

MEMORANDUM

To: The City of Corpus Christi

From: Devan Shields
Kimley-Horn and Associates, Inc.

Date: January 19, 2015

Subject: Existing Sanitary Sewer Capacity – Rodd Field and Holly



This memorandum is intended to provide capacity information for existing sanitary sewer lines between the intersection of Rodd Field Rd and Holly Rd and Wooldridge Lift Station 61. Projected sanitary sewer loads are provided based on assumptions relating sewer loads to existing zoning. Results of the analysis indicate that existing sanitary sewer lines along Rodd Field Road and Wooldridge Road have sufficient capacity to convey sewer loads from the study area without surcharging. Questions or comments regarding this information should be directed to Devan Shields.

INTENT

The intent of this memorandum is to evaluate the capacity of existing sanitary sewer lines between the intersection of Rodd Field Road and Holly Road and Wooldridge Lift Station 61, as shown in Figure 1. The evaluation is being performed to determine whether existing lines here have sufficient capacity to accept flows from a proposed development southeast of the above referenced intersection (project site). The project site includes 17.5 acres of proposed commercial development. The City of Corpus Christi (City) has requested that this analysis be performed as grounds to deviate from the 2014 amendment to the Wastewater Collection System Master Plan that shows loads from the project site being conveyed southeast to Wooldridge II Lift Station 48, and instead route wastewater flows from the project site northwest through existing gravity lines to Wooldridge Lift Station 61.

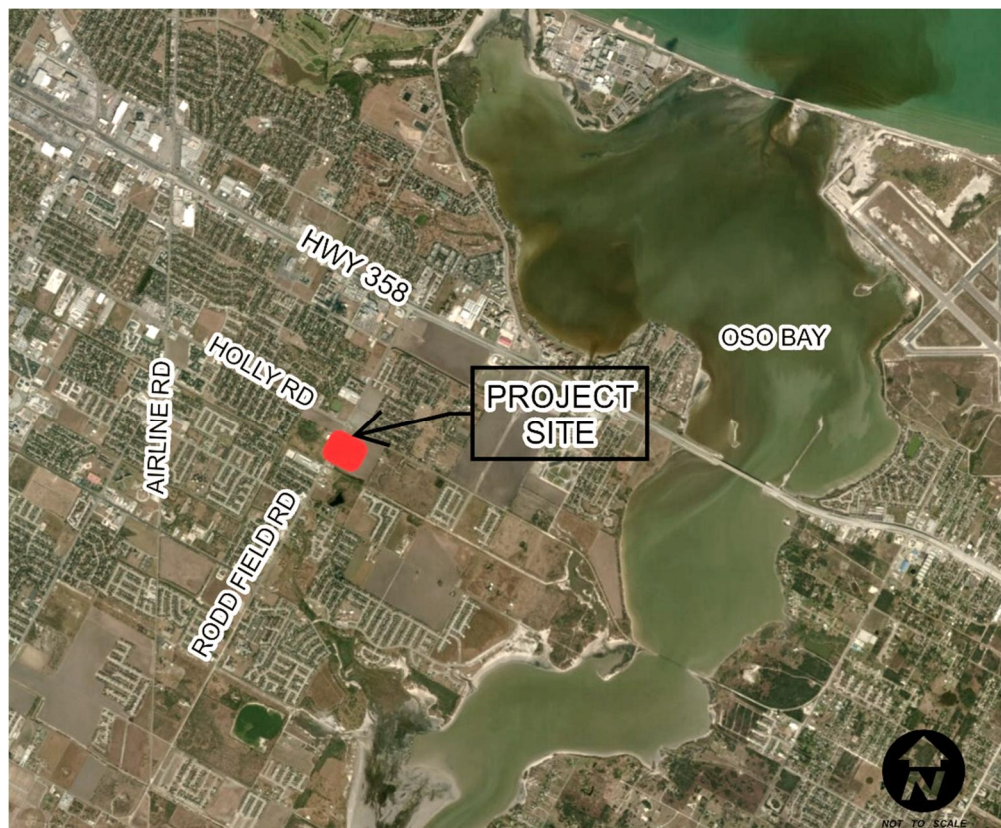


Figure 1: Project Location Map

EXISTING SYSTEM LAYOUT

The project site is located at the boundary between two existing sanitary sewer basins. This study was limited to sewer mains between an existing sanitary sewer manhole along Rodd Field Road mid-way between Holly Road and Wooldridge Road and the junction structure within Wooldridge Road at Wooldridge Lift Station 61. Existing system information was provided to Kimley-Horn by the City in the form of GIS shapefiles. Kimley-Horn utilized data from these files in determining existing system layout and capacity.

ANALYSIS

Three different sanitary sewer main sizes convey flows from the project site to Wooldridge Lift Station 61. The critical capacity points are locations along the main where the line size changes. Peak loads are evaluated and compared with capacity in the smaller line at these locations, which are referred to further in this memorandum as choke points. These locations are indicated in the attached Exhibit 1, and include the following:

- Choke Point 1: The transition between a 12-inch sewer main to the southeast and a 15-inch sewer main to the northwest along Wooldridge Road near Gentle Wind Avenue.
- Choke Point 2: The transition between a 15-inch sewer main to the southeast and an 18-inch sewer main to the northwest along Wooldridge Road near Bay Wind Drive.
- Choke Point 3: The connection of the 18-inch sewer main to the junction structure outside Wooldridge Lift Station 61 northwest of Wool Drive along Wooldridge Road.

Because the 2014 Wastewater Collection System Master Plan Amendment shows sewer loads from the project site draining to Wooldridge II Lift Station 48 and Wooldridge II Lift Station 48 pumps into Wooldridge Lift Station 61, further capacity analysis of the wastewater collection system is not necessary in this study.

Average sanitary sewer load assumptions based on existing zoning correlated with those used in the City's Wastewater Collection System Master Plan documents, and include:

- Zones RS-1, RS-4.5, RS-6, and RS-TF: 1,400 gallons/day/acre
- Zones RM-1 and RM-3: 3,500 gallons/day/acre
- Zones CN-1, CN-2, and CG-2: 900 gallons/day/acre
- Zones FR and PUD: 700 gallons/day/acre
- Zone ON: 1,100 gallons/day/acre
- Zone IL: 1,800 gallons/day/acre

Service populations are based on zoning and projected loads, with an assumed loading rate of 75 gallons/day for each person.

Exhibit 1 outlines the study area, shows the location of the project site, and breaks down the study area into 10 sub-areas. Composition of the sub-areas with regards to zoning, service area, service population, and average wastewater yield is shown in the Appendix.

Sewer line capacity is assumed to be the normal flow calculated using Manning's Equation with an n value of 0.013, with the pipe flowing full at the Texas Commission on Environmental Quality (TCEQ) minimum slope as stated in Chapter 217/317 for each pipe size (see Appendix). Peaking factors are determined by Harmon's peaking factor equation.

Choke Point 1

Choke Point 1, as shown on Exhibit 1, is the section of 12-inch sewer line directly upstream of the transition to the 15-inch line. Wastewater loads for Choke Point 1 include the Project Site, which is an area of 17.5 acres zoned for commercial use. This area includes a proposed 5.30 acre supermarket site with a projected average yield of 1,100 gallons/day. Wastewater loads for Choke Point 1 also include sub-areas 9 and 10. Total average wastewater yield for this choke point is 0.11 million gallons/day (MGD), with a peak hour flow of 0.40 MGD. Capacity of a 12-inch sewer line at the TCEQ minimum slope for a 12-inch line of 0.20% is 1.03 MGD, so the existing 12-inch line has enough capacity for the proposed wastewater loads shown here without surcharging. Table 1 shows details for Choke Point 1, as well as for Choke Points 2 and 3.

Table 1 –Choke Point Flow Rates

Choke Point	Sub-Area	Service Area		Service Population	Average Wastewater Yield		Peak Factor	Peak Hr Design Flow	
		(ft ²)	(acres)		(gpm)	(MGD)		(gpm)	(MGD)
1	Project Site	753,900	17.30	159	1	0.01	3.69	31	0.04
	10	1,194,902	27.43	428	22	0.03		122	0.18
	9	2,264,106	51.98	867	45	0.07		166	0.24
Total		4,212,908	96.71	1,454	76	0.11		279	0.40
2	Choke Point 1	4,212,908	96.71	1,454	76	0.11	3.13	237	0.34
	8	2,987,790	68.59	1,630	85	0.12		266	0.38
	7	957,050	21.97	381	20	0.03		62	0.09
	6	2,201,290	50.53	731	38	0.05		119	0.17
	5	412,070	9.46	177	9	0.01		29	0.04
	4	1,186,614	27.24	502	26	0.04		82	0.12
	3	1,109,900	25.48	279	15	0.02		45	0.07
	2	2,793,974	64.14	1,412	74	0.11		230	0.33
Total		15,861,596	364.13	6,565	342	0.49		1071	1.54
3	Choke Point 2	15,861,596	364.13	6,565	342	0.49	3.11	1064	1.53
	1	979,715	22.49	368	19	0.03		60	0.09
Total		16,841,311	386.62	6,933	361	0.52		1123	1.62

ft² – square feet

gpm – gallons per minute

Hr – hour

Choke Point 2

Choke Point 2, as shown on Exhibit 1, is the section of 15-inch sewer line directly upstream of the transition to the 18-inch line. Wastewater loads for Choke Point 2 consist of the wastewater loads for Choke Point 1 plus those from sub-areas 2 through 8. Total average wastewater yield for this choke point is 0.49 MGD, with a peak hour flow of 1.54 MGD. Capacity of a 15-inch sewer line at the TCEQ minimum slope for a 15-inch line of 0.15% is 1.62 MGD, so the existing 15-inch line has enough capacity for the proposed wastewater loads shown here without surcharging.

Choke Point 3

Choke Point 3, as shown on Exhibit 1, is the section of 18-inch sewer line directly upstream of the junction structure outside Wooldridge Lift Station 61. Wastewater loads for Choke Point 3 consist of the wastewater loads for Choke Point 2 plus those from sub-area 1. Total average wastewater yield for this choke point is 0.52 MGD, with a peak hour flow of 1.62 MGD. Capacity of an 18-inch sewer line at the TCEQ minimum slope for an 18-inch line of 0.11% is 2.25 MGD, so the existing 18-inch line has enough capacity for the proposed wastewater loads shown here without surcharging.

CONCLUSION

The results of the analysis illustrate that the addition of wastewater flows from the project site will not adversely affect current service conditions in the existing system, and that based on current zoning the existing 12-, 15-, and 18-inch lines have sufficient capacity to convey projected peak wastewater flows from the study area at build-out to Wooldridge Lift Station 61 without surcharging. The point at which the projected peak flows come closest to existing line capacity is the 15-inch sewer line between Windblown Drive and the transition to an 18-inch main southeast of Bay Wind Drive along Wooldridge Road. Projected flows from the project site have a minimal impact on this condition, with an average projected sewer load of 1,100 gallons per day for the 5.30 acre site, or about 210 gallons/day/acre compared with the general commercial assumption of 900 gallons/day/acre. The projected flow rate is significantly impacted by large areas within sub-areas 2 and 8 zoned for multifamily development which are undeveloped at this time.

APPENDIX

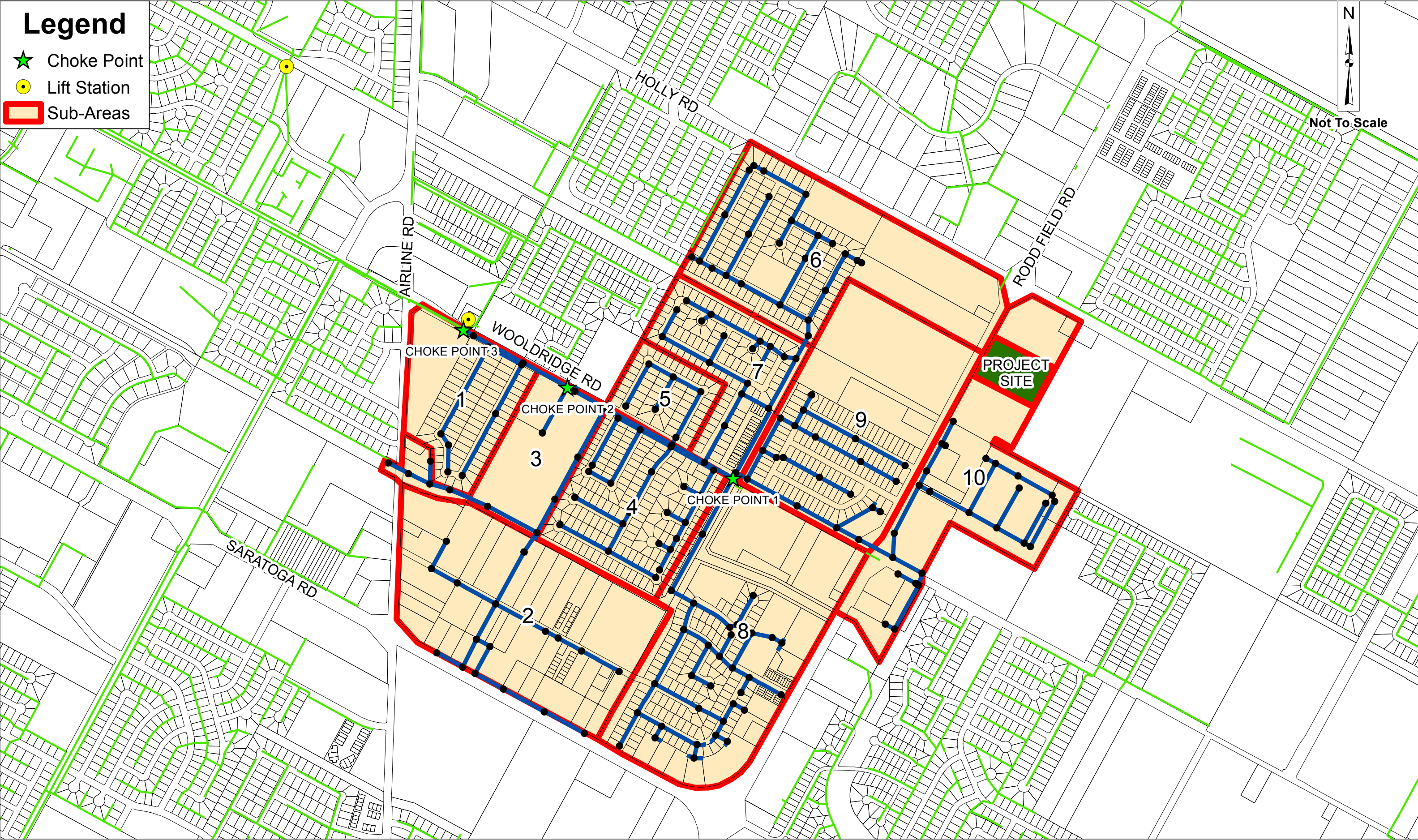


Exhibit 1
Rodd Field Rd and Holly Rd Sanitary Sewer

Sub-Area Zoning Composition

Sub-Area	Zoning Classification	Service Area		Service Population	Average Wastewater Yield	
		(ft2)	(acres)		(gpm)	(mgd)
1	CN-1	229,771	5.28	63	3.3	0.0047
	CN-2	109,000	2.50	30	1.6	0.0023
	FR	1,197	0.03	0	0.0	0.0000
	RS-6	639,747	14.69	274	14.3	0.0206
2	CG-2	970,074	22.27	267	13.9	0.0200
	CN-1	74,146	1.70	20	1.1	0.0015
	FR	380	0.01	0	0.0	0.0000
	ON	164,615	3.78	55	2.9	0.0042
	PUD	84,902	1.95	18	0.9	0.0014
	RM-1	586,193	13.46	628	32.7	0.0471
	RM-3	47,897	1.10	51	2.7	0.0039
	RS-6	822,005	18.87	352	18.3	0.0264
3	RS-TF	43,762	1.01	19	1.0	0.0014
	CG-2	129,963	2.98	36	1.9	0.0027
	CN-2	462	0.01	0	0.0	0.0000
	FR	835,895	19.19	179	9.3	0.0134
	ON	4,408	0.10	1	0.1	0.0001
	RM-1	4,349	0.10	5	0.2	0.0004
	RS-4.5	14,262	0.33	6	0.3	0.0005
4	RS-6	120,560	2.77	52	2.7	0.0039
	FR	37,565	0.86	8	0.4	0.0006
	PUD	311	0.01	0	0.0	0.0000
	RM-1	2,412	0.06	3	0.1	0.0002
	RS-4.5	266,005	6.11	114	5.9	0.0085
5	RS-6	880,321	20.21	377	19.6	0.0283
	FR	26	0.00	0	0.0	0.0000
6	RS-6	412,044	9.46	177	9.2	0.0132
	FR	985,935	22.63	211	11.0	0.0158
	IL	57	0.00	0	0.0	0.0000
	ON	6,148	0.14	2	0.1	0.0002
7	RS-6	1,209,148	27.76	518	27.0	0.0389
	FR	45,166	1.04	10	0.5	0.0007
	IL	3,264	0.08	2	0.1	0.0001

**Sub-Area Zoning
Composition (cont'd)**

Sub-Area	Zoning Classification	Service Area		Service Population	Average Wastewater Yield	
		(ft ²)	(acres)		(gpm)	(mgd)
7	PUD	93,089	2.14	20	1.0	0.0015
	RS-6	815,531	18.72	349	18.2	0.0262
8	CG-2	390,701	8.97	108	5.6	0.0081
	CN-1	418,178	9.60	115	6.0	0.0086
	FR	136,089	3.12	29	1.5	0.0022
	RM-1	781,647	17.94	837	43.6	0.0628
	RS-6	1,261,175	28.95	540	28.1	0.0405
9	CG-2	448,948	10.31	124	6.4	0.0093
	CN-1	57,978	1.33	16	0.8	0.0012
	FR	13,891	0.32	3	0.2	0.0002
	IL	242,176	5.56	133	7.0	0.0100
	ON	569,908	13.08	192	10.0	0.0144
	RS-6	931,204	21.38	399	20.8	0.0299
10	CN-1	432,867	9.94	119	6.2	0.0089
	FR	83,098	1.91	18	0.9	0.0013
	RS-4.5	678,938	15.59	291	15.2	0.0218
PROJECT	SITE (CG-2)	753,900	17.31	159	8.3	0.0119

TCEQ Maximum/Minimum Pipe Slopes by Size

Size of Pipe (<i>inches</i>)	Minimum Slope (%)	Maximum Slope (%)
6	0.5	12.35
8	0.33	8.4
10	0.25	6.23
12	0.2	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.3
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	1.26
36	0.045	1.12
39	0.04	1.01