Appendix I – Sewer Capacity Memorandum

TECHNICAL MEMORANDUM

Date: March 11, 2024 **BKF Job Number: 20220570-10**

Deliver To: San Mateo, Public Works
From: Alyssa Jacobson, Project Manager
Subject: Block 20 – San Mateo Sewer Calculations

INTRODUCTION

The following memorandum presents calculations showing that the proposed 6-inch laterals and the existing 8-inch sewer main on S Claremont Street will support the proposed mixed-use use project at 500 E 4th Avenue.

EXISTING CONDITIONS

The existing site consists of a portion of the City of San Mateo's Block 20. The project proposes to re-develop an existing single-family home, restaurant, and demolished gas station within the block. The site is approximately 33,790-square feet (0.78 acres). Laterals currently serve the site along the site's perimeter, owned and maintained by the City of San Mateo.

EXISTING SANITARY SEWER DEMAND

The City of San Mateo does not have published design criteria for sewer demand calculation. Therefore, the Redwood City Design Criteria Volume III Attachment Q has been used to calculate projected water demand and Attachment L for sewage generation projection.

Attachment Q calculates the projected water demand based on the land use, either by using the number of persons per day or the square footage of each use. Attachment L calculated the sewer generation projection as 95% of indoor water demand plus infiltration using the projected water demand.

The existing site being re-developed consists of 1 single-family residential home, and approximately 1,325-square feet of commercial space.

The total existing Average Daily Flow (ADF) for the proposed building is shown in Table 1 below.

Table 1: Existing Sewer Average Daily Flow

	ADF (GPD)
Residential	194
Commercial	165
Total Average Daily Flow	359

Attachment L for the existing building is included in Appendix B.

PROPOSED CONDITIONS

The proposed site comprises a 7-story mixed-use office and residential building with 72 multi-family residential units, and 98,717-square feet of office space, and two levels of basement garage parking.

There are two proposed 6" sewer laterals for the proposed building along the southwest end of the building, connecting to the existing 8" sanitary sewer line along S Claremont Street.

Minimum design requirements are as follows:

- Sewer laterals shall have a minimum slope of 2% for 6-inch pipes
- Sewer laterals shall be constructed on a slope to provide a minimum of 2 feet per second and shall not exceed 10 feet per second.

PROPOSED SANITARY SEWER DEMAND

The proposed sewer demand was calculated using the same method as the existing sewer demand calculation using Redwood City's Design Criteria Attachments Q and L.

The total proposed Average Daily Flow for the proposed building is shown in Table 2 below.

Table 2: Proposed Sewer Average Daily Flow

	ADF (GPD)
Residential	9,063
Office	12,193
Infiltration	8.4
Total Average Daily Flow	21,265

Attachment L for the proposed building is included in Appendix B.

Attachment L defines the Peak Wet Weather Flows (PWWF) as 2.5 times the Peak Diurnal Flows calculated in the attachment. Table 3 below summarizes the PWWF for the existing and proposed buildings.

Table 3: Summary of Proposed PWWF

	PWWF (GPM)
Existing Building	0.9
Proposed Building	54.9
Increase in Demand	**54.0**

PIPE CAPACITY OF SEWER MAINS

The maximum pipe capacities of the proposed 6" sewer lateral and the existing 8" sewer main were determined using Manning's Equation for pipe flow. A 6" lateral running at 2% will have a maximum capacity of 325 GPM. Since the project is discharging a maximum of 54.9 GPM, split between the two laterals, each of the proposed 6" laterals will have sufficient capacity and discharge approximately 27.5 GPM. Each 6" lateral will run at a maximum of 9% full.

The existing 8" VCP has a capacity of 259 GPM due to the flat slope of the pipe. The proposed building will increase the PWWF by 54.0 GPM from the existing condition and cause the pipe to run at 21% full when conveying only the flows produced by the project. The increased project flows will impact the capacity of the existing system.

See Appendix C for Pipe Velocity and Flow calculations.

SUMMARY

The proposed development will increase the flow in the existing 8" sewer main in S Claremont Street and will take up approximately 21% of the available capacity in the main.

APPENDIX

Appendix A – Existing Water and Sewer Demands
Appendix B – Proposed Water and Sewer Demands Attachment L
Appendix C – Pipe Capacity Checks

APPENDIX A

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE Block 20 Existing
JOB NUMBER 2022570-10
JOB LOCATION 500 E 4th Ave

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/2024

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Multi - Family
   _____ Units X 2.2 Persons = _____ Persons

2. Single Family
   1 Units X 3.4 Persons = 3.40 Persons

3.40 Persons X 60* GPD = 204 **GPD Projected**

B. OFFICE/COMMERCIAL

1,325 sqft X 0.13 gpd/sqft = 173 **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3:

= _____ **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

A. RESIDENTIAL

17 gpd X 3.40 persons = 58 **GPD Projected**

B. COMMERCIAL

1,325 sqft X 3.5 cuft of water /sqft of landscape per year = 4,638 **CUFT/YR**

To convert to GPD:

4,638 cuft/yr X 7.48 gal/cuft X 1 yr/365 days = 95 **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 530 **GPD Projected**

* From SFPUC Demand Study by URS, " Projected Water Usage for BAWSCA Agencies " , Tech Memo of August 2006.

ATTACHMENT Q (2 of 3)

WATER DEMAND PROJECTION WORKSHEET
OCCUPANT LOADS

JOB TITLE Block 20 Existing
JOB NUMBER 2022570-10
JOB LOCATION 500 E 4th Ave

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/2024

DESIGNED USE OF THE FACILITY	OCCUPANT LOAD OF FLOOR AREA
A. SCHOOL/CLASSROOM	20 sqft/person
B. HEALTH CLUB	50 sqft/person/shift (3 shifts per day)
C. MANUFACTURING AREAS	200 sqft/person
D. NURSERIES (DAY-CARE)	35 sqft/person
E. STORAGE FACILITIES	300 sqft/person

ATTACHMENT Q (3 of 3)

WATER DEMAND PROJECTION WORKSHEET
UNIT LOADS

JOB TITLE Block 20 Existing
JOB NUMBER 2022570-10
JOB LOCATION 500 E 4th Ave

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/2024

TYPE OF ESTABLISHMENT	VOLUME OF CONSUMPTION/DAY
Assembly Halls	2 gal per seat
Bowling Alley	75 gal per lane
Churches	7 gal per seat
Dance Halls	2 gal per person
General Hospitals	0.27 gal per sqft
Health Clubs	25 gal per person
Laundries	400 gal per machine
Manufacturing (excluding industrial usage)	30 gal per person/shift
Motels with bath, toilet and kitchen wastes	170 gal per room
Nursing homes/Daycare	75 gal per person
Medical Offices (other than hospitals)	0.18 gal per sqft
Research and Development	0.21 gal per sqft
Schools	35 gal per person
Service Station	750 gal per bay
Storage facilities	1 gal per person
Stores (Retail type)	450 gal per 25 ft frontage
(Food -- non-restaurant type)	900 gal per 25 ft frontage
Trailer parks or tourist camps (with built-in bath)	50 gal per person

APPENDIX A

ATTACHMENT Q (1 of 3)

WATER DEMAND PROJECTION WORKSHEET

JOB TITLE Block 20 Proposed
JOB NUMBER 2022570-10
JOB LOCATION 500 E 4th Ave

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/2024

INDOOR WATER DEMAND PROJECTION

A. RESIDENTIAL

1. Multi - Family
   72 Units X 2.2 Persons = 159 Persons

2. Single Family
   _____ Units X 3.4 Persons = _____ Persons

159 Persons X 60* GPD = 9,540 **GPD Projected**

B. OFFICE/COMMERCIAL

98,717 sqft X 0.13 gpd/sqft = 12,834 **GPD Projected**

C. HOTEL

_____ rooms X 195 gpd/room = _____ **GPD Projected**

D. RESTAURANTS

_____ seats X 30 gpd/seat = _____ **GPD Projected**

E. ALL OTHERS SEE PAGE 3:

= _____ **GPD Projected**

LANDSCAPING WATER DEMAND PROJECTION

A. RESIDENTIAL

17 gpd X 159 persons = 2,703 **GPD Projected**

B. COMMERCIAL

5,148 sqft X 3.5 cuft of water /sqft of landscape per year = 18,018 **CUFT/YR**

To convert to GPD:

18,018 cuft/yr X 7.48 gal/cuft X 1 yr/365 days = 370 **GPD Projected**

TOTAL DOMESTIC WATER DEMAND PROJECTION

INDOOR + LANDSCAPING PROJECTION = 25,447 **GPD Projected**

* From SFPUC Demand Study by URS, " Projected Water Usage for BAWSCA Agencies " , Tech Memo of August 2006.

ATTACHMENT Q (2 of 3)

WATER DEMAND PROJECTION WORKSHEET
OCCUPANT LOADS

JOB TITLE Block 20 Proposed
JOB NUMBER 2022570-10
JOB LOCATION 500 E 4th Ave

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/2024

DESIGNED USE OF THE FACILITY	OCCUPANT LOAD OF FLOOR AREA
A. SCHOOL/CLASSROOM	20 sqft/person
B. HEALTH CLUB	50 sqft/person/shift (3 shifts per day)
C. MANUFACTURING AREAS	200 sqft/person
D. NURSERIES (DAY-CARE)	35 sqft/person
E. STORAGE FACILITIES	300 sqft/person

ATTACHMENT Q (3 of 3)

WATER DEMAND PROJECTION WORKSHEET
UNIT LOADS

JOB TITLE Block 20 Proposed
JOB NUMBER 2022570-10
JOB LOCATION 500 E 4th Ave

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/2024

TYPE OF ESTABLISHMENT	VOLUME OF CONSUMPTION/DAY
Assembly Halls	2 gal per seat
Bowling Alley	75 gal per lane
Churches	7 gal per seat
Dance Halls	2 gal per person
General Hospitals	0.27 gal per sqft
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Manufacturing (excluding industrial usage)	30 gal per person/shift
Motels with bath, toilet and kitchen wastes	170 gal per room
Nursing homes/Daycare	75 gal per person
Medical Offices (other than hospitals)	0.18 gal per sqft
Research and Development	0.21 gal per sqft
Schools	35 gal per person
Service Station	750 gal per bay
Storage facilities	1 gal per person
Stores (Retail type)	450 gal per 25 ft frontage
(Food -- non-restaurant type)	900 gal per 25 ft frontage
Trailer parks or tourist camps (with built-in bath)	50 gal per person

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE Block 20 Existing
JOB NUMBER 20220570-10
JOB LOCATION 500 E 4th Avenue

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/24

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

204 GPD_W X 0.95 = 194 **GPD_S**

B. OFFICE/COMMERCIAL

173 GPD_W X 0.95 = 165 **GPD_S**

C. HOTEL

____ GPD_W X 0.95 = ____ **GPD_S**

D. RESTAURANTS

____ GPD_W X 0.95 = ____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= ____ **GPD_S**

F. INFILTRATION

1. PVC pipe: ____ miles X 100 GPD X ____ diameter (in.) = ____ **GPD_S**
2. Clay pipe: ____ miles X 500 GPD X ____ diameter (in.) = ____ **GPD_S**

G. AVERAGE DAILY FLOW = 359 GPD (SUM OF A - F)

H. PEAK DIURNAL HOURLY FLOW* FOR PUMPING STATIONS

Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 0.84 **GPM**

2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 0.90 **GPM**

* Peak hourly dirunal flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

I. PEAK WET WEATHER FLOWS

PWWF for pipes shall be calculated using methodology specified per Design Criteria VI. For Pump Stations, Peaking Factor shall be the higher value calculated for pipe PWWF or 2.5 times the Peak Diurnal Flows calculated in Step (H.) above.

ATTACHMENT L

SEWAGE GENERATION PROJECTION WORKSHEET

JOB TITLE Block 20 Proposed
JOB NUMBER 20220570-10
JOB LOCATION 500 E 4th Avenue

CAL. BY RFE
CHKD. BY RFE
DATE 3/7/24

ATTACHMENT Q MUST BE COMPLETE BEFORE PROCEEDING

SEWER GENERATION IS BASED ON 95% OF INDOOR WATER DEMAND PROJECTION

Key: GPD_W = GPD Water Demand Projected from Attachment Q
GPD_S = GPD Sewer Demand Projected

A. RESIDENTIAL

9,540 GPD_W X 0.95 = 9,063 **GPD_S**

B. OFFICE/COMMERCIAL

12,834 GPD_W X 0.95 = 12,193 **GPD_S**

C. HOTEL

_____ GPD_W X 0.95 = _____ **GPD_S**

D. RESTAURANTS

_____ GPD_W X 0.95 = _____ **GPD_S**

E. ALL OTHERS TO BE REVIEWED ON A CASE BY CASE BASIS

= _____ **GPD_S**

F. INFILTRATION

1. PVC pipe: 0.01402 miles X 100 GPD X 6 diameter (in.) = 8.4 **GPD_S**
2. Clay pipe: _____ miles X 500 GPD X _____ diameter (in.) = _____ **GPD_S**

G. AVERAGE DAILY FLOW = 21,265 GPD (SUM OF A - F)

H. PEAK DIURNAL HOURLY FLOW* FOR PUMPING STATIONS

Peak Business Hr. Flow = [(B+C+E)/12 hrs + (F/24 hrs)] x 2.5/60min + [(A+D)/12 hrs]/60 min = 54.9 **GPM**

2. Peak Off-Hrs. Flow = [(A+C+D)/12hrs + (F/24hrs)] x 2.5/60 min + ((B+E)/12 hrs)/60 min = 48.4 **GPM**

* Peak hourly dirunal flows assume an effective 12-hour day and that office and residential peaks occur at separate times.

I. PEAK WET WEATHER FLOWS

PWWF for pipes shall be calculated using methodology specified per Design Criteria VI. For Pump Stations, Peaking Factor shall be the higher value calculated for pipe PWWF or 2.5 times the Peak Diurnal Flows calculated in Step (H.) above.

APPENDIX C

PIPE VELOCITY AND FLOW
Using Manning's Equation for Pipe Flow

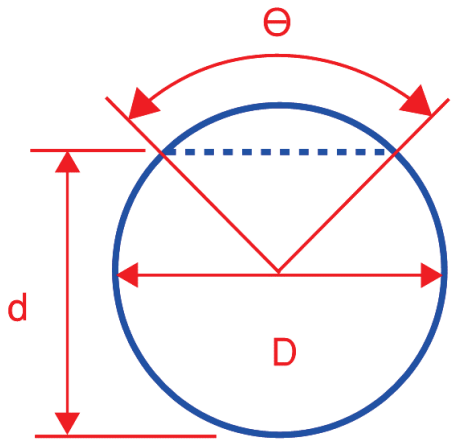
Project	Block 20, San Mateo	**Location**	EX 8-inch SS Lateral on S Claremont St
Calc By	RFE	**Date**	3/7/2024

Equations

$Q=(1.486/n)AR_h^{2/3}S^{1/2}$

$V=(1.486/n)R_h^{2/3}S^{1/2}$

$Q=V \times A$



Definitions

Q=Pipe flowrate (cubic feet per second)
V=flow velocity (feet per second)
D=pipe diameter (inches)
d=depth of flow (inches)
R_h=A/P = hydraulic radius (feet)
A=cross sectional area (square feet)
P=wetted perimeter (feet)
S=slope of channel (ft/ft)
n=Manning's roughness coefficient

Pipe Characteristics

D=	8.0	inches	θ=	120.0	degrees
d=	6.00	inches	A=	0.28	square feet
material=	VCP		P=	1.40	feet
n=	0.013		R_h=	0.20	feet
S=	0.003	ft/ft			

Pipe Velocity and Flow

Velocity (ft/s)	**Flow (cfs)**	**Flow (gpm)**	**Proposed Flow (GPM)**	**Percent Full**
2.058	**0.58**	**259**	**54.9**	**21%**

APPENDIX C

PIPE VELOCITY AND FLOW
Using Manning's Equation for Pipe Flow

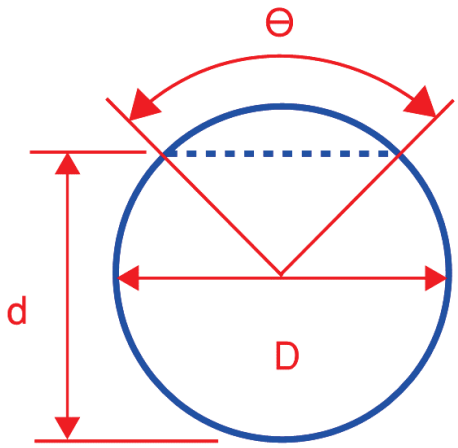
Project	Block 20, San Mateo	**Location**	PR 6-inch SS Lateral on S Claremont St
Calc By	RFE	**Date**	3/7/2024

Equations

$Q=(1.486/n)AR_h^{2/3}S^{1/2}$

$V=(1.486/n)R_h^{2/3}S^{1/2}$

$Q=V \times A$



Definitions

Q=Pipe flowrate (cubic feet per second)
V=flow velocity (feet per second)
D=pipe diameter (inches)
d=depth of flow (inches)
R_h=A/P = hydraulic radius (feet)
A=cross sectional area (square feet)
P=wetted perimeter (feet)
S=slope of channel (ft/ft)
n=Manning's roughness coefficient

Pipe Characteristics

D=	6.0	inches	θ=	120.0	degrees
d=	4.50	inches	A=	0.16	square feet
material=	PVC		P=	1.05	feet
n=	0.013		R_h=	0.15	feet
S=	0.020	ft/ft			

Pipe Velocity and Flow

Velocity (ft/s)	**Flow (cfs)**	**Flow (gpm)**	**Proposed Flow (GPM)**	**Percent Full**
4.581	**0.72**	**325**	**54.9**	**17%**