TAB

Appendix P:
Sewer System Hydraulic Analysis

Sewer System Hydraulic Analysis

Date: October 1, 2007

For:	City Of Orange	By:	John R Gass, P.E.
	Public Works Department		Project Engineer
	Orange, CA		Hunsaker & Associates Irvine, Inc.

Project: Ridgeline Equestrian Estates

Hunsaker & Associates Irvine, Inc. (H&A) is pleased to submit the Sewer System Hydraulic Analysis for the Ridgeline Equestrian Estates project. This analysis has been prepared to describe the available capacity in the existing sewer system for the aforementioned residential development project in the City of Orange. The project lies within the jurisdiction of the City of Orange and their standards have been used for this report. Hydraulic models were prepared using Haestad Methods software to model the peak flows the proposed sewer systems would experience.
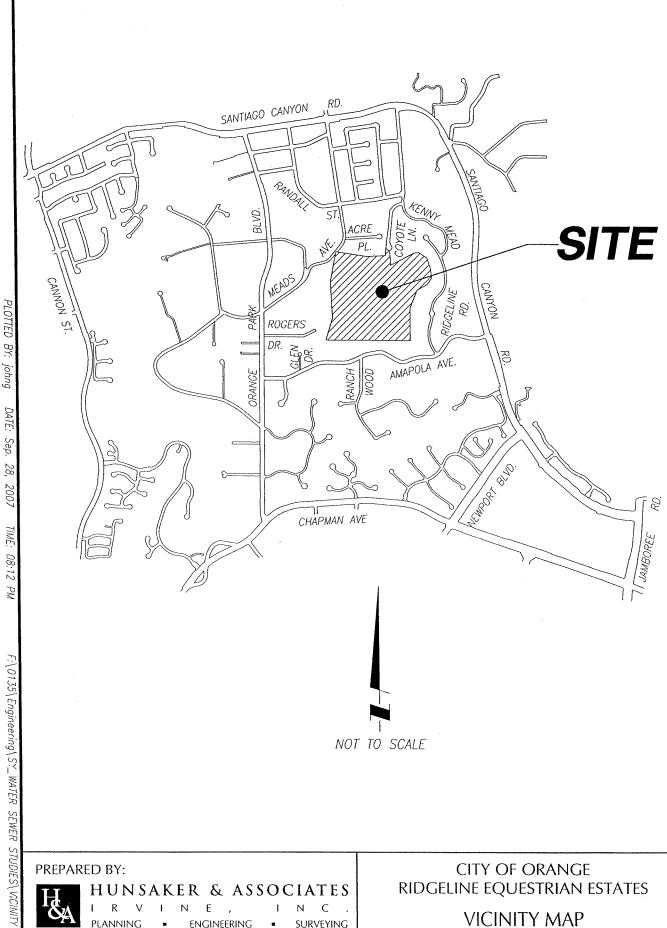
THE EXISTING 8-INCH SEWER SYSTEM WITHIN THE RIDGELINE EQUESTRIAN ESTATES PROJECT MEETS THE DESIGN STANDARDS SPECIFIED BY THE CITY OF ORANGE. This evaluation is based on existing and known conditions and should be re-evaluated if these conditions change or new information becomes available. Any interpretation of the information presented in this report should be referred to H&A to ensure the integrity of the results.

Project Location

The Ridgeline Equestrian Estates project is located adjacent to Meads Avenue in the City of Orange. The general project location is shown on exhibit entitled, "Vicinity Map – Figure 1."

Summary of Findings

1. The upstream tributary area consist of 35 existing dwelling units and the proposed development has 39 Dwelling units for a total of 74 Dwelling units to the existing 8-inch sewer line that runs through the northern portion of the project.

2. The existing and proposed sewer system schematic is shown on the attached "Sewer System Model - Figure 2." The exhibit identifies points of sewer connection, sewer reaches, manholes, proposed and existing sewer mains.

3. The existing onsite sewer system consists of 8-inch diameter mains constructed at slopes of 1.9 percent or greater. The maximum calculated D/d at the minimum slope was 0.12 < 0.5.

SANTIAGO CANYON RD.

SITE

SANTIAGO CANYON RD.

RANDALL ST.

KENNY MEAD

ACRE PL.

COYOTE LN.

RIDGELINE RD.

PARK BLVD.

MEADS AVE.

ROGERS DR.

GLEN DR.

ORANGE

RANCH WOOD

AMAPOLA AVE.

CANNON ST.

NEWPORT BLVD.

CHAPMAN AVE

JAMBOREE RD.

NOT TO SCALE

PREPARED BY:

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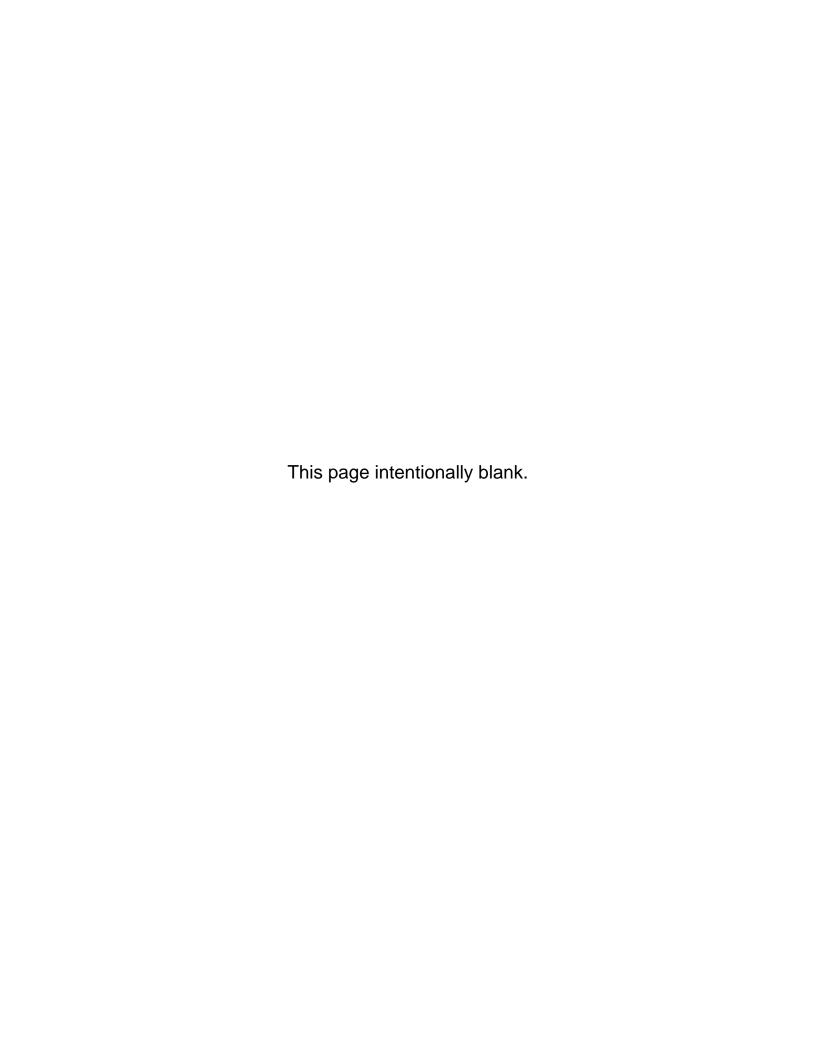
CITY OF ORANGE
RIDGELINE EQUESTRIAN ESTATES

VICINITY MAP

FIGURE
1

JOB NO. 3040-1X   DATE: 10/1/2007

STALLION STREET

RANDALL ST

MEADS AVE

COYOTE LANE

KENNYMEAD ST

ACRE PLACE

TRACT NO. 7238

TRACT NO. 8802

⑤ ④ ③ ② ①

RIDGELINE RD

TRACT NO. 8802

TRACT NO. 931

AMAPOLA AVENUE

LEGEND

——————— PROPOSED ONSITE 8-INCH SEWER LINE

- - - - - - - EXISTING ONSITE 8-INCH
SEWER LINE BEING ANALIZED

- - - - - - - EXISTING OFFSITE 8-INCH SEWER LINE

- - - - - - - EXISTING 12-INCH SEWER LINE

- - - - - - - EXISTING 21-INCH TRUNK SEWER

● EXISTING MANHOLE

● PROPOSED MANHOLE

400' 200' 0' 400' 800'

GRAPHIC SCALE: 1"=400'

PREPARED BY:

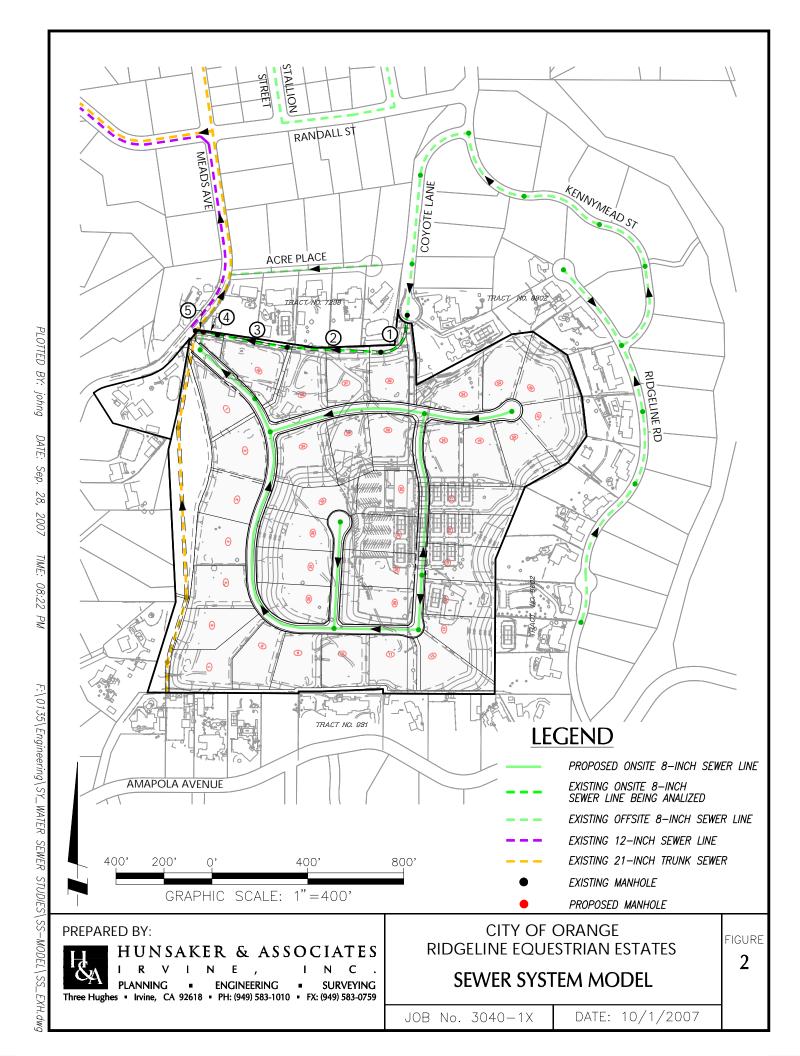## HUNSAKER & ASSOCIATES
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SEWER SYSTEM MODEL

FIGURE

2

JOB No. 3040-1X   DATE: 10/1/2007

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4.   The total estimated sanitary sewer flows for the proposed and existing developments were based upon the City of Orange design criteria. The sanitary sewer flows include the estimated existing and proposed wastewater flows from the drainage area based upon the land uses.

5.   In order to calculate the available capacity of the existing sewer system, we have prepared a hydraulic model using FlowMaster 2005 (v8.0) by Haestad Methods. The summary of outputs from the model runs is included in the Appendix of this report.

We sincerely trust these calculations will provide sufficient evidence that the existing sewer system is adequate for the proposed Ridgeline Equestrian Estates project. Please contact me at (949) 768-2579 or James H. Smith, P.E. at (949) 458-5454 if you have any questions.

JG:tl
Enclosures
xc: Jonathan Petke, H&A

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APPENDIX

SEWER SYSTEM
FLOWMASTER CALCULATIONS

Sewer Study - Ridgeline Equestrian Estates

Estimated Sewer Flows

Reach	Density [1] (DU's)	Duty [2] (gpd/Unit)	Qa (gpd)	∑Qa (gpd)
1	35	298	10,430	10,430
2	-	298	-	10,430
3	-	298	-	10,430
4	-	298	-	10,430
5	39	298	11,622	22,052

Note:

(1) Density is based on a unit count of the tributay area based on City of Orange Atlas map

(2) Duty based on City of Orange Design Criteria

Sewer Study - Ridgeline Equestrian Estates

Existing Sewer System

Estimated Capacity Calculations

Pipe No.	Length (ft)	Pipe Dia (in)	Slope (ft/ft)	Avg. Dry Weather		Peak Dry Weather		
				$\sum Q_{ADWF}$ (mgd)	Velocity (ft/s)	Q_{PDWF} [1] (mgd)	Calc'd [2] d/D	Velocity (ft/s)
1	218	8	0.1123	0.0104	2.8	0.0313	0.08	3.9
2	397	8	0.0190	0.0104	1.5	0.0313	0.12	2.1
3	299	8	0.0382	0.0104	1.9	0.0313	0.10	2.7
4	74	8	0.2020	0.0104	3.4	0.0313	0.07	4.8
5	22	8	0.2020	0.0221	4.3	0.0662	0.10	6.1

Note:

(1) $Q_{PDWF} = 3 \times (Q_{ADWF})$

(2) FlowMaster Calculation (City's Design Criteria = d/D $\leq$ 0.50 @ Q_{PDWF})

Sewer Study - Ridgeline Equestrian Estates
Existing Sewer System
(Peak Dry Weather Flows)
FlowMaster Calculations

Project Description

Worksheet:	Reach 1
Flow Element:	Circular Pipe
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.1123	ft/ft
Diameter	8	in
Discharge	0.0313	mgd

Results

Normal Depth	0.05	in
Flow Area	0.01	ft²
Wetted Perimeter	0.38	ft
Top Width	0.36	ft
Critical Depth	0.10	ft
Percent Full	7.7	%
Critical Slope	0.00693	ft/ft
Velocity	3.91	ft/s
Velocity Head	0.24	ft
Specific Energy	0.29	ft
Froude Number	3.69	
Maximum Discharge	2.8153	mgd
Discharge Full	2.6171	mgd
Slope Full	0.00002	ft/ft
Flow Type	SuperCritical	

Project Description

Worksheet:	Reach 2
Flow Element:	Circular Pipe
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.0190	ft/ft
Diameter	8	in
Discharge	0.0313	mgd

Results

Normal Depth	0.08	in
Flow Area	0.02	ft²
Wetted Perimeter	0.47	ft
Top Width	0.43	ft
Critical Depth	0.10	ft
Percent Full	11.7	%
Critical Slope	0.00697	ft/ft
Velocity	2.11	ft/s
Velocity Head	0.07	ft
Specific Energy	0.15	ft
Froude Number	1.61	
Maximum Discharge	1.1580	mgd
Discharge Full	1.0765	mgd
Slope Full	0.00002	ft/ft
Flow Type	SuperCritical	

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Project Engineer: Hunsaker & Associates Inc
FlowMaster [08.01.058.00]
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Sewer Study - Ridgeline Equestrian Estates
Existing Sewer System
(Peak Dry Weather Flows)
FlowMaster Calculations

Project Description

Worksheet:	Reach 3
Flow Element:	Circular Pipe
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.0382	ft/ft
Diameter	8	in
Discharge	0.0313	mgd

Results

Normal Depth	0.07	in
Flow Area	0.02	ft²
Wetted Perimeter	0.43	ft
Top Width	0.40	ft
Critical Depth	0.10	ft
Percent Full	9.9	%
Critical Slope	0.00687	ft/ft
Velocity	2.70	ft/s
Velocity Head	0.11	ft
Specific Energy	0.18	ft
Froude Number	2.24	
Maximum Discharge	1.6420	mgd
Discharge Full	1.5264	mgd
Slope Full	0.00002	ft/ft
Flow Type	SuperCritical	

Project Description

Worksheet:	Reach 4
Flow Element:	Circular Pipe
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.2020	ft/ft
Diameter	8	in
Discharge	0.0313	mgd

Results

Normal Depth	0.04	in
Flow Area	0.01	ft²
Wetted Perimeter	0.35	ft
Top Width	0.33	ft
Critical Depth	0.10	ft
Percent Full	6.7	%
Critical Slope	0.00696	ft/ft
Velocity	4.79	ft/s
Velocity Head	0.36	ft
Specific Energy	0.40	ft
Froude Number	4.86	
Maximum Discharge	3.7758	mgd
Discharge Full	3.5100	mgd
Slope Full	0.00002	ft/ft
Flow Type	SuperCritical	

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Sewer Study - Ridgeline Equestrian Estates
Existing Sewer System
(Peak Dry Weather Flows)
FlowMaster Calculations

Project Description

Worksheet:	Reach 5
Flow Element:	Circular Pipe
Friction Method:	Manning Formula
Solve For:	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.2020	ft/ft
Diameter	8	in
Discharge	0.0662	mgd

Results

Normal Depth	0.06	in
Flow Area	0.02	ft²
Wetted Perimeter	0.42	ft
Top Width	0.39	ft
Critical Depth	0.15	ft
Percent Full	9.5	%
Critical Slope	0.006563	ft/ft
Velocity	6.08	ft/s
Velocity Head	0.57	ft
Specific Energy	0.64	ft
Froude Number	5.16	
Maximum Discharge	3.7758	mgd
Discharge Full	3.5100	mgd
Slope Full	0.00007	ft/ft
Flow Type	SuperCritical	

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