

WATER & SANITATION REPORT

FOR

PARKER TOWN HALL

November 3, 2023

Prepared For:

Town of Parker
20120 E. Main Street
Parker, CO 80138
(303) 840-9546

Prepared By:

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S. A. Miro Job No. 22139

ENGINEER'S STATEMENT

This Water and Sanitation Report for the design of Parker Town Hall was prepared by me or under my direct supervision in accordance with the provisions of the Parker Water and Sanitation District (District) Standards and Specifications for the responsible parties thereof. I understand that the district does not and shall not assume liability for utility facilities designed by others.



Megan H. Vogt, P.E.
Registered Professional Engineer
State of Colorado No. 47666

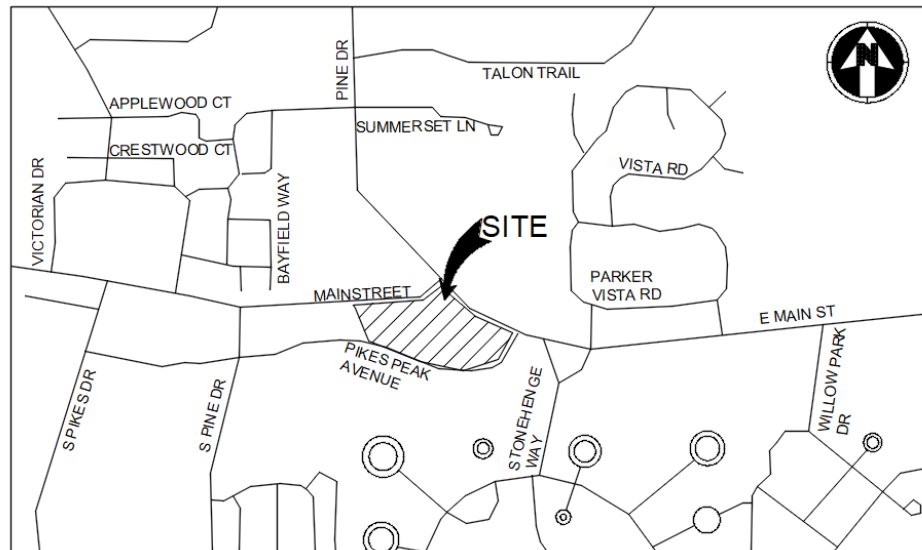
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I. GENERAL LOCATION AND SITE CONDITION

A. LOCATION

The proposed Parker Town Hall expansion project (hereby referred to as “the project”) is located at 20120 Mainstreet in Parker, Colorado. This area, also known as “the site”, is bound by Mainstreet on the northwest, East Mainstreet on the northeast, Pikes Peak Avenue to the south, and a private access road to the west.



VICINITY MAP
SCALE: NTS

B. DESCRIPTION OF PROPERTY

Present on the existing site is the currently operating existing town hall, which is an existing 34,456 SF two story building. The remainder of the site consists of paved walks, drives and parking areas, with landscaped areas around the perimeter. The existing “old town hall” is located directly west of the site and will not be disturbed as a part of this project.

The project consists of the expansion of the existing town hall building as well as the associated drive lanes, parking areas, utility infrastructure, and landscaping elements. The expansion consists of a two-story addition directly east of the existing town hall building, which is anticipated to be 30,200 SF with no below-grade interior space.

C. EXISTING UTILITY CONDITIONS

Existing Water

The site is surrounded by existing water mains. Existing 8” water mains are located within Pikes Peak Avenue and the private access road west of the property, both of which connect to the larger 16” water main north of the site. Three existing hydrants are located on site, all located within the parking lot.

The existing town hall building is currently served by a 1.5” domestic service and a 6” fire service through a single combination tap off of the existing 8” water main within Pikes Peak Avenue.

Existing Sanitary Sewer

An existing 20" PVC sanitary main is located south of the site, within Pikes Peak Avenue. An 8" PVC stub from the larger 20" main runs onto the site, dead-ending at a manhole just southeast of the existing roundabout.

The existing town hall is currently served by a 4" sanitary service that connects into the existing 8" PVC stub through a wye connection, approximately 26' downstream of the manhole. With the exception of the 4" service line that serves the existing town hall, no other off-site flows appear to be conveyed to the 20" main through this sanitary stub.

II. SITE UTILITY DESIGN

A. PROPOSED WATER

Proposed System

To serve both the existing town hall and the proposed addition, the existing 1.5" domestic service line will be upsized to a 2" domestic service line. The existing 6" fire service line will remain as-is, as it is sufficient to serve the new addition alongside the existing town hall. The new domestic line is proposed to be tapped off of the combination service line that currently serves the building, maintaining existing conditions at the main.

One existing fire hydrant will be relocated south of its current location to align with the reconfigured parking lot. The other two hydrants are expected to remain in place.

Fire Flow Demand

Fire flow demands are calculated based on 2018 IFC Criteria with Appendices B, C and D, per South Metro's Fire Rescue's adopted fire code within the Town of Parker. The following summarizes the fire flow demand, with complete calculations provided within the appendix.

FIRE FLOW BLOCK

TOTAL FIRE FLOW REQUIRED FOR THIS SITE IS 2,625 GPM MINIMUM @
20 PSI RESIDUAL PRESSURE
THIS FLOW MUST BE PROVIDED FROM A MINIMUM OF 3 FIRE
HYDRANTS
INDIVIDUALLY, EACH FIRE HYDRANT MUST SUPPLY 1500 GPM MINIMUM
@ 20 PSI RESIDUAL PRESSURE

CODE USED FOR ANALYSIS: 2018 IFC WITH APPENDICES B, C AND D

OCCUPANCY GROUPS: A3, B

CONSTRUCTION TYPE: IIB

FIRE FLOW CALCULATION AREA: 64,656 SF
TOTAL BUILDING AREA: 64,656 SF

BUILDING IS ANTICIPATED TO BE CONSTRUCTED WITH AN AUTOMATED
FIRE SPRINKLER SYSTEM (NFPA 13) SO FIRE FLOW REQUIREMENT HAS
BEEN REDUCED BY 50%.

The proposed site will be served by three fire hydrants, satisfying the requirements of the adopted fire code. However, further coordination with South Metro Fire District is needed to determine if additional hydrants will be required for hose pull purposes.

B. PROPOSED SANITARY

Proposed System

A new 6" sanitary service is proposed to serve the new addition. The new line will tie in at the existing dead-end manhole and will outfall to the 20" main within Pikes Peak Avenue utilizing the existing 8" sanitary stub. The existing 4" sanitary service line will remain to serve the existing town hall.

System Capacity Verification

While Parker Water and Sanitation District Standards and Specifications (*PWSD Standards and Specifications*) does not contain criteria to estimate sanitary demand for new developments; Parker Water and Sanitation District 2020 Water and Wastewater Master Plan (*Master Plan*) contains various methodologies and sources used within the master plan to estimate future demand.

Similarly to the master plan, this study opts to utilize City and County of Denver's Sanitary Sewer Design Technical Manual (*Manual*), to calculate demand for the proposed addition and to verify the existing system capacity for additional flows. Average flow rates for the residential facilities are based on the number of units served, the population densities for each residential land use or zone listed in Table 2.04.1, and a per capita flow rate. Flows from commercial facilities are based on a per acreage average daily flow for each land use or zone as listed in Table 2.04.3 of the *Manual*.

The sewage flow calculations are based on the following formulas:

Residential Units:

$$Q_{req} = (PF \times Q_{avg} + I) / 0.86$$

$$Q_{peak} = (2.6 \times Q_{avg})^{0.84}$$

Where:

Q_c = Per capita flow rate (120 gpd/capita)

P = People per Unit (per Table 2.04.1 of the Manual)

D = Number of Units

PF = Peaking Factor = $2.6 \times Q_{avg}^{-0.16}$ [Maximum $PF = 4$]

I = Infiltration/inflow = $(500 \text{ gal/acre})(\text{Site Acreage})(1.55 \times 10^{-6})$

$Q_{avg} = Q_c (P)(D)$

Commercial Areas:

$$Q_{avg} = (GSF \times GPD/1000)$$

$$\text{Peaking Factor (PF)} = 2.6 \times Q_{avg}^{-0.16} \text{ [Maximum PF = 4]}$$

$$Q_{req} = ((PF \times Q_{avg} + I) / 0.86)$$

Where:

Q_{avg} = Average Daily Flow

GSF = Gross Building Square Footage

Q_{req} = Required Sewer Capacity

I = Infiltration/inflow = $(500 \text{ gal/acre})(\text{Site Acreage})(1.55 \times 10^{-6})$

For the purposes of this calculation, the entire area of the town hall was modeled as a “place of assembly,” resulting in a peak flow of **0.13 cfs** from the proposed addition, and **0.16 cfs** from the existing town hall, resulting in a total of **0.29 cfs** from the site. Per City and County of Denver Sanitary Criteria, capacity of the pipe is 80% of the pipe. The 8” PVC pipe that the project is proposing to connect to will only serve the existing town hall and the proposed addition with no other off-site flows conveyed through this line. The 0.29 cfs of flow from the site corresponds to a 29.1% full pipe, indicating that there is sufficient capacity for the project. Refer to the appendix for detailed calculations.

III. CONCLUSION

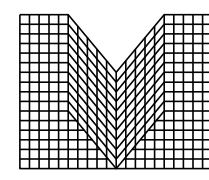
The proposed water and sanitary sewer will operate within the District Standards. Please refer to the appendix for additional information and documentation.

IV. REFERENCES

- 1.) *Parker Water and Sanitation District Standards and Specifications*, Parker Water and Sanitation District, revised January 2017.
- 2.) *Parker Water and Sanitation District 2020 Water and Wastewater Master Plan*, Parker Water and Sanitation District, 2020
- 3.) *2018 International Fire Code*
- 4.) *Sanitary Sewer Design Technical Manual*, City and County of Denver, revised March 2008

APPENDIX

APPENDIX A: UTILITY PLAN

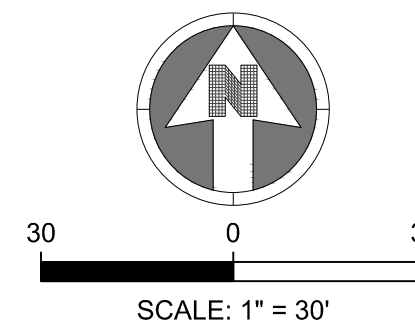


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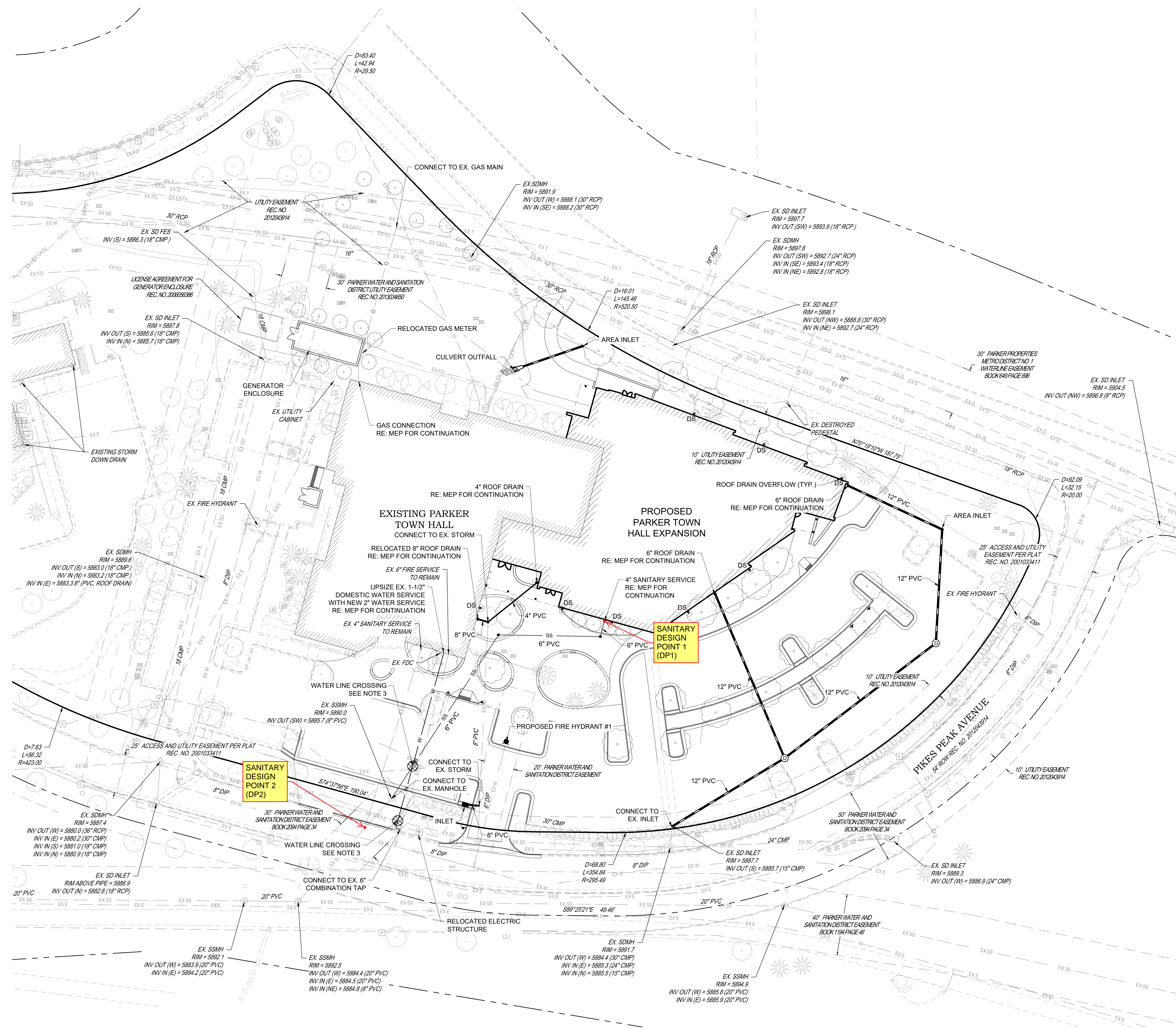


Know what's below.
Call before you dig.



NOTES:

- SEE SHEET C-501 FOR UTILITY NOTES AND LEGEND
- DRY UTILITIES ARE SHOWN FOR REFERENCE ONLY. FINAL DESIGN TO BE COORDINATED WITH UTILITY PROVIDER
- CONTRACTOR TO ADJUST WATER LINE AS NECESSARY TO MAINTAIN A MINIMUM OF 4.5' OF COVER BELOW FINISH GRADE AND 18" BETWEEN OTHER UTILITIES.



DATE	DESCRIPTION
11/03/2023	FIRST TOWN SUBMITTAL

NO.	PROJECT	DRAWING TITLE:
1	PARKER TOWN HALL EXPANSION 20120 MAIN STREET PARKER, CO 80138	UTILITY PLAN

DESIGNED BY:	RJH
DRAWN BY:	RLH
CHECKED BY:	MHV
MIRO JOB NO.	22139
DRAWING NUMBER:	C-511

FILE PATH: C:\Users\sthd\CAAC\Projects\A. Miros\Inc\Civil\Jobs\22139 Parker Town Hall\05 CAD\Plans and Details\C511-UTIL-PLAN.dwg C511 - 10/27/2023

APPENDIX B: DEMAND CALCULATIONS

Appendix 3B – Demand Projection Notes

Non-Residential Water Use

Table 3B-8 | Indoor Water Use by Building Type

	Source 1	Recommended	Source 2 Low	Source 2 High	Source 3	Source 4
Office Buildings	200	100*	48	101		74
Restaurants	500	Per Source 1	356	907	526	426
Bars & Lounges	300	Per Source 1				
Hotels & Motels	350	Per Source 1			329	330
Neighborhood Stores	200	Per Source 1				
Department Stores	200	Per Source 1				
Laundries & Dry Cleaning	1000	Per Source 1				
Banks & Financial Buildings	300	Per Source 1				
Medical Buildings & Clinics	300	Per Source 1				
Warehouses	100	Per Source 1				
Meat & Food Processing Plants	2800	Per Source 1				
Auto Dealer, Repair & Service	20	Per Source 1				
Supermarket	200	Per Source 1	142	175		
Trade Businesses – Plumber, Exterminator, etc.	200	Per Source 1				
Mobile Home Dealer, Lumber Co., Flea Market	300	Per Source 1				
Factories – Manufacturing	800	Per Source 1				
Hospitals (450 gal/bed)						

(1) City and County of Denver 2008 Sanitary Planning Criteria (Table 2.04.3)

(2) Commercial and Industrial End Water Uses, AWWA WRF 2000

(3) Benchmarking Industrial, Commercial, and Institutional Water Use, 2007 Colorado WaterWise Council

(4) Methodology for Evaluating Water Use in Commercial, Industrial, and Institutional Sections, WRF 2015

*200 gpd/1000 sq. ft. is higher than any other reference usage when the sole use is office space. Jacobs believes the City of Denver value assumes a certain degree of cafeteria is included in the flow, which is calculated separately in this demand tool.

Assumed Average Commercial Water Use	119	gpd/1000 sq. ft.
Assumed Average Commercial Water Use	0.119	gpd/sq. ft.
Assumed Average Industrial Water Use	58	gpd/1000 sq. ft.
Assumed Average Industrial Water Use	0.058	gpd/sq. ft.

CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS

SECTION 2: SANITARY PLANNING CRITERIA

website DENVERGOV.ORG → CITY PLANNING → ZONING INFORMATION → ZONE DISTRICTS AND DEFINITIONS for a description of various zoning classifications in use in Denver.

<http://www.denvergov.org/Zoning/ZoneDistrictDescriptions/tabid/396290/Default.aspx>

- 2.03.2 Land use maps to be used for the design period may be obtained from the Denver Community Planning and Development Agency. Additionally, coordination with the regional land use data base established by the Denver Regional Council of Governments (DRCOG) is suggested.
- 2.03.3 Current zoning or projected land use classifications for planning areas shall be used in planning for the projected sanitary sewage flow as determined using the criteria contained in Section 2.03. Projected population and land use (as presented in the Denver Comprehensive Plan or DRCOG projections) shall be used to develop sewage flow projections for large planning areas.
- 2.03.4 Computations of population for the tributary residential land use areas are based on the estimated population density (See Table 2.04.1). Forecasts of population and economic activity for individual small areas should be consistent with regional plans.

2.04 SANITARY SEWER FLOW CRITERIA

- 2.04.1 Residential, average flow rates shall be based on:
 - a. The number of units served,
 - b. The population densities for each residential land use or zone listed in Table 2.04.1, and
 - c. A per capita flow rate of 120 GPD

In the case of a conceptual study, the average flow rate may be based on the per acre flows listed in Table 2.04.1 for each land use.
- 2.04.2 Industrial and commercial average sewage flow rates shall be based on a per acre average daily flow for each land use or zone as listed in Table 2.04.2.
- 2.04.3 The relationship of the peak flow to average flow is given in Figure 2.04.1 and Table 2.04.5. Peak flow, along with maximum infiltration, shall determine the hydraulic capacity of sewers in all cases.
- 2.04.4 Infiltration/Inflow (I/I) rate shall be 500 gallons per gross acre of tributary area per day.

This infiltration/inflow value is a design figure for average conditions expected during the service life of sanitary sewers. High groundwater tables, poor soil conditions, or any other unusual conditions may call for a special study of other infiltration/inflow and its affect on sewer capacity.

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DEPARTMENT OF PUBLIC WORKS

SECTION 2: SANITARY PLANNING CRITERIA

- 2.04.5 The sewer's hydraulic capacity shall be such that the sewer is flowing at no more than 80% of the full depth at the calculated future peak flow rate. A depth-variable friction factor shall be used such that the partial flow rate at 80% depth is approximately 86% of the sewer's full-flow capacity (see Figure 2.07.1). The peak sewage flow rate shall be equal to the summation of commercial, industrial, and residential average flows multiplied by an appropriate peaking factor plus an infiltration/inflow allowance.

Required sewer capacity = ((peak factor x average sewage flow) + infiltration/inflow) / .86

For example, consider a 29 acre parcel, zoned R-2A, having 348 dwelling units. The following information is developed:

Conversion: 1 gal/day = 1.55×10^{-6} cfs
Average Flow: $348 \times 2.1 \times 120 \times 1.55 \times 10^{-6} = .14$ cfs
Peak Factor: $2.6 \times (0.14)^{-0.16} = 3.578$ (Figure 2.04.1)
Infiltration/Inflow: $500 \times 29 \times 1.55 \times 10^{-6} = .02$ cfs
Required sewer capacity: $((3.578 \times .14) + .02) / .86 = 0.60$ cfs

- 2.04.6 Sewers shall be sized based on the Manning Equation and a depth-variable friction factor ("n") equal to one of the following:

TYPE OF PIPE	"n" Factor
Vitrified Clay Pipe (VCP)	.013
Reinforced Concrete Pipe (RCP)	.013
Plastic-Lined RCP	.013
Cement-Lined Cast Iron (CIP, DIP)	.013
Plastic (PVC, etc.)	.013
Brick	.015
Plastic-Lined Brick	.013

The Manning Equation for circular pipes flowing full is

$$Q = \frac{0.00061}{n} \times D^{8/3} \times S^{1/2}$$

Where Q = Flow in cfs,

0.00061 factor = $1.486 \times (\pi/4) \times (1/4)^{2/3} \times (1/12)^{8/3}$
n = Friction factor (see above),
D = Pipe diameter in inches, and
S = pipe slope in feet per foot.

CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS

SECTION 2: SANITARY PLANNING CRITERIA

TABLE 2.04.1- RESIDENTIAL FLOW FACTORS

LAND USE	DENSITY	ZONE	DEFINITION	APPROXIMATE BLUEPRINT DENVER LAND USE	CRITERIA		
					Units per Acre	Population per Unit	Gallons per Net Acre per Day*
SFR	Low	RS4	Single-Unit Detached Dwellings, Suburban Density		2.7	3.1	1000
SFR	Medium	RX	Attached or Clustered Single-Unit Dwellings, Low Density		4	3.1	1500
SFR	High	R0 R1	Single-Unit Detached Dwellings, Low Density Single-Unit Detached Dwellings, Low Density	Single Family Residential	6	2.8	2000
MFR	Low	R2	Multi-Unit Dwellings, Low Density		6	2.8	2000
MFR	Medium	R2A R2B R3X	Multi-Unit Dwellings, Medium Density Multi-Unit Dwellings, Medium Density Multi-Unit Dwellings, Medium Density	Single Family Duplex	12	2.1	3000
MFR	High	R3 R4 R4X RMU-20	Multi-Unit Dwellings, High Density Multi-Unit Dwellings and/or Offices, High Density Multi-Unit Dwellings and/or Offices, High Density Residential Mixed Use	Urban Residential	24	2.1	6000
MFR	Very High	RMU-30	Residential Mixed Use		100	2.0	24000

SFR = Single-Family Residential

MFR = Multi-Family Residential

*Based on 'Net' Area. Gross Area = Net Area + Right-of-Way.

GPAD for net area = GPAD for gross area / 1.25 (i.e. Net area is adjusted downward from gross area by 125%)

CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS

SECTION 2: SANITARY PLANNING CRITERIA

TABLE 2.04.2 – NON-RESIDENTIAL FLOW FACTORS

LAND USE	DENSITY	ZONE	DEFINITION	APPROXIMATE BLUPRINT DENVER LAND USE	GALLONS PER NET ACRE DAY
NR	Low	B2	Neighborhood Business	Pedestrian Shopping District	2500
NR	Low	B2 B3 BA3 CCN I0 I1 I2	Neighborhood Business Shopping Center Arterial General Business Cherry Creek North Light Industrial General Industrial Heavy Industrial	Pedestrian Shopping District Regional Center Entertainment Cultural Exhibit Industrial Neighborhood Center	3000
NR	Medium	B1 B4 BA1 BA2 BA4 GTWY H1A MS1 R5	Limited Office General Business Arterial Office and Multi-Unit Dwellings Arterial Service Auto Sales and Service Gateway District Hospital Main Street - 1 Institutional	Commercial Corridor Town Center Employment Campus	5000
NR	High	B7 B8 B8A B8G CMU-10 H1B H2 MS2 MS3 PRV	Historic Business Intensive General Business / High Density Residential Arapahoe Square zone district Golden Triangle zone district Commercial Mixed Use Hospital Hospital Main Street - 2 Main Street - 3 Platte River Valley District	Mixed Use	8000
NR	Med High	CMU-20	Commercial Mixed Use		30000
NR	Very High	B5 CMU-20 TMU-30	Central Business District Commercial Mixed Use Transit Mixed Use	Downtown Transit Oriented (TOD)	66000
OS		O1 O2 OS-1	Open Space Open Space / Agricultural Open Space	Golf Course Open Space Limited Park	50

*Based on 'Net' Area. Gross Area = Net Area + Right-of-Way.

GPAD for net area = GPAD for gross area / 1.25 (i.e. Net area is adjusted downward from gross area by 125%)

NR = Non-Residential

OS = Open Space

CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS
SECTION 2: SANITARY PLANNING CRITERIA

TABLE 2.04.3 - COMMERCIAL/INDUSTRIAL FLOW FACTORS

Type of Establishment Future Average Flow	(GPD/1000 Gross Building sq. ft.)
Office Buildings	200
Restaurants	500
Bar & Lounges	300
Hotels & Motels	350
Neighborhood Stores	200
Department Stores	200
Laundries & Dry Cleaning	1000
Banks & Financial Buildings	300
Medical Buildings & Clinics	300
Warehouses	100
Meat & Food Processing Plants	2800
Car Washes	1900
Service Stations	20
Auto Dealer, Repair & Service	150
Super Market	200
Trade Businesses - Plumbers, Exterminator, etc.	200
Mobile Home Dealer, Lumber Co., Drive-In Movies, Flea Markets	300
Places of Assembly - Churches, Schools, Libraries, Theaters	600
Factories - Manufacturing raw products into finished products	800
Hospitals	450 gal/bed



SANITARY PEAK FLOW CALCULATIONS (PROPOSED ADDITION)

Project Name: Parker Town Hall
 Miro Project # 22139
 Parker Project #

Calculated By: RLH
 Date: 10/27/2023

Commercial	Type of Development	Gross Area (SF)	Commercial Flow Factor ^[1] (GPD/1,000 SF)	Average Daily Flow (GPD)	Average Daily Flow (cfs)
	Industrial	0	100	0	0.000
	Retail	0	200	0	0.000
	Office	0	200	0	0.000
	Hotel	0	350	0	0.000
	Places of Assembly	30,200	600	18,120	0.028
Commercial Total:					0.028

Residential	Type of Development	Units	Demand (GPD/Person)	Average Daily Flow ^[2] (GPD)	Average Daily Flow (cfs)
	Apartments	0	120	0	0.000
	Townhomes	0	120	0	0.000
	Residential Total:				

Inflow		Total Site Area (acres)	Gallons per acre ^[3]	Gallons	Infiltration/Inflow (cfs) ^[3]
	Infiltration	0.42	500	210	0.0003

Total		Average Daily Flow (cfs)	Peak Factor ^[4]	Required Sewer Capacity ^[5] (cfs)
	Commercial	0.028		
	Residential	0.000		
	Site Total:	0.028	4.00	0.13

Notes:

[1] Flow Rate is based on a "Type of Establishment Future Average Flow" for the type of proposed construction, as listed in Table 2.04.3 of CCD Sanitary Design and Technical Criteria Manual

[2] Based on 2.1 people per residential unit

[3] Infiltration/Inflow rate of 500 gallons per gross acre is defined in section 2.04.4 of CCD Sanitary Design and Technical Criteria Manual.
 Infiltration/Inflow = (500 Gal/Acre) x (Site Acreage) x (1.55x10⁻⁶ CFS)

[4] Peak Factor = 2.6 x (Average Flow (cfs))^{-0.16} (Maximum Peak Factor = 4)

[5] Required Sewer Capacity = ((Peak Factor x Average Flow) + Infiltration/Inflow)/0.86



SANITARY PEAK FLOW CALCULATIONS (EXISTING)

Project Name: Parker Town Hall
 Miro Project # 22139
 Parker Project #

Calculated By: RLH
 Date: 10/27/2023

Commercial	Type of Development	Gross Area (SF)	Commercial Flow Factor ^[1] (GPD/1,000 SF)	Average Daily Flow (GPD)	Average Daily Flow (cfs)
	Industrial	0	100	0	0.000
	Retail	0	200	0	0.000
	Office	0	200	0	0.000
	Hotel	0	350	0	0.000
	Places of Assembly	37,156	600	22,294	0.035
Commercial Total:					0.035

Residential	Type of Development	Units	Demand (GPD/Person)	Average Daily Flow ^[2] (GPD)	Average Daily Flow (cfs)
	Apartments	0	120	0	0.000
	Townhomes	0	120	0	0.000
	Residential Total:				

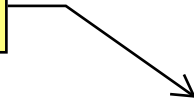
Inflow		Total Site Area (acres)	Gallons per acre ^[3]	Gallons	Infiltration/Inflow (cfs) ^[3]
		Infiltration	0.48	500	240

Total		Average Daily Flow (cfs)	Peak Factor ^[4]	Required Sewer Capacity ^[5] (cfs)
	Commercial	0.035		
	Residential	0.000		
	Site Total:	0.035	4.00	0.16

Notes:

- [1] Flow Rate is based on a "Type of Establishment Future Average Flow" for the type of proposed construction, as listed in Table 2.04.3 of CCD Sanitary Design and Technical Criteria Manual
- [2] Based on 2.1 people per residential unit
- [3] Infiltration/Inflow rate of 500 gallons per gross acre is defined in section 2.04.4 of CCD Sanitary Design and Technical Criteria Manual.
 Infiltration/Inflow = (500 Gal/Acre) x (Site Acreage) x (1.55x10⁻⁶ CFS)
- [4] Peak Factor = 2.6 x (Average Flow (cfs))^{-0.16} (Maximum Peak Factor = 4)
- [5] Required Sewer Capacity = ((Peak Factor x Average Flow) + Infiltration/Inflow)/0.86

FLOWS FROM ONLY THE
NEW TOWN HALL ADDITION



Worksheet for Prop. 6" PVC @ 0.5% (DP1)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.500 %
Diameter	6.0 in
Discharge	0.13 cfs
Results	
Normal Depth	2.1 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.6 ft
Hydraulic Radius	1.1 in
Top Width	0.47 ft
Critical Depth	2.1 in
Percent Full	34.2 %
Critical Slope	0.426 %
Velocity	2.19 ft/s
Velocity Head	0.07 ft
Specific Energy	0.25 ft
Froude Number	1.093
Maximum Discharge	0.55 cfs
Discharge Full	0.52 cfs
Slope Full	0.032 %
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	34.2 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.1 in
Critical Depth	2.1 in
Channel Slope	0.500 %
Critical Slope	0.426 %

FLOWS FROM THE EXISTING TOWN HALL AND THE PROPOSED ADDITION



Worksheet for Ex. 8" PVC @ 1.00% (DP2)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	1.000 %
Diameter	8.0 in
Discharge	0.29 cfs
Results	
Normal Depth	2.3 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.8 ft
Hydraulic Radius	1.3 in
Top Width	0.61 ft
Critical Depth	3.0 in
Percent Full	29.1 %
Critical Slope	0.385 %
Velocity	3.43 ft/s
Velocity Head	0.18 ft
Specific Energy	0.38 ft
Froude Number	1.619
Maximum Discharge	1.69 cfs
Discharge Full	1.57 cfs
Slope Full	0.034 %
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	29.1 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.3 in
Critical Depth	3.0 in
Channel Slope	1.000 %
Critical Slope	0.385 %

FIRE FLOW CALCULATIONS

<u>Project Information</u>
Project Name: Parker Town Hall Expansion
Miro Project No: 22139
Parker Project No:
Revised Date: 10/27/2023
Calculated By: RLH

BUILDING SQUARE FOOTAGE BY FLOOR			
EXISTING TOWN HALL		PROPOSED ADDITION	
LEVEL	AREA (SF)	LEVEL	AREA (SF)
1	20,804	1	18,282
2	13,652	2	11,918
TOTAL	34,456	TOTAL	30,200

Code Used: 2018 IFC w/ Appendices B, C, and D
Occupancy Group: A3, B
Construction Type: IIB

Combination Construction Percentage Calculation					
Construction Type	IA and IB	IIA and IIIA	IV and V-A	IIB and IIIB	V-B
Square footage by Type				64656	
Total Square Footage	64,656				
GPM Req'd based on Total SF	2,750	3,750	4,500	5,250	6,750
Percentage Calc (Type SQFT/Total SQFT)	0%	0%	0%	100%	0%
% x GPM = New GPM	0	0	0	5,250	0
Bldg. Sprinklered?	N/A	N/A	N/A	YES	N/A
50% Reduction for Fully Sprinklered Bldg.	0	0	0	2,625	0
Add both types GPM for Total GPM Req'd	2,625				
Min # of Hydrants Per Table Appendix C	3				
Max Distance from Hydrant Per Table Appendix C	225				