J·R ENGINEERING
A Westrian Company

October 10, 2022

Mr. Jacob James
City of Lone Tree Public Works
9220 Kimmer Drive
Lone Tree, CO 80124

Re: Thrive Townhomes at Ridgegate – Drainage Compliance Letter

Dear Mr. James:

Please accept this letter as verification of drainage compliance for the Thrive Townhomes at Ridgegate Project, located in the northeast quarter of Section 23, Township 6 South, Range 67 West of the Sixth Principal Meridian, City of Lone Tree, Douglas County, Colorado. High Note Avenue bound the site to the north, Lyric Street to the east, Stanza Lane to the west, and Stanza Circle to the south. A vicinity map for the project is included in the Attachments to this letter.

This project consists of 30 multi-family buildings with associated parking, drive, and landscape areas. Existing infrastructure is in place to service the proposed project. The site is located within Lot 367, Ridgegate Southwest Village Filing No. 1.

The purpose of this letter is to demonstrate that the proposed project conforms to the established drainage patterns and criteria set forth in the previously approved Phase III Drainage Report for Ridgegate Southwest Village Filing 1. The governing master report is the Approved *Phase III Drainage Report for Ridgegate Southwest Village Filing 1* by JR Engineering, LLC, addendum #1 revised September 28, 2021. The referenced information from the governing master report is included in the Attachments of the report.

The site is tributary to the Happy Canyon floodplain as defined by the FEMA Flood Insurance Rate Maps, FIRM #08035C0063H and effective September 4, 2020, and is included in the Attachments. The site lies entirely within Zone X which is the flood insurance rate zone that corresponds to areas outside the one percent annual chance floodplain.

The Natural Resources Conservation Service Web Soil Survey in the approved drainage reports identify the soil on the property as Hydrologic Soils Group C and D. Hydrologic Group C soils are described as “soils that have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure.” Hydrologic Group D soils are described as “soils that have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.” A soils map has been included in the Attachments.

Currently, the project site is vacant. The site generally slopes east to west, with slopes ranging between 3.0% to 25%. Existing infrastructure to the north in High Note Avenue, to the west in Stanza Lane, to the south in Stanza Circle, and to the east in Lyric Street include storm sewer, sanitary sewer, water mains, and other utilities.

The site is located within Ex-Basin A37 (52.8% impervious, 1.00 acres), Ex-Basin A38 (47.1% impervious, 1.61 acres), Ex-Basin A40 (75.0% impervious, 1.73 acres), Ex-Basin A41 (53.0% impervious, 1.88 acres), and Ex-Basin A43 (49.8% impervious, 2.50 acres) as defined in the Phase III Drainage Report for Ridgegate Southwest Village

7200 South Alton Way, Suite C400, Centennial, CO 80112
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Filing 1, see Attachments D. For the 2.39 acres within the project site, the total impervious area onsite assumed by the Ridgegate Southwest Village Filing 1 is 1.63 acres. In the proposed condition, the site will consist of 30 multifamily units and associated parking, landscape and drive aisles and consists of four basins. Basin B1 (13.8% impervious, 0.25 acres) will drain offsite to the west to the existing Stanza Circle where runoff will then be conveyed via curb and gutter to existing storm sewer and then ultimately conveyed to EURV Pond A to the northeast. Basin B2 (71.8% impervious, 1.35 acres) will drain offsite to the west to the existing Stanza Lane where runoff will then be conveyed via curb and gutter to existing storm sewer and ultimately conveyed to EURV Pond A. Basin B3 (34.7% impervious, 0.06 acres) will sheet flow offsite to the east into existing Basin A27, where runoff is captured by an existing inlet and conveyed to the EURV Pond A. Basin B4 (53.1% impervious, 0.73 acres) will sheet flow offsite to the north to the existing High Note Avenue where runoff will then be conveyed via curb and gutter to existing storm sewer and ultimately conveyed to EURV Pond A. For the 2.39 acres within the project site, total proposed impervious area onsite is 1.42 acres.

In accordance with the previously approved report, this site will to drain to EURV Pond A located north of the site where water quality will be provided. In the proposed condition, onsite runoff will be captured by existing storm sewer infrastructure and conveyed to the existing EURV Pond A, satisfying permanent water quality requirements for the site.

Table 1: Historic Imperviousness vs. Proposed Imperviousness

Historic Basins Per Previously Approved Drainage Report

Basin ID	Percent Impervious	Area Onsite	Impervious Area
EX- Basin A37	52.8%	0.01 Acres	0.01 Acres
EX-Basin A38	47.1%	0.13 Acres	0.06 Acres
EX-Basin A40	75.0%	1.70 Acres	1.28 Acres
EX-Basin A41	53.0%	0.18 Acres	0.10 Acres
EX-Basin A43	49.8%	0.37 Acres	0.18 Acres
Total	**67.8%**	**2.39 Acres**	**1.63 Acres**

Proposed Basins Onsite

Basin ID	Percent Impervious	Area	Impervious Area
B1	13.8%	0.25 Acres	0.04 Acres
B2	71.8%	1.35 Acres	0.97 Acres
B3	34.7%	0.06 Acres	0.02 Acres
B4	53.1%	0.73 Acres	0.39 Acres
Total	**59.1%**	**2.39 Acres**	**1.42 Acres**

As shown in Table 1, the proposed impervious area is 1.42 acres and the impervious area assumed from the Phase III Drainage Report for Ridgegate Southwest Village Filing 1 is 1.63 acres. Since the proposed impervious area is less than the historic impervious area, the proposed development is in conformance with the Filing 1 Phase III Drainage Report and City of Lone Tree Drainage Criteria.

Sincerely,
JR ENGINEERING, LLC

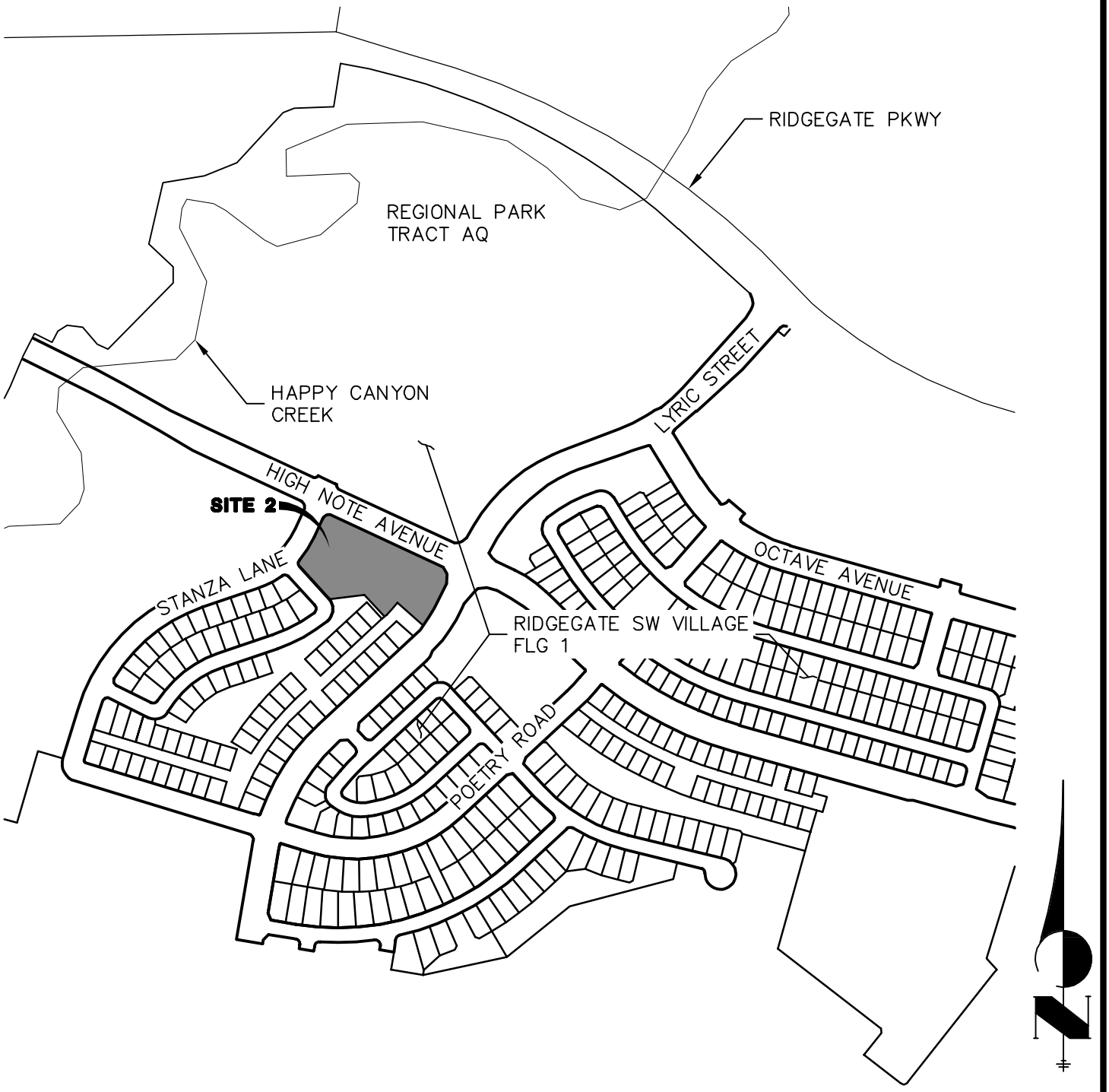
Aaron L. Clutter, P.E.

Attachments:

- Attachment A
  - Vicinity Map
  - NRCS Soils Map
  - FEMA Flood Insurance Rate Map
- Attachment B
  - Hydrologic Calculations
- Attachment C
  - References-Previously Approved Phase III Drainage Report, Addendum #1, Sheet 7
- Attachment D
  - Historic Drainage Map
  - Proposed Drainage Plan

ATTACHMENT A

FIGURES



VICINITY MAP

SCALE 1'=500'

SITE 2
15950.04
6/06/22
SHEET 1 OF 1

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Custom Soil Resource Report
Soil Map

Map Scale: 1:5,070 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Castle Rock Area, Colorado
Survey Area Data: Version 14, Aug 31, 2021

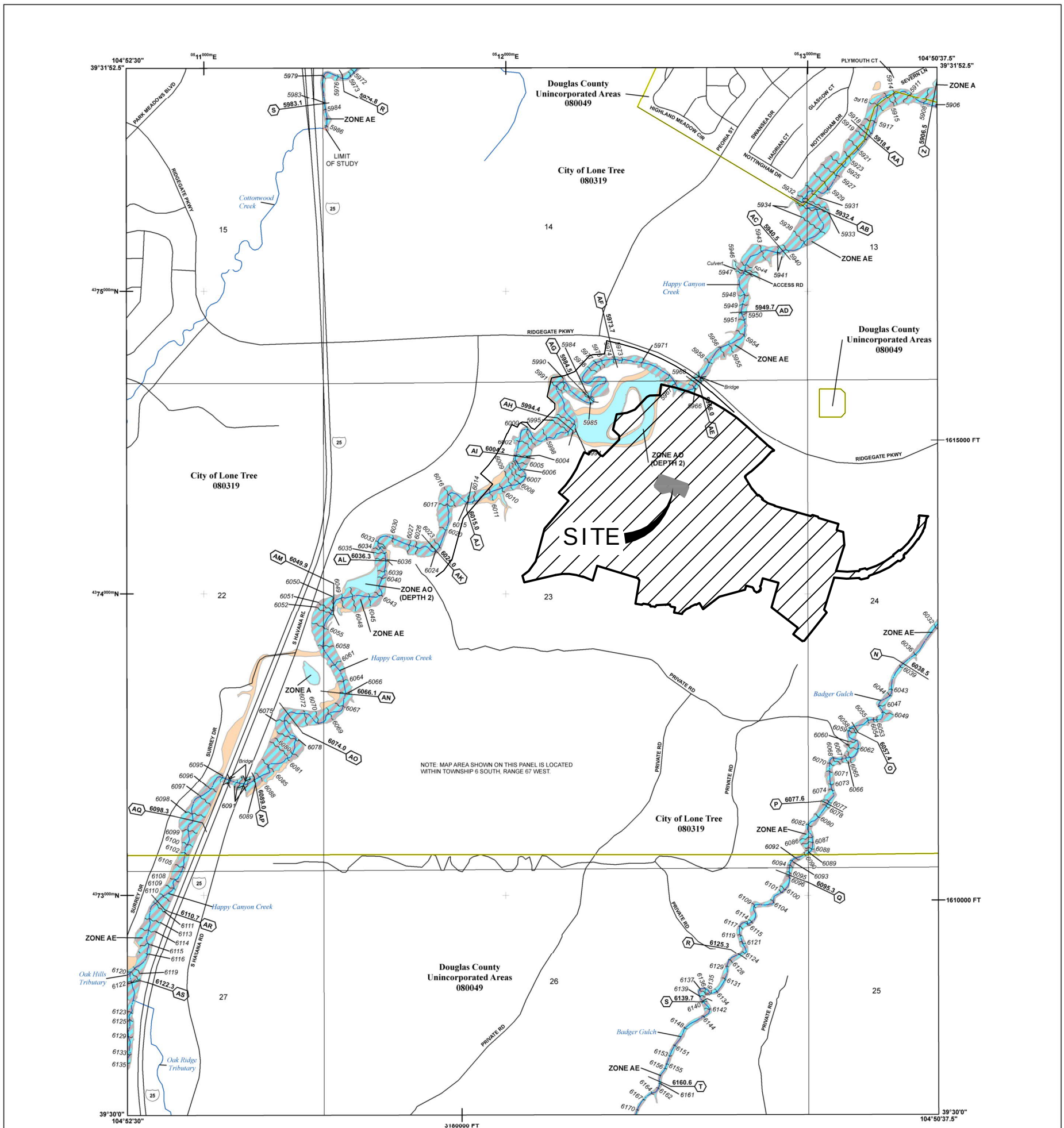
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
En	Englewood clay loam	34.5	32.2%
Fu	Fondis-Kutch association	33.9	31.6%
Lo	Loamy alluvial land	15.4	14.4%
NsE	Newlin-Satanta complex, 5 to 20 percent slopes	21.1	19.7%
RmE	Renohill-Buick complex, 5 to 25 percent slopes	2.2	2.0%
Totals for Area of Interest		**107.0**	**100.0%**



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes. *Zone X*

OTHER AREAS
- NO SCREEN Areas of Minimal Flood Hazard *Zone X*
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Accredited or Provisionally Accredited Levee, Dike, or Floodwall
- Non-accredited Levee, Dike, or Floodwall

OTHER FEATURES
- E 18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

SCALE

Map Projection:
NAD83 UTM Zone 13N
Western Hemisphere; Vertical Datum: NAVD88

1 inch = 500 feet 1:6,000

0 1,000 2,000 Feet

0 250 500 Meters

PANEL LOCATOR

FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO
And Incorporated Areas

PANEL 63 OF 495

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0063	H
LONE TREE, CITY OF	080319	0063	H

VERSION NUMBER
2.3.3.2

MAP NUMBER
08035C0063H

MAP REVISED
SEPTEMBER 4, 2020

ATTACHMENT B

HYDROLOGIC CALCULATIONS

COMPOSITE % IMPERVIOUS CALCULATIONS

Subdivision: Ridgegate
Location: Douglas County - Zone 1

Project Name: Thrive Townhomes at Ridgegate
Project No.: 15950.04
Calculated By: CGM
Checked By:
Date: 6/17/22

Basin ID	Total Area (ac)	Multi-Family Residential			Roads/Pond			Open Space/Park			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
B1	0.25	75%	0.00	0.0%	100%	0.03	12.0%	2%	0.22	1.8%	13.8%
B2	1.35	75%	0.74	41.1%	100%	0.41	30.4%	2%	0.20	0.3%	71.8%
B3	0.06	75%	0.00	0.0%	100%	0.02	33.3%	2%	0.04	1.3%	34.7%
B4	0.73	75%	0.43	44.2%	100%	0.06	8.2%	2%	0.24	0.7%	53.1%
TOTAL	2.39										59.1%

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS

Subdivision: Ridgegate
Location: Douglas County - Zone 1

Project Name: Thrive Townhomes at Ridgegate
Project No.: 15950.04
Calculated By: CGM
Checked By:
Date: 6/17/22

Basin ID	Total Area (ac)	Basins Total Weighted % Imp.	Hydrologic Soil Group			Hydrologic Soil Group			Minor Coefficients			Major Coefficients			Basins Total Weighted C_5	Basins Total Weighted C_{100}
			Area A (ac)	Area B (ac)	Area C/D (ac)	% A (ac)	% B (ac)	% C/D (ac)	$C_{5,A}$	$C_{5,B}$	$C_{5,C/D}$	$C_{100,A}$	$C_{100,B}$	$C_{100,C/D}$		
B1	0.25	13.8%	0.00	0.00	0.25	0%	0%	100%	0.07	0.10	0.15	0.22	0.49	0.54	0.15	0.54
B2	1.35	71.8%	0.00	0.00	1.35	0%	0%	100%	0.56	0.60	0.62	0.67	0.76	0.78	0.62	0.78
B3	0.06	34.7%	0.00	0.00	0.06	0%	0%	100%	0.22	0.27	0.32	0.38	0.59	0.63	0.32	0.63
B4	0.73	53.1%	0.00	0.00	0.73	0%	0%	100%	0.38	0.43	0.47	0.52	0.68	0.70	0.47	0.70
TOTAL	2.39	59.1%	0.00	0.00	2.39	0%	0%	100%	---	---	---	---	---	---	0.52	0.73

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

Where:

i = % imperviousness (expressed as a decimal)

C_A = Runoff coefficient for Natural Resources Conservation Service (NRCS) HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

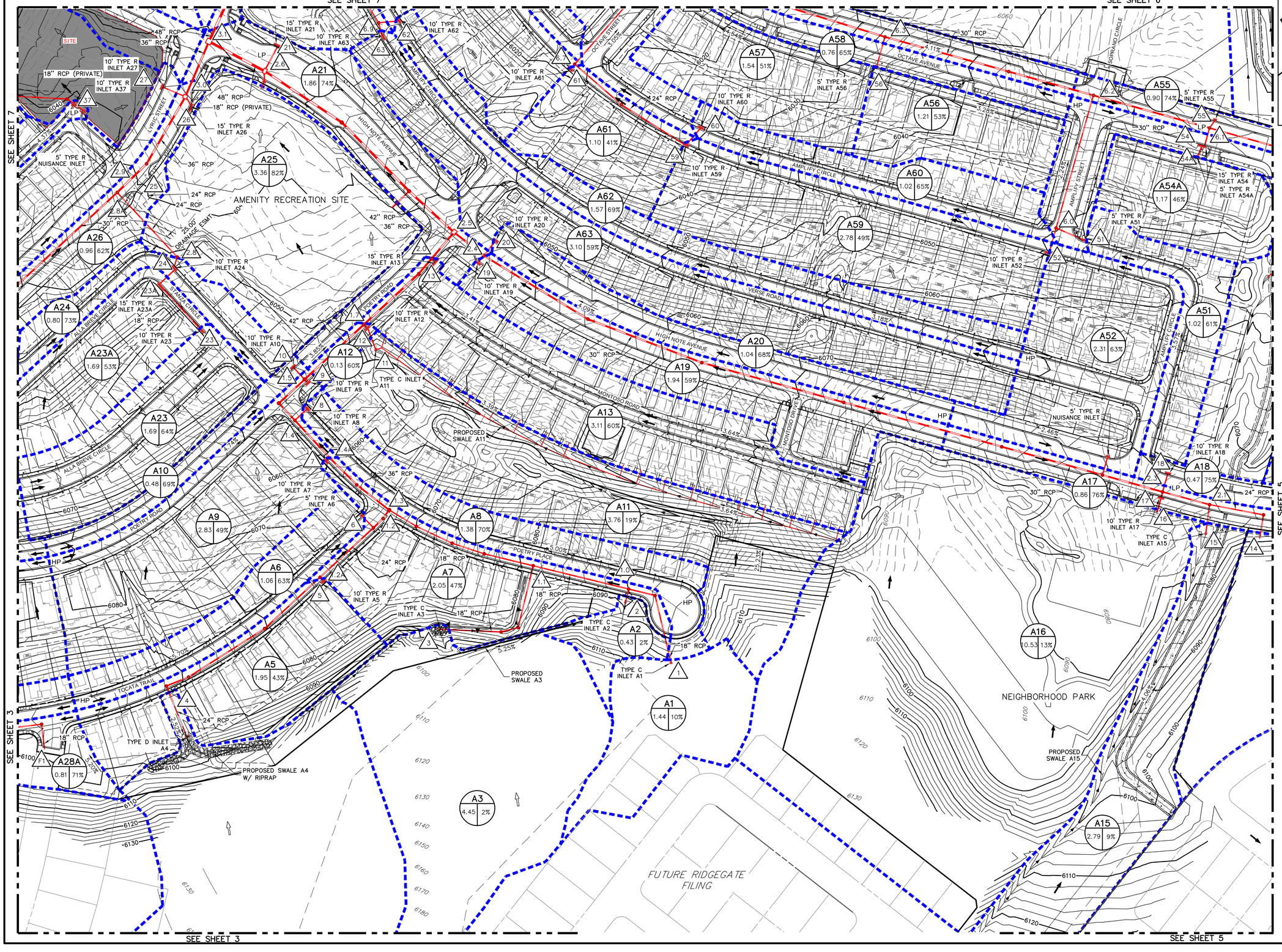
$C_{C/D}$ = Runoff coefficient for NRCS HSG C and D soils.

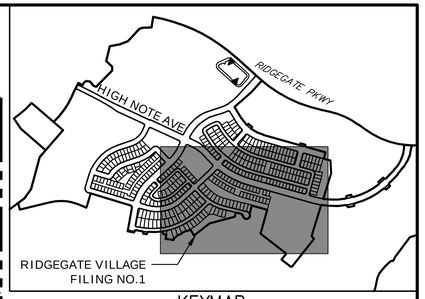
ATTACHMENT C

REFERENCED MATERIAL

RIDGEGATE FILING 1 DEVELOPMENT

PHASE III DRAINAGE REPORT - ADDENDUM #1





KEYMAP

SCALE: 1"=1000'

80 40 0 80 160

ORIGINAL SCALE: 1" = 80'

LEGEND:

- PROPOSED STORM SEWER
- 6000 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 6000 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- DRAINAGE BASIN
- A = BASIN DESIGNATION; B = AREA IN ACRES; C = PERCENT IMPERVIOUS
- 1 DESIGN POINT
- HP HIGH POINT
- LP LOW POINT
- DRAINAGE ARROW
- EXISTING DRAINAGE ARROW
- PROPOSED DRAINAGE SWALE

PHASE III DRAINAGE MAP
RIDGEGATE DEVELOPMENT
JOB NO. 15950.01
6/4/21 REV. 9/17/21
SHEET 4 OF 7

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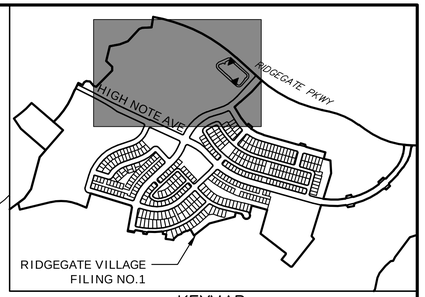
RIDGEGATE FILING 1 DEVELOPMENT

PHASE III DRAINAGE REPORT - ADDENDUM #1



KEYMAP
SCALE: 1"=1000'

EURV POND A		
Tributary Area:	171.50	AC
Percent Impervious:	48.30	%
WQCV:	2.892	AC-FT
WQCV WSEL:	5983.35	FT
EURV:	7.815	AC-FT
EURV WSEL:	5986.08	FT
100-YR VOLUME:	10.145	AC-FT
100-YR WSEL:	5987.22	FT
INFLOW:	430.84	CFS
OUTFLOW:	344.25	CFS

80 40 0 80 160
ORIGINAL SCALE: 1" = 80'

LEGEND:

- PROPOSED STORM SEWER
- 6000 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 6000 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- DRAINAGE BASIN
- A = BASIN DESIGNATION; B = AREA IN ACRES; C = PERCENT IMPERVIOUS
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- HP HIGH POINT
- LP LOW POINT
- DRAINAGE ARROW
- EXISTING DRAINAGE ARROW
- PROPOSED DRAINAGE SWALE

PHASE III DRAINAGE MAP
RIDGEGATE DEVELOPMENT
JOB NO. 15950.01
6/4/21 REV. 9/17/21
SHEET 7 OF 7

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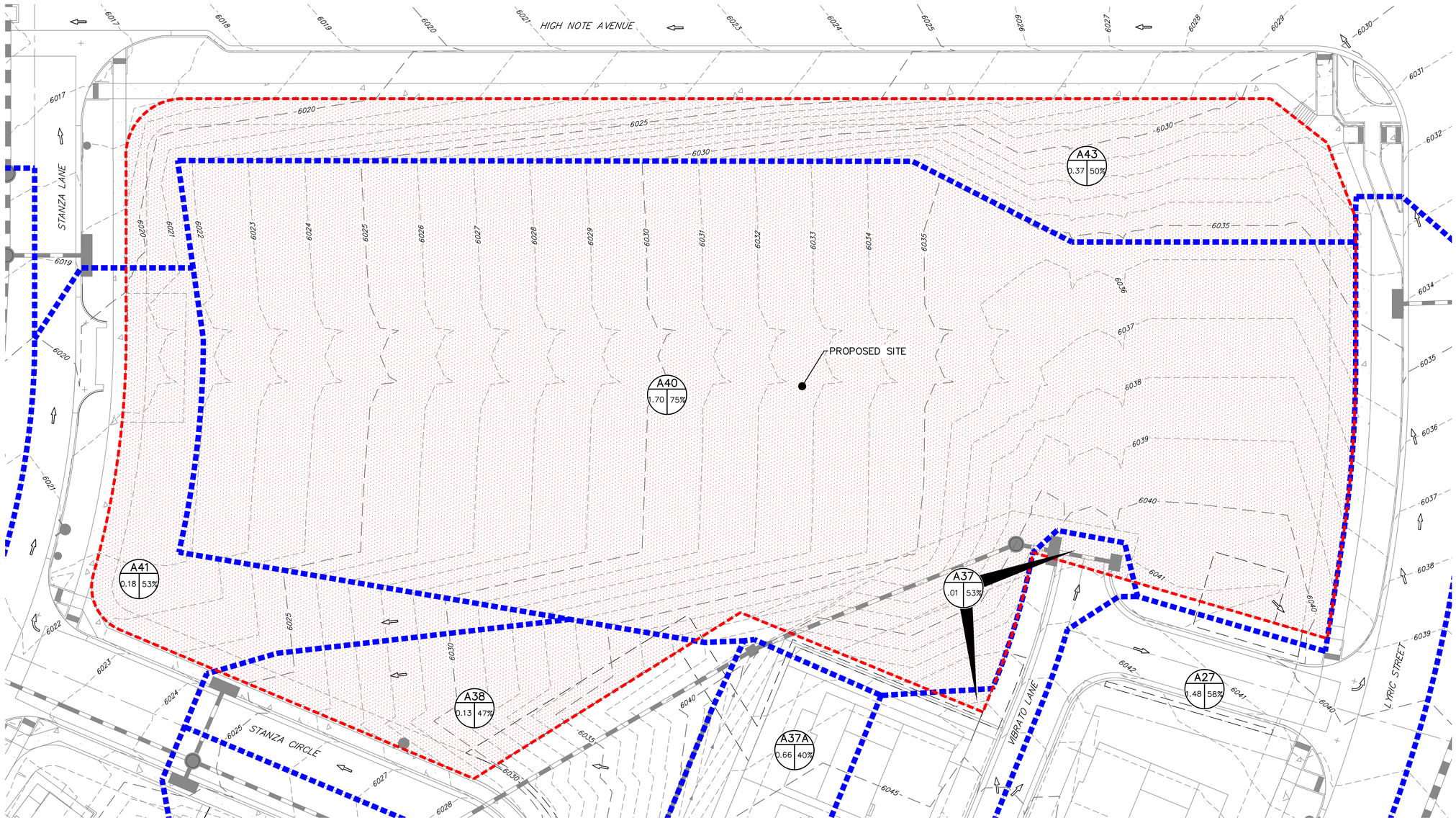
SEE SHEET 2
SEE SHEET 3
SEE SHEET 6

ATTACHMENT D

DRAINAGE MAPS

THRIVE TOWNHOMES AT RIDGEGATE

HISTORIC DRAINAGE MAP



LEGEND:

- EXISTING STORM SEWER
- 6000 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED DRAINAGE BASIN
- EXISTING DRAINAGE BASIN
- A = BASIN DESIGNATION
  B = AREA IN ACRES
  C = 5–YR RUNOFF COEFFICIENT
  D = 100–YR RUNOFF COEFFICIENT
- 1 DESIGN POINT
- EXISTING DRAINAGE ARROW
- PROPOSED SITE

20 10 0 20 40

ORIGINAL SCALE: 1" = 20'

HISTORIC DRAINAGE MAP
THRIVE TOWNHOMES AT RIDGEGATE
JOB NO. 15950.04
6/17/2022
SHEET 1 OF 1

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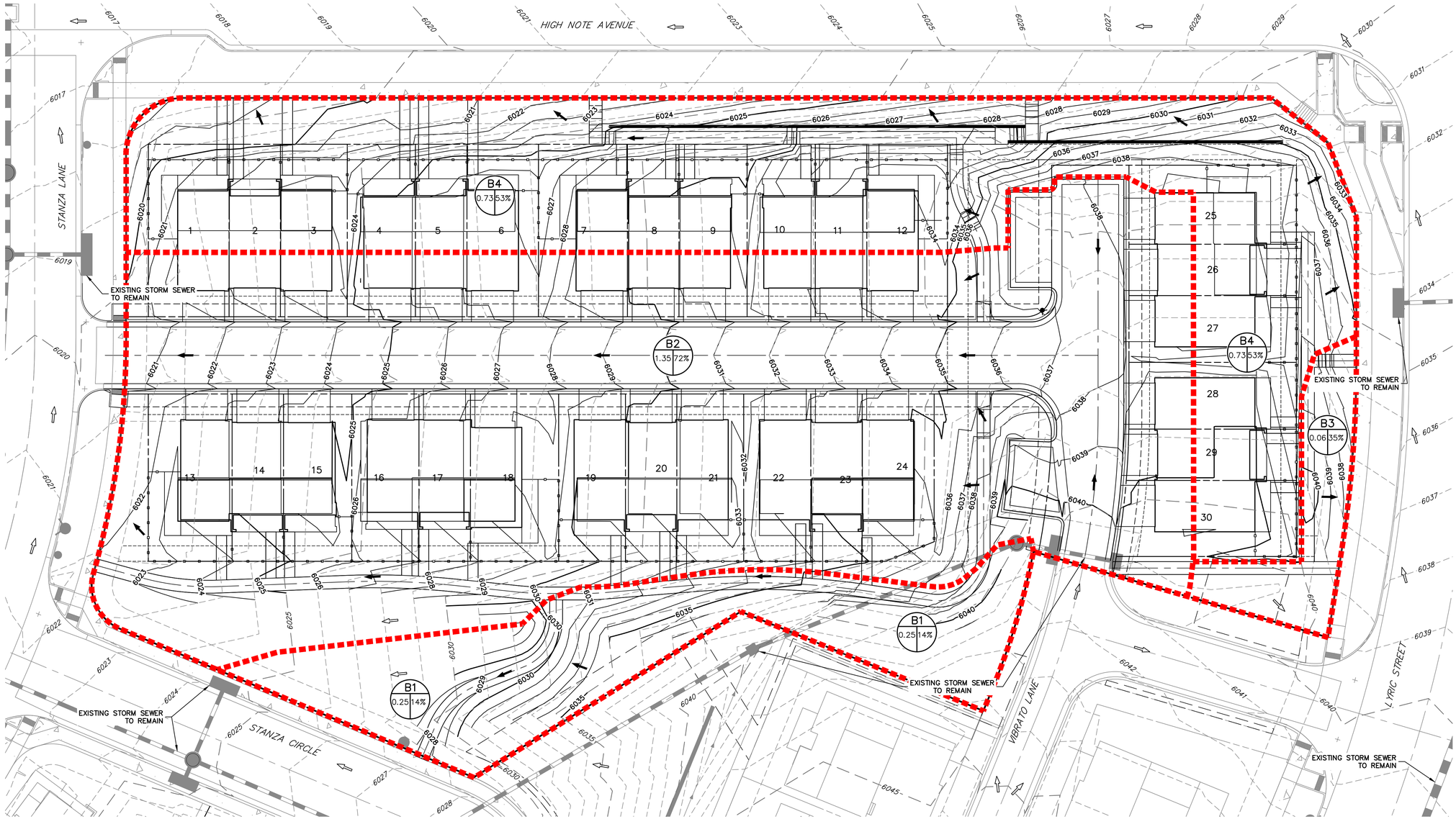
THRIVE TOWNHOMES AT RIDGEGATE

DRAINAGE MAP



LEGEND:

- PROPOSED STORM SEWER
- EXISTING STORM SEWER
- 6000 PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- 6000 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED DRAINAGE BASIN

A = BASIN DESIGNATION
B = AREA IN ACRES
C = 5-YR RUNOFF COEFFICIENT
D = 100-YR RUNOFF COEFFICIENT

1 DESIGN POINT

DRAINAGE ARROW

EXISTING DRAINAGE ARROW

20 10 0 20 40

ORIGINAL SCALE: 1" = 20'

DRAINAGE MAP
THRIVE TOWNHOMES AT RIDGEGATE
JOB NO. 15950.04
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SHEET 1 OF 1

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