

Davis Development Multi Family

UTILITY CONFORMANCE LETTER

Project:

**Davis Development Multi-Family
Aurora, Colorado**

Client:

**Davis Development, Inc.
7375 W. 52nd Avenue. Ste. 200
Arvada, CO 80002
Michael Lee
303-302-2502**

Prepared By:

**Kimley-Horn and Associates, Inc.
1125 17th Street, Suite 1400
Denver, CO 80202**

Prepared: April 13, 2022

APPROVED FOR ONE YEAR FROM THIS DATE	

City Engineer	Date
Water Department	Date
Fire Department	Date

ENGINEER'S CERTIFICATION

This report and plan for the utility design of the Vista Creek Multi-Family Development was prepared by me (or under my direct supervision) in accordance with the provisions of City of Aurora Standards and Specifications for Water, Sanitary Sewer and Storm Drainage Criteria and was designed to comply with the provisions thereof.

Adam Harrison, PE
Registered Professional Engineer
State of Colorado No. 51758

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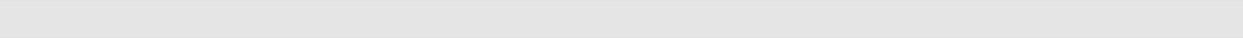
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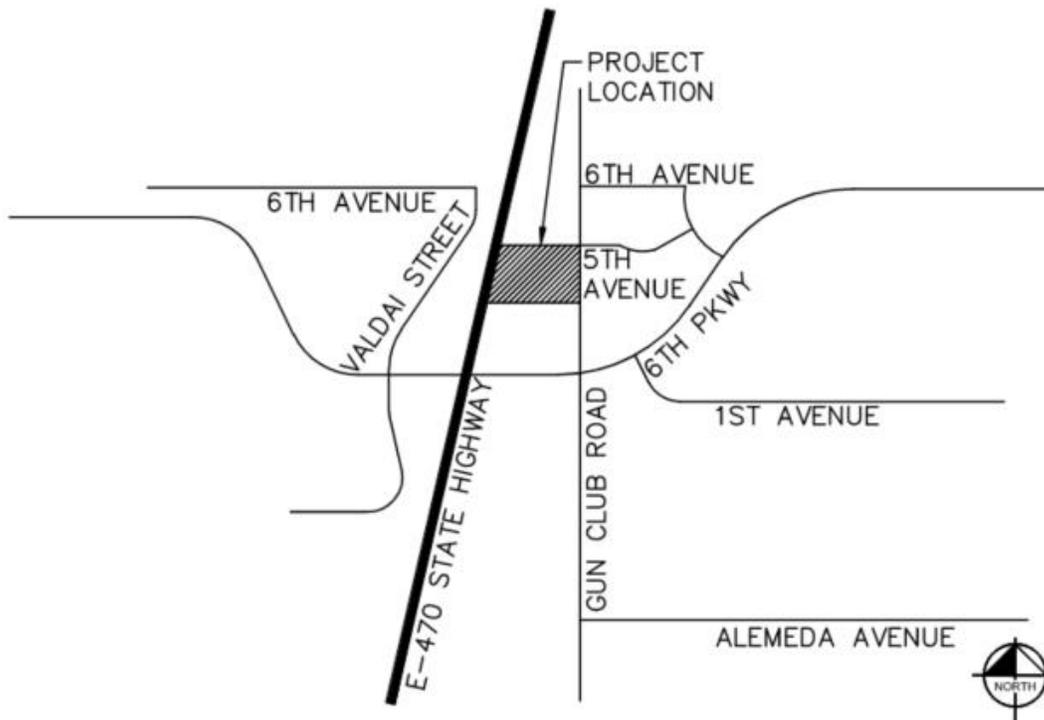
INTRODUCTION

Location

The Site is located to the south of East 5th Avenue and West of Gun Club Road, situated in the Northeast 1/4 of the Northeast 1/4 of the Northeast 1/4 of Section 12, Township 4 South, Range 66 West of the 6th Principal Meridian, County of Arapahoe, State of Colorado. The proposed Project is located bounded by vacant land to the south, East 5th Avenue ROW to the north, E-470 to the west and Gun Club Road to the East. The 12.5 +/- acre project site is currently undeveloped and consists of primarily sparse native grass, weeds, and brush cover.

Vicinity Map

A vicinity map is provided below for reference:



Proposed Land Use

The Site is currently undeveloped land and is zoned Mixed Use Regional district (MU-R). The proposed ±12.5-acre development is anticipated to consist of a multi-family development.

Development of the property will include public road and sidewalk improvements along Gun Club Road. The Project will also include extensions of the sanitary sewer and water distribution systems developed by properties to the south within the Lamar Landing Subdivision. The proposed development of this property is consistent with the current zoning within the E470 Corridor and is in conformance with the City of Aurora Criteria.

SANITARY SEWER SYSTEM

The proposed Project Site is served by the First Creek Transfer line and is located within Sanitary Sewer Basin SS0S3 per the *First Creek Transfer Sanitary Sewer Service Boundary Map* in Appendix C.

The sanitary sewer design outlined herein is consistent with the City of Aurora Standards and Specifications for Water, Sanitary Sewer and Storm Drainage Criteria (the “Criteria”).

Sanitary Sewer Loading

The sanitary sewer loading used for the design of the main is based on the tables provided in Section 5.03.9 of the Criteria as outlined below for each of the anticipated uses on site:

Table 1: Sanitary Sewer Loads	
<i>Use</i>	<i>Average Day Flow</i>
Multi-Family	68 gpd/capita

The proposed sanitary sewer main shall be sized for the *Peak Hourly Flow*, which is equal to the Average Day Flow multiplied by the *Peaking Factor*. The peaking factor from the *First Creek Transfer Sanitary Sewer Service Boundary Map* of 2.38 was used for the calculation of the loading. The total Peak Hourly and Average Daily flows anticipated to be added to the existing transfer sewer main are summarized in Table 2 below. A detailed analysis of each Sanitary Sewer Basin and pipe size has been included in Appendix A.

Table 2: Sanitary Sewer Loading Analysis				
<i>Area/Land Use</i>	<i>Area (ac)</i>	<i>Average Daily Flow (gpd)</i>	<i>Total Avg Daily Flow (gpm)</i>	<i>Peak Hour Flow (gpm)</i>
PA-7 - Detention	1.14	-	-	-
PA-4 - Retail	3.53	5,295.00	4.04	9.12
PA-8 - Open Space	1.55	-	-	-
PA-6 - Retail	2.61	3,915.00	2.99	6.74
PA-3 - Retail	1.92	2,880.00	2.20	4.96
PA-2 - Multi Family	1.77	7,722.76	5.90	13.30
PA-5 - Open Space	1.03	-	-	-
PA-10 – Davis MF	12.5	52,364.08	40.00	90.18
Vista Creek MF	9.13	59,898.48	45.76	103.16
PA-11 - Open Space	1.13	-	-	-
Total to Ex Sanitary Sewer Main				227.46

The proposed sanitary sewer main shall be sized for the *Peak Hourly Flow*, which is equal to the Average Day Flow multiplied by the *Peaking Factor* as found in the equation below with a maximum result of 4 and a minimum of 1.7

$$\text{Peaking Factor} = 5 \div p^{0.167}, \text{ where 'p' is population in thousands}$$

When applied to each of the proposed uses, the peaking factor was greater than 4.0, thus 4.0 has been utilized as the peaking factor for the entire site. See the sanitary loading used to size the proposed main extension to the Vista Creek development below in Table 3.

Table 3: Sanitary Sewer Loading Analysis for Main Sizing				
<i>Area/Land Use</i>	<i>Area (ac)</i>	<i>Average Daily Flow (gpd)</i>	<i>Total Avg Daily Flow (gpm)</i>	<i>Peak Hour Flow (gpm)</i>
PA-10 Davis MF	12.5	52,364.08	40.00	149.09

Sanitary Sewer Connectivity

The proposed sanitary sewer main extension will be approximately 670 lineal feet and will serve the Vista Creek MF Development. The main will extend the 1,110 lineal foot main extension installed by the Lamar Landing development for a total contributing area of ±34.1-acres. A new 8-inch PVC sanitary sewer main line extension will extend north from the stub installed by the development to the south. A peaking factor of 4.0 will be used to design the main extension to the Vista Creek development, see the calculations in Appendix A.

Sanitary Sewer Demand Summary

The First Creek Transfer Sanitary Sewer Service Boundary Map outlines Sanitary Sewer Basin SS0S3 consisting of 62-acres and with an overall anticipated peak hour demand of 244.0 gpm, however it is critical to note that the basin peak flows were determined using a peaking factor of 2.38. Summing the flows from the Lamar Landing Master Utility Report and the Vista Creek Multi Family development yields a peak flow of 227.46 gpm, which is less than the 244.0 gpm from the First Creek Transfer station study.

WATER SYSTEM

The water demand rates and distributions system design are based on the City of Aurora Standards and Specifications for Water.

Water Distribution Loading

The domestic water and fire flow design has been based on the following typical demand rates, consistent with the City Criteria as outlined below in Tables 4 and 5.

Table 4: Domestic Water Demands			
<i>Use</i>	<i>Average Day</i>	<i>Max Day</i>	<i>Max Hour</i>
Multifamily	101 gpd/capita ¹	Average Day x2.8	Average Day x4.5

¹ MF zoning assumes 2.77 people per unit

The fire flows have been calculated based on the City of Aurora adopted fire code IFC 2015. Based on the typical demand rates as summarized in Table 3 and the IFC, the resulting water demands for the Lamar Landing Subdivisions are as follows:

Table 5: Water Demand Analysis Summary			
Area/Land Use	Demand (gpm)		
	Average Day	Max Day	Peak Hour
PA-7 - Detention	-	-	-
PA-4 - Retail	3.68	10.30	16.55
PA-8 - Open Space	-	-	-
PA-6 - Retail	2.72	7.61	12.23
PA-3 - Retail	2.00	5.60	9.00
PA-2 - Multi Family	7.97	22.30	35.85
PA-5 - Open Space	-	-	-
Vista Creek MF	61.78	172.99	278.02
PA-10 – Davis MF	54.01	370.03	243.05

Water Distribution Modeling

The Project is in Aurora pressure zone 3 with and has an HGL of 5,720. The maximum pressure is assumed to be 72 psi and the min pressure assumed to be 68 psi. Consistent with the City Criteria and ISO Criteria, the system will be analyzed based on the maximum day plus fire flow demand with a minimum residual pressure of 20 psi. The system will also meet the maximum allowable velocity of 3.0 fps for 8-inch domestic lines during both the average day and peak hour scenarios and maximum velocity of 10.0 fps for 8-inch domestic lines and up to 15.0 fps for the hydrant lines during the fire flow scenario. The fire flow component of the water distribution system was evaluated to display 1,500 gpm of flow is available at each hydrant and throughout the system while maintaining allowable pressures, per the 2009 IFC.

Water Connectivity

The Vista Creek water line will connect to the existing 8-inch water main loop constructed by the proposed Lamar Landing Subdivision to the south, and loop to an existing water line constructed in the Gun Club Road ROW. The new 8-inch main will connect to the existing main in Gun Club Road at two locations, at the north end and south end of the Gun Club site frontage. The 8-inch water main will be located within a utility easement along the private access drives around the site. Additional 8-inch water stubs will be installed to serve each of the future developments within the subdivision.

CONCLUSIONS

This utility conformance letter was prepared in compliance with the City of Aurora Standards and Specifications for Wastewater and Water Distribution Systems. The proposed sanitary sewer and domestic water systems will provide adequate capacity to serve the Vista Creek Multi Family Development.

REFERENCES

Water, Sanitary Sewer & Storm Drainage Infrastructure Standards and Specifications, City of Aurora; September 2019.

Cross Creek Master Utility Report, High Country Engineering, October 2002.

Lamar Landing Master Utility Report, Kimley-Horn, March 2021

Appendix A
Sanitary Sewer Demands

Sanitary Sewer Loading Analysis for Interceptor										
Area/Land Use	Area (ac)	Dwelling Units (DU) ²	Equivalent Population ¹	Loading Rate (gpd/capita)	Average Daily Flow (gpd)	Average Daily Flow (gpm)	Infiltration @10% (gpm)	Total Avg Daily Flow (gpm)	Peaking Factor ³	Peak Hour Flow (gpm)
PA-7 - Detention	1.14	-	-	-	-	-	-	-	-	-
PA-4 - Retail	3.53	-	77.66	1,500	5,295	3.68	0.37	4.04	2.38	9.12
PA-8 - Open Space	1.55	-	-	-	-	-	-	-	-	-
PA-6 - Retail	2.61	-	57.42	1,500	3,915	2.72	0.27	2.99	2.38	6.74
PA-3 - Retail	1.92	-	42.24	1,500	2,880	2.00	0.20	2.20	2.38	4.96
PA-2 - Multi Family	1.77	41	113.57	68	7,723	5.36	0.54	5.90	2.38	13.30
PA-5 - Open Space	1.03	-	-	-	-	-	-	-	-	-
PA-10 - Davis MF	12.50	278	770.06	68	52,364	36.36	3.64	40.00	2.38	90.18
Vista Creek MF	9.13	318	880.86	68	59,898	41.60	4.16	45.76	2.38	103.16
PA-11 - Open Space	1.13	-	-	-	-	-	-	-	-	-
Total to Ex Sanitary Sewer Main										227.46
Cross Creek Regional Utility Peak Hour Flow from Basin SSOS3										244.00

¹ Multi-family at 2.77 persons per DU, Equivalent population for retail/commercial is 22/acre

² Assumes 23/units per Acre

³ Peaking factor from Cross Creek Regional Utility

Sanitary Sewer Loading for Proposed 8" Main										
Area/Land Use	Area (ac)	Dwelling Units (DU) ²	Equivalent Population ¹	Loading Rate (gpd/capita)	Average Daily Flow (gpd)	Average Daily Flow (gpm)	Infiltration @10% (gpm)	Total Avg Daily Flow (gpm)	Peaking Factor ⁴	Peak Hour Flow (gpm)
PA-10 -Davis MF	12.50	278	770.06	68	52,364	36.36	3.64	40.00	4.00	149.09

⁴Peaking Factor = $5 \div p^{0.167}$, where 'p' is population in thousands

Davis Development MF Proposed Sanitary Sewer Main

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth
Input Data	
Roughness Coefficient	0.010
Channel Slope	0.600 %
Diameter	8.0 in
Discharge	149.09 gal/min
Results	
Normal Depth	2.9 in
Flow Area	0.1 ft ²
Wetted Perimeter	0.9 ft
Hydraulic Radius	1.6 in
Top Width	0.64 ft
Critical Depth	3.2 in
Percent Full	35.7 %
Critical Slope	0.391 %
Velocity	2.97 ft/s
Velocity Head	0.14 ft
Specific Energy	0.37 ft
Froude Number	1.249
Maximum Discharge	587.47 gal/min
Discharge Full	546.13 gal/min
Slope Full	0.045 %
Flow Type	Supercritical

V: 1	H: 1
------	------

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Average End Depth Over Rise	0.0 %
Normal Depth Over Rise	35.7 %
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.9 in
Critical Depth	3.2 in
Channel Slope	0.600 %
Critical Slope	0.391 %

Appendix B
Water Demands

Water Demand Analysis									
<i>Area/Land Use</i>	<i>Area (ac)</i>	<i>Dwelling Units (DU)¹</i>	<i>Equivalent Population</i>	<i>Average Day Per Capita Flow (gpd)</i>	<i>Average Daily Flow (gpm)</i>	<i>Max Hour: Average Day Factor</i>	<i>Max Hour (gpm)</i>	<i>Max Day: Average Day Factor</i>	<i>Max Day (gpm)</i>
Davis MF	12.50	278	770.06	101	54.01	4.50	243.05	2.80	151.23

¹ Multi-family at 2.77 persons per DU, Equivalent population for retail/commercial is 22/acre

Water Demand Analysis Summary - From Lamar Landing Master Utility Report

Area/Land Use	Demand (gpm)		
	Average Day	Max Day	Peak Hour
PA-7 - Detention	-	-	-
PA-4 - Retail	3.68	10.30	16.55
PA-8 - Open Space	-	-	-
PA-6 - Retail	2.72	7.61	12.23
PA-3 - Retail	2.00	5.60	9.00
PA-2 - Multi Family	7.97	22.30	35.85
PA-5 - Open Space	-	-	-
Vista Creek MF	61.78	172.99	243.05
PA-10 - Davis MF	54.01	151.23	243.05
Total	132.15	370.03	559.73



**Required Fire Flow Calculations
Vista Creek MF
Aurora, Colorado**

Project Description: Multi-Family Residential
 Construction Type: V-A
 Total Building Area (sf) 330,544
 Sprinklered?: Sprinklered per NFPA 13

Determine construction types, area of each construction type, % of each construction type vs. total, and total square footage.

	Construction Type	SF of Construction Type	% of Total Building	Required Fire Flow (gpm)	Reduced Fire Flow for Sprinklers (gpm)*
NE Bldg 2	V-A	77,070	23.3%	6,000	1500
NW Bldg 1	V-A	69,655	21.1%	4,500	1500
SE Bldg 4	V-A	85,039	25.7%	6,000	1500
SW Bldg 3	V-A	98,780	29.9%	5,000	1500
Sum	V-A	330,544	100%	--	--

*A reduction in required fire-flow of up to 75 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system installed in accordance with Section 903.3.1.2. The resulting fire-flow shall not be less than 1,500 gallons per minute (5678 L/min) for the prescribed duration as specified in Table B105.1.

Apply Fire Flow to Hydrant Table (Table C105.1)

1 Hydrants Required**

**A. If hydrant can meet 1,500 gpm @ 20 psi minimum. Based on flow test, the existing hydrant has a flow of 6,048 gpm; therefore no additional hydrant is required to meet the required fire flow of 1,500 gpm minimum.

Average Spacing Required? (Table C105.1) 500 ft***

***f. A 50-percent spacing increase shall be permitted where the building is equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1

Current Fire Hydrants 6
Current Average Spacing 250 ft

We have spaced these hydrants to provide access to all sides of the buildings

Appendix C
Reference Utility Maps

202189 2/3

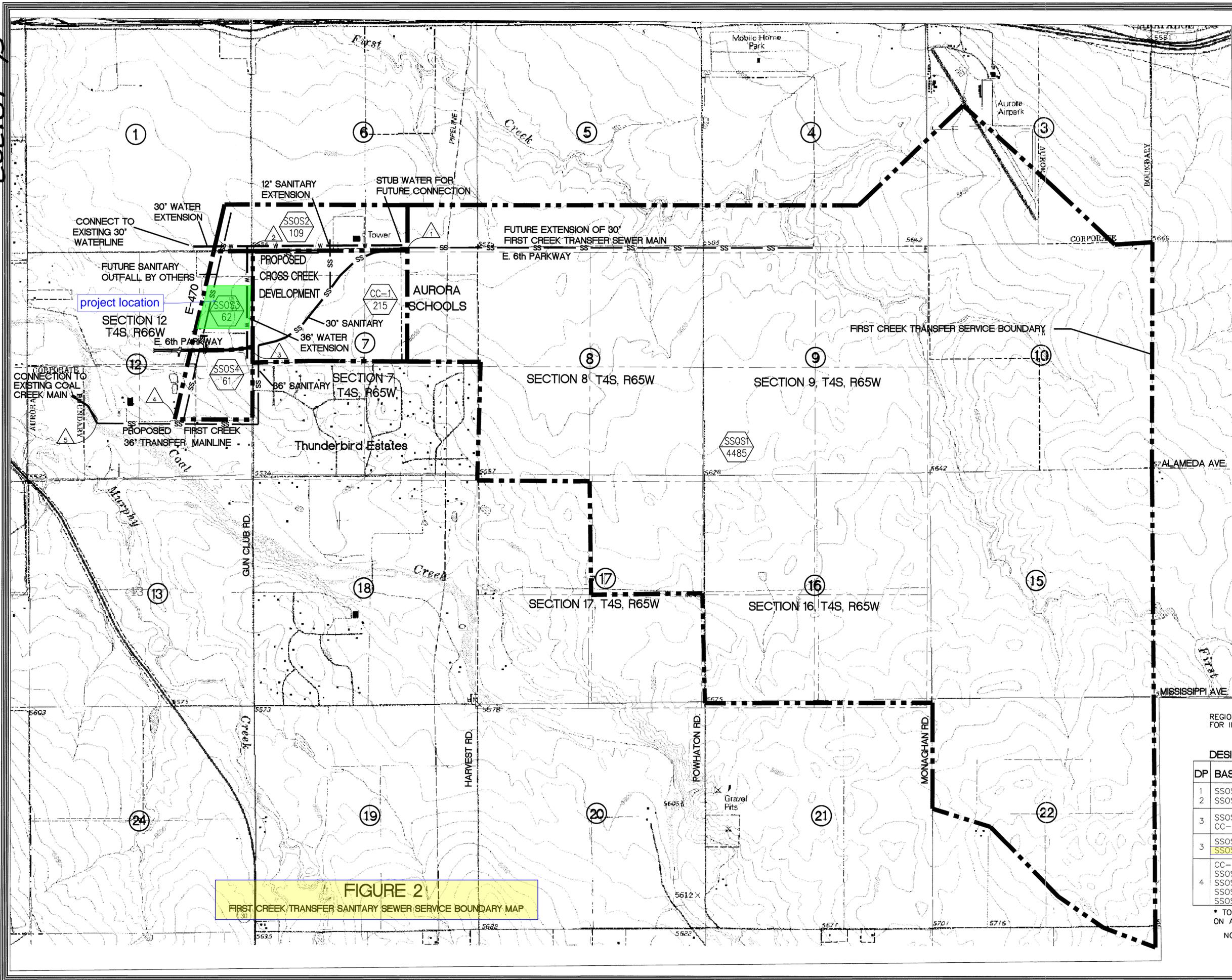
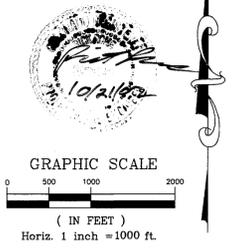


FIGURE 2
FIRST CREEK TRANSFER SANITARY SEWER SERVICE BOUNDARY MAP

- LEGEND**
- BASIN DESIGNATION
 - AREA (ACRES)
 - DESIGN POINT
 - BASIN BOUNDARY
 - SEWER TRUNK LINE
 - WATERLINE



REGIONAL DESIGN PRESENTED FOR INFORMATION ONLY

DESIGN FLOW SUMMARY CHART

DP	BASIN	BASIN PEAK HOUR	TOTAL PEAK HOUR
1	SSOS1	10,839.0	---
2	SSOS2	429.1	429.1
3	SSOS1	10,839.0	---
	CC-1	770.9	11,609.9
3	SSOS2	429.1	---
	SSOS3	244.0	673.1
4	CC-1	770.9	---
	SSOS1	10,839.0	---
	SSOS2	429.1	---
	SSOS3	244.0	---
	SSOS4	239.8	11,700.9*

* TOTAL BASIN PEAK FLOW IS BASED ON A UNIFORM PEAK FACTOR OF 2.38
NOTE: PEAK HOUR FLOWS MAY NOT BE DIRECTLY ADDITIVE DUE TO VARYING PEAK FACTORS FOR POPULATION DISTRIBUTION.

CALL UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
or 534-6700
OR
CALL 724-8888 DURING ADVANCE
CALLING HOURS TO ADVANCE
FOR THE MARKING OF UNDERGROUND
UTILITIES

NO.	DATE	REVISION	BY

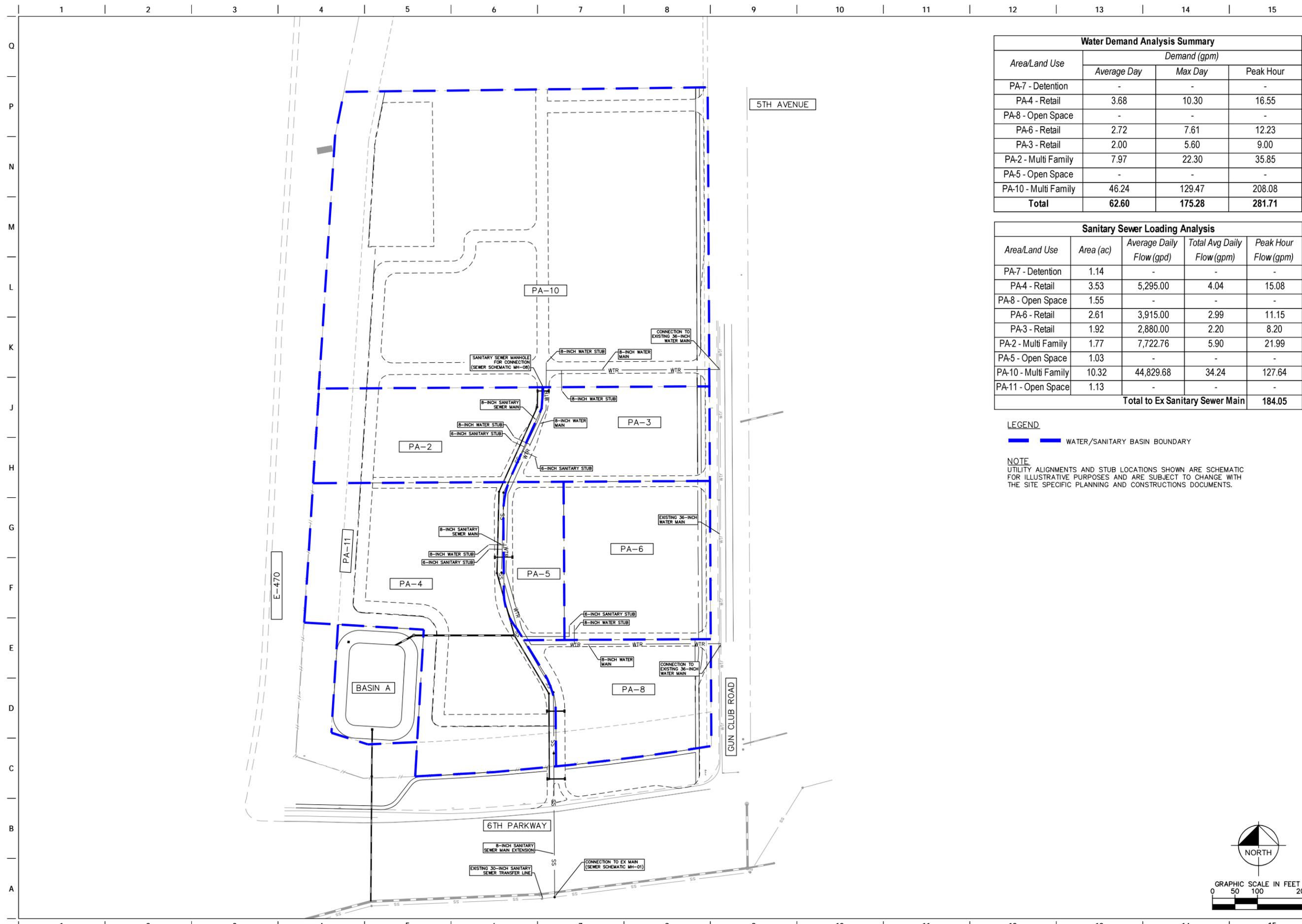
DES. DR. CK. DATE
HIGH COUNTRY ENGINEERING, INC.
14 INVERNESS DRIVE EAST, SUITE D-166
ENGLEWOOD, CO 80112
PH: (303) 925-0544 FX: (303) 925-0547
FILE: SAN-REG-EXHIB



US HOME
AURORA, COLORADO
CROSS CREEK
REGIONAL UTILITY EXHIBIT

PROJECT NO.
2022004.55

202189 2/3



Water Demand Analysis Summary			
Area/Land Use	Demand (gpm)		
	Average Day	Max Day	Peak Hour
PA-7 - Detention	-	-	-
PA-4 - Retail	3.68	10.30	16.55
PA-8 - Open Space	-	-	-
PA-6 - Retail	2.72	7.61	12.23
PA-3 - Retail	2.00	5.60	9.00
PA-2 - Multi Family	7.97	22.30	35.85
PA-5 - Open Space	-	-	-
PA-10 - Multi Family	46.24	129.47	208.08
Total	62.60	175.28	281.71

Sanitary Sewer Loading Analysis				
Area/Land Use	Area (ac)	Average Daily Flow (gpd)	Total Avg Daily Flow (gpm)	Peak Hour Flow (gpm)
PA-7 - Detention	1.14	-	-	-
PA-4 - Retail	3.53	5,295.00	4.04	15.08
PA-8 - Open Space	1.55	-	-	-
PA-6 - Retail	2.61	3,915.00	2.99	11.15
PA-3 - Retail	1.92	2,880.00	2.20	8.20
PA-2 - Multi Family	1.77	7,722.76	5.90	21.99
PA-5 - Open Space	1.03	-	-	-
PA-10 - Multi Family	10.32	44,829.68	34.24	127.64
PA-11 - Open Space	1.13	-	-	-
Total to Ex Sanitary Sewer Main				184.05

LEGEND

— WATER/SANITARY BASIN BOUNDARY

NOTE

UTILITY ALIGNMENTS AND STUB LOCATIONS SHOWN ARE SCHEMATIC FOR ILLUSTRATIVE PURPOSES AND ARE SUBJECT TO CHANGE WITH THE SITE SPECIFIC PLANNING AND CONSTRUCTIONS DOCUMENTS.

PROJECT NO.: 096888000

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4632 South Union Street, Suite 1000
Denver, Colorado 80237 (303) 228-2300

QuikTrip No. 4209

NWC E. 6TH AVE & GUN CLUB RD.
AURORA, CO

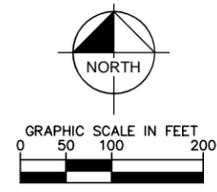


PROTOTYPE: P-99 (08/01/19)
DIVISION:
VERSION: 001
DESIGNED BY:
DRAWN BY:
REVIEWED BY:

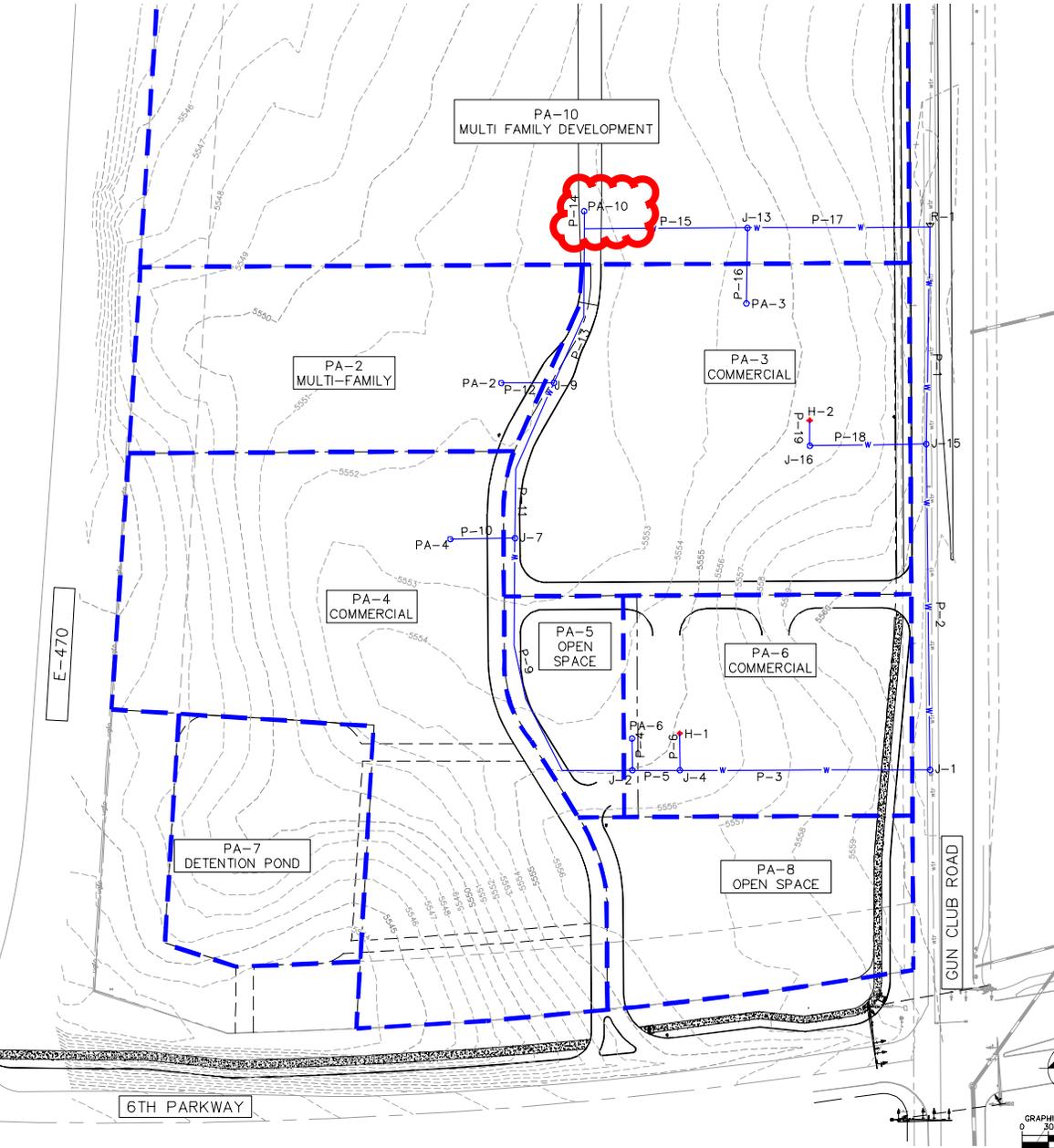
REV	DATE	DESCRIPTION	ORIGINAL ISSUE DATE:

SHEET TITLE:
MASTER UTILITY MAP

SHEET NUMBER:
UT-01



MASTER WATERCAD EXHIBIT



Area/Land Use	Demand (gpm)		
	Average Day	Max Day	Peak Hour
PA-7 - Detention	-	-	-
PA-4 - Retail	3.82	10.70	17.20
PA-8 - Open Space	-	-	-
PA-6 - Retail	1.57	4.40	7.08
PA-3 - Retail	3.08	8.63	13.88
PA-2 - Multi Family	8.55	23.94	38.47
PA-5 - Open Space	-	-	-
PA-10 - Multi Family	42.55	119.14	191.47
Total	59.58	166.81	268.09

APPROVED ON THIS DATE _____

CITY ENGINEER _____ DATE _____

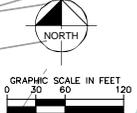
WATER DEPARTMENT _____ DATE _____

FIRE DEPARTMENT _____ DATE _____



LAMAR LANDING

AURORA, COLORADO
March 7, 2022



Kimley»Horn
 4582 SOUTH ULSTER STREET
 SUITE 1500
 DENVER, COLORADO, 80237
 303.228.2300

C:\1507\1507.dwg K:\DATA\COLUMBIAN\QUARTZ\4582 AURORA\CAD\DWG\MASTER WATERCAD DWG.DWG 3/2/2022 10:17 AM

Lamar Landing Subdivision
Water Demand Analysis
Active Scenario: Max Daily + Fire
Fire Flow Node FlexTable: Fire Flow Report

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (Zone)	Velocity of Maximum Pipe (ft/s)
H-1	True	2,500.00	2,501.00	56	J-4	28.38
H-2	True	2,500.00	2,501.00	61	J-16	28.38
J-1	True	2,500.00	2,501.00	68	J-15	0.83
J-2	True	2,500.00	2,501.00	65	H-1	10.39
J-5	True	2,500.00	2,501.00	64	PA-5	9.47
J-7	True	2,500.00	2,501.00	65	PA-5	8.72
J-11	True	2,500.00	2,501.00	66	PA-10	10.50
PA-10	True	2,500.00	2,501.00	64	J-11	16.79
J-9	True	2,500.00	2,501.00	65	PA-2	9.39
PA-2	True	2,500.00	2,501.00	62	J-9	16.11
PA-5	True	2,500.00	2,501.00	59	J-5	15.96
PA-4	True	2,500.00	2,501.00	61	J-7	16.03
PA-6	True	2,500.00	2,501.00	60	H-1	16.01
J-13	True	2,500.00	2,501.00	67	PA-3	12.16
PA-3	True	2,500.00	2,501.00	65	J-13	16.00
J-4	True	2,500.00	2,501.00	64	H-1	10.10
J-16	True	2,500.00	2,501.00	66	H-2	15.96
J-15	True	2,500.00	2,501.00	69	J-1	0.83