Dewberry

TECHNICAL MEMORANDUM 1

Date: March 24, 2021

To: City of Louisville

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Subject: City of Louisville and Redtail Ridge Development Flows and Loads - Updated March 24, 2021

BACKGROUND

The City of Louisville is located in southern Boulder along the Front Range in central Colorado. A general location map for the planning area is shown on **Figure 1**. The City of Louisville was founded in 1878 and incorporated in 1882. During its early days, Louisville was a coal mining town that was composed of many immigrant neighborhoods. The City is named after Louis Nawatny, a landowner during the City's early mining days, who platted a portion of his farmland and named it after himself. The City was a mining town until the closure of the last mine during the 1950s. Since that time, the City has transitioned to a suburban residential community.

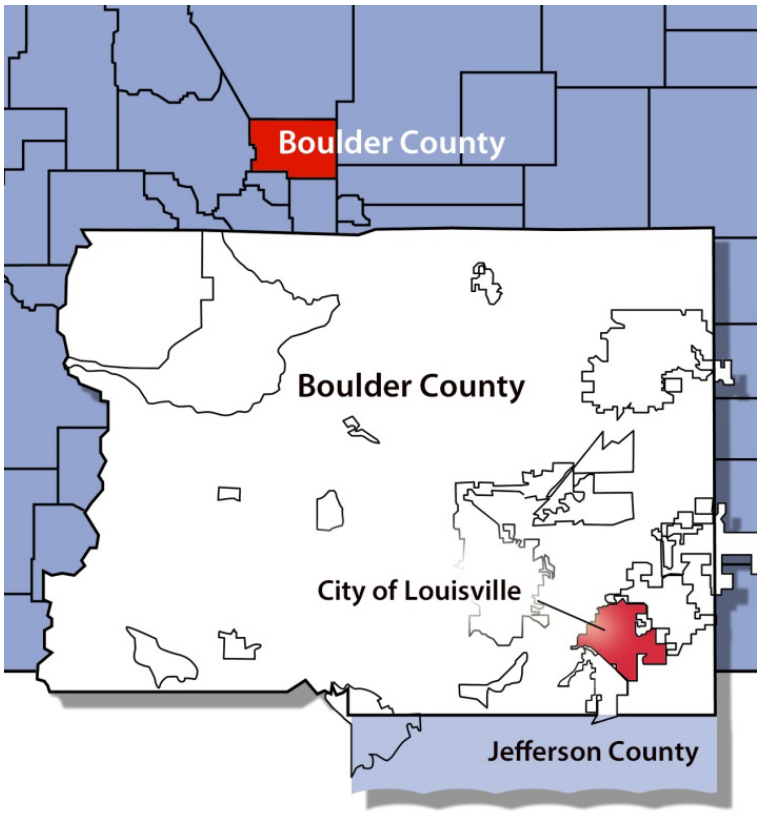

Figure 1 - City of Louisville Location Map

INTRODUCTION

The City of Louisville owns and operates its own wastewater treatment plant (WWTP) and secures water rights for its residents. The City also provides non-potable (wastewater reuse) to the Coal Creek Golf Course, Louisville Sports Complex, Miner's field, and Louisville Community Park.

SERVICE AREA AND POPULATION

The service area is the City of Louisville's border. It encompasses 8.6 square miles and in addition to residences and commercial space, contains 26 parks and approximately 1,700 acres open space. **Figure 1** shows the City boundary and the service area. The City's Boundaries are US 36 to the south, the City of Broomfield to the southeast, City of Lafayette to the north, the Davidson Mesa Open Space/Unincorporated Boulder County to the west, and Broomfield County to the east. The City is

comprised of primarily residential (single family and multifamily homes) with some industrial, commercial and retail space.

WASTEWATER INFRASTRUCTURE

The WWTP is located at 1555 Empire Road in Louisville; approximately 0.6 mile east of downtown Louisville. The WWTP is shown in **Figure 2**. The plant currently treats an average of approximately 1.8 million gallons per day (mgd) and 4,334 pounds per day (ppd) of five-day biological oxygen demand (BOD_5). The plant is rated for 2.53 mgd and 5,515 ppd of BOD_5. The plant is currently operating at about 71 percent its rated hydraulic capacity and 79 percent of its rated organic capacity.

Figure 2 - City of Louisville Wastewater Treatment Plant

The headworks has two mechanical screens, one manual bar screen, a grit removal system, and flow measurement. The lift station has five sewage lift pumps, four of which are normally in operation. The secondary treatment process is a Johannesburg process consisting of three aeration basins, three secondary clarifiers, and the associated process equipment (pumps and blowers). UV units provide disinfection in two channels prior to all flow exiting the effluent flume. The solids handling process consists of a solids holding tank, a rotary drum thickener, an aerobic digester, and one dewatering centrifuge.

REDTAIL FLOW AND LOADS

In December 2020, the Redtail Ridge development was modified from the original plan. Changes include a decrease in developed area from approximately 7 million square feet to just over 3 million square feet of general office, industrial, and retail space. Dewberry was hired to provide an existing capacity evaluation and evaluate the feasibility of adding flows and loads from the proposed updates to the Redtail Ridge Development. Three phases of development are planned. The timing of these developments is unknown at this time and are likely contingent on a number of factors.

The City of Louisville does not have sufficient data from office, retail, and industrial users available to make wastewater flow projections based on data. Therefore, various resources and assumptions are required to project wastewater flow and loads of a new development. Three phases of development are

anticipated between the years 2023 to 2035. Phasing provided by Brue Baukol is shown in **Table 1** below.

Table 1 – Redtail Ridge Project Phasing Summary

Phase	General Office, ft²	Industrial, ft²	Retail, ft²
Phase 1	286,666	414,000	0
Phase 2	716,667	690,000	15,000
Phase 3	716,667	276,000	0
TOTAL	**1,720,000**	**1,380,000**	**15,000**

Each phase of development includes general office and industrial zoning. A small amount of retail is included in Phase II. As a result, the majority of the flow and load is a result of general office and industrial space. General office space makes up approximately 55 percent of the total area and industrial makes up approximately 44 percent of the total area.. Dewberry developed a range of projections anticipating low, mid, and high level growth. These projections were developed from several commonly accepted literature sources, and state and county regulations. **Table 2** summarizes our engineering assumptions:

Table 2 – Flow and Loading per Capita Contribution Assumptions

Commercial or Residential Units	Flow per Unit per Day	BOD_5 per Unit per Day
General Office[1,2], gal/day-person, lb BOD/day-person	20	0.05
Industrial[2] – Domestic Wastewater, gal/person-day, mg/L	35	0.05
Light Industrial Wastewater[3], gal/acre-day, mg/L	1,500	300
Medium Industrial Wastewater[3], gal/acre-day, mg/L	3,000	300
Heavy Industrial Wastewater, gal/acre-day, mg/L	4,500	300
Retail, gal/ft², lb BOD/ft²	0.38	0.001

[1]CDPHE Onsite Wastewater System Regulations
[2]Boulder County Onsite Wastewater System Regulations
[3]Metcalf and Eddy, Wastewater Engineering 5th Edition

Table 2 above includes the assumptions for per capita contributions for commercial and industrial spaces. . CDPHE and Boulder County also have standards for determining per unit contributions in onsite wastewater system regulations. These regulations are conservative and generally used for sizing typical onsite wastewater systems. A typical onsite wastewater system is generally defined as a leachfield or drain system that is treated by onsite soils. These guides tend to have higher values to enlarge soil based systems to ensure proper treatment.

Wastewater flows and loads for general office space generally consist of domestic use during the day. Industrial wastewater flow and load is extremely dependent on the type of industry. Metcalf and Eddy, a widely used reference for wastewater treatment planning and design, establishes typical nondomestic wastewater sources from light and medium wet type industries (**Table 2**). Light industrial is considered those industries with very little to none wet type processes, while medium assumes industries with some wet type processes. Heavy wet-type industries can vary significantly. For these projections, Dewberry assumed heavy industrial to be one and half times the assumed medium industrial wastewater flow.

Wastewater strength of industrial flows was considered to be 300 mg/L for all industry types. This is the surcharge BOD_5 limit established by the City of Louisville for industrial wastewater customers. For these projections, it is assumed that any potential high strength industrial wastewater producers will have pretreatment to avoid surcharges from the City.

Table 3 provides projection assumptions for low, medium, and high flow contributions. These projections assumptions were adjusted based on U.S. Census Bureau Data and typical office space per person in the Denver metropolitan area, and information provided by Brue Baukol

Table 3 – Flow and Loading per Capita Contribution Assumptions

Commercial or Residential Unit Assumptions	Low	Medium	High
Office Space sq ft/person	350	300	250
Industrial (Domestic), sq ft/person	714	333	200
Industrial Wastewater, gal/sq ft	0.03	0.07	0.10

Table 3 above is instrumental for development of low, medium, and high flow and load projections. The assumptions relate to population density Office space per person is based on the assumption of a 15 foot wide by 15 foot long office with accounting for common space use such as conference room space, hallways, restrooms, stairwells, breakrooms, kitchens, and shipping and receiving areas. Industrial space per person is based upon the number of parking spaces provided on the updated illustrative site plan. For these projections, it was assumed that all employees occupy one parking space per person with no employees utilizing public transportation.

The results of this flow and load are included in the following tables. **Tables 4 and 5** provide low, medium, and high flow and load estimated projections associated with the Redtail Ridge Development.

Table 4 Redtail Ridge Flow Projections

Flow	ADF, MGD (% Increase from Permitted Capacity)			MMF, MGD (% Increase from Permitted Capacity)		
	LOW	MID	HIGH	LOW	MID	HIGH
PHASE 1	0.05 (+2.4%)	0.09 (+4.3%)	0.14 (+6.5%)	0.06 (+2.4%)	0.11 (+5.2%)	0.17 (+7.9%)
PHASE 2	0.10 (+4.9%)	0.17 (+8.2%)	0.26 (+12.1%)	0.13 (+4.9%)	0.21 (+9.9%)	0.31 (+14.5%)
PHASE 3	0.06 (+3.0%)	0.10 (+4.5%)	0.13 (+6.4%)	0.08 (+3.0%)	0.11 (+5.4%)	0.16 (+7.6%)
TOTAL	**0.22 (+10.4%)**	**0.36 (+17.1%)**	**0.53 (+25.0%)**	**0.26 (+10.4%)**	**0.43 (+17.1%)**	**0.63 (+25.0%)**

Note: ADF = average day flow, MMF = average day in max month flow, MGD = million gallons per day

Table 5 Redtail Ridge Load (BOD_5) Projections

BOD LOAD	ADL, PPD (% Increase from Permitted Capacity)			MML, PPD (% Increase from Permitted Capacity)		
	LOW	MID	HIGH	LOW	MID	HIGH
PHASE 1	106 (+2.3%)	181 (+3.9%)	268 (+5.8%)	127 (+2.8%)	217 (+4.7%)	321 (+7.0%)
PHASE 2	225 (+4.9%)	357 (7.8%)	509 (+11.1%)	270 (+5.9%)	428 (+9.3%)	611 (+13.3%)
PHASE 3	145 (+3.2%)	208 (+4.5%)	284 (+6.2%)	175 (+3.8%)	250 (+5.4%)	340 (+7.4%)
TOTAL	**476 (+10.4%)**	**746 (+16.2%)**	**1061 (+23.1%)**	**571 (+12.4%)**	**896 (+19.5%)**	**1273 (+27.7%)**

Note: ADL = average day load, MML = average day in max month load, ppd = pounds per day

Table 4 presents estimated flow projections from Redtail Ridge ranging from 0.26 to 0.63 mgd for the maximum month. **Table 5** presents estimated BOD_5 projections from Redtail ranging from 571 to 1,273 ppd for the maximum month. The Louisville WWTP is currently rated for 2.53 MGD maximum month flow and 5,515 ppd of BOD_5. Three phases of development would consume approximately 10 percent to 25 percent of rated hydraulic capacity and 12 percent to 28 percent of rated biological capacity, both on a maximum month basis.

Industrial wastewater accounts for approximately 22 percent to 27 percent of the total flow and 25 percent to 34 percent of the total BOD_5 loading. The assumptions made for these projections are conservative and it is likely the high end of these projections will not be observed. For instance, although it is unknown, it is unlikely that all the industrial will consist of heavy wet type process industries. Realistic projections are likely to fall in the mid-range which cover some combination of light, medium, and heavy industrial. Therefore, the mid-range projections were used in defining future plant capacity.

The City of Louisville WWTP permitted capacity includes planned future development until buildout in 2025 (projected). The Redtail Ridge development was not included in previous buildout projections that define the current permitted capacity. As a result, the projected wastewater flows and loads from the Redtail Ridge development will exceed the City's current rated wastewater treatment flow capacity. Estimated future plant rated capacity with flows and loads from Redtail Ridge are approximately 2.96 MGD and 6,411 ppd BOD_5 on a max month basis. As a result, some improvements to increase the capacity and maintain the current level of redundancy at the WWTP may be necessary. The infrastructure improvements required are discussed in Technical Memorandum 2.