COUNTRY GENTLEMAN ESTATES SUBDIVISION

STORM WATER MANAGEMENT PLAN

JUNE 2019
REVISED NOV 3, 2019

Owner / Developer:

Conexion Resource Group, LLC
15600 San Pedro, Suite 101
San Antonio, Texas 78232

Prepared by:

DELGADO ENGINEERING

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TBPE # F-17091

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I. INTRODUCTION

The subject tract is located in central Bexar County at the intersection of Gentleman Road and Vivian Ln. The tract is located within the City of Balcones Heights, Texas (see Exhibit 1 - Location Map). The property is currently bounded by existing apartment complex to the north, Chick-fil-a to the east, Gentleman Road to the west and an existing apartment complex to the south. Currently, the tract is undeveloped with grass on the property. The proposed development will consist of 6 townhomes and one shared driveway. An overall aerial photo and USGS Map is included for your reference as Exhibits 2 and 3, respectively.

A review of Federal Emergency Management Agency (FEMA) Map Number 48029C0385G, dated September 29, 2010 indicates that the property is not within the FEMA 100-year flood zone. A FEMA Map is included for your reference as Exhibit 4.

II. EXISTING CONDITIONS ANALYSIS - HYDROLOGY

Hydrology-Areas EX1 and EX2:

Runoff from On-site drainage area EX1 sheet flows toward the north and drains onto an existing concrete channel and drains under Gentleman Road and continues to the west in an existing concrete channel. Runoff from On-site drainage area EX2 sheet flows southwest and drains onto Gentleman Road. Then Off-site drainage area EX3 drains across Gentleman Road and down Vivian Ln for approximately 430 feet and drains into an existing sidewalk over drain. Then it drains south across Rogiers Park for approximately 360 feet and drains under Pleasant Drive into a 15-foot u-channel. (see Exhibit 5).

The existing onsite hydrologic storm water runoff flows for the 5, 25 and 100-year storms events are shown in Table 1 below. The rational method was used to calculate the flow rates.

	Table 1 – Existing Conditions									
Study Point	Drainage Area	Total Area	$C_{weighted}$	Tc	I_5	I_{25}	I_{100}	Q_5	Q_{25}	Q_{100}
1	EX1	0.042	0.47	5	7.88	11.00	13.79	0.16	0.22	0.27
2	EX2	0.541	0.53	14	5.47	7.60	9.48	1.57	2.18	2.72
3	EX3	2.67	0.70	14	5.47	7.60	9.48	10.22	14.20	17.72

** Time of Concentration based on the using Figure 5.4.1 Overland flow time (Source: "DESIGN" by Elwyn Seelys Figure H).*
** Shallow Concentrated Flow using Figure 5.4.2 Average Velocities for Estimating Travel Time for Shallow Concentrated Flow (Source: NCS Technical release 55-Figure 3-1).*
** Channel flow using Manning's equation (Equation 5.4.3).*
** Runoff Coefficient (C) derived from City of San Antonio Table 5.5.3A-Runoff Coefficient (C value) - percentage.*
** Rainfall Intensities (I) derived from City of San Antonio Table 5.5.1A of the UDC.*

See Exhibit 5: Existing Drainage Plan for existing site conditions and drainage area locations.

III. ULTIMATE/PROPOSED DEVELOPMENT CONDITIONS ANALYSIS - HYDROLOGY

Hydrology-Areas EX1 and EX2:

Runoff from On-site drainage area P1 (no development in this area) sheet flows toward the north and drains onto an existing concrete channel and drains under Gentleman Road and continues to the west in an existing concrete channel.

Runoff from On-site drainage area P2 sheet flows toward proposed common drive and drains southwest Gentleman Road. Then Off-site drainage area P3 drains across Gentleman Road and down Vivian Ln for approximately 430 feet and drains into an existing sidewalk over drain. Then it drains south across Rogiers Park for approximately 360 feet and drains under Pleasant Drive into a 15-foot u-channel (see Exhibit 5).

The proposed/ultimate onsite hydrologic storm water runoff flows for the 5, 25 and 100-year storms events account for existing industrial and school developments and are shown in Table 2 below. The standard rational method was used to calculate the flow rates.

Table 2 - Onsite Proposed/Ultimate Development Conditions

Study Point	Drainage Area	Total Area	$C_{weighted}$	Tc	I_5	I_{25}	I_{100}	Q_5	Q_{25}	Q_{100}
1	P1	0.042	0.47	5	7.88	11.00	13.79	0.16	0.22	0.27
No development	In P1,C is	Same	as EX1							
2	P2	0.541	0.77	12	5.86	8.19	10.24	2.44	3.41	4.27
3	P3	2.67	0.75	14	5.47	7.60	9.48	10.95	15.22	18.98

** Time of Concentration based on the using Figure 5.4.1 Overland flow time (Source: "DESIGN" by Elwyn Seelys Figure H).*
** Shallow Concentrated Flow using Figure 5.4.2 Average Velocities for Estimating Travel Time for Shallow Concentrated Flow (Source: NCS Technical release 55-Figure 3-1).*
** Channel flow using Manning's equation (Equation 5.4.3).*
** Runoff Coefficient (C) derived from City of San Antonio Table 5.5.3A-Runoff Coefficient (C value) - percentage.*
** Rainfall Intensities (I) derived from City of San Antonio Table 5.5.1A of the UDC.*

See Exhibit 6: Master Drainage Plan for Proposed/Ultimate Conditions with proposed site conditions and drainage area locations.

The difference between existing and proposed development storm events at site are shown in Table 5 below.

Table 5 - Existing vs. Proposed Development

	Q_5 cfs		Q_{25} cfs	Q_{100} cfs
Concentration Point 1 (Existing)	0.16		0.22	0.27
Concentration Point 1 (Proposed)	0.16		0.22	0.27
Difference in flow	+ 0.00		+ 0.00	+ 0.00
Concentration Point 2 (Existing)	1.57		2.18	2.72
Concentration Point 2 (Proposed)	2.44		3.41	4.27
Difference in flow	+ 0.87		+ 1.23	+1.55

IV. MITIGATION

This site does not fall in the mandatory detention for the City of San Antonio, no detention will be provided. "The increased runoff resulting from proposed development will not produce a significant adverse impact to other properties, habitable structures or drainage infrastructure systems to a point 2,000 feet downstream. Downstream conditions (including actual curb depth) in this reach have been field verified by myself or members of my staff. Therefore, the owner requests to participate in the Regional Storm Water Management Program by paying a fee in-lieu-of onsite detention." The client is requesting fee in leu of detention (see Exhibit 7 for Regional Storm Water Management Participation Form).

V. SUMMARY

This Stormwater Management Report is for Country Gentleman Estates Subdivision improvements. The downstream curb inlets on Vivian (6 – 5" x 12" openings on South and 6 – 5" x 12" opening on north) have plenty of capacity to carry proposed CFS of 10.22 and my calculations show that that location Ultimate development is only 10.95 CFS with our development and increase of only 0.73 CFS for 5-year, 1.02 CFS for 25-year and 1.26 CFS for 100-year storm events (see calculations on Attachment 1 "The increased runoff resulting from proposed development will not produce a significant adverse impact to other properties, habitable structures or drainage infrastructure systems to a point at the downstream inlet.

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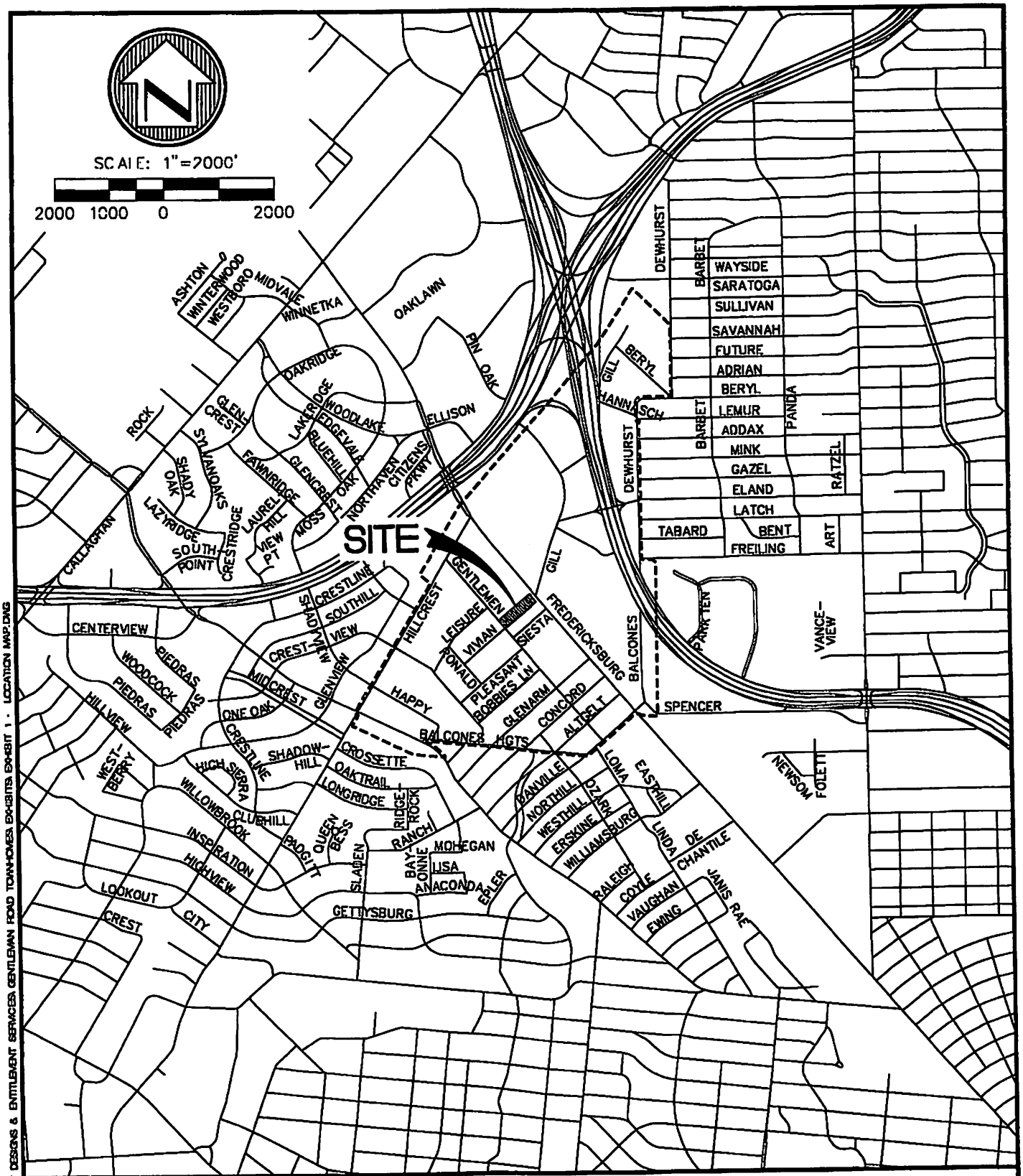
Attachment 1

Location Map



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GENTLEMAN ROAD TOWNHOMES
LOCATION MAP

EXHIBIT 1

DATE: 2019-06-28

JOB: GENTLEMAN

C:\ USERS\ BLAZE\ ONEDRIVE\ CAY DESIGNS & ENTITLEMENT SERVICES\ GENTLEMAN ROAD TOWNHOMES\ EXHIBITS\ EXHIBIT 1 - LOCATION MAP.DWG

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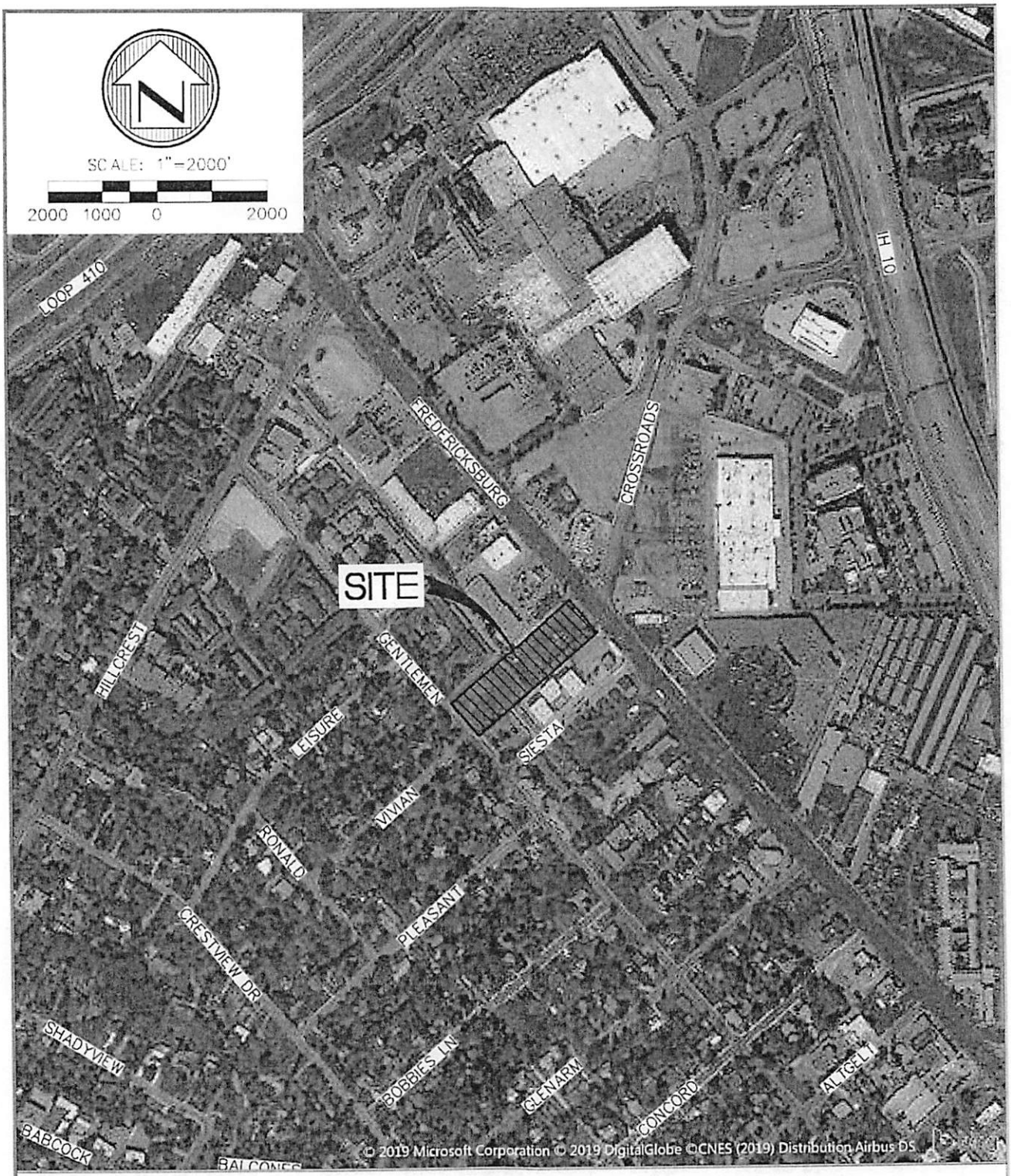
Exhibit 2

Aerial Exhibit

6315 Sentry Point, San Antonio, Texas 78245 - Firm # 17091



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GENTLEMAN ROAD TOWNHOMES
AERIAL PHOTOGRAPH (SITE VIEW)

EXHIBIT 3

DATE: 2019-06-28

JOB: GENTLEMAN

C:\USERS\BLAZE\ONEDRIVE\CAY DESIGNS & ENTITLEMENT SERVICES\GENTLEMAN ROAD TOWNHOMES\EXHIBITS\EXHIBIT 3 - AERIAL (SITE).DWG

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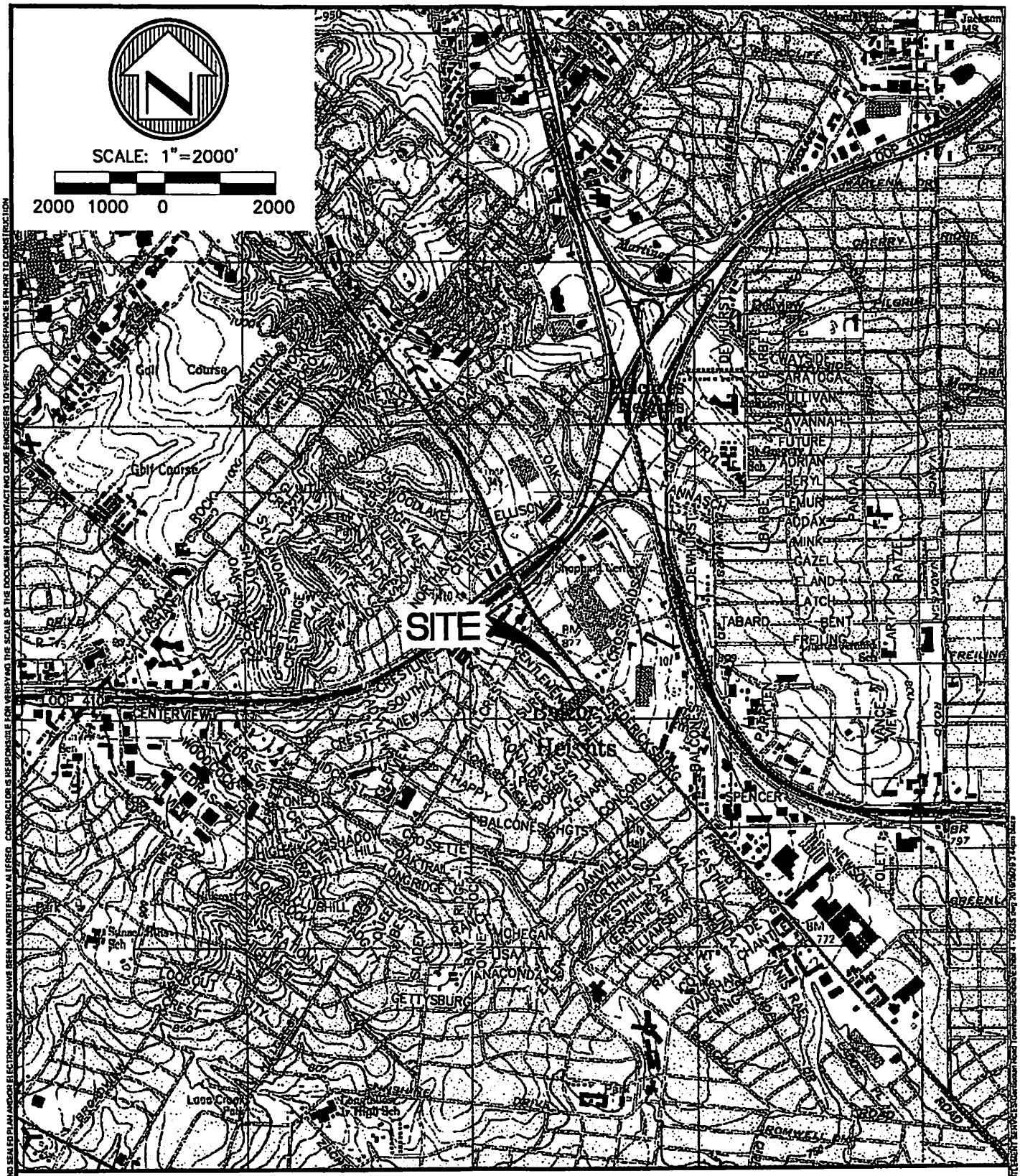
Exhibit 3

USGS Quadrangle Map



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GENTLEMAN ROAD TOWNHOMES
USGS EXHIBIT

EXHIBIT 3

DATE: 2019-06-28

JOB: GENTLEMAN

REPRODUCTION OF THE ORIGINAL SIGNED AND SEALED PLAN MODEL ELECTRONIC MEDIA MAY HAVE BEEN INADVERTENTLY ALTERED. CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE SCALE OF THE DOCUMENT AND CONTACTING CLIDE ENGINEERS TO VERIFY DISCREPANCIES PRIOR TO CONSTRUCTION

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Exhibit 4

FEMA FIRM Map

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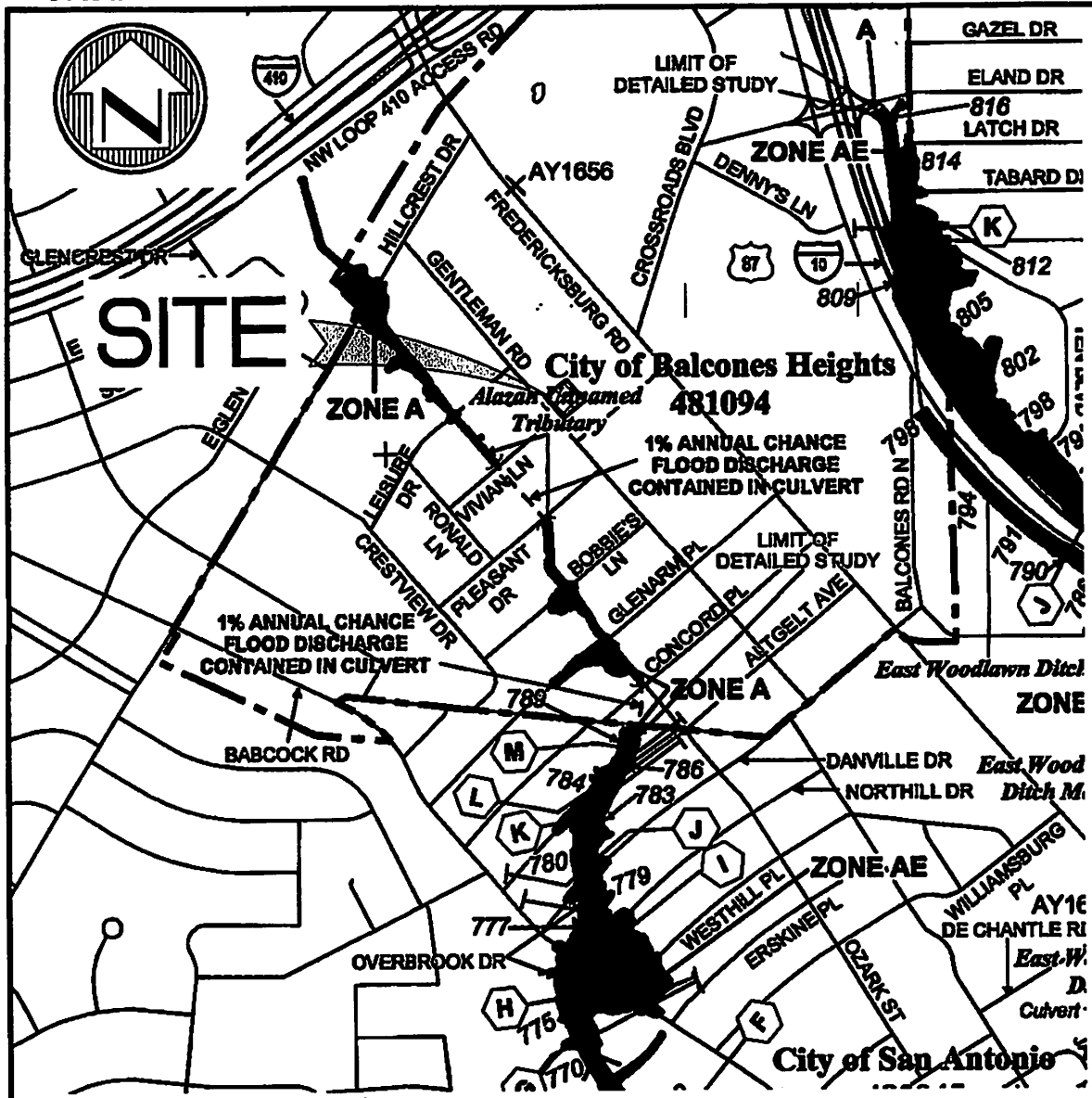

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0385G

FIRM

FLOOD INSURANCE RATE MAP

BEXAR COUNTY, TEXAS AND INCORPORATED AREAS

PANEL 385 OF 785

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
BALCONES HEIGHTS, CITY OF	481094	0385	G
SAN ANTONIO, CITY OF	480045	0385	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48029C0385G

MAP REVISED
SEPTEMBER 29, 2010

Federal Emergency Management Agency

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GENTLEMAN ROAD TOWNHOMES
FIRM EXHIBIT

EXHIBIT 4

DATE: 2019-06-28

JOB: GENTLEMAN

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Exhibit 5

Master Drainage Existing Conditions

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Exhibit 6

Master Drainage Proposed/Ultimate Conditions

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Exhibit 7

Subdivision Plat

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Attachment 1

On and Off-Site Hydrologic & Hydraulic Calculations

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Hydrologic Stormwater Runoff On-site Existing Conditions E1

Sheet Flow: 0 LF, Average to poor Grass and 2% slope = 5 **min** (Source: "Design" by Elwyn Seelys Figure H)

Shallow Concentrated Flow: 0 LF, unpaved = **0 min** (Source: NCS Technical release 55- Figure 3-1)

Channel Flow: 0 LF, 0% Slope, Avg Velocity 6 ft/sec = **0 min**

Q = C I A

C = 0.47

Tc = 5 min = 7.88 (5 yr) = 11.00 (25 yr) = 13.79 (100 yr)

A = 0.042

Q_5 = 0.47 x 7.88 x 0.042= 0.16 CFS

Q_{25} = 0.47 x 11.00 x 0.042= 0.22 CFS

Q_{100} = 0.47 x 13.79 x 0.042 = 0.27 CFS

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Hydrologic Stormwater Runoff On-site Proposed Conditions P1

Sheet Flow: 00 LF, Average Grass and 1.25% slope = 5 **min** (Source: "Design" by Elwyn Seelys Figure H)

Shallow Concentrated Flow: 0 LF, paved @ 1%= 0 **min** (Source: NCS Technical release 55-Figure 3-1)

Shallow Concentrated Flow: 0 LF, unpaved @ 0% = **0 min** (Source: NCS Technical release 55-Figure 3-1)

Channel Flow: 0 LF, 0% Slope, Avg Velocity 5 ft/sec = 0 **min**

Q = C I A

C = 0.47

I = 5 min = 7.88 (5 yr) = 11.00 (25 yr) = 13.79 (100 yr)

A = 0.042

Q_5 = 0.47 x 7.88 x 0.042= 0.16 CFS

Q_{25} = 0.47 x 11.00 x 0.042= 0.22 CFS

Q_{100} = 0.47 x 13.79 x 0.042 = 0.27 CFS

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Hydrologic Stormwater Runoff Existing Conditions E2

Sheet Flow: 160 LF, Average to poor Grass and 3% slope = 14 **min** (Source: "Design" by Elwyn Seelys Figure H)

Shallow Concentrated Flow: **0** LF, paved = 1.4 ft/sec, 0 / 0 = 0 sec = Tc = **0 min** (Source: NCS Technical release 55- Figure 3-1)

Channel Flow: 0 LF, 0% Slope, Avg Velocity 6 ft/sec = **0 min**

Q = C I A

C = 0.53

I = 14 min = 5.47 (5 yr) = 7.60 (25 yr) = 9.48 (100 yr)

A = 0.541

Q_5 = 0.53 x 5.47 x 0.541 = 1.57 CFS

Q_{25} = 0.53 x 7.60 x 0.541 = 2.18 CFS

Q_{100} = 0.53 x 9.48 x 0.541 = 2.72 CFS

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Hydrologic Stormwater Runoff Existing Conditions P2

Sheet Flow: 80 LF, Average to poor Grass and 2% slope = 12 **min** (Source: "Design" by Elwyn Seelys Figure H)

Shallow Concentrated Flow: 160 LF, paved = 2.0% Slope, 160 / 3.0 = 184 sec = Tc = 1 **min** (Source: NCS Technical release 55- Figure 3-1)

Channel Flow: 0 LF, 0% Slope, Avg Velocity 6 ft/sec = **0 min**

Q = C I A

C = 0.77

I = 12 min = 5.86 (5 yr) = 8.19 (25 yr) = 10.24 (100 yr)

A = 0.541

Q_5 = 0.77 x 5.86 x 0.541 = 2.44 CFS

Q_{25} = 0.77 x 8.19 x 0.541 = 3.41 CFS

Q_{100} = 0.77 x 10.24 x 0.541 = 4.27 CFS

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Hydrologic Stormwater Runoff Proposed Conditions EX3

Sheet Flow: 80 LF, Average to Grass and 5% slope = 9.5 **min** (Source: "Design" by Elwyn Seelys Figure H)

Shallow Concentrated Flow: 755 LF, paved = 2.8 ft/sec, 755 / 2.8 = 236 sec = Tc = **4.5 min** (Source: NCS Technical release 55- Figure 3-1)

Channel Flow: 0 LF, 0% Slope, Avg Velocity 6 ft/sec = **0 min**

Q = C I A

C = (0.78 x 0.96) + (0.77 x 0.47) + (1.12 x 0.67) / 2.67 = 0.70

Streets = 0.51AC, Large Lots 1.12AC, Commercial 0.27

I = 14 min = 5.47 (5 yr) = 7.60 (25 yr) = 9.48 (100 yr)

A = 2.67

Q_5 = 0.70 x 5.47 x 2.67 = 10.22 CFS

Q_{25} = 0.70 x 7.60 x 2.67 = 14.20 CFS

Q_{100} = 0.70 x 9.48 x 2.67 = 17.72 CFS

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Hydrologic Stormwater Runoff Proposed Conditions P3

Sheet Flow: 80 LF, Average to Grass and 5% slope = 9.5 **min** (Source: "Design" by Elwyn Seelys Figure H)

Shallow Concentrated Flow: 755 LF, paved = 2.8 ft/sec, 755 / 2.8 = 236 sec = Tc = **4.5 min** (Source: NCS Technical release 55- Figure 3-1)

Channel Flow: 0 LF, 0% Slope, Avg Velocity 6 ft/sec = **0 min**

Q = C I A

C = (0.78 x 0.96) + (0.27 x 0.47) + (1.12 x 0.67) + (0.50 x 0.77)/ 2.67 = 0.75

Streets = 0.51AC, Large Lots 1.12AC, Commercial 0.27ac, Res Small 0.50ac

I = 14 min = 5.47 (5 yr) = 7.60 (25 yr) = 9.48 (100 yr)

A = 2.67

Q_5 = 0.75 x 5.47 x 2.67 = 10.95 CFS

Q_{25} = 0.75 x 7.60 x 2.67 = 15.22 CFS

Q_{100} = 0.75 x 9.48 x 2.67 = 18.98 CFS

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Firm # 17091