,343,105**	**$4,991,995**	**$2,853,345**	**($2,232,445)**
24	SIF Collections	714,739	442,560	460,510	961,900	1,724,200	1,936,000	2,238,200	2,305,000	2,369,000	2,744,000	3,175,600	3,310,500
25	SIF Interest Income	281,992	126,350	87,220	91,380	75,580	88,830	68,020	73,010	133,720	199,680	114,130	0
26	SIF Capital Expenditures	(2,389,077)	(1,007,537)	(673,270)	(1,939,840)	(1,467,940)	(532,420)	(2,289,390)	(968,090)	(961,730)	(5,190,230)	(8,483,420)	(2,172,020)
27	SIF Capital Expenditure - 402 Sewer Line	0	0	0	0	(270,530)	(2,562,440)	0	0	0	0	0	0
28	Reimbursement from General Fund - 402 Sewer Line	0	0	0	0	0	442,000	0	0	0	0	0	0
29	Development Reimbursements - 402 Sewer Line	0	0	0	0	0	107,900	107,900	107,900	107,900	107,900	107,900	107,900
30	Year-end Cash Adjustment	0	0	0	0	0	0	0	0	0	0	0	0
31	**ENDING BALANCE-SYSTEM IMPACT FEES**	**$3,610,102**	**$3,171,475**	**$3,045,935**	**$2,159,375**	**$2,220,685**	**$1,700,555**	**$1,825,285**	**$3,343,105**	**$4,991,995**	**$2,853,345**	**($2,232,445)**	**($986,065)**
32	**TOTAL AVAILABLE FUNDS**	**$8,977,786**	**$8,922,706**	**$9,668,256**	**$7,559,616**	**$6,308,446**	**$6,084,016**	**$7,388,686**	**$9,966,328**	**$12,535,999**	**$8,703,276**	**($499,959)**	**$761,668**

TABLE 6-3
LOVELAND WATER AND POWER
WASTEWATER UTILITY
10-YEAR FINANCIAL FORECAST

7.0 References

Ayres and Associates, (2005). *Flood Insurance Study/Map Revision for the Floodplain Restudy of the Big Thompson River Through Loveland, CO*, August 2005. Adopted by FEMA December 19, 2006.

Ayres and Associates, (2007). *Wastewater Collection Modeling Study*, 2007.

Big Thompson Watershed Forum (BTWF), (2007). *Retrospective Analysis of Big Thompson Water Quality, 2001-2006*. 2007.

Black and Veatch, (1982). *Infiltration/Inflow Study*. April 1982.

Black and Veatch, (1980). *Water Wastewater Financial Master Plan*, Loveland, Colorado.

Brown and Caldwell, (2004). *Big Thompson River Ammonia Loss Study*, 2004.

Brown and Caldwell, (2007). *Water and Wastewater Cost-of-Service Study and Rate Design*, February 2007.

CH2M HILL, (1998). *Water and Wastewater Masterplan Report*, May 1998.

CH2M HILL, (1999). *Water Reclamation Site Feasibility/Incremental Expansion Study*, March 1999.

CH2M HILL, (2002). *Site Application for Step Feed, UV Disinfection, and Secondary Electrical Improvements*, 2002.

CH2M HILL, (2002). *Wastewater Treatment Plant Secondary Electrical Study*, 2002.

CH2M HILL, (2005). *Wastewater Treatment Plant Odor Management Phase 2 Final Report*, May 2005.

CH2M HILL, (2006). *Wastewater Treatment Plant Headworks Evaluation*, September 2006.

CH2M HILL, (2007). *CDPS Permit Application for Permit No. CO-0026701*, 2007.

CH2M HILL, (2007). *Wastewater Treatment Plant Solids Processing Evaluation*, November 2007.

CH2M HILL, (2008). *Water Distribution Analysis*, 2008.

City of Loveland, (2009). *Annual Data and Assumptions Report*, January 1, 2009.

City of Loveland, (2008). *2009-2018 Capital Improvements Plan*, 2008.

City of Loveland Website Water Quality Report 2006, www.ci.loveland.co.us/wp/water/water_quality/waterqual06.pdf.

Colorado Department of Public Health and Environment (CDPHE). Water Quality Control Commission. Regulation 93, *Section 303(d) List Water Quality Limited Segments Requiring TMDLs*. Effective April 30, 2008.

Colorado Department of Public Health and Environment (CDPHE). Water Quality Control Commission. Regulation 94, *Colorado's Monitoring and Evaluation List*. Effective April 30, 2008.

Colorado Department of Public Health and Environment (CDPHE). Water Quality Control Commission. *Design Criteria Considered in the Review of Wastewater Treatment Facilities, Policy 96-1*. Effective April 9, 2007.

Metcalf and Eddy, Inc. (1991). *Wastewater Engineering, Treatment, Disposal, and Reuse 3rd Edition*, McGraw-Hill, Inc, 1991.

North Front Range Water Quality Planning Association (2007). North Front Range Water Quality Planning Association Utility Plan Guidance, June 28, 2007.

Richard P. Arber Associates, (2004). *Second Use Water Program Development*, July 2004.

Spronk Water Engineers, (2005). *Raw Water Master Plan*, November 2005.

Stantec, (2005). *South Horseshoe Lift Station Study,* March 18, 2005.

Stantec, (2008). *South Horseshoe Lift Station Emergency Storage Memorandum*, April 22, 2008.

8.0 Technical Support Appendices

Contents of the Technical Support Appendices are listed below. If a section is not applicable to this Utility Plan and explanation has been given and that item is not included.

Appendix 8.A	**Legal Description and Evidence of Site Ownership**
Appendix 8.B	**Special Surveys (e.g., Endangered Species)**
Appendix 8.C	**NEPA Process**
Appendix 8.D	**Site Characterization Report**
Appendix 8.E	**Soil Test Results**
Appendix 8.F	**Preliminary Effluent Limits**
Appendix 8.G	**Effluent Limits (Existing Wastewater Treatment Works)**
Appendix 8.H	**Planning and Zoning Information (e.g., Portion of Local Comprehensive Plan)**
Appendix 8.I	**Intergovernmental Agreements**
Appendix 8.J	**User Charge Study Analysis**
Appendix 8.K	**Air Quality Permit**
Appendix 8.L	**Odor Control Studies**
Appendix 8.M	**Stormwater Management Plan and Permit**
Appendix 8.N	**Summary of Public Hearings and Process**
Appendix 8.O	**Infiltration and Inflow Study**
Appendix 8.P	**City of Loveland Correspondence to CDPHE Regarding Influent BOD Loading**
Appendix 8.Q	**Rainfall Derived Infiltration/Inflow Analysis Graphs**
Appendix 8.R	**City of Loveland Annual Data and Assumptions Report, January 1, 2009**
Appendix 8.S	**WWTP Ammonia Limits Technical Memorandum**
Appendix 8.T	**Correspondence Between the City of Loveland and the Town of Johnstown regarding Potential Wastewater System Consolidation**
Appendix 8.U	**Calculations for Future Wastewater Flows**
Appendix 8.V	**Private Wastewater System Agreements**