Appendices

Appendix H Sewer Study

Appendices

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Sewer Capacity Study

FOR

1401 Quail Street
Newport Beach, CA 92660

Prepared By:

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I. INTRODUCTION:

The purpose of this study is to provide a site-specific sewer capacity study to assess the amount of wastewater generated by the proposed development of the project site at 1401 Quail Street, Newport Beach, CA. This sewer study will assess if the city sewer system capacity is sufficient when the project site is redeveloped from a commercial site to a residential site and if the change in the sewer usage complies with the City of Newport Beach's design criteria indicated in the City's Sewer Master Plan (SMP).

II. EXISTING AND DEVELOPED SITE CONDITIONS:

Existing Conditions:

The proposed project site, approximately 1.71 acres, is located in the City of Newport Beach, Orange County, California. The site is at the North-West corner of Quail Street and Spruce Avenue and has an existing office building structure along with a surface parking lot. The current land use is for a 1-story office complex. The site is relatively flat and drains from south to north, and is identified as Assessor Parcel Number 427-332-04. The zoning code is PC-11 and the site is enclosed by an existing parking lot to the West, Spruce Street to the South-East, and Quail Street to the North-East. See Figure 1 in Appendix A for the project Vicinity Map Information.

Developed Conditions:

The proposed project is comprised of a 7-story podium apartment building with one level of subterranean parking. Vehicular access to the building will be from the proposed driveway entrance on Spruce Avenue.

III. EXISTING AND PROPOSED SEWER LAYOUT:

Existing Sewer Layout

An existing sewer lateral off Spruce Street connects the private street to the existing 8" VCP public sewer main. The public sewer main originates on Spruce Street at the existing sewer laterals, with manhole ID MHM28_019, and drains in the northeast direction to manhole MHM28_018 at Quail Street. The sewer main then increases to a 10" diameter VCP and continues to the southeast to MHM28_033, located at the intersection of Quail Street and Dove Street. The sewer system maintains a 10" diameter and continues to the north to manhole MHM28_003, located at the intersection of Dove Street and Newport Place. The sewer main then increases to 15" diameter and continues to the east to Macarthur Blvd. and then to the north to MHM28_051. The sewer main then increases to an 18" diameter and continues for a short run to MHM27 to discharge in to the Orange County Sanitation District sewer main. For data analyzing purposes, the study will separate this sewer path into 4 different segments. See Figure 1 below for a graphic representation of the existing sewer system.

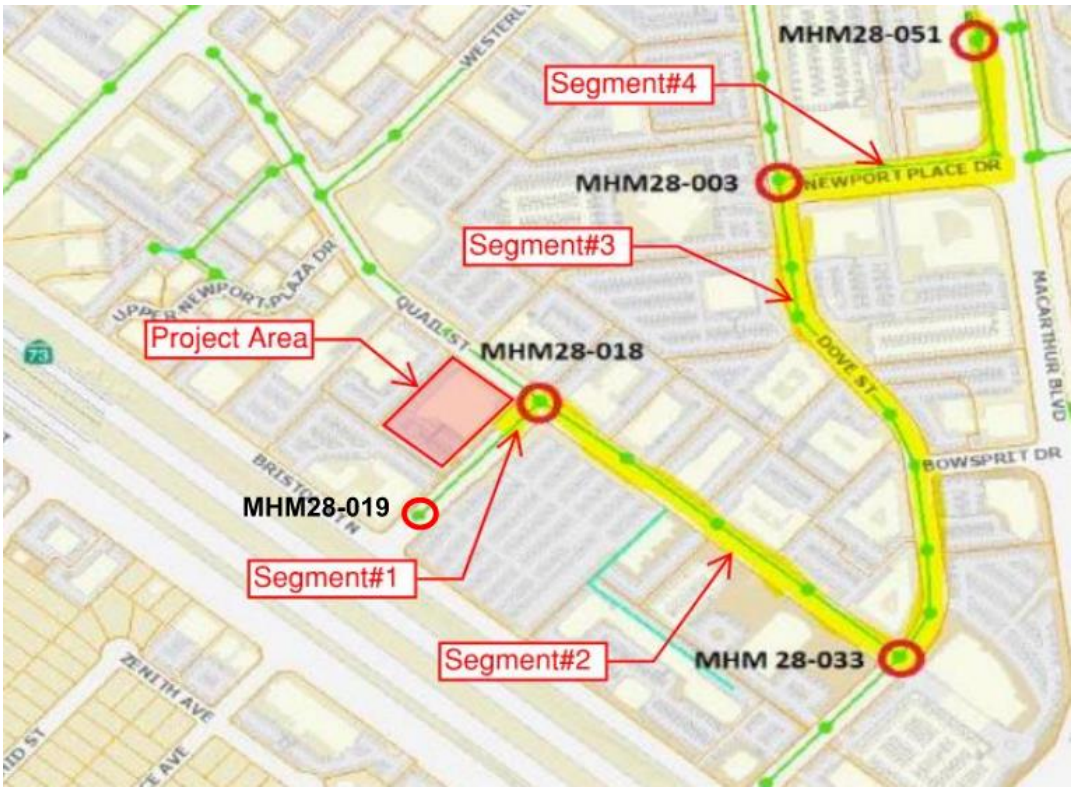


Figure 1. Existing Sewer System at Project Site

Proposed Sewer Layout

No change to the public sewer system is proposed as part of this project and the existing 8" VCP sewer lateral servicing the site is proposed to be re-used for the development. The only change proposed will be made for the land use of the project site from a commercial use to a residential use. The project site is currently an office complex with a surface-level parking lot. The proposed project will redevelop the site to construct a 7-story 16-unit podium building, with 6 levels of residential apartment over 1 level of slab grade parking garage, and 1 level of sub-terranean parking. The change in use for the site is anticipated to increase the rate of discharge to the system and are further detailed and justified below.

IV. DESIGN CRITERIA:

IV.1. Sewer Design Criteria

Design criteria utilized in this report are based on the City of Newport Beach's Sewer Master Plan (SMP) prepared by AKM Consulting Engineers (August 2010) The focus of this study is to calculate the generation rates for the existing and proposed development based on land use generation rates in order to calculate the projected ratio of flow depth versus pipe diameter (d/D).

d/D Requirements: Based on the City's SMP, existing sewer pipes are considered deficient if this ratio is greater than 0.6 at peak dry weather flows and 0.8 at peak wet weather flows.

Manning's Friction Factor: Per City's SMP requirements, a Manning's friction factor of 0.013 has been utilized on all flow calculations.

Flow Generation Rates: Since water use records were unavailable to the parcels in the sewer system, a typical unit flow factor of 2500 gallons per day per acre (gpd/ac) is

utilized for the project based on the commercial use and the maps provided in the City's SMP (See Appendix D).

Peaking Factor (Dry Weather): Per the City's SMP, a peaking factor formal has been applied to the calculated daily generation rates as follows:

$$PDWF\ (mgd) = 2.20 \times ADWF\ (mgd)^{0.92}$$

See Table 1 below for a brief summary of the key design factors utilized in the report and Appendix B for a listing of the City's required design criteria for sewer systems.

Table 1. Sewer Design Criteria

Flow Depth vs Pipe Diameter Ratio (d/D)	Manning's Friction Factor (n value)	Unit Flow Factor (gpd/ac)	Peaking Factor
0.6 for all pipe sizes at peak dry weather flow 0.8 for all pipe sizes at peak wet weather flow	0.013	2,500	PDWF (mgd) = 2.20 x ADWF (mgd) $^{0.92}$

IV.2. Maximum Allowed Flow

The maximum allowed flow for each segment has been determined by identifying the minimum diameter and slope of pipe within the segment, and calculating the flows for the given pipe diameter and slope at a d/D ratio = 0.6. Pipe flows were calculated utilizing the above noted design factors and the software, Hydraulic Toolbox, for each critical pipe segment (See Appendix C). The results of the calculations are included in the Table 2 below.

Table 2. Maximum Allowed Flow Segment Capacity of the Existing Sewer System

Segment Number	MH Reach from	MH Reach to	Pipe Diameter D (in)	Pipe Diameter D (ft)	Minimum Slope in Reach (%)	Depth of Flow @ d/D=0.6 (ft)	Maximum Allowed Flow @ d/D = 0.6 (CFS)
#1	MHM28_019	MHM28_018	8	0.67	1	0.4	0.82
#2	MHM28_018	MHM28_033	10	0.83	0.26	0.5	0.75
#3	MHM28_033	MHM28_003	10	0.83	0.4	0.5	0.93
#4	MHM28_003	MHM28_051	15	1.25	0.2	0.75	1.94
-	MHM28_051	MHM27	18	1.5	0.2	0.9	3.16

IV.3. Existing Flow Rates

The formula for the Average Dry Weather Flows (ADWF) is a function of the total tributary parcel acreage and the above noted generation rates. The formula is listed below.

$$Q = A * 2500 \text{ gpd/ac}$$

Where: Q = ADWF (gpd)
A = Tributary Area (Acres)

Known residential developments captured in this report include:

- 1300 Bristol St – 193 units @ 160 gpd/unit
- 1400 Bristol St – 221 units @ 160 gpd/unit
- 1600 Dove St – 249 units @ 160 gpd/unit
- Newport Crossing (1660 Dove St/1701 Corinthian Way) – 350 units

See figure 2 below for the assumed tributaries for each segment and refer to Appendix C for a listing of all Area-Based Flow Calculations.

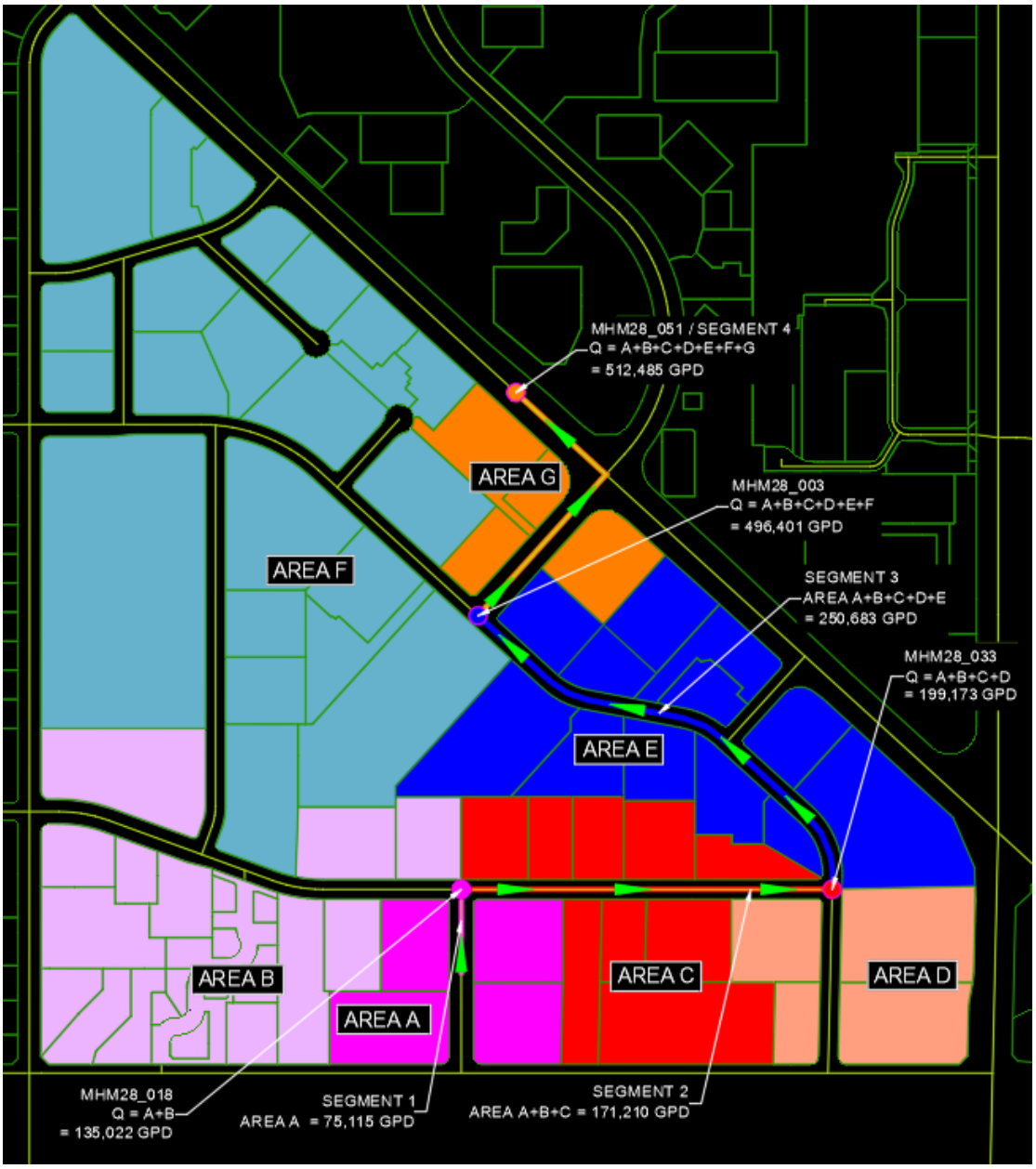


Figure 2. Tributary Areas and Existing Wastewater Flows

Given the Q values for the segments noted in Figure 2, the Q is converted to million gallon per day (mgd) which was subsequently used to calculate the peak dry weather flow for each segment based on the Peaking Factor Formula provided in the City's SMP. The calculated peak dry weather flow was then converted to cubic feet per second (cfs) and compared to the maximum allowed flow for the given segment (see

Table 2 for reference of existing segment capacities). See Table 3 below for a summary of the total peak flows compared to the maximum allowed flow of each segment.

Table 3. Existing Peak Flows and Maximum Allowed Flow

EXISTING PEAK DRY WEATHER FLOWS (PDWF) AND MAXIMUM ALLOWED FLOW				
	Segment #1	Segment #2	Segment #3	Segment #4
PDWF (mgd)	0.20	0.43	0.62	1.19
PDWF (cfs)	0.31	0.67	0.96	1.84
Maximum Allowed Flow d/D = 0.6 (cfs)	0.82	0.75	0.93	1.94
Available Flow (cfs)	**0.51**	**0.08**	**-0.03**	**0.10**
Capacity Compliance	☑	☑	**DEFICIENT**	☑

IV.4. Proposed Flow Rates

The total area of the project site at 1401 Quail St, Newport Beach, CA is 1.71 acres. Utilizing the typical unit flow factor of 2500 gpd/ac, the existing flow at the project location is calculated as 4,275 gpd. According to the City's SMP, the residential unit flow factors range from 110 gpd/du to 240 gpd/du (see Appendix D for the City's SMP Unit Flow Factor Map). Based on review of similar parcels within the City, a generation rate of 160 gpd/du has been selected for the subject parcel. Given the proposed 78 dwelling units, the calculated daily flow for the proposed condition is 12,480 gpd. As a result, the total increase in daily flow is calculated as the difference between the proposed flow and the existing flow at the project site, being **8,205 gpd.** Results of this calculation are summarized below in Table 4:

Table 4. Total Daily Flow Increase at the Project Site

Existing Flow at Project Site (GPD)	Proposed Flow at Project Site (GPD)	Total Increase in Flow (GPD)
4,275	12,480	**8,205**

Based on the above noted increase in daily sewer generation rates, the total system peak flows were re-calculated with the additional 8,205 gpd added into each segment's calculations. The results of the proposed system flows are presented in Table 5 below.

Table 5. Peak Flows (Existing + Development) and Maximum Allowed Flow

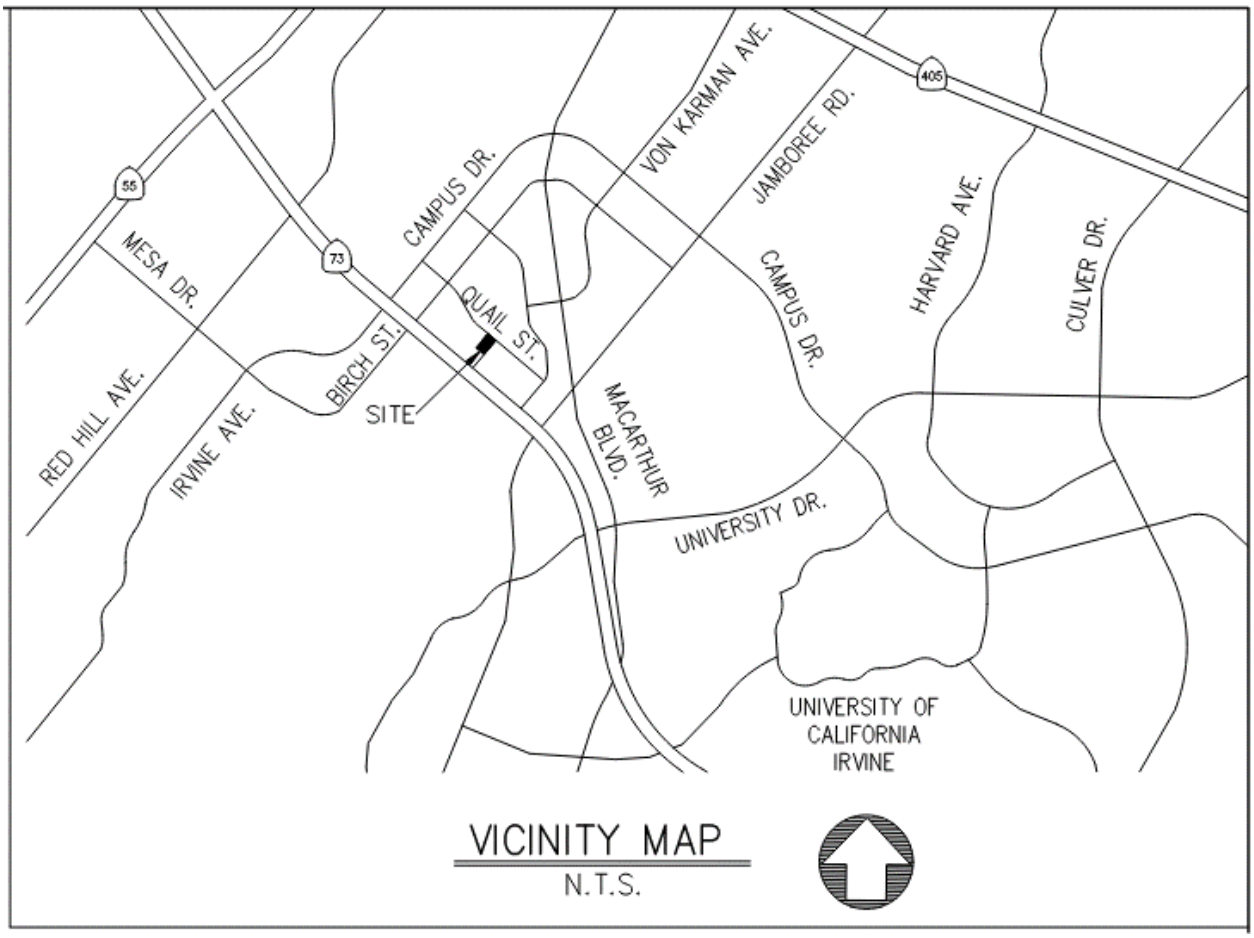
PROPOSED PEAK DRY WEATHER FLOWS (PDWF) AND MAXIMUM ALLOWED FLOW				
	Segment #1	Segment #2	Segment #3	Segment #4
PDWF (mgd)	0.22	0.45	0.64	1.21
PDWF (cfs)	0.34	0.70	0.99	1.87
Maximum Allowed Flow d/D = 0.6 (cfs)	0.82	0.75	0.93	1.94
Available Flow	**0.48**	**0.05**	**-0.06**	**0.07**
Capacity Compliance	☑	☑	**DEFICIENT**	☑

V. RESULTS AND CONCLUSIONS:

Based on the above noted calculations, data, and the City's SMP guidelines, the existing sewer system has adequate capacity to handle the increase in projected daily sewer generation rates from the proposed development. Although when adding the sewer generation rates of other future developments in the surrounding area, the capacity of Segment #3 becomes deficient.

Sewer Segment #3, a 10" VCP sewer main located on Dove Street between Newport Place and Bowspirit Drive, would be considered deficient by the City's design requirements for the depth to diameter ratio. This is due not solely because of this development, but because of future development of other projects in the region. While the removal of the existing 10" VCP and installation of new 12" VCP sewer main would be required if all developments were to occur, it is not the scope of work for this project.

Appendix A: Vicinity Map



Appendix B: Sewer Design Criteria

Sewer System Criteria

Collection System	
Minimum Pipe Size	8-inch
Minimum Velocity	2.0 ft/sec at average flow 3.0 ft/sec at peak dry weather flow
Pipe Depth to Diameter Ratio for *Existing Pipes*	0.60 for all pipe sizes at peak dry weather flow 0.80 for all pipe sizes at peak wet weather flow
Pipe Depth to Diameter Ratio for *New Construction*	0.50 for pipes 15-inches and smaller at peak dry weather flow 0.60 for pipes 18-inches and larger at peak dry weather flow 0.80 for all pipe sizes at peak wet weather flow

Minimum Sewer Slopes

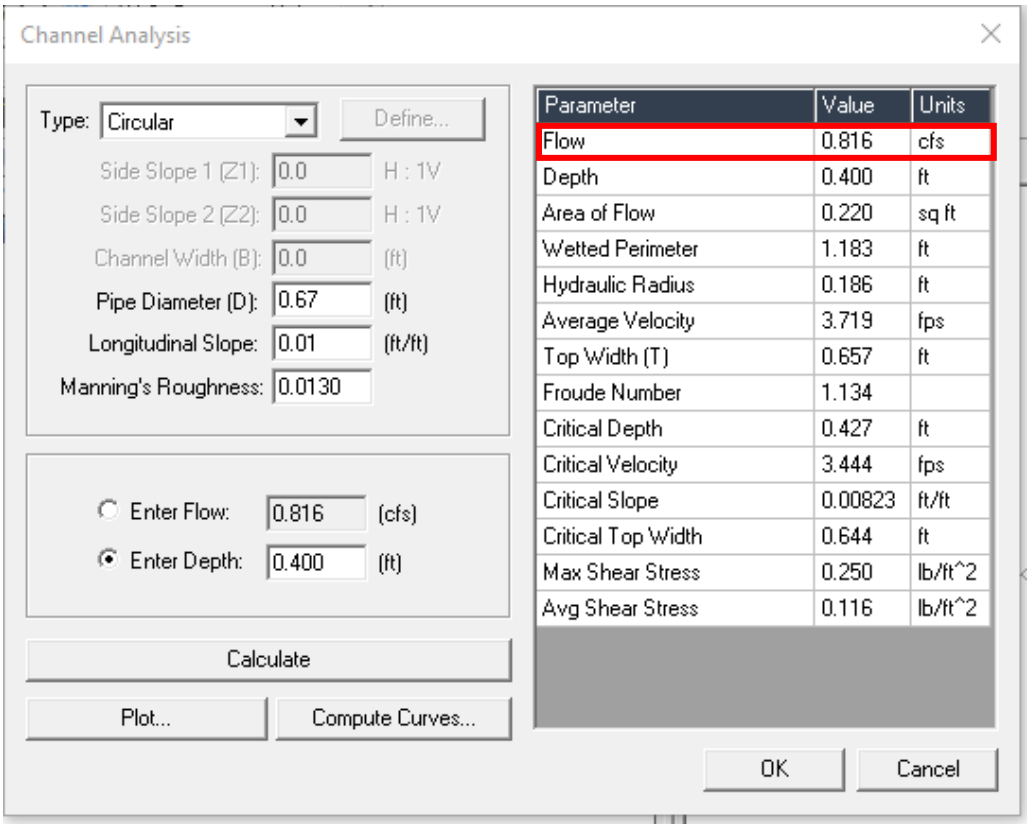
Sewer Size (in)	2 ft/sec Velocity Slope	3 ft/sec Velocity Slope
8	0.0029	0.0065
10	0.0022	0.0049
12	0.0017	0.0038
15	0.0013	0.0029
18	0.0010	0.0022
21	0.0008	0.0018
24	0.0007	0.0015

**Assuming d/D = 0.60 and n=0.013*

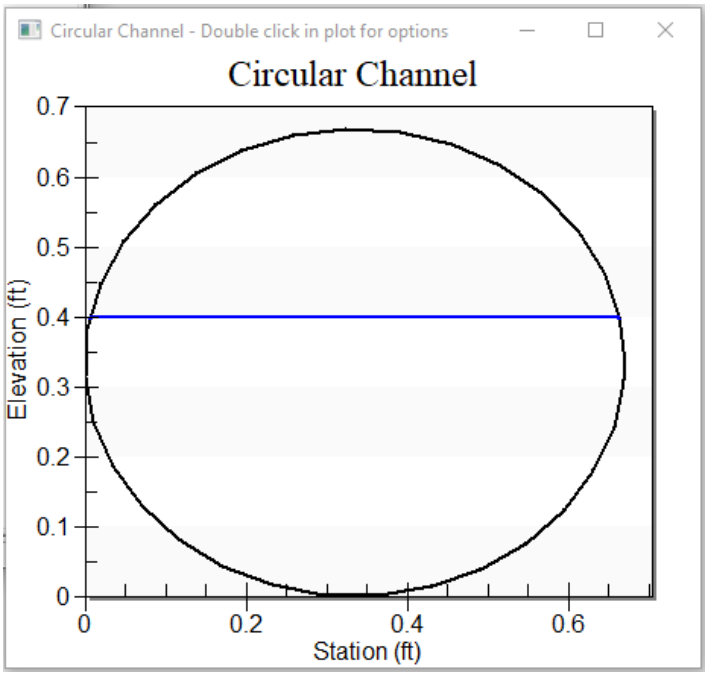
Appendix C- Existing Flow Calculations

8 Inch VCP @ 1.0% Slope

Segment #1 - MHM28_019 to MHM28_018

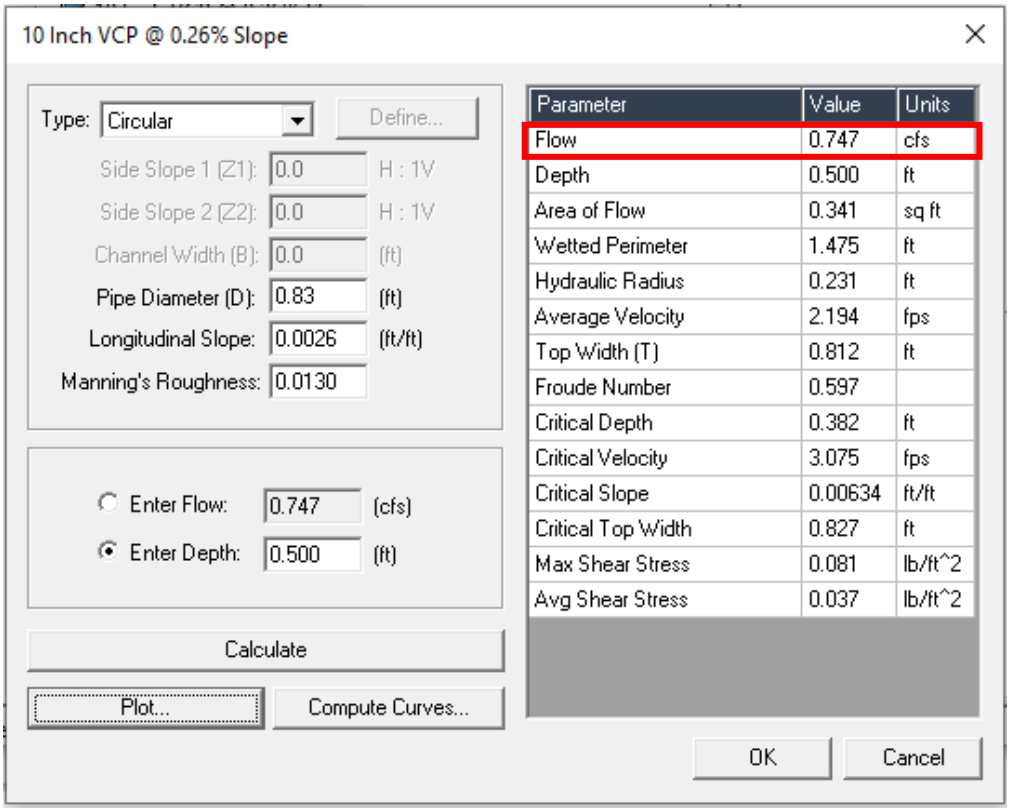


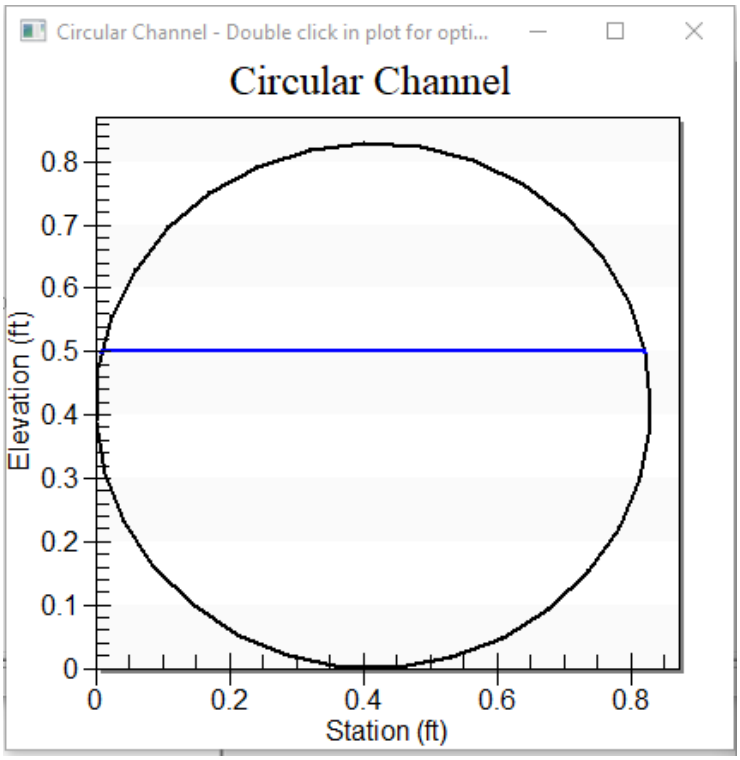
Parameter	Value	Units
Flow	0.816	cfs
Depth	0.400	ft
Area of Flow	0.220	sq ft
Wetted Perimeter	1.183	ft
Hydraulic Radius	0.186	ft
Average Velocity	3.719	fps
Top Width (T)	0.657	ft
Froude Number	1.134	
Critical Depth	0.427	ft
Critical Velocity	3.444	fps
Critical Slope	0.00823	ft/ft
Critical Top Width	0.644	ft
Max Shear Stress	0.250	lb/ft^2
Avg Shear Stress	0.116	lb/ft^2



10 Inch VCP @ 0.26% Slope

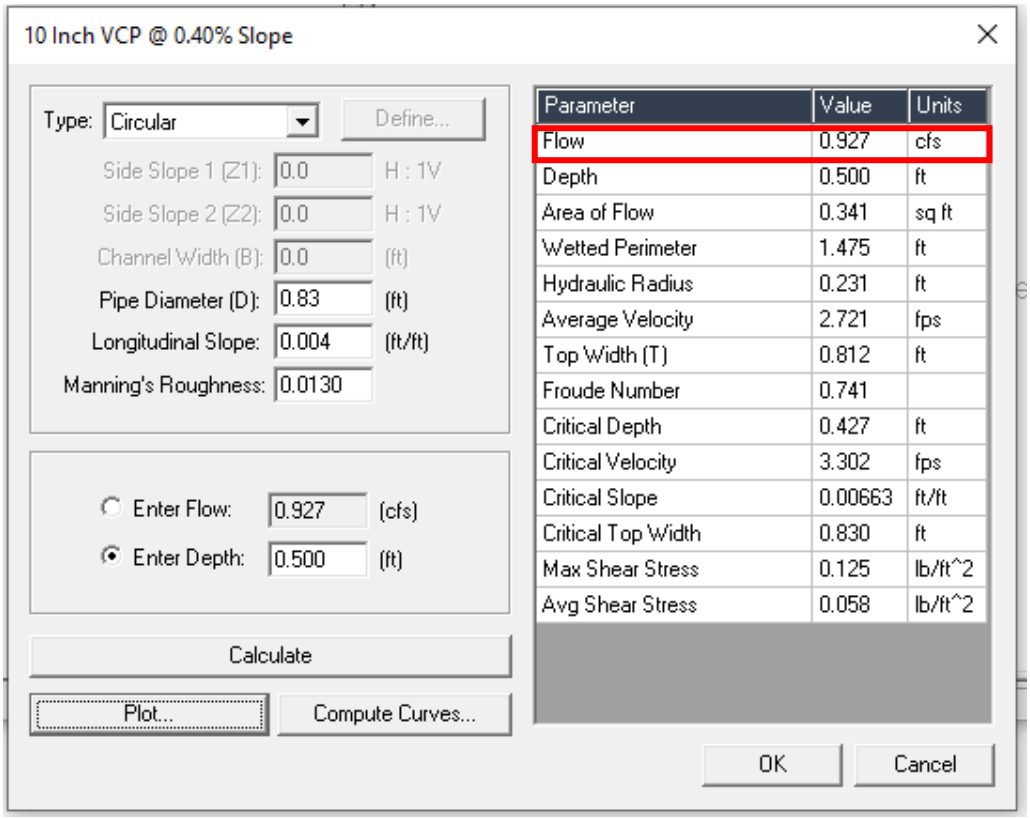
Segment #2 - MHM28_018 to MHM28_033

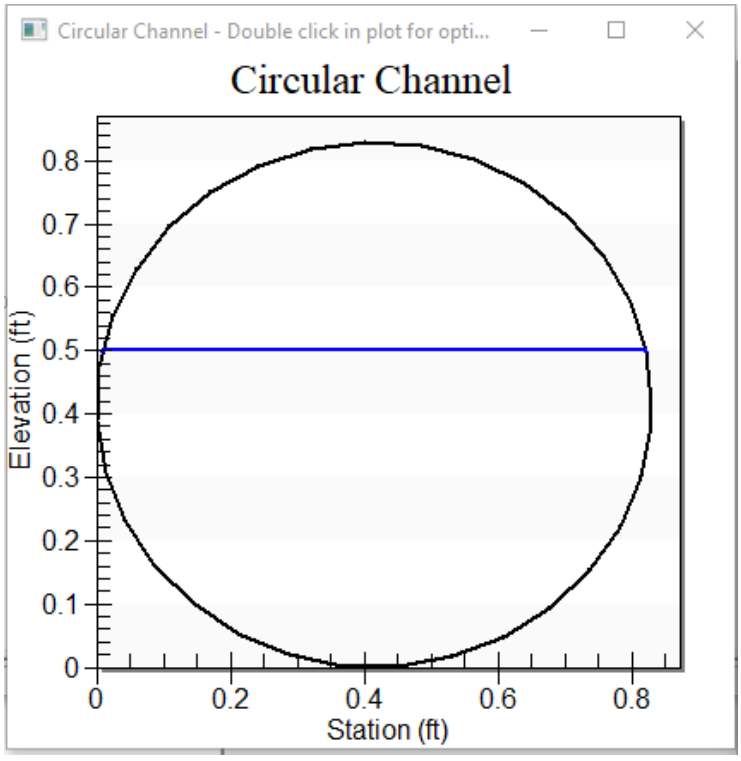




10 Inch VCP @ 0.40% Slope

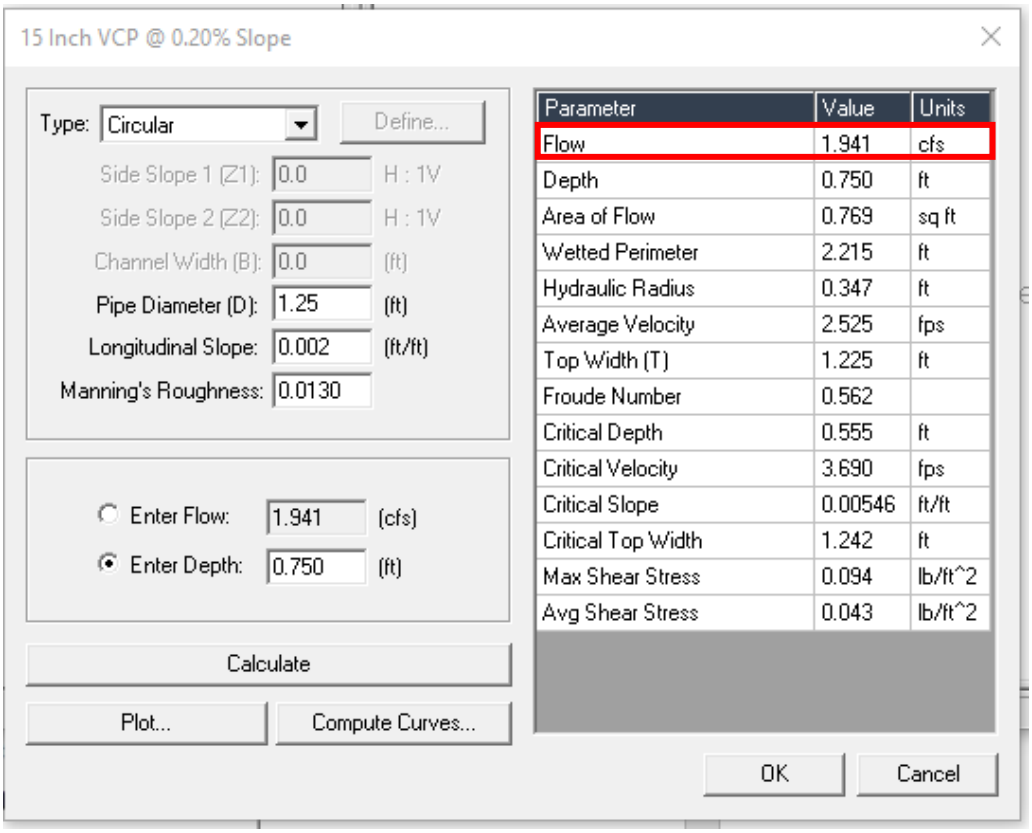
Segment #3 - MHM28_033 to MHM28_003

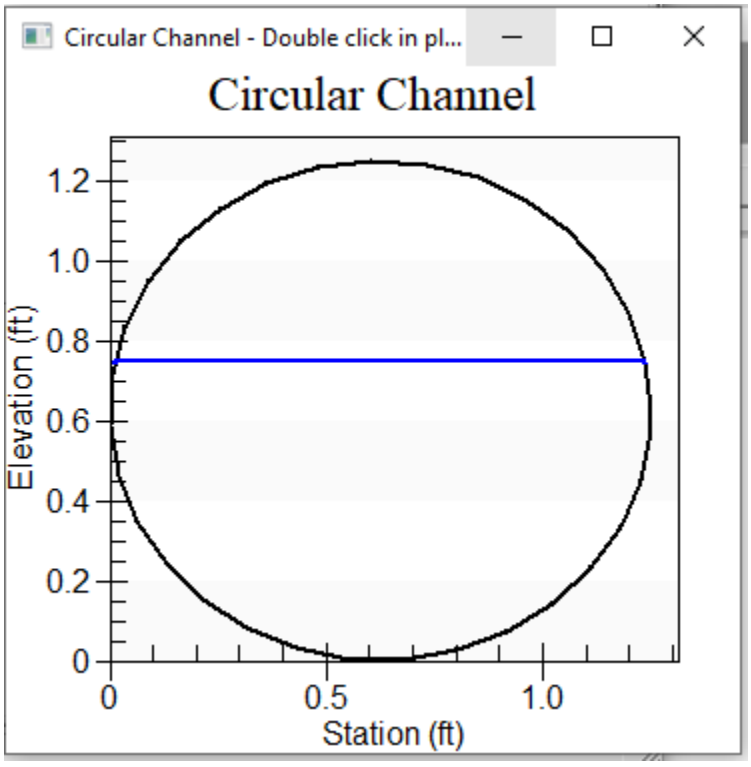




15 Inch VCP @ 0.20% Slope

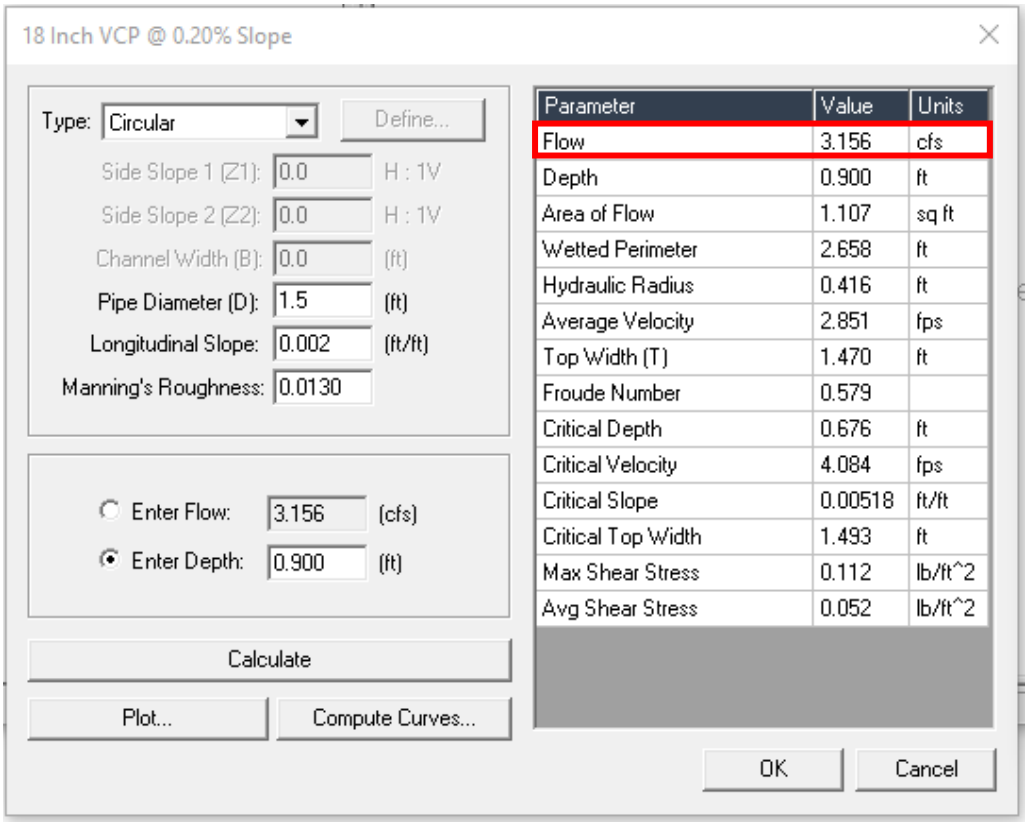
Segment #4 - MHM28_003 to MHM28_051

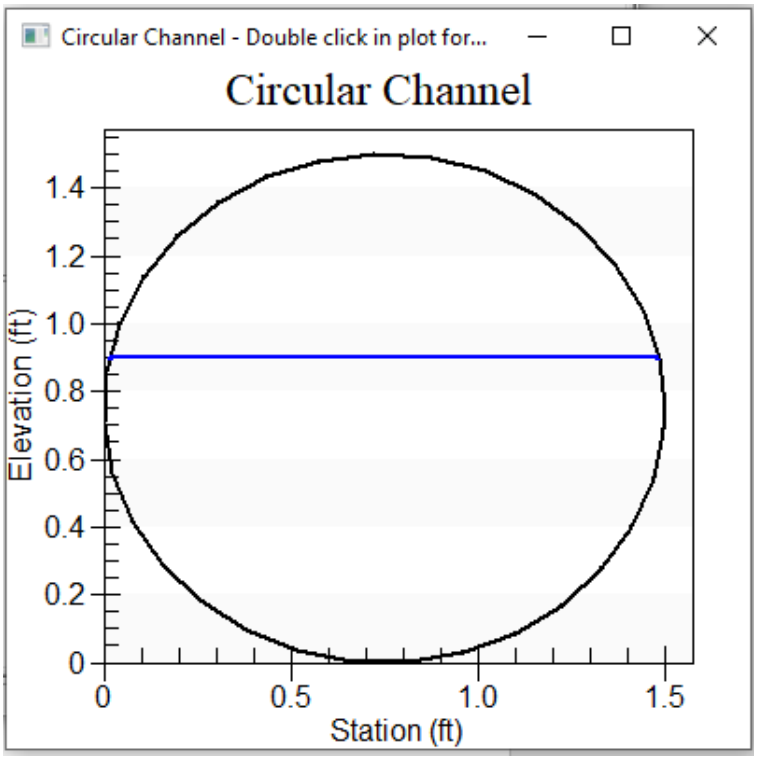




18 Inch VCP @ 0.20% Slope

MHM28_051 to MHM27





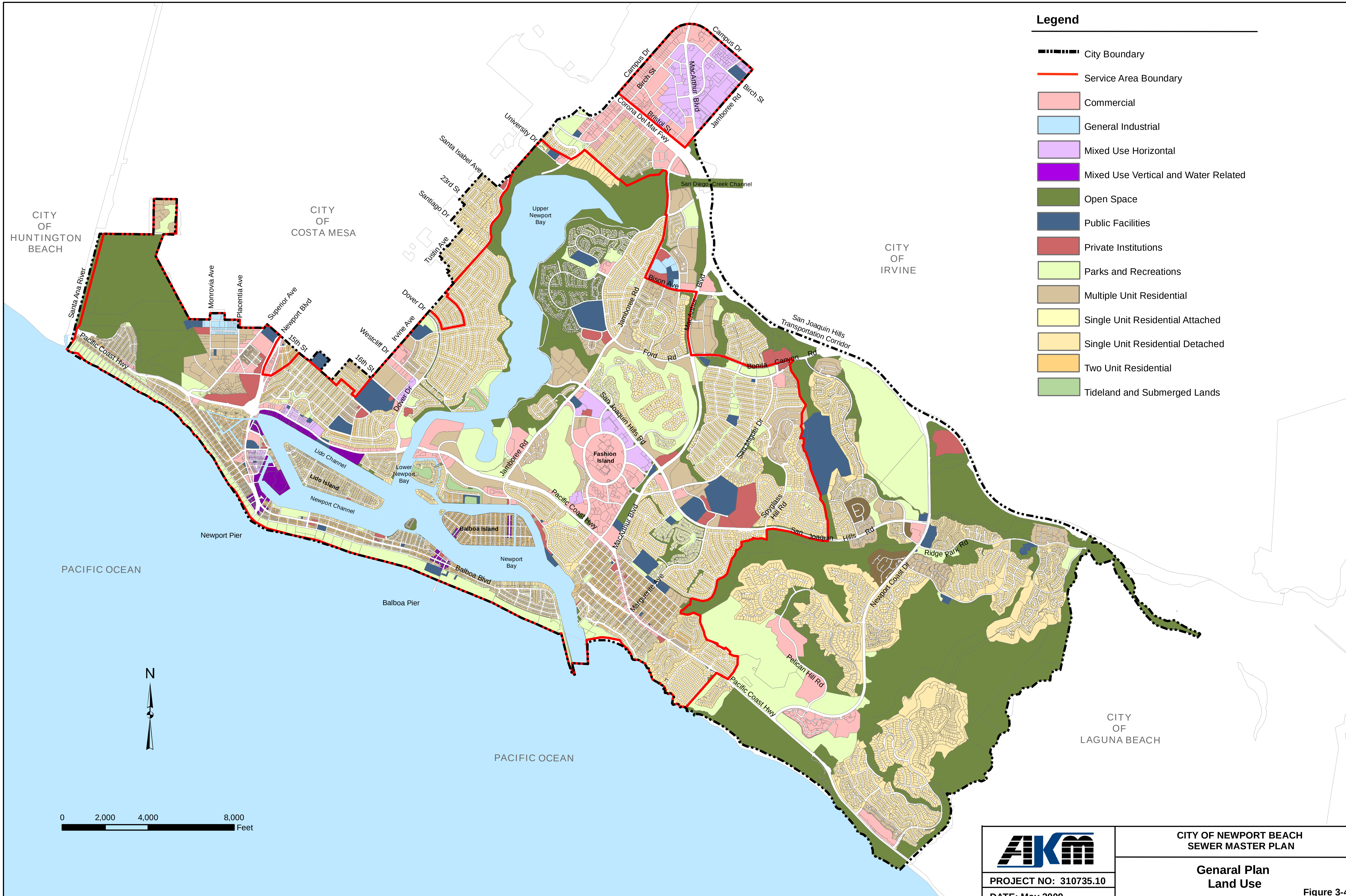
AREA BASED SEWER GENERATION RATES (2,500 GPD/AC)				
Address or Parcel #	**Area (acre)**	**AREA NAME**	**Tributary to Segment #**	**Flow (GPD)**
1400 Bristol St (221 DU)	2.38	A	1	**35,360***
1300 Brsitol St (193 DU)	1.97	A	1	**30,880***
1401 Quail St	1.70	A	1	4,250
1301 Quail St	1.85	A	1	4,625
SEGMENT 1 SUMMARY	**7.90**	**A**	**-**	**75,115**
***Flow is increased reflect actual future condition per sewer study reports prepared by Tait & Associates, August 2021 and December 2022.**				
1400 Quail St	1.47	B	2	3,675
1451 Quail St	0.71	B	2	1,763
1451 Quail St	0.71	B	2	1,763
1500 Quail St	1.59	B	2	3,967
1500 Quail St	0.79	B	2	1,983
1501 Quail St	1.11	B	2	2,775
1501 Quail St	1.11	B	2	2,775
1701 Quail St	1.22	B	2	3,050
1811 Quail St	0.69	B	2	1,725
No Site Address	2.15	B	2	5,381
3880 Birch St	1.21	B	2	3,025
2 Upper Newport Plaza Dr	0.18	B	2	450
6 Upper Newport Plaza Dr	0.76	B	2	1,900
3 Upper Newport Plaza Dr	0.20	B	2	500
4 Upper Newport Plaza	0.54	B	2	1,350
6 Upper Newport Plaza Dr	0.76	B	2	1,900
6 Upper Newport Plaza Dr	0.76	B	2	1,900
7 Upper Newport Plaza Dr	0.31	B	2	775
6 Upper Newport Plaza Dr (Different)	0.23	B	2	575
3620 Birch St	0.90	B	2	2,250
3610 Birch St	1.13	B	2	2,825
3600 Birch St	0.93	B	2	2,325
1550 Bristol St N	0.86	B	2	2,150
6 Upper Newport Plaza Dr	0.18	B	2	450
1 Upper Newport Plaza Dr	0.21	B	2	525
3636 Birch St	2.38	B	2	5,950
1800 Quail St	0.51	B	2	1,275
1900 Quail St	0.37	B	2	925
1300 Quail St	1.50	C	2	3,750
1301 Quail St	1.85	C	2	4625
1200 Quail St	1.00	C	2	2500
1100 Quail St	1.15	C	2	2,875
1101 Quail St	1.00	C	2	2,500
1000 Bristol St	3.91	C	2	9775
1000 Quail St	1.52	C	2	3800
895 Dove St	1.98	C	2	4,938
901 Dove St	0.57	C	2	1,425
SEGMENT 2 SUMMARY	**46.34**	**A+B+C**	**-**	**171,210**
900 Bristol St	1.00	D	3	2500
3601 Jamboree Rd	2.87	D	3	7,175
895 Dove St	1.975	D	3	4,938
3901 McArthur Blvd	2.67	D	3	6,675

3901 McArthur Blvd	2.67	D	3	6,675
3901 McArthur Blvd	2.67	E	3	6,675
901 Dove St	0.57	E	3	1,425
901 Dove St	0.57	E	3	1,425
3991 McArthur Blvd	0.83	E	3	2,075
1001 Dove St	1.51	E	3	3,775
1101 Dove St	1.49	E	3	3,725
1000 Dove St	0.90	E	3	2,250
1151 Dove St	1.75	E	3	4,375
1201 Dove St	1.80	E	3	4,488
1201 Dove St	1.80	E	3	4,488
1200 Dove St	2.17	E	3	5,417
1200 Dove St	2.17	E	3	5,417
3991 McArthur Blvd	0.83	E	3	2,075
1050 Dove St	1.56	E	3	3,900
SEGMENT 3 SUMMARY	**78.13**	**A+B+C+D+E**	**-**	**250,683**
1600 Dove St (249 DU)	2.49	F	4	**39,840***
1701 Corinthian Way & 1660 Dove St Newport Crossings (350 DU)	5.68	F	4	**76,050***
1401 Dove St	1.92	F	4	4,800
1301 Dove St	6.46	F	4	16,150
4100 Newport Place Dr	1.25	F	4	3,117
4241 McArthur Blvd	0.72	F	4	1,800
4221 McArthur Blvd	1.10	F	4	2,750
4100 Newport Place Dr	1.25	F	4	3,117
1601 Dove St	1.00	F	4	2,494
1601 Dove St	1.00	F	4	2,494
1601 Dove St	1.00	F	4	2,494
1601 Dove St	1.00	F	4	2,494
No Site Address	2.15	F	4	5,381
4000 Westerly Pl	1.46	F	4	3,650
No Site Address	2.15	F	4	5,381
3990 Westerly Pl	1.46	F	4	3,650
1500 Quail St	1.59	F	4	3,967
1500 Quail St	0.79	F	4	1,983
No Site Address	2.15	F	4	5,381
4200 Birch St	0.60	F	4	1,500
4200 Birch St	0.60	F	4	1,500
4250 Birch St	0.70	F	4	1,750
4250 Birch St	0.70	F	4	1,750
4251 McArthur Blvd	1.08	F	4	2,700
4229 McArthur Blvd	1.45	F	4	3,625
4301 McArthur Blvd	0.50	F	4	1,250
4301 McArthur Blvd	0.50	F	4	1,250
4341 McArthur Blvd	0.94	F	4	2,350
4343 McArthur BLvd	1.00	F	4	2,500
4545 McArthur Blvd	3.16	F	4	7,900
4545 McArthur Blvd	3.16	F	4	7,900
1375 Dove St	1.68	F	4	4,200
3901 Westerly Pl	0.64	F	4	1,600
3919 Westerly Pl	0.37	F	4	925
3900 Birch St	0.97	F	4	2,425
4000 Birch St	0.52	F	4	1,300
4001 Westerly Pl	0.86	F	4	2,150

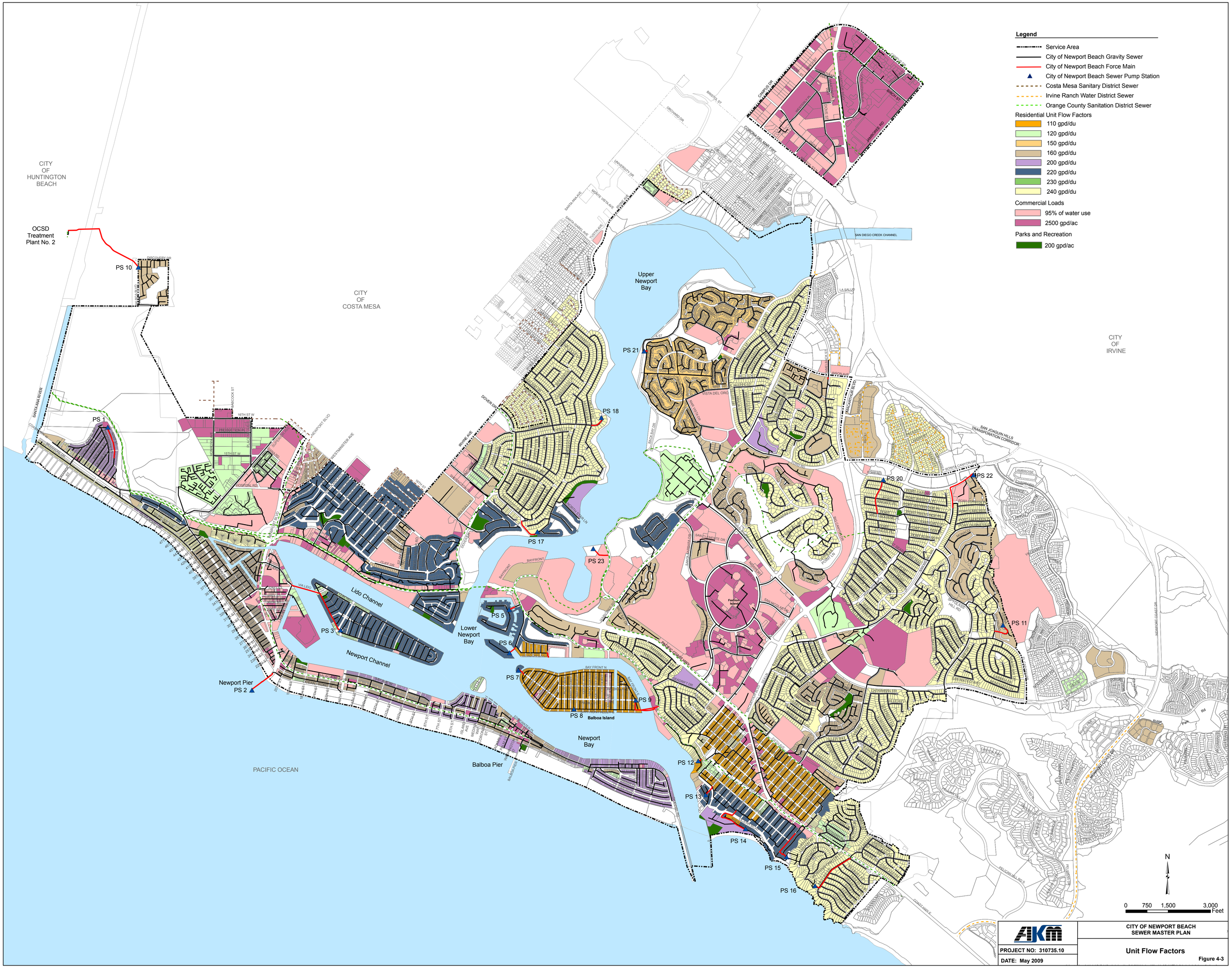
4020 Birch St	0.72	F	4	1,800
4029 Westerly Pl	0.52	F	4	1,300
4100 Birch St	0.38	F	4	950
4120 Birch St	0.58	F	4	1,450
4101 Westerly Pl	0.97	F	4	2,425
1901 Dove St	0.51	F	4	1,275
1801 Dove St	0.38	F	4	950
4100 Newport Place Dr	1.25	G	4	3,117
1200 Dove St	2.17	G	4	5,417
4141 McArthur Blvd	2.23	G	4	5,575
4101 McArthur Blvd	0.79	G	4	1,975
SEGMENT 4 SUMMARY	**144.66**	**A+B+C+D+E+F+G**	**-**	**512,485**

***Flow is increased reflect actual future condition per sewer study report prepared by Tait & Associates, January 2023 and Fuscoe Engineering, May 2017.**

Appendix D – City of Newport Beach SMP Exhibits



Legend
City Boundary
Service Area Boundary
Commercial
General Industrial
Mixed Use Horizontal
Mixed Use Vertical and Water Related
Open Space
Public Facilities
Private Institutions
Parks and Recreations
Multiple Unit Residential
Single Unit Residential Attached
Single Unit Residential Detached
Two Unit Residential
Tideland and Submerged Lands
CITY OF HUNTINGTON BEACH
CITY OF COSTA MESA
CITY OF IRVINE
CITY OF LAGUNA BEACH
PACIFIC OCEAN
PACIFIC OCEAN
Upper Newport Bay
Lower Newport Bay
Newport Bay
Fashion Island
Lido Island
Balboa Island
Lido Channel
Newport Channel
Newport Pier
Balboa Pier
San Diego Creek Channel
San Joaquin Hills Transportation Corridor
Pacific Coast Hwy
Balboa Blvd
Jamboree Rd
MacArthur Blvd
San Joaquin Hills Rd
Newport Coast Dr
Pelican Hill Rd
Marguerite Ave
Bonita Canyon Rd
Ford Rd
Bison Ave
Campus Dr
Birch St
Bristol St
Corona Del Mar Fwy
University Dr
Santa Isabel Ave
23rd St
Santiago Dr
Tustin Ave
Dover Dr
Irvine Ave
Westcliff Dr
16th St
15th St
Newport Blvd
Superior Ave
Placentia Ave
Monrovia Ave
Santa Ana River
San Miguel Dr
Spyglass Hill Rd
Ridge Park Rd
N
0 2,000 4,000 8,000 Feet
AKM
CITY OF NEWPORT BEACH SEWER MASTER PLAN
Genaral Plan Land Use
PROJECT NO: 310735.10
DATE: May 2009
Figure 3-4


Legend
Service Area
City of Newport Beach Gravity Sewer
City of Newport Beach Force Main
City of Newport Beach Sewer Pump Station
Costa Mesa Sanitary District Sewer
Irvine Ranch Water District Sewer
Orange County Sanitation District Sewer
Residential Unit Flow Factors
110 gpd/du
120 gpd/du
150 gpd/du
160 gpd/du
200 gpd/du
220 gpd/du
230 gpd/du
240 gpd/du
Commercial Loads
95% of water use
2500 gpd/ac
Parks and Recreation
200 gpd/ac
CITY OF HUNTINGTON BEACH
CITY OF COSTA MESA
CITY OF IRVINE
OCSD Treatment Plant No. 2
PS 10
PS 1
PS 18
PS 17
PS 23
PS 21
PS 20
PS 22
PS 11
PS 5
PS 3
PS 6
PS 7
PS 9
PS 8
PS 12
PS 13
PS 14
PS 15
PS 16
Newport Pier
PS 2
Upper Newport Bay
Lower Newport Bay
Lido Channel
Newport Channel
Balboa Island
Balboa Pier
Newport Bay
PACIFIC OCEAN
SAN DIEGO CREEK CHANNEL
SANTA ANA RIVER
Fashion Island
SAN JOAQUIN HILLS TRANSPORTATION CORRIDOR
N
0 750 1,500 3,000 Feet
AKM
PROJECT NO: 310735.10
DATE: May 2009
CITY OF NEWPORT BEACH
SEWER MASTER PLAN
Unit Flow Factors
Figure 4-3