Appendix M. 2016 Water System Master Plan and 2015 Sewer Master Plan

Appendix

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WATER SYSTEM MASTER PLAN UPDATE

FOR

GLE-EDGEWATER PROPERTIES, LLC
RANCHO MIRAMONTE SP

CITY OF CHINO

January 2016

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MILLCREEK FARMING ASSOCIATES, LLC
Rancho Miramonte SPA

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Rancho Miramonte SPA

CITY OF CHINO

WATER SYSTEM MASTER PLAN UPDATE

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WATER SYSTEM MASTER PLAN UPDATE FOR

RANCHO MIRAMONTE FARMING ASSOCIATES, LLC
RANCHO MIRAMONTE SPA

CITY OF CHINO

PURPOSE

The purpose of this report is to update the "Water System Master Plan Update for the Edgewater Development" prepared by MWH dated October 2007 **(2007 MWH Report)** and to present the results of the potable and recycled water system analysis that was performed to determine the required pipe sizes of the water distribution lines for the Rancho Miramonte Development project in the City of Chino. The project is located within the Preserve Specific Plan, located southerly of Pine Avenue, and modifies the project approved in 2007 known as the Edgewater Development. The project consists of 20 buildable lots with 18 lots for low and medium density detached single family residential dwelling units with a total unit count of 823 dwelling units. A clubhouse for the project will be built on one of the lots (Lot 20) and a church and agricultural museum are planned for one of the lots (Lot 5)

INTRODUCTION

The Edgewater SPA to the Preserve SP was approved by the City of Chino in 2009 with a total of 1,074 dwelling units. The "Water System Master Plan Update for the Edgewater Development" prepared by MWH dated October 2007 **(2007 MWH Report)** was prepared based on a unit count of 1,074 dwelling units and multiple lakes. The proposed lakes were to be filled with recycled water with an estimated annual demand of 307 acre-ft per year. These lakes have been removed for the Rancho Miramonte Specific Plan Amendment and replaced with two proposed water features (fountains using recycled water).

The 2007 MWH report considered the offsite facilities that were needed for the entire Preserve area; the listed offsite facilities were based on the assumption the Edgewater Project was a "stand alone" project and that none of the implementing offsite facilities were constructed for the Preserve area. Since 2007, several of the proposed facilities including domestic groundwater wells and well head treatment facilities have been constructed by the Preserve Project and others.

An update to the 2007 MWH Report was completed in March 2009. This report incorporated the "standalone" project into the city wide system to evaluate the need for modifications or facility recommendations. This report will also be used to determine the need for offsite improvements. The Rancho Miramonte SPA project will be conditioned to either build offsite facilities as described in the March 2009 update to the 2007 MWH Report, or make a "fair share" contribution towards the construction of the offsite facilities as determined by the City in the project conditions of approval.

PROPOSED RANCHO MIRAMONTE SPA

The current Edgewater SPA was approved by the City of Chino in 2007 with a total of 1,074 dwelling units. The proposed Rancho Miramonte SPA proposes 823 detached single family residential units. Fire flow demands are the critical case for determining line sizes for the project. The allocated units per lot are based on the projected final lot configuration proposed at the "B" Map level for the project and are shown on the Rancho Miramonte Land Use Plan exhibit prepared by The Planning Center and shown on Figure 5.

The proposed Rancho Miramonte SPA results in a Potable Water Average Day Demand (ADD) of 236 gpm as compared to the ADD of 337 gpm of the previously approved Edgewater SPA. The Maximum Day Demand for Rancho Miramonte is 331 gpm.

ULTIMATE PROJECT CONSTRUCTION

The analysis was made for the ultimate condition when the planned low and medium density development is implemented. The project requires two points of connection to the existing water system. The first point of connection is located at the intersection of Pine Avenue and Chino Corona Road, with the second point of connection on Pine Avenue at Hellman Avenue.. Based on discussion with the City, the second point of connection will be constructed with the first phase of the project. A 12" waterline will be constructed from the intersection of Pine Ave and Cucamonga Ave to the intersection of Chino-Corona Road and Cucamonga Ave with a 12" waterline constructed in the re-aligned Chino Corona Road going northeasterly from the northeast corner of the Rancho Miramonte property toward Hellman Avenue, and thence northerly in Hellman Avenue to Pine Avenue as shown on Figure 2 – Offsite Water Infrastructure.

Based on the Peak Hour Demand – Ultimate Condition hydraulic modelling results, the maximum pressure in the pipeline is along Chino Corona Road at Junctions J-1 (70.8 psi), J-2 (72.9 psi) & J-3 (71.3 psi). To address maximum pressure criteria of 90 psi during non-fire flow conditions, pressure reducing valves (PRVs) at Junctions J-1 and J-3 with a setting of 70 psi is recommended.

Figure 1 shows the model schematic diagram for the ultimate condition. Figure 2 shows the existing and proposed water facilities within the Preserve SP area, and Figure 3 shows the proposed water facilities within the Rancho Miramonte SPA. Figure 4 shows Land Use within the Preserve SP area north of Chino Corona Avenue, with Figure 5 showing the Land Use within the Edgewater SPA which lies south of Chino Corona Avenue.

WATER DEMAND FACTORS

The water demand factors used in the 2007 MWH Report have been modified based on meter read data analyzed for the Preserve and the College Park – Phase 2 Potable Water Study in 2012. The updated Water Demand Factors were shown in Table 3 of the 2012 College Park – Phase 2 Potable Water Study and are reproduced herein for reference:

Table 3
City of Chino
Revised Potable Water Demand Factors
for New Residential Development

Land Use Designation (Density, du/acre)	Factors Based on Master Plan (gpd/du)	Updated Factors June 2011 (gpd/du)
EDR (1-3)	455	455
LDR-1 (3-5)	630	630
LDR (5-7)	420	420
MDR-1 (7-9)	103	343
MDR-2 (9-11)	322	258
MDR-3 (11-13)	268	201
HDR-1 (13-16)	266	186
HDR-2 (16+)	266	186

These water demand factors are to be used in planned communities where recycled water is available (recycled water is assumed to make up at approximately 30 percent of the total water demand, with potable water supplying the other 70 percent).

The water requirements for the project were based on the above together with the following criteria:

- An average day demand of 3000 (gpd) for the club house. This models a “commercial use” for the club house lot, which is a conservative assumption for water master planning purposes.
- A ratio of 1.4 X average day demand for the maximum day demand
- A ratio of 2.2 X maximum day demand for the peak hour demand.
- 1,500 gpm fire demand for low and medium density residential units for 2 hour duration
- 3,000 gpm fire demand for the Clubhouse for 3 hour duration
- Minimum residual pressure for peak hour demand of 40 psi.
- Minimum residual pressure for maximum day demand plus fire flow of 20 psi at critical fire hydrants.

Velocity in pipelines 12” and greater not to exceed 3 ft/sec, and not to exceed 5 ft/sec for pipelines less than 12” unless otherwise approved by the City Engineer.

- A Hazen-Williams friction "C" factor of 130 was used for pipes in the analysis

See Table I for the water demands under average day, maximum day and peak hour conditions. Table IA shows the water demands based on the unit allocation as shown in the Plan Center’s Land Use Summary exhibit which is attached as Figure 6A.

The control hydraulic grade line (HGL) elevation used for the ultimate condition was 731.59. This control elevation was based on a 64.5 psi residual pressure at 2,040 gpm (max day plus fire flow from two sources). To obtain the HGL, the ground elevation was added to the residual pressure: 582.5 + (64.54 X 2.31) = 731.59.

NETWORK ANALYSIS RUNS

Four (4) sets of network analysis runs were made for the ultimate condition for the project based on the conservative assumptions of land use demand factors for LDR (630 gpd/du) & MDR-1 (343 gpd/du) instead of the reduced water demand factors as shown in Table 1A on Page 6. This results in conservative calculations of resulting pressures for system analysis.

The first is for max day demand; the second for max day demand plus 3,000 gpm fire flow at Node J-8; the third for max day demand plus 1,500 gpm fire flow at Node J-11 and the fourth for peak hour demand.

For run number 1 (Maximum Day Demand condition) the minimum residual pressure was 72.75 psi @ Nodes J-10 and Node J-11.

For run number 2 (Maximum Day Demand plus 3,000 gpm @ Node J-8), the minimum residual pressure was 47.37 psi at Node J-10.

For run number 3 (Maximum Day Demand plus 1,500 gpm @ Node J-11), the minimum residual pressure was 62.82 psi at Node J-11.

For run number 4 (Peak Hour Demand), the minimum residual pressure was 70.63 psi at Nodes J-10 & J-11.

Based on the results of the computer simulations shown on the attached printouts and schematic pipe diagrams, the water system design at build out for the ultimate condition will exceed the minimum required water residual pressures.

Table 1 - Land Use Summary

		43,560				
Lot Number	Area (sf)	Area (Ac's)		Land Use	Average Density	Number of Units
1	436,945	10.0309		MDR-1	8.08	81
2	374,917	8.6069		MDR-2	9.29	80
3	262,401	6.0239		LDR	6.31	38
4	317,927	7.2986		MDR-2	9.59	70
5	220,671	5.0659		Neigh. Comm.	0.00	0
6	300,592	6.9006		MDR-3	11.01	76
7	476,384	10.9363		LDR	5.21	57
8	160,342	3.6809		LDR	5.71	21
9	60,028	1.3781		LDR	6.53	9
10	159,463	3.6608		LDR	6.28	23
11	109,012	2.5026		MDR-1	8.79	22
12	183,943	4.2228		LDR	5.92	25
13	376,223	8.6369		MDR-1	7.76	67
14	467,602	10.7347		LDR	5.78	62
15	523,072	12.0081		LDR	5.33	64
16	60,740	1.3944		MDR-2	10.04	14
17	50,400	1.1570		MDR-1	8.64	10
18	541,383	12.4284		LDR-1	3.30	41
19	383,488	8.8037		MDR-1	7.16	63
20	155,177	3.5624		Clubhouse		0
	5,620,710	129.0337				823

Table 1A - Domestic Water Consumption

Water		43,560		1440				1.4	
Lot Number	Area (sf)	Area (Ac's)	DU's	Land Use	Water Demand Factor (gpd/du)	Average Day Water Demand (gpd)	Average Day Water Demand (gpm)	Maximum Day Water Demand (gpd) (1)	Maximum Day Water Demand (gpm)
1	436,945	10.0309	81	MDR-1	343	27,783	19.29	38,896	27.01
2	374,917	8.6069	80	MDR-2	258	20,640	14.33	28,896	20.07
3	262,401	6.0239	38	LDR-2	420	15,960	11.08	22,344	15.52
4	317,927	7.2986	70	MDR-2	258	18,060	12.54	25,284	17.56
5	220,671	5.0700	0	Neigh. Comm	3,000	15,210	10.56	21,294	14.79
6	300,592	6.9006	76	MDR-3	201	15,276	10.61	21,386	14.85
7	476,384	10.9363	57	LDR-2	420	23,940	16.63	33,516	23.28
8	160,342	3.6809	21	LDR-2	420	8,820	6.13	12,348	8.58
9	60,028	1.3781	9	LDR-2	420	3,780	2.63	5,292	3.68
10	159,463	3.6608	23	LDR-2	420	9,660	6.71	13,524	9.39
11	109,012	2.5026	22	MDR-1	343	7,546	5.24	10,564	7.34
12	183,943	4.2228	25	LDR-2	420	10,500	7.29	14,700	10.21
13	376,223	8.6369	67	MDR-1	343	22,981	15.96	32,173	22.34
14	467,602	10.7347	62	LDR-2	420	26,040	18.08	36,456	25.32
15	523,072	12.0081	64	LDR-2	420	26,880	18.67	37,632	26.13
16	60,740	1.3944	14	MDR-2	258	3,612	2.51	5,057	3.51
17	50,400	1.1570	10	MDR-1	343	3,430	2.38	4,802	3.33
18	541,383	12.4284	41	LDR-1	630	25,830	17.94	36,162	25.11
19	383,488	8.8037	63	MDR-1	343	21,609	15.01	30,253	21.01
20	155,177	3.5600	0	Clubhouse	3,000	10,680	7.42	14,952	10.38
A-BB (2)		75	0	OS-R		21,762	15.11	30,466	21.16
	5,620,710	129.0355	823			339,999	236	475,998	331

(1) Maximum day water demand equals 1.4 x average day water demand per Chino Preserve Hydraulic Analysis Update Final report dated December 2007

(2) OS-R Lots A through BB potable demand from WSA report dated December 2015 by Penco Engineering

Reduction from Edgewater SPA to Rancho Miramonte SPA

	Average Day Demand (gpm)	Maximum Day Water Demand (gpd)	Maximum Day Water Demand (gpm)	Average Day Demand (gpm)	Maximum Day Water Demand (gpd)	Maximum Day Water Demand (gpm)
Rancho Miramonte	236	475,998	331	101	105,902	51
Edgewater SPA (2)	336.7	581,900	382			

(2) From Table 2 - EIR Appendix K.3 - Water System Master Plan Update prepared by MWH - October 2007 for Edgewater SPA

Pipe Report									
Pipe Number	Start Junction	End Junction	Length (ft)	Diameter (in)	Roughness "C"	Discharge (gpm)	Headloss (ft)	Velocity (ft/s)	Fr. Slope (ft/1000ft)
P-1	R-1	J-1	9000	12	130	0.00	0.00	0.00	0.00
P-2	R-2	J-2	4195	12	130	309.39	1.21	0.88	0.29
P-3	J-1	J-4	732	12	130	-10.28	0.00	0.03	0.00
P-4	J-2	J-3	2138	12	130	152.88	0.16	0.43	0.08
P-5	J-4	J-2	2273	12	130	-156.51	0.19	0.44	0.08
P-6	J-4	J-5	308	12	130	146.23	0.02	0.41	0.07
P-7	J-5	J-6	493	12	130	106.19	0.02	0.30	0.04
P-8	J-6	J-7	977	12	130	88.42	0.03	0.25	0.03
P-9	J-7	J-8	608	12	130	53.97	0.01	0.15	0.01
P-10	J-8	J-10	1003	12	130	41.60	0.01	0.12	0.01
P-11	J-10	J-11	862	12	130	-12.52	0.00	0.04	0.00
P-12	J-11	J-12	1267	12	130	-34.54	0.01	0.10	0.01
P-13	J-12	J-13	841	12	130	-65.74	0.01	0.19	0.02
P-14	J-13	J-9	968	12	130	-70.85	0.02	0.20	0.02
P-15	J-8	J-9	600	8	130	-43.02	0.03	0.27	0.05
P-16	J-3	J-9	829	12	130	-152.88	0.06	0.43	0.08

Junction Report					
Junction Number	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure Head (ft)	Pressure (psi)
J-1	568	10.28	736.22	168.22	72.78
J-2	564	0.00	736.41	172.41	74.59
J-3	567	0.00	736.25	169.25	73.22
J-4	568	0.00	736.22	168.22	72.78
J-5	568	40.04	736.20	168.20	72.77
J-6	568	17.77	736.18	168.18	72.76
J-7	567	34.45	736.16	169.16	73.19
J-8	567	55.38	736.15	169.15	73.18
J-9	568	39.02	736.18	168.18	72.76
J-10	568	54.12	736.14	168.14	72.75
J-11	568	22.02	736.14	168.14	72.75
J-12	567	31.20	736.15	169.15	73.18
J-13	567	5.11	736.16	169.16	73.19

Pipe Report									
Pipe Number	Start Junction	End Junction	Length (ft)	Diameter (in)	Roughness "C"	Discharge (gpm)	Headloss (ft)	Velocity (ft/s)	Fr. Slope (ft/1000ft)
P-1	R-1	J-1	9000	12	130	1245.75	34.27	3.53	3.81
P-2	R-2	J-2	4195	12	130	2063.64	40.68	5.85	9.70
P-3	J-1	J-4	735	12	130	1235.47	2.76	3.50	3.75
P-4	J-2	J-3	2099	12	130	1443.47	10.50	4.09	5.00
P-5	J-4	J-2	2274	12	130	-620.17	2.38	1.76	1.05
P-6	J-4	J-5	293	12	130	1855.64	2.33	5.26	7.97
P-7	J-5	J-6	487	12	130	1815.60	3.72	5.15	7.65
P-8	J-6	J-7	975	12	130	1797.83	7.32	5.10	7.51
P-9	J-7	J-8	640	12	130	1763.38	4.64	5.00	7.25
P-10	J-8	J-10	996	12	130	-585.65	0.94	1.66	0.94
P-11	J-10	J-11	872	12	130	-639.77	0.97	1.81	1.11
P-12	J-11	J-12	1263	12	130	-661.79	1.49	1.88	1.18
P-13	J-12	J-13	846	12	130	-692.99	1.09	1.97	1.29
P-14	J-13	J-9	985	12	130	-698.10	1.28	1.98	1.30
P-15	J-8	J-9	601	8	130	-706.35	5.76	4.51	9.60
P-16	J-9	J-3	826	12	130	-1443.47	4.13	4.09	5.00

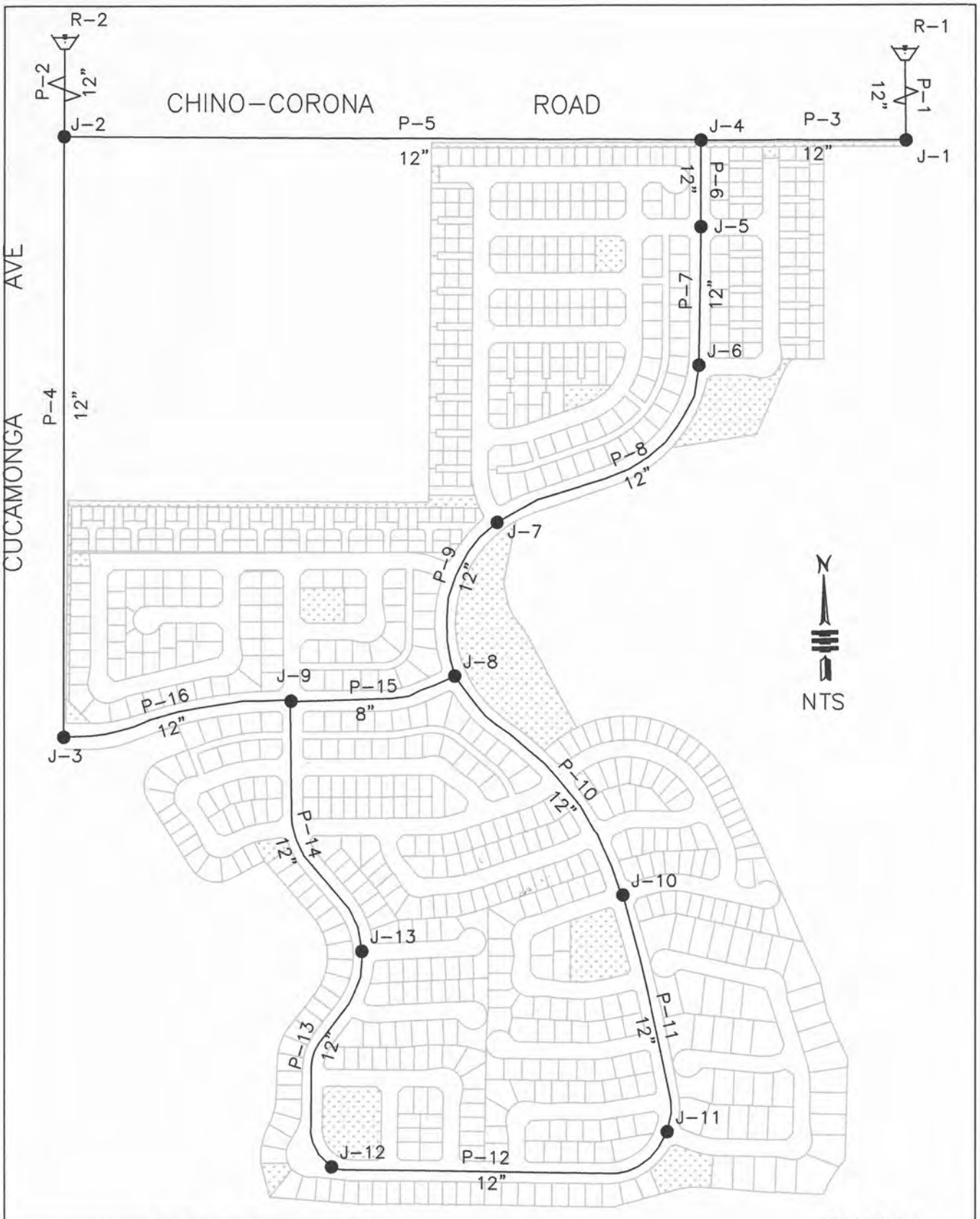
Junction Report					
Junction Number	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure Head (ft)	Pressure (psi)
J-1	568	10.28	697.32	129.32	55.95
J-2	564	0.00	696.94	132.94	57.52
J-3	567	0.00	686.44	119.44	51.68
J-4	568	0.00	694.57	126.57	54.76
J-5	568	40.04	692.23	124.23	53.75
J-6	568	17.77	688.51	120.51	52.14
J-7	567	34.45	681.19	114.19	49.40
J-8	567	3055.38	676.55	109.55	47.40
J-9	568	39.02	682.31	114.31	49.46
J-10	568	54.12	677.49	109.49	47.37
J-11	568	22.02	678.45	110.45	47.79
J-12	567	31.20	679.94	112.94	48.87
J-13	567	5.11	681.03	114.03	49.34

Pipe Report									
Pipe Number	Start Junction	End Junction	Length (ft)	Diameter (in)	Roughness "C"	Discharge (gpm)	Headloss (ft)	Velocity (ft/s)	Fr. Slope (ft/1000ft)
P-1	R-1	J-1	9000	12	130	606.70	9.04	1.72	1.01
P-2	R-2	J-2	4195	12	130	1202.69	14.97	3.41	3.57
P-3	J-1	J-4	735	12	130	596.42	0.72	1.69	0.97
P-4	J-2	J-3	2099	12	130	853.43	3.97	2.42	1.89
P-5	J-4	J-2	2274	12	130	-349.26	0.82	0.99	0.36
P-6	J-4	J-5	293	12	130	945.68	0.67	2.68	2.29
P-7	J-5	J-6	487	12	130	905.64	1.03	2.57	2.11
P-8	J-6	J-7	975	12	130	887.87	1.98	2.52	2.03
P-9	J-7	J-8	640	12	130	853.42	1.21	2.42	1.89
P-10	J-8	J-10	996	12	130	907.14	2.11	2.57	2.12
P-11	J-10	J-11	872	12	130	853.02	1.65	2.42	1.89
P-12	J-11	J-12	1263	12	130	-669.00	1.52	1.90	1.20
P-13	J-12	J-13	846	12	130	-700.20	1.11	1.99	1.31
P-14	J-13	J-9	985	12	130	-705.31	1.31	2.00	1.33
P-15	J-8	J-9	601	8	130	-109.09	0.18	0.70	0.30
P-16	J-9	J-3	826	12	130	-853.43	1.56	2.42	1.89

Junction Report					
Junction Number	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure Head (ft)	Pressure (psi)
J-1	568	10.28	722.55	154.55	66.87
J-2	564	0.00	722.65	158.65	68.64
J-3	567	0.00	718.69	151.69	65.63
J-4	568	0.00	721.83	153.83	66.56
J-5	568	40.04	721.16	153.16	66.27
J-6	568	17.77	720.14	152.14	65.82
J-7	567	34.45	718.16	151.16	65.40
J-8	567	55.38	716.95	149.95	64.87
J-9	568	39.02	717.13	149.13	64.52
J-10	568	54.12	714.84	146.84	63.53
J-11	568	1522.02	713.19	145.19	62.82
J-12	567	31.20	714.71	147.71	63.91
J-13	567	5.11	715.82	148.82	64.39

Pipe Report									
Pipe Number	Start Junction	End Junction	Length (ft)	Diameter (in)	Roughness "C"	Discharge (gpm)	Headloss (ft)	Velocity (ft/s)	Fr. Slope (ft/1000ft)
P-1	R-1	J-1	9000	12	130	0.00	0.00	0.00	0.00
P-2	R-2	J-2	4195	12	130	680.65	5.21	1.93	1.24
P-3	J-1	J-4	735	12	130	-22.62	0.00	0.06	0.00
P-4	J-2	J-3	2099	12	130	336.34	0.71	0.95	0.34
P-5	J-4	J-2	2274	12	130	-344.31	0.80	0.98	0.35
P-6	J-4	J-5	293	12	130	321.69	0.09	0.91	0.31
P-7	J-5	J-6	487	12	130	233.61	0.08	0.66	0.17
P-8	J-6	J-7	975	12	130	194.51	0.12	0.55	0.12
P-9	J-7	J-8	640	12	130	118.72	0.03	0.34	0.05
P-10	J-8	J-10	996	12	130	91.53	0.03	0.26	0.03
P-11	J-10	J-11	872	12	130	-27.54	0.00	0.08	0.00
P-12	J-11	J-12	1263	12	130	-75.98	0.03	0.22	0.02
P-13	J-12	J-13	846	12	130	-144.62	0.06	0.41	0.07
P-14	J-13	J-9	985	12	130	-155.86	0.08	0.44	0.08
P-15	J-8	J-9	601	8	130	-94.64	0.14	0.60	0.23
P-16	J-9	J-3	826	12	130	-336.34	0.28	0.95	0.34

Junction Report					
Junction Number	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure Head (ft)	Pressure (psi)
J-1	568	22.62	731.60	163.60	70.78
J-2	564	0.00	732.41	168.41	72.86
J-3	567	0.00	731.70	164.70	71.26
J-4	568	0.00	731.61	163.61	70.78
J-5	568	88.09	731.51	163.51	70.75
J-6	568	39.09	731.43	163.43	70.71
J-7	567	75.79	731.31	164.31	71.09
J-8	567	121.84	731.28	164.28	71.08
J-9	568	85.84	731.42	163.42	70.70
J-10	568	119.06	731.25	163.25	70.63
J-11	568	48.44	731.25	163.25	70.63
J-12	567	68.64	731.28	164.28	71.08
J-13	567	11.24	731.34	164.34	71.10



LEGEND	
R-1	HGL FOR POINT OF CONNECTION
J-1	JUNCTION NUMBER
P-1	PIPE NUMBER
8"	PIPE SIZE

FIGURE 1

SCHEMATIC DIAGRAM FOR
WATER SYSTEM ANALYSIS
RANCHO MIRAMONTO
CITY OF CHINO

Euclid Ave

Grove Ave

Merrill Ave

Pine Ave.

Hellman Ave.

Chino Corona Rd

WATER

- WATER EXISTING
- WATER FUTURE
- WATER PROPOSED

1500 0 1500 3000 4500

Scale: 1" = 1500'

rmb
robert m. beers pe
8175 Limonite Avenue, Suite E
Jurupa Valley, CA 92509
Ph. (951) 317-2041 Fax (951) 360-2080

Mill Creek Farming Associates, LLC

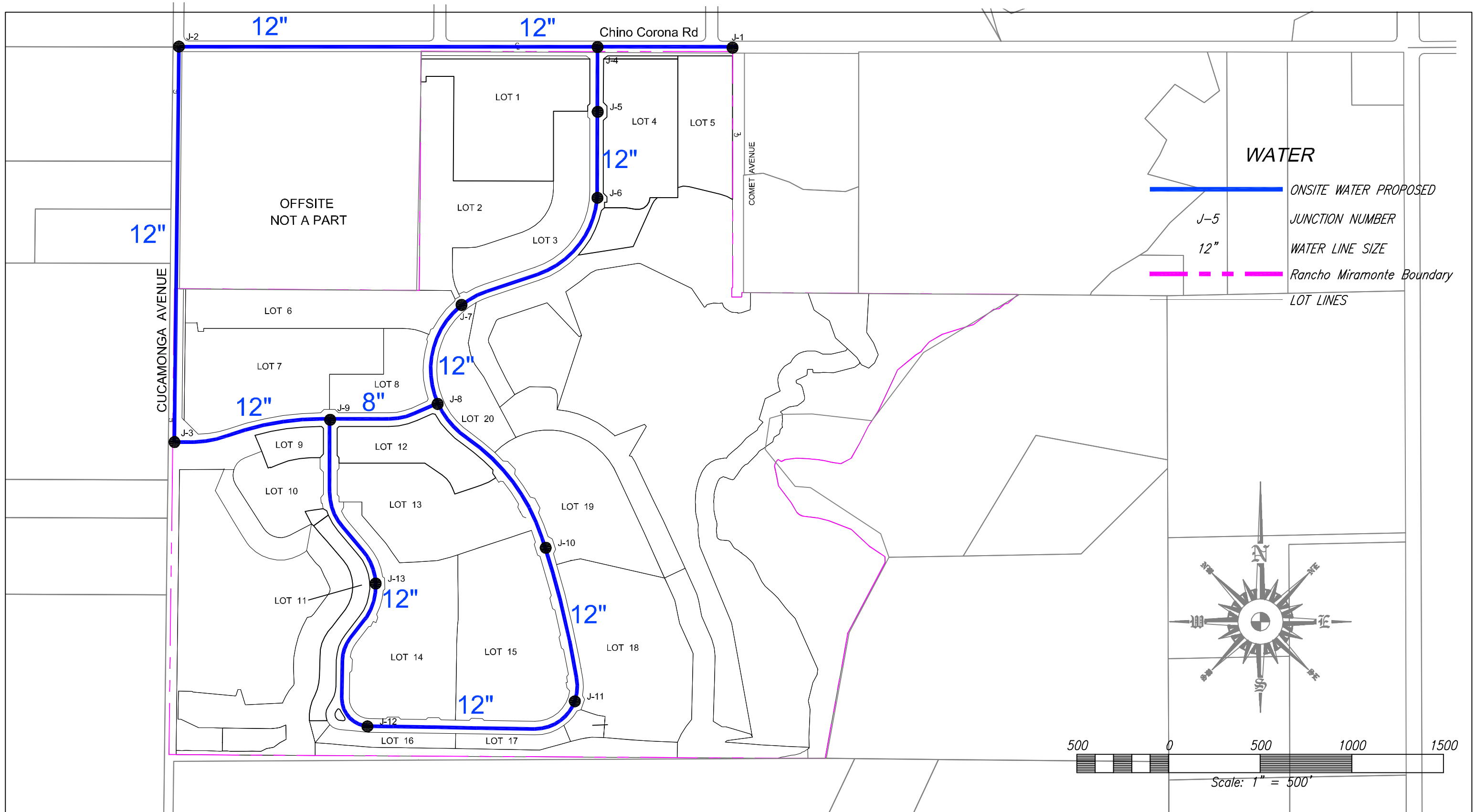
Rancho Miramonte SPA

Figure 2 - Offsite Water Infrastructure

PREPARED BY: R.M.B.

DATE: 06-22-15

1 of 1



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Mill Creek Farming Associates, LLC

Rancho Miramonte SPA

Figure 3 - Onsite Water Infrastructure

PREPARED BY: R.M.B.

DATE: 06-22-15

1 of 1

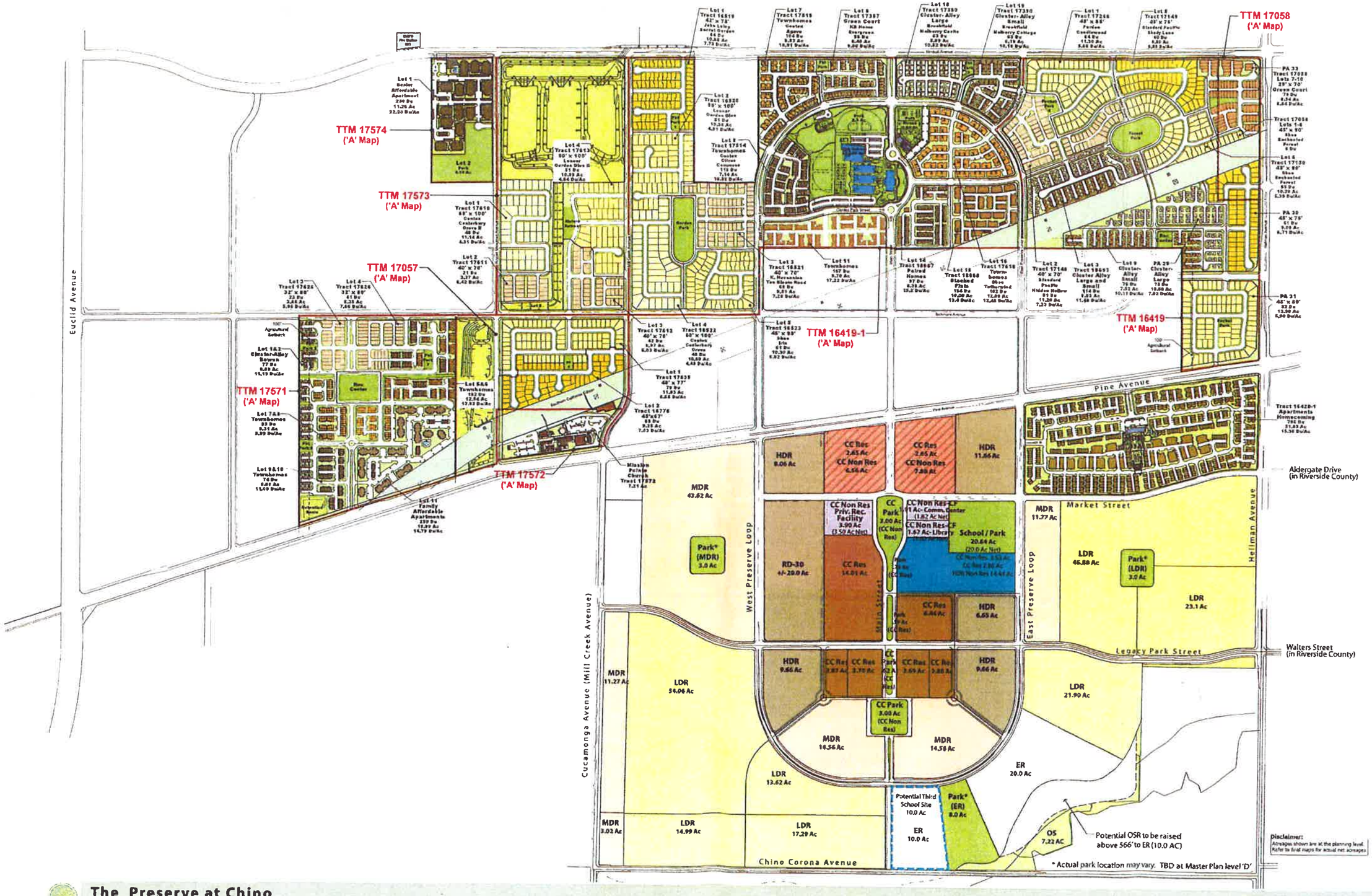

TTM 17574 ('A' Map)
TTM 17573 ('A' Map)
TTM 17057 ('A' Map)
TTM 17571 ('A' Map)
TTM 17572 ('A' Map)
TTM 16419-1 ('A' Map)
TTM 17058 ('A' Map)
TTM 16419 ('A' Map)
Euclid Avenue
Pine Avenue
Aldergate Drive (in Riverside County)
Market Street
Hellman Avenue
West Preserve Loop
East Preserve Loop
Main Street
Legacy Park Street
Walters Street (in Riverside County)
Cucamonga Avenue (Mill Creek Avenue)
Chino Corona Avenue
HDR 8.06 Ac
CC Res 2.65 Ac CC Non Res 6.56 Ac
CC Res 2.65 Ac CC Non Res 7.89 Ac
HDR 11.66 Ac
MDR 43.62 Ac
CC Non Res Priv. Rec. Facility 3.90 Ac (3.50 Ac Net)
CC Park 3.00 Ac (CC Non Res)
CC Non Res-CF 1.91 Ac- Comm. Center (1.82 Ac Net)
CC Non Res-CF 1.67 Ac- Library
School / Park 20.64 Ac (20.0 Ac Net)
MDR 11.77 Ac
LDR 46.88 Ac
Park* (LDR) 3.0 Ac
LDR 23.1 Ac
Park* (MDR) 3.0 Ac
RD-30 +/- 20.0 Ac
CC Res 14.01 Ac
CC Res 6.44 Ac
HDR 6.69 Ac
HDR 9.56 Ac
CC Res 3.87 Ac
CC Res 3.70 Ac
CC Res 3.69 Ac
CC Res 3.88 Ac
HDR 9.06 Ac
MDR 11.27 Ac
LDR 54.06 Ac
CC Park 3.00 Ac (CC Non Res)
LDR 21.90 Ac
MDR 16.56 Ac
MDR 14.58 Ac
ER 20.0 Ac
LDR 12.62 Ac
Potential Third School Site 10.0 Ac
Park* (ER) 8.0 Ac
ER 10.0 Ac
MDR 3.02 Ac
LDR 14.99 Ac
LDR 17.29 Ac
OS 7.22 AC
Potential OSR to be raised above 566' to ER (10.0 AC)
* Actual park location may vary. TBD at Master Plan level 'D'
Disclaimer: Acreages shown are at the planning level. Refer to final maps for actual net acreages
The Preserve at Chino
Lewis Community Developers
Chino, California
Amendment To Master Plan Concept for Phase 1-4
LDCING

Figure 4

RANCHO MIRAMONTE LAND USE PLAN

Rancho Miramonte Specific Plan Preliminary Buildout		
Land Use	Acres	Units
Base Designations		
Low Density Residential [1]	87.70	520
Medium Density Residential	33.42	303
Neighborhood Commercial [2]	5.07	
Clubhouse / Park	3.56	
Open Space Recreation (including Parks)	55.09	
Open Space Natural	66.99	
Backbone Roads	19.33	
Totals	271.16	823

Notes:
[1] Per The Preserve SP, the minimum lot size in the Low Density category is 3,600 sq. ft. However, along 45% of the perimeter of the LDR's edge abutting the Open Space area, the minimum lot size is 8,700 square feet.
[2] The neighborhood commercial is intended to accommodate local-serving uses that are compatible with the community theme such as a church, museum, crop cultivation, retail, market, deli, and café.

LOW DENSITY (3-8 DU/AC)
MEDIUM DENSITY (8-12 DU/AC)
CLUBHOUSE/PARK
OPEN SPACE RECREATION
OPEN SPACE NATURAL
Neighborhood Commercial
ROAD
566' ELEVATION CONTOUR (PROPOSED)
MILL CREEK

NOT TO SCALE

RECYCLED WATER DEMANDS

The 2007 MWH Report assumed recycled water would be used to satisfy the initial lake filling, lake replenishment, open space irrigation, and public space irrigation demands. The five (5) lakes proposed in the Edgewater SPA have been reduced to two (2) water features/fountains in the revised land plan, thus significantly decreasing the recycled water demand for the Rancho Miramonte SPA.

Table 4 of the 2007 MWH Report estimated the need for annual replenishment water for the proposed lakes in the Edgewater SPA at 307 acre-feet per year.

Based on the two proposed water features/fountains in the Rancho Miramonte SPA, we have estimated the annual replenishment water demand at 18 acre-feet per year. See Appendix B for calculations.

Per Table 6 of the 2007 MWH Report, 36-acres of Open Space was assumed to be irrigated. Table 6 is shown herein for reference:

TABLE 6
Open Space Recreation Irrigation Demand

Irrigated Area (acres)	Water Duty (gpd/acre)	Average Annual Demand (Acre-ft/yr)	Maximum Day Demand (MGD)	Peak Hour Demand (gpm)
36	2,900	116	0.27	560.7

(From 2007 Edgewater SPA)

Peaking factor of 2.6 used for recycled water (for ADD to MDD) and 3.0 for MDD to PHD
Recycled Water peaking factors obtained from City of Chino 2004 Water Master Plan Update

The Open Space area proposed to be irrigated by the Rancho Miramonte SPA is 75 acres, which is an increase of nominally 208% over the assumed irrigated open space in the Edgewater SPA. The following table shows the revised estimated recycled water demand for Open Space Recreation uses in the Rancho Miramonte SPA:

Rancho Miramonte SPA
Open Space Recreation Irrigation Demand

Irrigated Area (acres)	Water Duty (gpd/acre)	Average Annual Demand (Acre-ft/yr)	Maximum Day Demand (MGD)	Peak Hour Demand (gpm)
75	2,900	219.40	0.509	1,061

Peaking factor of 2.6 used for recycled water (for ADD to MDD) and 3.0 for MDD to PHD
Recycled Water peaking factors obtained from City of Chino 2004 Water Master Plan Update

Table 7 of the 2007 MWH Report shows the Public Space Irrigation Demand, including an estimate of use for the County of Orange 38-acre parcel at the southeast corner of Cucamonga Avenue and Chino Corona Road. The results for Public Space Irrigation Demand for Table 7 of the 2007 MWH Report and the revised Rancho Miramonte SPA Land Use are summarized below. See attached Public Space Irrigation Demand table for reference.

	2007 MWH Report			2015 Rancho Miramonte SPA		
Land Use	Average Day Demand (gpd) Recycled Water	Average Day Demand (acre-ft/yr) Recycled Water	Maximum Day Demand (MGD) Recycled Water (1)	Average Day Demand (gpd) Recycled Water	Average Day Demand (acre-ft/yr) Recycled Water	Maximum Day Demand (MGD) Recycled Water
Low Density	105,624	118.3	0..27	70,276	78.7	0.18
Medium Density	39,606	44.4	0.10	76,355	85.5	0..20
High Density	21,528	24.1	0.06	0	0	0.0
Neighborhood Commercial	0	0	0	4,563	7.8	0.01
Clubhouse	0	0	0	3,204	5.5	0.01
Low Density (County of Orange)	41,040	46	0.11	41,040	46	0.11
Roads	0	0	0	0	0	0.00
Totals	207,798	232.8	0.54	195,438	218.9	0.51

We have included the County of Orange 38-acre in the 2015 Rancho Miramonte SPA Recycled Water demand analysis for consistency purposes with the previously approved Edgewater SPA and EIR.

Total annual Recycled Water Demand for the 2015 Rancho Miramonte SPA is 219.4 acre-feet (Open Space Irrigation – see Appendix D) + 218.9 acre-feet (Public Space Irrigation Demand) + 18.0 acre-feet (Lake replenishment) = 456.3 acre-feet. The total annual Reclaimed Water Demand for the Edgewater SPA identified in the 2007 MWH Report was 610 acre-feet (which included 307 acre-feet for lake replenishment).

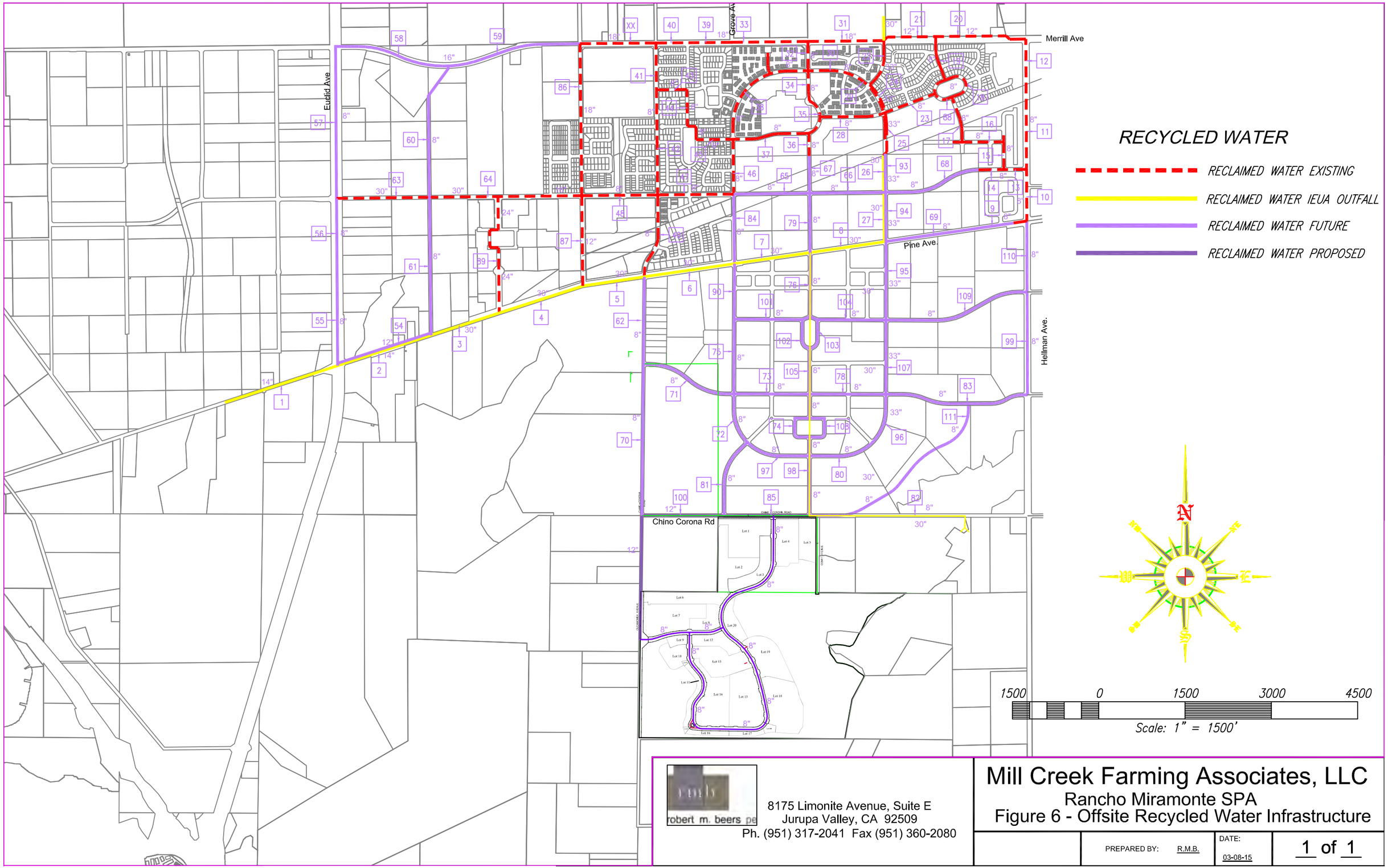
2007 MWH Report	Edgewater SPA					
Land Use Category	Acres	Water Duty (gpd/acre)	Recycled Water %	Recycled Water Average Day Demand (gpd)	Recycled Water Average Day Demand (acre-ft/yr)	Recycled Water Maximum Day Demand (MGD) (1)
Low Density	97.8	3,600	30.0%	105,624	118.3	0.27
Medium Density	28.7	4,600	30.0%	39,606	44.4	0.10
High Density	15.6	4,600	30.0%	21,528	24.1	0.06
Low Density (County of Orange)	38	3,600	30.0%	41,040	46.0	0.11
subtotals	180.1			207,798	232.8	0.54
Net Edgewater Area (Acres)	142.1					
2015 Rancho Miramonte						
Land Use Category	Acres	Water Duty (gpd/acre)	Recycled Water %	Recycled Water Average Day Demand (gpd)	Recycled Water Average Day Demand (acre-ft/yr)	Recycled Maximum Day Demand (MGD) (1)
Low Density	65.07	3,600	30.0%	70,276	78.7	0.18
Medium Density	55.33	4,600	30.0%	76,355	85.5	0.20
High Density	0	4,600	30.0%	0	0.0	0.00
Low Density (County of Orange)	38	3,600	30.0%	41,040	46.0	0.11
Neighborhood Comm.	5.07	3,000	30.0%	4,563	5.1	0.01
Clubhouse	3.56	3,000	30.0%	3,204	3.6	0.01
subtotals	167.03			195,438	218.9	0.51
Net RM Area (Acres)	129.03					
				Demand Factors		
	Average Day Demand	195,438	gpd			
	Max Day Demand	508,139	gpd	2.6	times ADD	
	Peak Hour	1,059	gpm	3.0	times MDD	
(1) Recycled Water Peaking Factors obtained from City of Chino 2004 Water Master Plan Update						

The Rancho Miramonte SPA project Average Day Demand recycled water demand is 76% of the 2007 Edgewater SPA project (461/610) = 0.76). The offsite County of Orange 38-acre property was assumed to need 46 acre-feet/yr of reclaimed water for irrigation purposes. We have included this recycled water demand in our tabulation for the Rancho Miramonte SPA for consistency with the 2007 Edgewater SPA & EIR documents and for comparison purposes.

The Recycled Water System recommendations from the 2007 MWH report included a 12-inch diameter waterline on the northern and western boundaries of the Edgewater Development along Chino-Corona Road and Cucamonga Avenue to create a looped system of supply. In the future, the 12-inch diameter waterline in Chino-Corona Road will be interconnected at two locations with the Planned City Reclaimed Water system in Subarea 2 (see Figure 6 – Offsite Recycled Water Infrastructure). The Rancho Miramonte Development proposes the same point of connection to IEUA's system at the existing 30-inch diameter discharge line to Rancho Miramonte near the intersection of Chino-Corona Road and Comet Avenue.

A hydraulic model for the recycled water system was not developed for the Rancho Miramonte Development since our estimated use is only 80% of the demand used in the 2007 MWH report, and we are using the same 12-inch pipeline sizes in Chino-Corona Road and Cucamonga Avenue, and 8-inch pipelines within the Rancho Miramonte Development (see Figure 6A – Onsite Recycled Water Infrastructure). As noted in the 2007 MWH report, the demands of the Edgewater Development on the IEUA pipeline resulted in a relatively small pressure drop of 8 psi; the existing pressure at the point of connection is approximately 70 psi. The effects of the Rancho Miramonte Development are relatively minor on IEUAs transmission facilities and do not adversely impact the conveyance of water to the rest of the 800 zone.

"Figure 7 – Major Recycled Water Facilities" from the 2007 MWH Report is included for reference. Per "Table 10 – Recycled Water Model Results (PHD)" from the 2007 MWH Report, the model shows that sufficient pressure is delivered to the Rancho Miramonte (Edgewater Development), with a minimum pressure of 55 psi experienced during PHD. The maximum pipeline velocity determined in the model was 4.3 ft/sec. The recommend pipeline sizing is shown in Figure 6A – Onsite Recycled Water Facilities.



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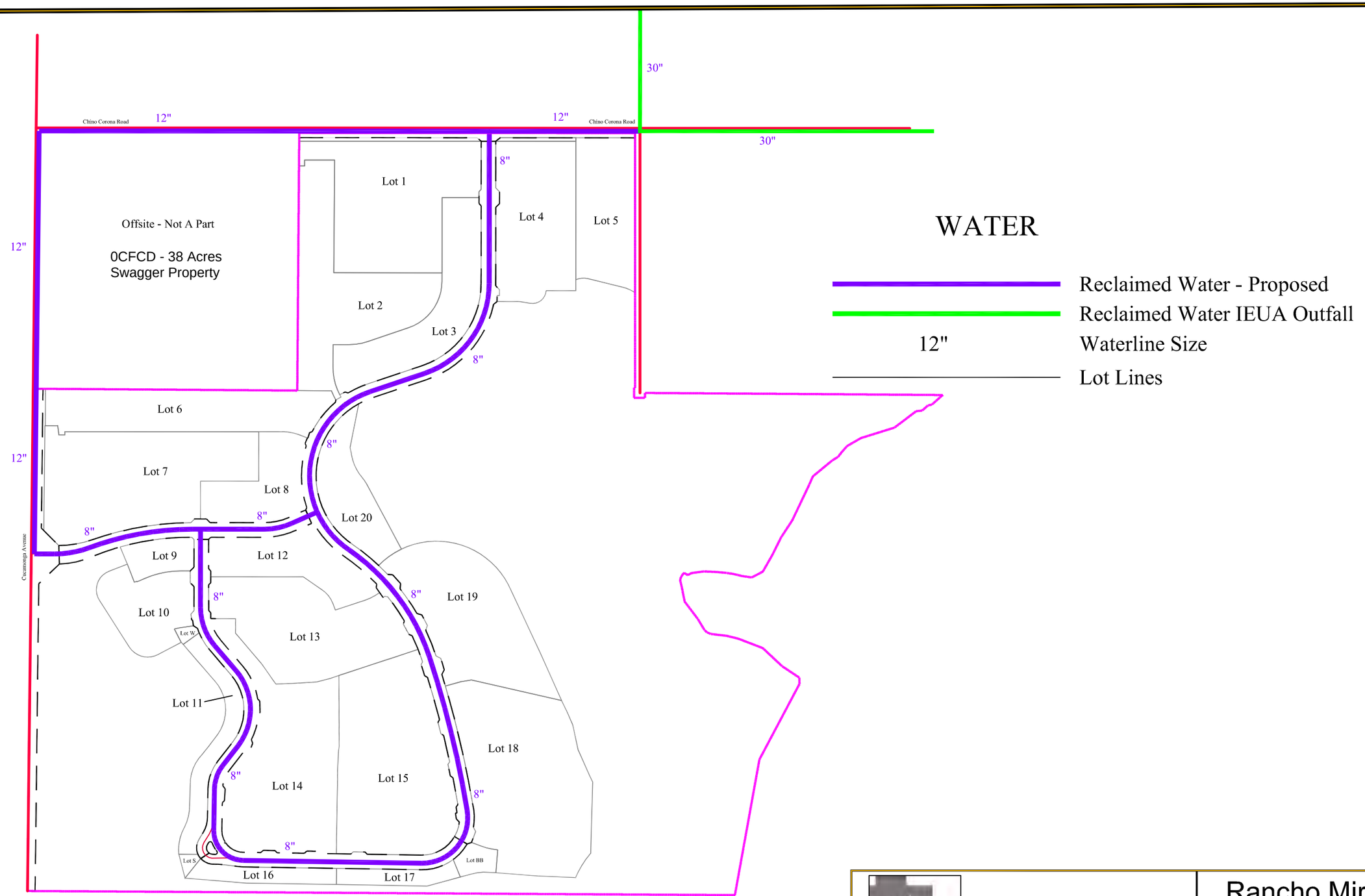
Mill Creek Farming Associates, LLC

Rancho Miramonte SPA

Figure 6 - Offsite Recycled Water Infrastructure

	PREPARED BY: R.M.B.	DATE: 03-08-15	1 of 1



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Cell: (951) 317-2041
Robert M. Beers, PE rmbeers777@hotmail.com

Rancho Miramonte Edgewater SPA

Figure 6A
Onsite Recycled Water

PREPARED BY: R.M.B. DATE: 03-08-15

Recycled Water Distribution System

Legend Key

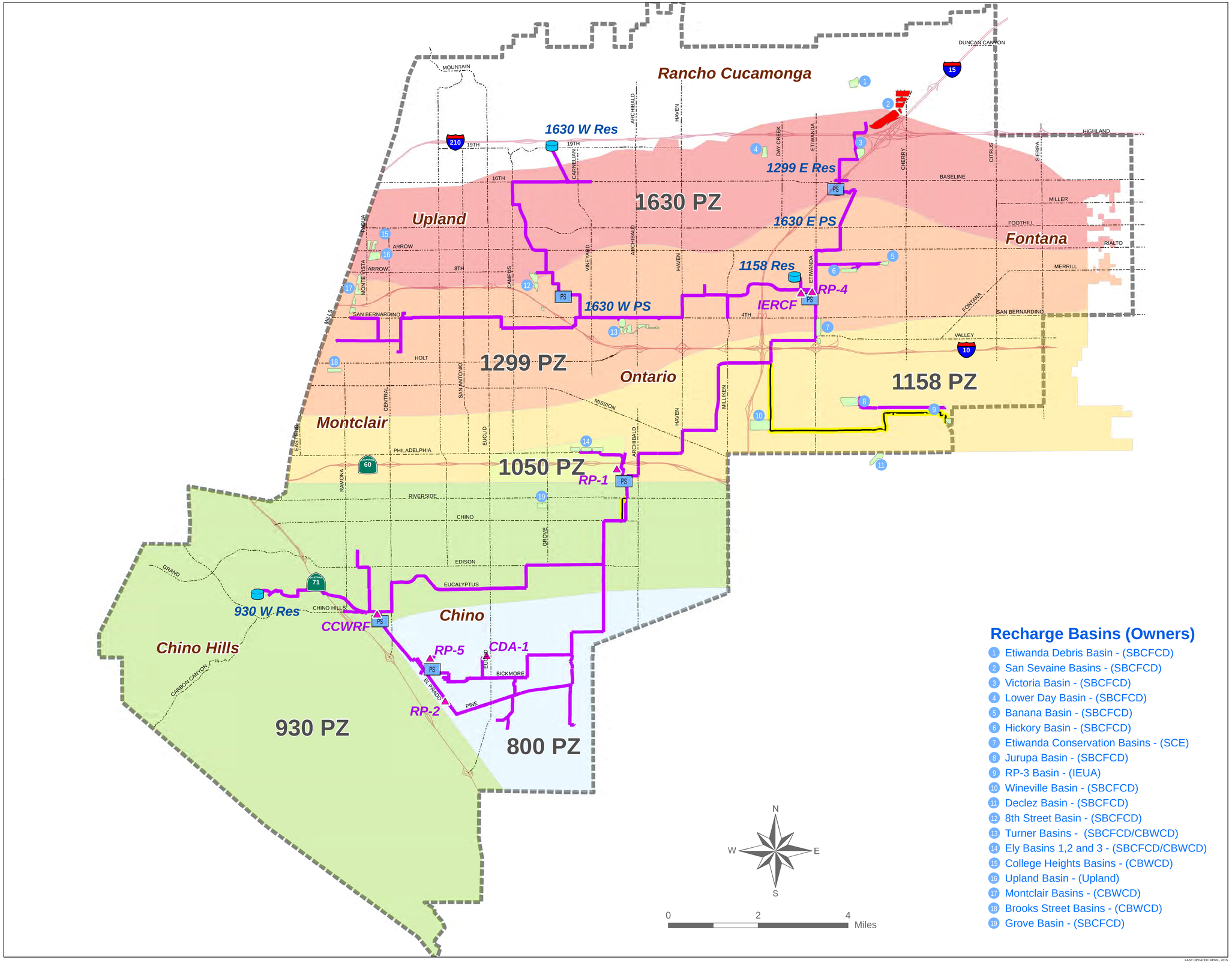
Pipeline Status
- Design
- Bid
- Construction
- Operating

Pump Station Status
- Design
- Bid
- Construction
- Operating

Reservoirs Status
- Design
- Bid
- Construction
- Operating

Recharge Improvement Status
- Design
- Bid
- Construction
- Operating

Inland Empire Utilities Agency
A MUNICIPAL WATER DISTRICT



Recharge Basins (Owners)

1. Etiwanda Debris Basin - (SBCFCD)
2. San Sevaine Basins - (SBCFCD)
3. Victoria Basin - (SBCFCD)
4. Lower Day Basin - (SBCFCD)
5. Banana Basin - (SBCFCD)
6. Hickory Basin - (SBCFCD)
7. Etiwanda Conservation Basins - (SCE)
8. Jurupa Basin - (SBCFCD)
9. RP-3 Basin - (IEUA)
10. Wineville Basin - (SBCFCD)
11. Declez Basin - (SBCFCD)
12. 8th Street Basin - (SBCFCD)
13. Turner Basins - (SBCFCD/CBWCD)
14. Ely Basins 1,2 and 3 - (SBCFCD/CBWCD)
15. College Heights Basins - (CBWCD)
16. Upland Basin - (Upland)
17. Montclair Basins - (CBWCD)
18. Brooks Street Basins - (CBWCD)
19. Grove Basin - (SBCFCD)

LAST UPDATED: APRIL, 2015

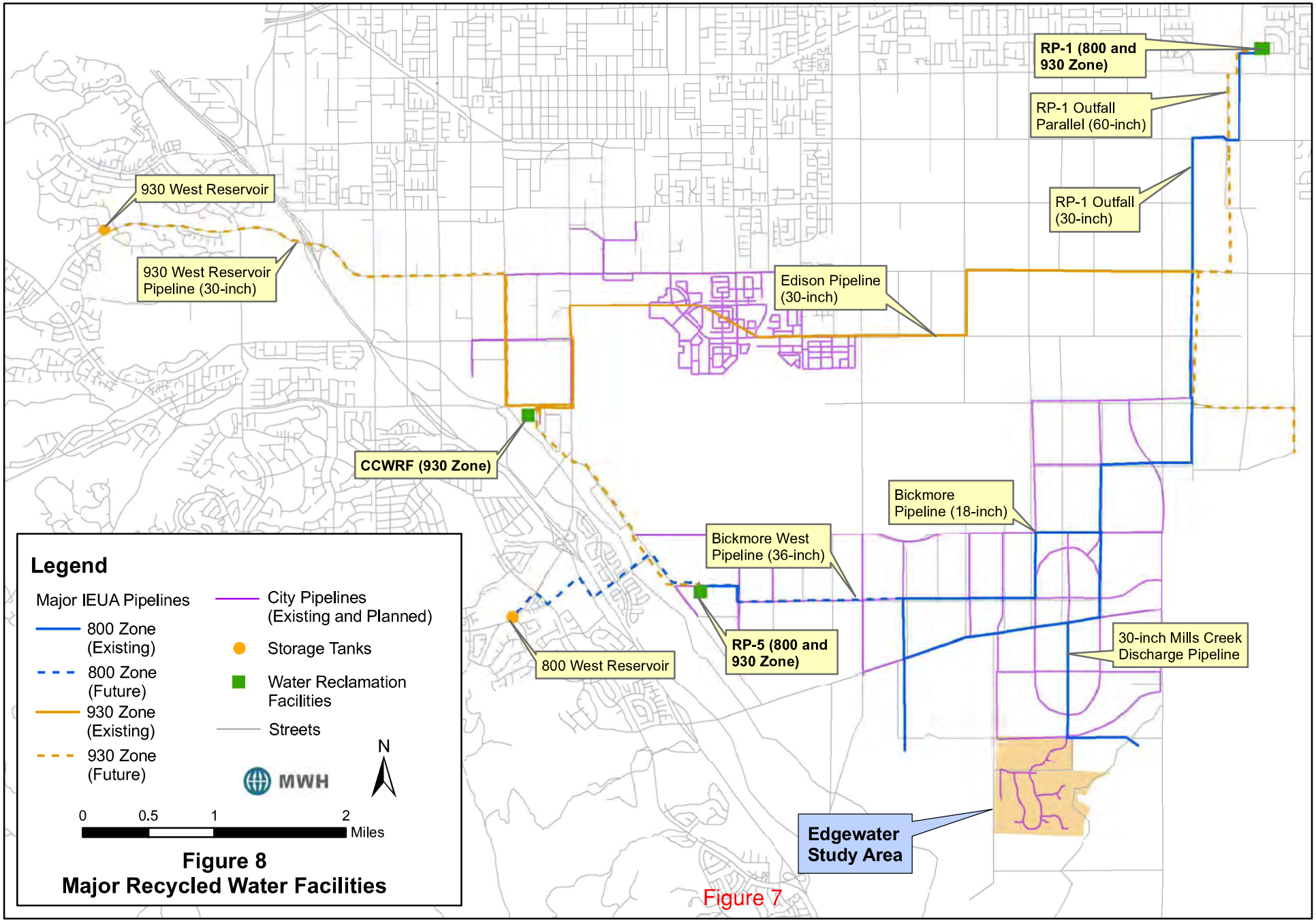


Figure 8
Major Recycled Water Facilities

Figure 7

WATER SUPPLY AND STORAGE

Potable Water Supply

The "Water System Master Plan Update for the Edgewater Development" prepared by MWH dated October 2007 (**2007 MWH Report**) assumed that the water supply for the Edgewater Development would be provided from one or more wells (concept wells) that would convey water to the intersection of Campus Avenue and Schaefer Avenue, the location of the City's planned potable water treatment and storage complex (Eastside Water Complex). Since 2007, the City has developed Well No. 16 and has drilled a pilot well for Well No. 17 at the Eastside Water Complex now located at 7537 Schaefer Avenue. The 2007 MWH Report assumed the Edgewater Project would independently develop a new water supply, treatment, storage, and transmission facilities from this location to the Edgewater Project.

New Groundwater Supply

The new water supply required for the Rancho Miramonte Development would require 331 gpm based on the Maximum Day Demand for the project. In 2015, Rancho Miramonte entered into an agreement with the landowner at 13315 South Bon View Avenue in the City of Ontario to drill a test well. A 600' deep well was drilled in accordance with the "Technical Memorandum for Hydrogeologic Evaluation of Moore Property" in attached Appendix C. Preliminary estimates of production rates from this well are in the range of 1,000 to 1,500 gpm, well in excess of the Rancho Miramonte SPA project demands.

Based on results from water quality analysis and other considerations, the City will determine if this proposed well is acceptable to meet the project's conditions of approval.

The City of Chino will determine which well development scenario is necessary to adequately serve the Rancho Miramonte Project. The Rancho Miramonte Project should be required to either make a "fair share" contribution towards the development cost of an existing water well (if feasible), construct a new groundwater supply well, or improve an existing well subject to a reimbursement agreement.

WATER TRANSMISSION FACILITIES

The 2007 MWH Report identified offsite water line transmission mains from the City's site near Schaefer & Campus to the Edgewater Project (see enclosed Figure 4 – "Model – Entire Network " from the MWH Report). A portion of the raw groundwater pipeline may be needed to convey water from the new well site to the Eastside Water Complex.

The 24" Transmission Line from the East Side Water Complex to Merrill Avenue has been constructed by others. The Rancho Miramonte project will be required to construct the 12" transmission main from Pine Avenue southerly along both Chino Corona Road to Cucamonga Avenue/Chino Corona Road, thence easterly along Chino Corona Road

across the project frontage, then along re-aligned Chino Corona Road to Hellman Avenue. Those facilities should be subject to DIF offset fee credits, or a reimbursement agreement.

WATER TREATMENT

Based on the timing of the need to increase potable water treatment for the City, the City may need the Rancho Miramonte project to fund the construction of the next incremental stage/phase of the water treatment facility to be located at the Eastside Water Complex Site at 7537 Schaefer Avenue. Those facilities should be subject to a reimbursement agreement and/or DIF offset fee credits, subject to determination of "fair share" costs.

WATER STORAGE

The 2007 MWH Report determined a required storage volume of 1.94 MG for the Edgewater SPA project as shown in Table 14 – that table is recreated here for reference.

TABLE 14
Storage Volume Calculation

Storage Volume Type	Planning Criteria	Required Volume (MG)
Operational	30% MDD	0.37
Fire Fighting	4,000 gpm x 4 hrs	0.96
Emergency	50% MDD	0.61
Total		**1.94**

Based on the revised MDD of 0.48 MG for the Rancho Miramonte project and the use of reclaimed water for irrigation purposes, the revised consumptive use storage volumes required for the project are shown below:

Updated Consumptive Use Storage Volume Calculation

Storage Volume Type	Planning Criteria	Required Volume (MG)
Operational	30% MDD	0.14
Emergency	50% MDD	0.24
Total		**0.38**

Based on the timing of the need to provide water storage in the City water system, the City may need Rancho Miramonte to fund the construction of a water storage facility for the 790 Zone, subject to a reimbursement agreement and/or DIF offset fee credits, subject to determination of "fair share" costs.

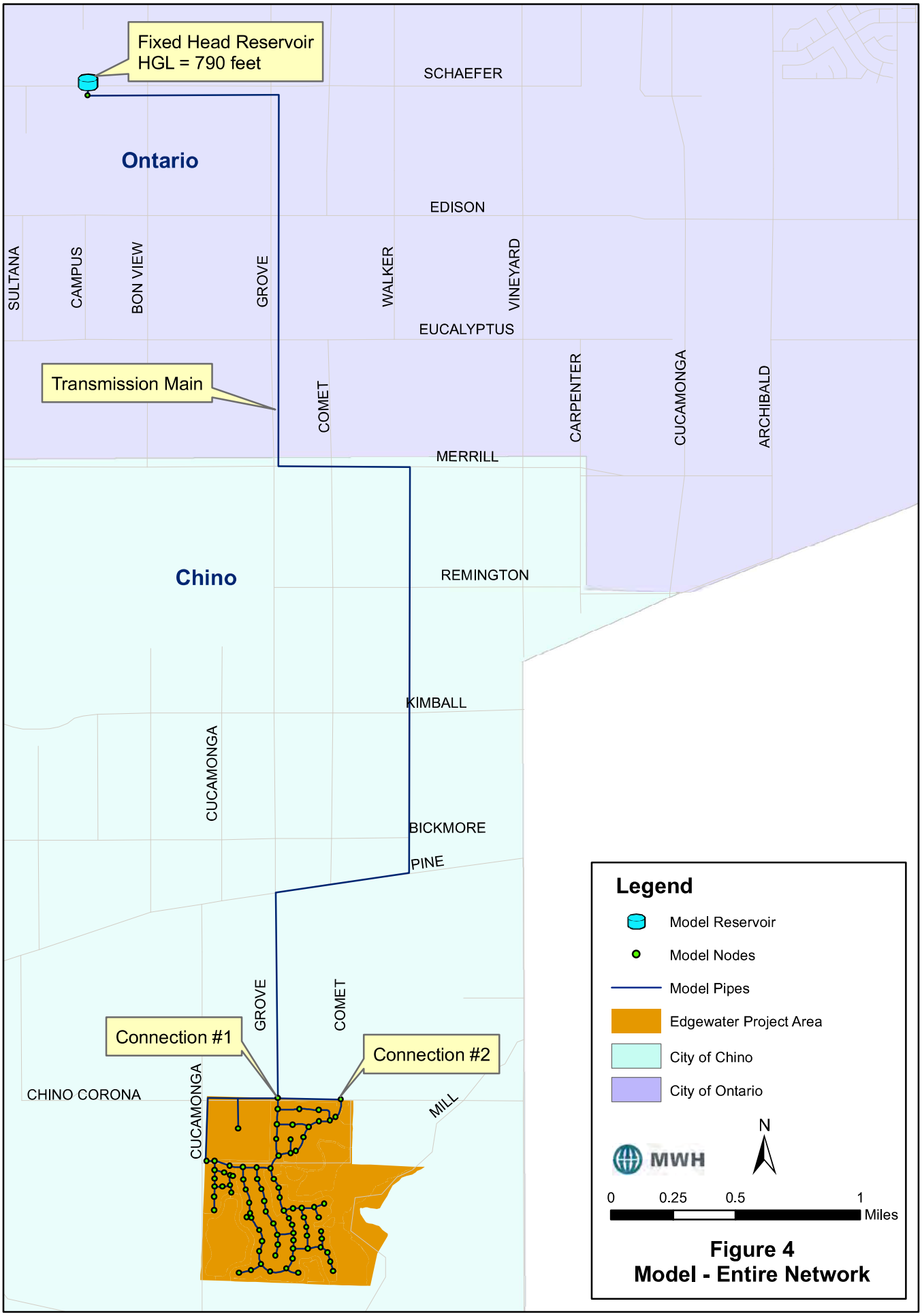


Figure 4
Model - Entire Network

Appendix A – Fire Flow Test Results

CITY OF CHINO
PUBLIC WORKS/ENGINEERING
13220 CENTRAL AVE.
CHINO, CA 91710

PHONE: (909) 591-9827 FAX (909) 590-5535

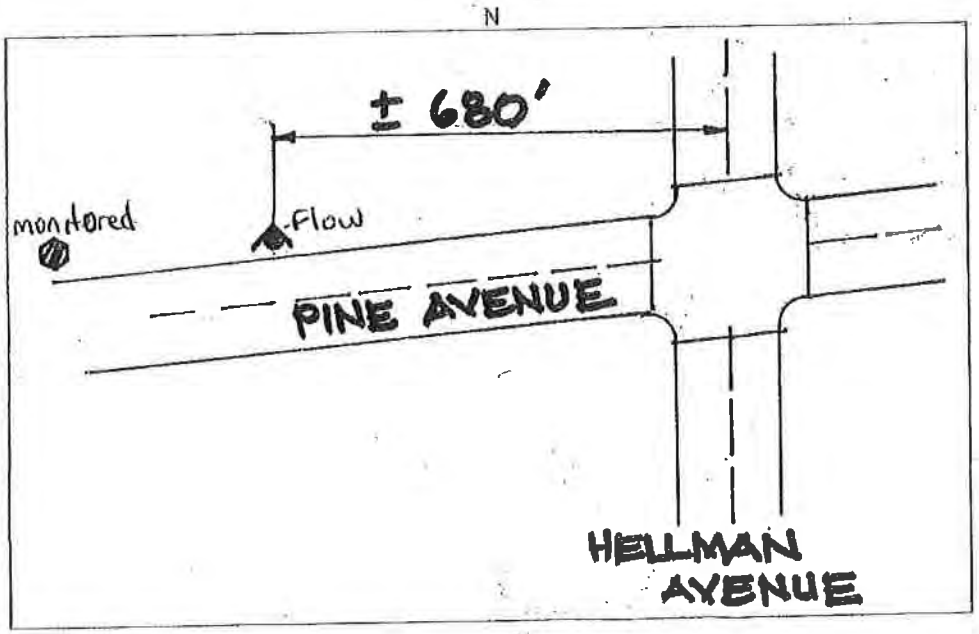
Contact Water Division staff at the number above to obtain information about the availability of fire hydrant flow test information. Complete the information below and indicate if you will be paying for a field test or computer-generated information. Forward this completed form and your payment to the Cashier in the Finance Department (first floor, or second floor). Once payment is received, this form will be forwarded to Water Division staff for processing of data/information requested.

REQUEST FOR FIRE FLOW AVAILABILITY INFORMATION FOR DEVELOPMENT

File Number	WPRES
Building Address	TRACT 16420-1
Nearest Cross Street	PINE AVE. & HELLMAN AVE.
Owner or Requestor	MADOLE & ASSOCIATES
Address	9302 PITTSBURGH AVE. SUITE 230 RANCHO CUCAMONGA CA 91730
Telephone No.	(909) 481-6322
Fax No.	(909) 230-8798

EMAIL: wiwatsuru@madoleinc.com

SKETCH OF HYDRANT LOCATION(S)



Date Paid: 7/25/11 Receipt No. 453499 Cash___ Check #X Visa ___ MC___

Fee for field test: $102 ☒

Fee for copy of recent field test results (within 6 mos.) $38 ☐

Fees effective January 2011

INFORMATION OF FIRE FLOW AVAILABILITY

(To be Completed by Water Purveyor Only)

City of Chino
Public Works Engineering
13220 Central Avenue
Chino, CA 91710
(909) 591-9827

The following flow information is in accordance with hydrants as shown on the attached map(s):

FILE NUMBER: WPLES

MONITORED HYDRANT

LOCATION: Pine Ave West of Hellman Ave.

STATIC PSI: 78 RESIDUAL PSI: 56

FLOW HYDRANT

LOCATION: Pine Ave. West of Hellman Ave.

PITOT: 28

DISTANCE FROM PROPOSED STRUCTURE: 680 ft HYDRANT TYPE/SIZE: 4"&2.5"

SIZE OF WATER MAIN: 12 inch

FIRE FLOW AT 20 PSI: 3839 DURATION: 2 HOURS

It is projected that the pressure zone(s) will decrease? If yes, explain. _____ YES ✓ NO

WATER PURVEYOR: City of Chino SIGNATURE: [signature]

DATE: 7-28-11 TITLE: Asst Water Utilities Supervisor

REMARKS: _____

THIS INFORMATION IS CONSIDERED VALID FOR SIX MONTHS

Any and all approvals by the Fire Department will be issued by the Fire Prevention Division only.
Deficiencies in water systems shall be resolved prior to building permit(s) or recordation.

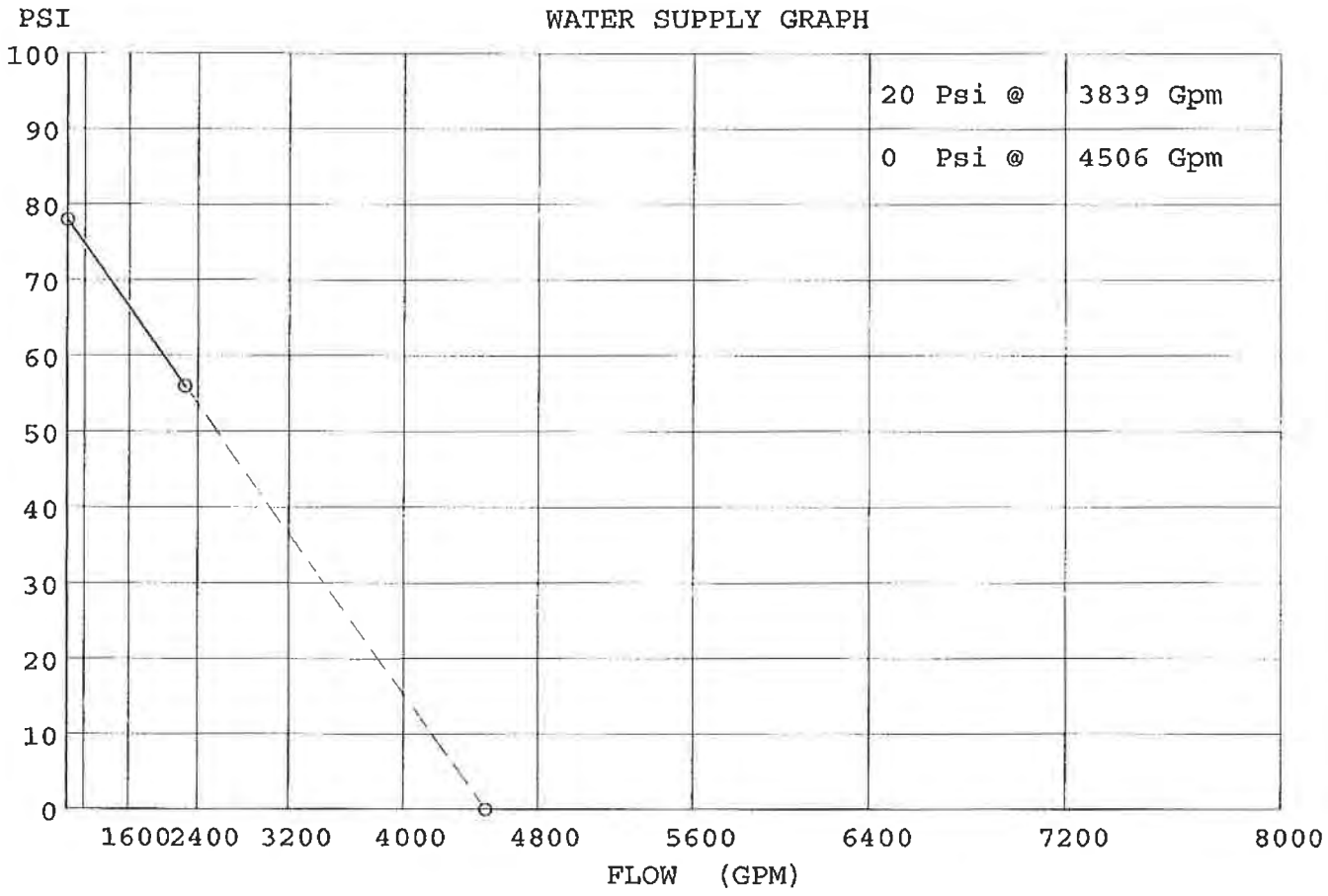
HYDRONICS : HYDRANT FLOW TEST 4.3 FOR WINDOWS - REPORT

ENGINEERS : CITY OF CHINO PUBLIC WORKS (909) 591-9841.
ADDRESS : 5050 Schaefer Avenue, Chino CA 91710.

File: T:\WATERP~1\HYDRFT43\WPRES.HFT
Test Hydrant: Date: 07/28/2011 Time: 11:30
Location: Pine Ave. & Hellman Ave
Elevation: 0 Tester: Vicario / Hornock
Remarks: 12'' main CL2 <.1 mg/L

HYDRANT	GAGE	DIAMETER	COEFF	PITOT	FLOW
	0	4 in	0.9	28 Psi	2273 Gpm

Gage: Static : 78 Psi Residual: 56 Psi Flow: 2273 Gpm



CITY OF CHINO
PUBLIC WORKS/ENGINEERING
13220 CENTRAL AVE.
CHINO, CA 91710

PHONE: (909) 591-9827 FAX (909) 590-5535

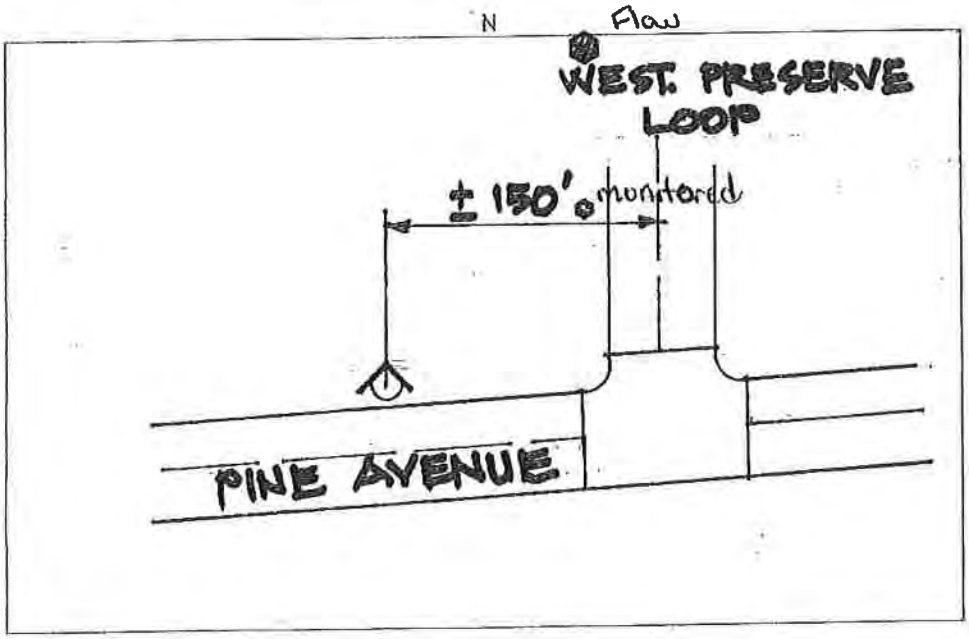
Contact Water Division staff at the number above to obtain information about the availability of fire hydrant flow test information. Complete the information below and indicate if you will be paying for a field test or computer-generated information. Forward this completed form and your payment to the Cashier in the Finance Department (first floor, or second floor). Once payment is received, this form will be forwarded to Water Division staff for processing of data/information requested.

REQUEST FOR FIRE FLOW AVAILABILITY INFORMATION FOR DEVELOPMENT

File Number	WPRESB
Building Address	TRACT 16420-1
Nearest Cross Street	PINE AVE. & WEST PRESERVE LOOP
Owner or Requestor	MADOLE & ASSOCIATES
Address	9302 PITTSBURGH AVE. SUITE 230 RANCHO CUCAMONGA CA 91730
Telephone No.	(909) 481-6322
Fax No.	(909) 230-8798

EMAIL: wiwatsuru@madoleinc.com

SKETCH OF HYDRANT LOCATION(S)



Date Paid: 7/25/11 Receipt No. 453499 Cash___ Check #X Visa___ MC___

Fee for field test: $102 ☒

Fee for copy of recent field test results (within 6 mos.) $38 ☐

Fees effective January 2011

INFORMATION OF FIRE FLOW AVAILABILITY

(To be Completed by Water Purveyor Only)

City of Chino
Public Works Engineering
13220 Central Avenue
Chino, CA 91710
(909) 591-9827

The following flow information is in accordance with hydrants as shown on the attached map(s):

FILE NUMBER: WPRESB

MONITORED HYDRANT

LOCATION: West Preserve Loop North of Pine Ave.

STATIC PSI: 85 RESIDUAL PSI: 60

FLOW HYDRANT

LOCATION: West Preserve Loop North of Pine Ave.

PITOT: 28

DISTANCE FROM PROPOSED STRUCTURE: 150 ft HYDRANT TYPE/SIZE: 4"&2.5"

SIZE OF WATER MAIN: 12 inch

FIRE FLOW AT 20 PSI: 3810 DURATION: 2 HOURS

It is projected that the pressure zone(s) will decrease? If yes, explain. _____ YES ✓ NO

WATER PURVEYOR: City of Chino SIGNATURE: [signature]

DATE: 7-28-11 TITLE: Asst. Water Utilities Supervisor

REMARKS: _____

THIS INFORMATION IS CONSIDERED VALID FOR SIX MONTHS

Any and all approvals by the Fire Department will be issued by the Fire Prevention Division only.
Deficiencies in water systems shall be resolved prior to building permit(s) or recordation.

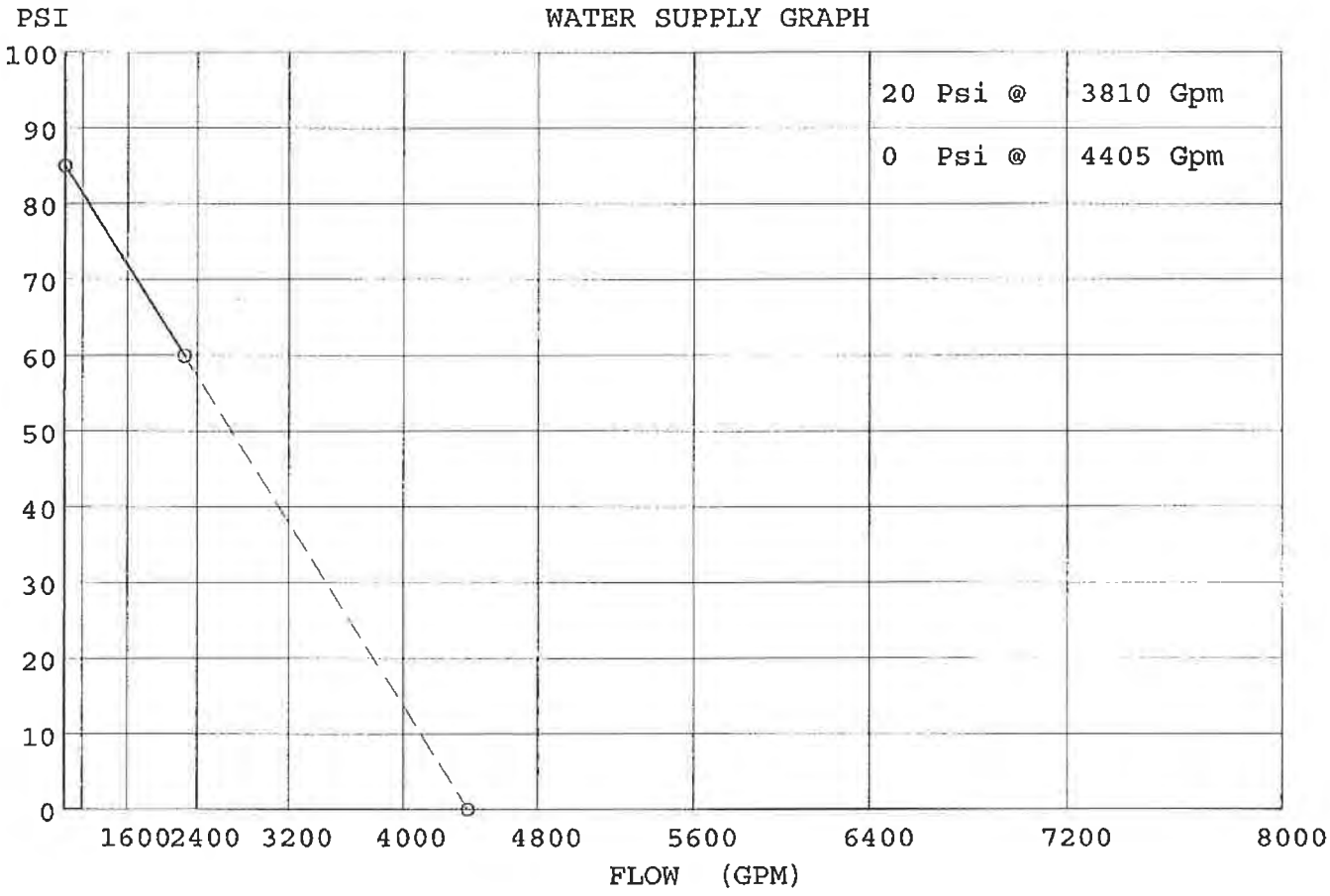
HYDRONICS : HYDRANT FLOW TEST 4.3 FOR WINDOWS - REPORT

ENGINEERS : CITY OF CHINO PUBLIC WORKS (909) 591-9841.
ADDRESS : 5050 Schaefer Avenue, Chino CA 91710.

File: T:\WATERP~1\HYDRFT43\WPRESB.HFT
Test Hydrant: Date: 07/28/2011 Time: 11:00
Location: Pine Ave. & W. Preserve loop
Elevation: 0 Tester: Vicario / Hornock
Remarks: 12 main CL2 <.1 mg/L

HYDRANT	GAGE	DIAMETER	COEFF	PITOT	FLOW
	0	4 in	0.9	28 Psi	2273 Gpm

Gage: Static : 85 Psi Residual: 60 Psi Flow: 2273 Gpm



Appendix B

Seasonal Lake Replenishment Demand

Table 4										
Seasonal Lake Replenishment Demand										
Lake Number	Area (sf)	Winter Usage (in/day)	Avg. Daily Winter Usage (gpd)	Spring Usage (in/day)	Avg. Daily Spring Usage (gpd)	Summer Usage (in/day)	Avg. Daily Summer Usage (gpd)	Autumn Usage (in/day)	Avg. Daily Autumn Usage (gpd)	Average Annual Demand (acre-ft/year)
1	60,000	0.12	4,488	0.25	9,350	0.39	14,586	0.25	9,350	10.6
2	42,000	0.12	3,142	0.25	6,545	0.39	10,210	0.25	6,545	7.4
Total	102,000		7,630		15,895		24,796		15,895	**18.0**
Seasonal Water Replenishment			**Winter**		**Spring**		**Summer**		**Autumn**	
Lake 1		**Gallons**	409,530		853,188		1,330,973		853,188	
Lake 2		**Gallons**	286,671		597,231		931,681		597,231	
		Gallons	**696,201**		**1,450,419**		**2,262,653**		**1,450,419**	
Total Water Repenishment	**gallons per year**	**Acre-feet/year**								
	5,859,692	**18.0**								

Appendix C

Technical Memorandum

Hydrogeologic Evaluation of Moore Property

Test Site

AVOCET
ENVIRONMENTAL, INC.

May 15, 2015 Project No. 1412.001

Mr. Joe Blum
Senior Project Manager
GLE-EDGEWATER PROPERTIES, LLC
1730 Evergreen Street
Duarte, California 91010

Technical Memorandum
Hydrogeologic Evaluation of Moore Property Test Site
13315 S. Bon View Avenue
Ontario, California

Dear Mr. Blum:

Agreement has been reached with the property owner at 13315 S. Bon View Avenue in Ontario, California (Moore Property) for drilling an exploratory boring to characterize the quantity and quality of groundwater that might be expected from a municipal-supply well installed on the property. The purpose of this technical memorandum is to evaluate the local hydrogeologic and water quality conditions based on available information from surrounding sites and comment on the potential for a well constructed on the property to supply groundwater of sufficient quantity and quality to achieve the project objectives.

BACKGROUND

As part of the entitlement process for the Trumark Homes/Rancho Miramonte planned community in Chino, California, the developer was tasked with acquiring, developing and dedicating a water production well to the city to offset the water consumed by the project. Based upon the proposed number of units, a well producing approximately 400 gallons per minute would be required to meet demand. Preliminary conversations with the City (Water and Environmental Manager, March 11, 2015) indicate that the City is interested in a well with a capacity in excess of 1,000 gallons per minute – similar to other City of Chino wells. The City has expressed an interest in cost sharing to construct a well with a production capacity greater than that required by the Rancho Miramonte development.

Groundwater in the Chino Basin commonly contains elevated levels of nitrate and total dissolved solids (TDS) and the City of Chino is presently constructing a plant to treat the water from area wells prior to distribution for potable use. Given the plant (7357 Schaefer Avenue) and feeder line locations, the target area for the well is within the City of Ontario in an area roughly bounded by E. Riverside Drive on the north, S. Bon View Avenue on the east, Schaefer Avenue on the south, and Euclid Avenue on the west. Given this target area, a candidate property for the municipal well, the Moore Property, was identified on the southeast corner of Chino Avenue and Bon View and permission has been given by the property owner to drill a test boring.

1 Technology Drive, Suite C515 ▪ Irvine, California 92618-5302
Phone 949-296-0977 ▪ Fax 949-296-0978
www.avocetenv.com

GEOHYDROLOGIC SETTING

The Moore Property is located in the southern part of the Chino Basin in Southern California. The Chino Basin is a fault-controlled alluvial basin, bounded in the southwest by the Chino Hills, in the northwest by the San Antonio Fault Zone; in the north by the San Gabriel Mountains; in the northeast by the Rialto-Colton Fault, in the east by the Jurupa Mountains, and in the south by La Sierra Hills. Over cycles of uplift and deposition through geologic time, sediments weathered from the uplands have filled the alluvial valley that makes up the Chino Basin.

The principal water-bearing units underlying the Moore Property include Holocene and Upper Pleistocene alluvium (DWR, 2006). The former consists of alluvial fan deposits with a maximum thickness of about 150 feet and the latter consists of interfingering alluvial and fluvial deposits with an estimated thickness of 700 to 1,000 feet in the study area (Wildermuth, 2003). These sediments have been divided by Wildermuth into three aquifer systems – an upper (Layer 1), middle (Layer 2), and lower (Layer 3) (MWD, 2007). In the study area, Layer 1 is estimated to extend from the static water level (approximately 160 feet below ground surface (bgs)) to about 210 feet bgs, below which Layer 2 extends to an approximate depth of 475 feet bgs with Layer 3 below (Wildermuth, 2007). Layer 1 is characterized as unconfined to semi-confined while Layer 2 is characterized as semi-confined to confined (MWD, 2007). Lithologic logs show that the upper and lower systems are not separated by a laterally extensive clay layer, rather there appears to be some degree of hydraulic connectivity between them.

PRODUCTION CAPACITY

The area encompassing the Moore Property includes numerous private domestic and agricultural wells and several municipal-supply water wells. Over the past decade, the average static water level in these wells has been about 580 feet above mean sea level (asl) or about 160 feet bgs. Production rates for municipal-supply water wells in the study area exceed 1,000 gallons per minute. These wells tap both the Upper and Middle aquifer systems (Layers 1 and 2) and may locally extend partly into Lower aquifer system (Layer 3).

The area encompassing the Moore Property includes numerous private domestic and agricultural wells and several municipal-supply water wells. Subsurface information derived from available geologic logs prepared for these wells reveal that potential aquifer zones having a reasonable thickness and possibly suitable values of permeability for municipal-supply groundwater development are present at the Moore Property site. Subsurface information derived from a test hole drilled near the intersection of Schaefer Avenue and S. Bon View Avenue (approx. 2,200 feet south of the Moore Property) indicates viable aquifer zones between the depths of 230 and 680 feet below ground surface (bgs). Testing, conducted on behalf of the City of Chino on one of their wells constructed on the Eastside Water Treatment Plant property (approximately 0.75-mile south of the Moore Property), revealed a production capacity on the order of 1,500 gallons per minute (gpm) with the majority (60 percent [%]) of the water obtained from aquifer systems occurring between the depths of 220 feet and 330 feet bgs. The remaining 40% of the well

production was derived from depths ranging from 435 feet to 580 feet bgs. Therefore the proposed 600-foot deep test boring on the Moore Property should penetrate the principal aquifer systems present in the southern Chino Basin. If the aquifer systems possess a thickness and permeability similar to those encountered on nearby properties, then resulting well could have a maximum pumping capacity in the range of 1,000 to 1,500 gpm.

WATER QUALITY

The area surrounding the Moore Property has been occupied by dairy operations since at least the 1950s. Consequently, there has been a significant impact to groundwater quality in the aquifer systems underlying the region from these dairy operations. Groundwater quality data from existing wells near the Moore Property shows a range of values with certain wells exceeding primary and/or secondary maximum contaminant levels (MCLs, i.e., drinking water standards) for total dissolved solids (TDS), nitrate, volatile organic compounds (VOCs), hexavalent chromium, perchlorate, and radionuclides. The treatment plant being constructed by the City of Chino was designed specifically to remove nitrate and dissolved solids from produced groundwater, so elevated concentrations of these contaminants are of little concern. Rather, it is the other above-listed contaminants that will determine the suitability of the water for the project.

To assess the local groundwater quality, a groundwater sample was collected from the Shady Grove Nursery well located approximately 600 feet south of the test boring site. The Shady Grove Nursery well was constructed in 1953 and is a 357' deep agricultural well, screened at four depths between 154 and 316 feet bgs. This sample was analyzed for VOCs and general mineral/physical properties. As expected, the results revealed elevated concentrations of nitrate (260 milligrams per liter [mg/L]) and TDS (880 mg/L). However, VOCs, hexavalent chromium, and perchlorate were not detected. Given the available information, groundwater produced from the Moore Property well should be suitable for treatment at the City's Eastside Treatment Facility.

CLOSING REMARKS

The exploratory boring site is located in the southern part of the Chino Groundwater Basin. Groundwater supply and test wells located in close site proximity indicate that aquifer systems of sufficient thickness and permeability for municipal supply development are present in this area of the basin. Groundwater samples collected from wells in the test boring vicinity indicate that water quality should be suitable for treatment (i.e., desalting) and subsequent potable use.

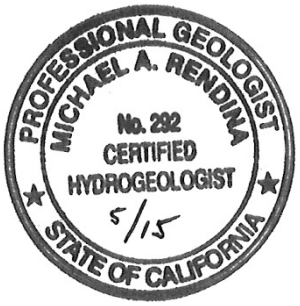
In brief, the scope of the proposed Moore Property testing program involves the drilling of a 17.5-inch boring to a depth of 600 feet, geologic and geophysical logging of the borehole, and identification of permeable intervals for isolated zone testing. The results of this test program should provide sufficient information for well design as well as to estimate the production capacity and water quality of a supply well installed at the site. This information could prove valuable in securing the City's interest in a cost-sharing arrangement for construction of a well with a capacity in excess of that required by the development. Moreover, portions of the work

undertaken as part of the test program will reduce the scope of work required when the well is ultimately installed. In other words, some of the costs incurred during the test program will result in savings during well construction.

If you have any questions, please do not hesitate to call.

Respectfully submitted,

AVOCET ENVIRONMENTAL, INC.



Michael A. Rendina, P.G., C.Hg.
Principal

MAR:sh
Enclosure
cc: Mr. Brian Goodell – The Gold Medal Group

P:\1412 Edgewater_Rancho Miramonte\Client Correspondence\Technical Memorandum_Capacity&Quality_2015-05-15.docx

REFERENCES

California Department of Public Health (CDPH), November 2008, Maximum Contaminant Levels and Regulatory Dates for Drinking Water U.S. EPA versus California.

California Department of Water Resources (DWR), January 2006, California's Groundwater: Upper Santa Ana Valley Groundwater Basin, Bulletin 118.

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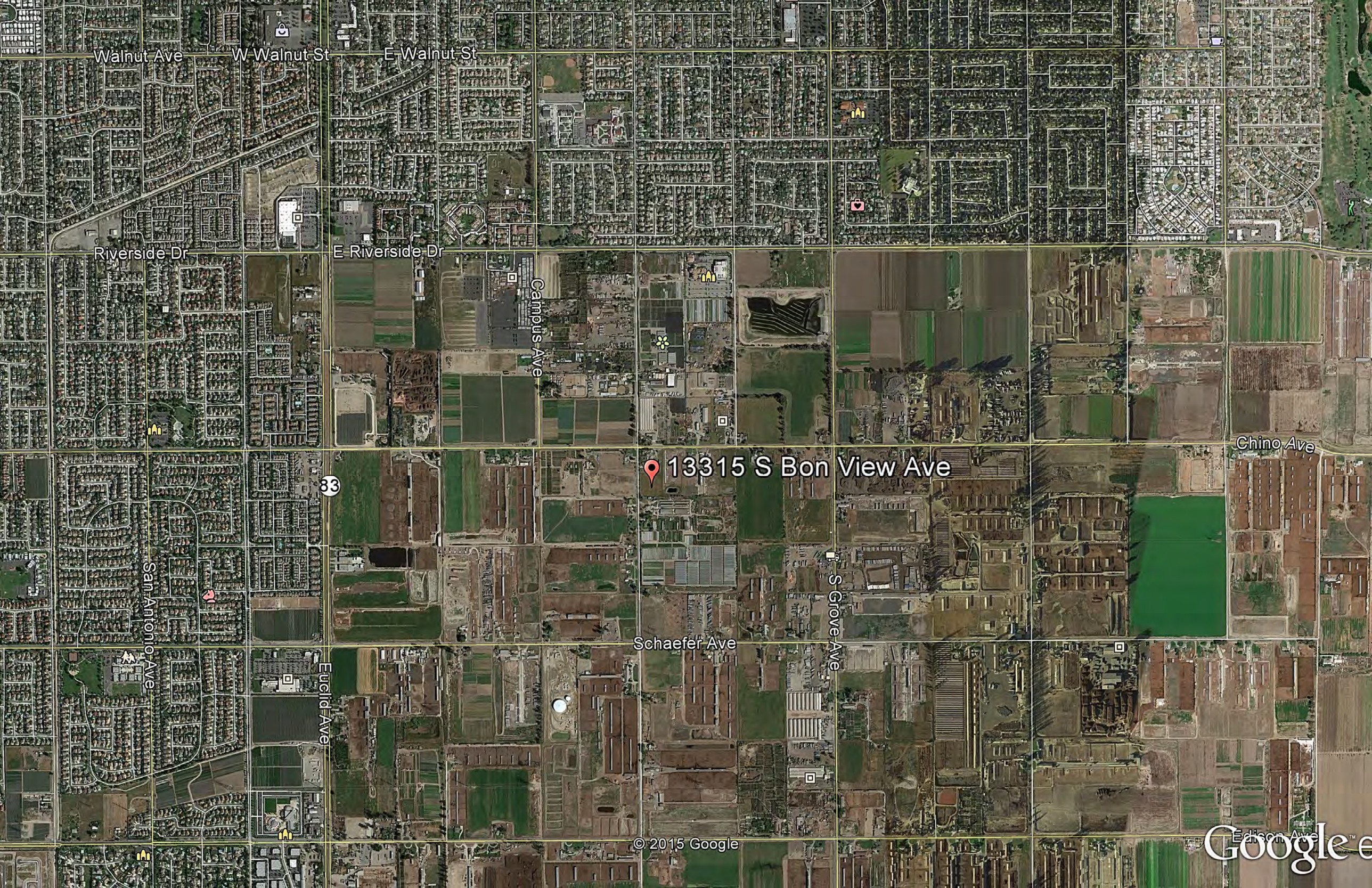
Wildermuth Environmental, Inc., September 2003, Optimum Basin Management Program Technical Memo Prepared for Chino Basin Watermaster.


Moore Property
Legend
Moore Test Hole Location
Property
Well
Well Lot (75' x 80')
Well 347
Well 115
200' Radius
100' Radius
Well 153 (Residential Well)
Chino Ave
Well Lot
Moore Test Hole Location
Former Dairy
Well 90
Septic Tank/Leach Field
S Bon View Ave
Nursery Well 202
Well 74
Google earth
© 2015 Europa Technologies
© 2015 Google
N
600 ft


Walnut Ave
W Walnut St
E Walnut St
Riverside Dr
E Riverside Dr
Campus Ave
13315 S Bon View Ave
Chino Ave
San Antonio Ave
Euclid Ave
Schaefer Ave
S Grove Ave
Edison Ave
83
© 2015 Google

Appendix D

Open Space Irrigation

Recycled Water Demand

Rancho Miramontes

Open Space Irrigation
Recycled Water Demand

Chino, CA

Lot #	Land Use	Area (acres)	Demand Factors: Land Use	Total Water Demand (gpd/ac)	Percent Indoor Water	Percent Outdoor Water	ADD Indoor (gpd)	ADD Outdoor (gpd)	ADD Outdoor (Ac-ft/yr)	MDD Outdoor (gpd)	PHD Outdoor (gpm)
A	OS	2.32	OS-R	2,900	10%	90%	673	6,055	6.78	15,744	33
B	OS	7.61	OS-R	2,900	10%	90%	2,207	19,862	22.25	51,641	108
C	OS	2.34	OS-R	2,900	10%	90%	679	6,107	6.84	15,879	33
D	OS	3.14	OS-R	2,900	10%	90%	911	8,195	9.18	21,308	44
E	OS	0.97	OS-R	2,900	10%	90%	281	2,532	2.84	6,582	14
F	OS	0.37	OS-R	2,900	10%	90%	107	966	1.08	2,511	5
G	OS	0.15	OS-R	2,900	10%	90%	44	392	0.44	1,018	2
H	OS	2.89	OS-R	2,900	10%	90%	838	7,543	8.45	19,612	41
I	OS	0.2	OS-R	2,900	10%	90%	58	522	0.58	1,357	3
J	OS	1.39	OS-R	2,900	10%	90%	403	3,628	4.06	9,433	20
K	OS	10.17	OS-R	2,900	10%	90%	2,949	26,544	29.73	69,014	144
L	OS	3.97	OS-R	2,900	10%	90%	1,151	10,362	11.61	26,940	56
M	OS	4.74	OS-R	2,900	10%	90%	1,375	12,371	13.86	32,166	67
N	OS	4.25	OS-R	2,900	10%	90%	1,233	11,093	12.43	28,841	60
R	OS	2.81	OS-R	2,900	10%	90%	815	7,334	8.22	19,069	40
S	OS	0.17	OS-R	2,900	10%	90%	49	444	0.50	1,154	2
T	OS	0.05	OS-R	2,900	10%	90%	15	131	0.15	339	1
U	OS	0.92	OS-R	2,900	10%	90%	267	2,401	2.69	6,243	13
V	OS	6.58	OS-R	2,900	10%	90%	1,908	17,174	19.24	44,652	93
W	OS	0.16	OS-R	2,900	10%	90%	46	418	0.47	1,086	2
X	OS	1.91	OS-R	2,900	10%	90%	554	4,985	5.58	12,961	27
Y	OS	16.34	OS-R	2,900	10%	90%	4,739	42,647	47.77	110,883	231
Z	OS	0.97	OS-R	2,900	10%	90%	281	2,532	2.84	6,582	14
BB	OS	0.62	OS-R	2,900	10%	90%	180	1,618	1.81	4,207	9
		75.04				totals	21,762	195,854	219.40	509,221	1,061

Average Day Demand	195,854	gpd		0.509
Maximum Day Demand	509,221	gpd	2.6 times ADD	
Peak Hour	1,061	gpm	3.0 times MDD	

Annual Recycled Water Use 219.40 Ac-ft/yr

RANCHO MIRAMONTE SPA

SEWER MASTER PLAN

CITY OF CHINO

CHINO AGRICULTURAL PRESERVE AREA

Prepared for:

GLE Edgewater, LLC
(formerly Millcreek Farming Associates, LLC)
1730 Evergreen Street
Duarte, CA 91010

Prepared by:

RMB
8175 Limonite Avenue, Suite E
Jurupa Valley, CA 92509
(951) 317-2041

March 5, 2013
Updated May 28, 2013
Updated November 18, 2013
Updated March 14, 2015
Updated July 1, 2015
Updated September 9, 2015

Prepared under the Supervision of:

_____

Robert M. Beers, P.E. **Date**

TABLE OF CONTENTS

PAGE

Sewer Master Plan Update

For
City of Chino – Rancho Miramonte SPA

INTRODUCTION

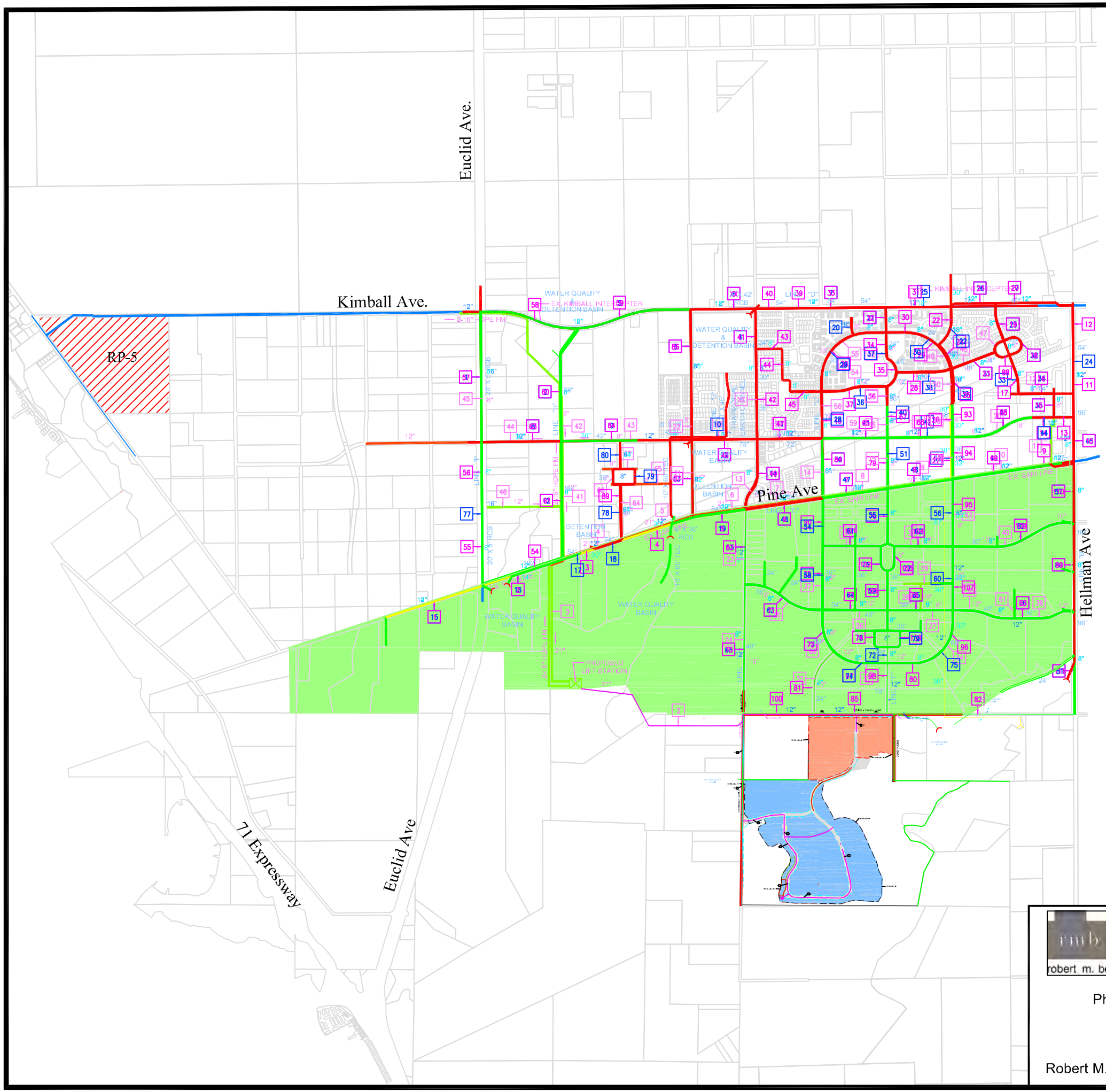
This report is an update of the City of Chino's Sewer Master Plan Report for Service Area D of Subarea 2 of the Chino Agricultural Preserve Area, dated November 6, 2007. This report revises the area previously called the Edgewater Development, and revisions to the Sewer Master Plan as recommended in the Sewer Study report dated August 2006, by L.D. King, Inc. (LD King Study) – see Sewer Service Area – Figure 1. A copy of the Sewer Service Area Map – Figure No. 3 from the November 2007 report is included in Appendix A for reference.

The Study Area is comprised of an approximately 271-acre area, bounded by Chino Corona Road on the north, Cucamonga Avenue on the west, Prado Reservoir to the south, and Mill Creek to the east. Approximately 129-acres are proposed to be developed with low & medium density residential development, with approximately 150-acres remaining as street row, open space and natural area (See Land Use Plan – Figure 2).

As noted in the City's Sewer Master Plan, all present and future wastewater generated by the Mill Creek SPA will be treated by Inland Empire Utilities Agency (IEUA) at their Reclamation Plant No. 5 (PR-5) located at the southeast corner of Kimball Avenue and El Prado Road.

Based on IEUA's Facilities Plan as shown in the 2007 Sewer Master, sewer flows from the portion of the Lewis Preserve project southerly of Pine Avenue (Service Area C of Subarea 2) were tabled to convey flows to the proposed Chino Corona Road Sewer Lift Station to be located at the northeast corner of the Chino Corona Road and Cucamonga Avenue. Subsequent modifications to the Master Plan relocated this Sewer Lift Station to the west of the State of California Institution for Women near Johnson Avenue. A copy of the 2010 L.D. King Sewer Facility Map for the Preserve Area is included in Appendix A which shows the new location for the Regional Sewer Lift Station.

This report presents preliminary alignments, sizes, and cost estimates for sewer facilities recommend for planning purposes, based on built-out condition of the study area based on the Chino General Plan and the Mill Creek Farming SPA development.



LEGEND

- SEWER AREA D-1
- SEWER AREA D-2
- SEWER EXISTING
- REGIONAL SEWER
- SEWER FUTURE
- SEWER PROPOSED

N.T.S.

8175 Limonite Avenue, Suite E
Jurupa Valley, CA 92509

Ph. (951) 360-2070 Fax (951) 360-2080
Cell: (951) 317-2041

Robert M. Beers, PE rmbeers777@hotmail.com

Rancho Miramonte SPA

Sewer Infrastructure

PREPARED BY: R.M.B. | DATE: 09-05-15 | 1 of 1

STUDY AREA

As Shown in Figure 1, the Study Area for Service Area D is bounded by Chino Corona Road on the north, Cucamonga Avenue on the west, Prado Reservoir to the south, and Mill Creek to the east.

The proposed Mill Creek Farming SPA are is proposed to be graded in a manner so as to "raise" the development portion of the study area above the Prado Flood Control Basin's "High Water Elevation" of 566.

LAND USE PLAN

This Sewer Master Plan Updated Study is based on built-out condition of the Land Use Plan as shown in Figure 2. Project breakdown of the Land Use Plan for Service Area D of Subarea 2 is as follows:

Description	Area	
Developed Area		
Low Density Residential	87.7	Acres
Medium Density Residential	33.42	Acres
Neighborhood Commercial	5.07	Acres
Clubhouse/Park	3.56	Acres
Pocket Parks (Lots "L", "S" & "W")	0.95	Acres
Subtotal Developed Area	129.98	Acres
Open Space – Recreational	54.14	Acres
Open Space – Natural	66.99	Acres
R-O-W	19.33	Acres
Total	271.16	Acres

The buildable area associated with the proposed Rancho Miramonte SPA is 7.93 acres smaller in size (5.6% less) than the Edgewater SPA.

The Edgewater SPA proposed 142.09 acres of residential development, whereas the proposed Ranch Miramonte SPA proposes 134.16 acres of combined residential and commercial development. A comparison of the Land Use Distribution between the Edgewater SPA and Rancho Miramonte SPA is as follows:

Table 2

Land Use Distribution - Service Area D

Comparison of Areas and Flows between Edgewater SPA and Rancho Miramonte SPA

Land Use Classifications	Residential Area (Acres)				Commerical				Office	IND	Public Facilities		Open Space	Agricultural	Total	Average Daily flows (gpd)
	ER	LDR	MDR	HDR	RC	CC	AR	NC	BP/O	LI	INS	AP	OSR-R	AG	Acres	
Flow Factors	536	1412	2395	3642	2500	3050	2500	2500	2000	1000	2500	1000	100	1000		
Edgewater *																
Service Area D-1		63.82	28.7	15.63				0					41.92		150.07	219,967
Service Area D-2		33.94	0	0				0					29.47		63.41	50,870
Subtotals		97.76	28.7	15.63									71.39		213.48	270,837
Total Residential Area	142.09		Total Developed Area (Residential + Commercial) =		142.09											
Rancho Miramonte																
Service Area D-1		87.33	6.28	0				3.56					43.53		140.7	151,604
Service Area D-2		6.02	25.91	0				5.06					11.56		48.55	84,361
Subtotals		93.35	32.19	0				8.62					55.09		189.25	235,964
Total Residential Area	125.54		Total Developed Area (Residential + Commercial) =		134.16											

* - from Table 2 of Appendix K.4 = Sewer Master Plan Update Report prepared by Bureau Veritas - Final Report November 2007

ER =	ESTATE RESIDENTIAL	RC =	REGIONAL COMMERCIAL	LI =	LIGHT INDUSTRIAL
LDR =	LOW DENSITY RESIDENTIAL	CC =	COMMUNITY CORE	INS =	INSTITUTIONAL
MDR =	MEDIUM DENSITY RESIDENTIAL	AR =	AIRPORT RELATED COMMERCIAL	AP =	AIRPORT
HDR =	HIGH DENSITY RESIDENTIAL	NC =	NEIGHBORHOOD COMMERCIAL	OS-R =	OPEN SPACE - RECREATIONAL
				AG =	AGRICULTURAL

NET AREA CHANGES (COMPARISON OF EDGEWATER TO RANCHO MIRAMONTE SPA)

	Acres							Acres					Acres		Acres	GPD
reduction =		LDR	MDR	HDR				NC					OSR-R		TOTAL	ADF
increase =		4.41	-3.49	15.63				-8.62					16.3		24.23	34,873

			Acres		
Edgewater SPA	Total Developed Area (Residential + Commercial) =	142.09	Net reduction in Residential Area =	16.55	Acres
Rancho Miramonte SPA	Total Developed Area (Residential + Commercial) =	134.16	Increase in Commercial Area =	8.62	Net Reduction in Buildable Area = 7.93

RANCHO MIRAMONTE LAND USE PLAN

Rancho Miramonte Specific Plan Preliminary Buildout		
Land Use	Acres	Units
Base Designations		
Low Density Residential [1]	87.70	520
Medium Density Residential	33.42	303
Neighborhood Commercial [2]	5.07	
Clubhouse / Park	3.56	
Open Space Recreation (including Parks)	55.09	
Open Space Natural	66.99	
Backbone Roads	19.33	
Totals	271.16	823

Notes:
[1] Per The Preserve SP, the minimum lot size in the Low Density category is 3,600 sq. ft. However, along 45% of the perimeter of the LDR's edge abutting the Open Space area, the minimum lot size is 8,700 square feet.
[2] The neighborhood commercial is intended to accommodate local-serving uses that are compatible with the community theme such as a church, museum, crop cultivation, retail, market, deli, and café.

LOW DENSITY (3-8 DU/AC)
MEDIUM DENSITY (8-12 DU/AC)
CLUBHOUSE/PARK
OPEN SPACE RECREATION
OPEN SPACE NATURAL
Neighborhood Commercial
ROAD
566' ELEVATION CONTOUR (PROPOSED)
MILL CREEK

NOT TO SCALE

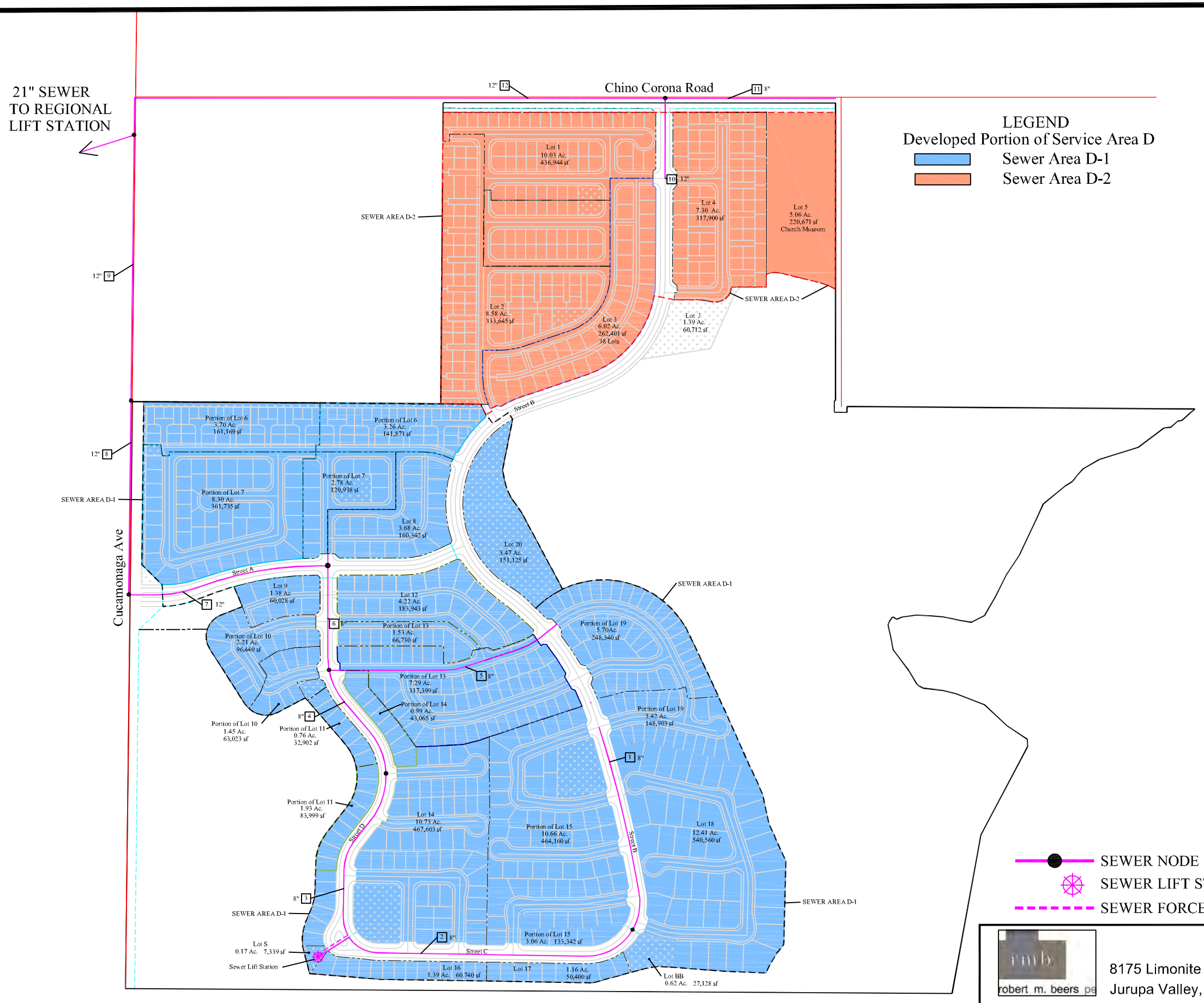
SEWER SERVICE AREA – Rancho Miramonte SPA

Service Area D is divided into two sub-areas, D-1 & D-2. Service Area D-1 is the portion of the site tributary to Cucamonga Avenue, and is approximately 93-acres in size. Service Area D-2 is the portion of the site tributary to Chino Corona Road and is approximately 37-acres in size.

These areas are shown on Figure 3.

Service Area D for the Rancho Miramonte SPA is 189.25 acres in size, as compared to the 213.48 acres for Service Area D for the Edgewater SPA. This is a reduction of nominally 12.25% of the size of the service area.

The number of proposed residential units for the Rancho Miramonte SPA is 823 low and medium density units, which is reduction of 251 units from the approved Edgwater SPA total of 1,074 units (approximatley 23.4% reduction).



Service Area D-1
Cucamonga Avenue

Segment Number	PEAK FLOW (CFS)	(MGD)	SLOPE (%)	D/d	V (fps)	Size (")
1	0.1279	0.083	0.75%	0.2363	2.03	8
2	0.1541	0.100	0.50%	0.2838	2.02	8
3	0.0628	0.041	1.50%	0.3488	2.06	8
4	0.2266	0.146	0.50%	0.3600	2.09	8
5	0.0644	0.042	1.50%	0.4650	2.12	8
6	0.3272	0.211	0.40%	0.2575	2.04	12
7	0.4031	0.260	0.40%	0.2867	2.17	12
8	0.4625	0.299	0.32%	0.3292	2.10	12
9	0.4625	0.299	0.32%	0.3292	2.10	12

Service Area D-2
Chino Corona Road

Segment Number	PEAK FLOW (CFS)	(MGD)	SLOPE (%)	D/d	V (fps)	Size (")
10	0.2355	0.152	0.50%	0.2067	2.01	12
11	0.0451	0.029	1.75%	0.1150	2.01	8
12	0.2759	0.178	0.50%	0.2233	2.11	12

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Rancho Miramonte SPA

Sewer Infrastructure

PREPARED BY: R.M.B. DATE: 09-05-15

SEWER FLOW PROJECTIONS

Based on a review of the unit wastewater flow generation factors used in the City of Chino's Sewer Master Plan, the following factors were used for the development of average and peak sewer flows generated within the Study Area.

Flow projections for the Residential Land Uses are based on an average daily flow generation of 80 gallons per day per person. The average estimated density in the study area is approximately 3.4 persons per dwelling unit (DU), based on the Preserve Specific Plan dated March 2003. Projected sewer flows in gallons per day per gross acre (pgd/acre) for each Land Use type are as follows:

Residential Land Use Type	Average DUs/acre	Average Daily Flows Rate
Estate	2	536 gpd/acre
Low Density	5.25	1,412 gpd/acre
Medium Density	9	2,395 gpd/acre
High Density	13.5	3,642 gpd/acre
Commercial		2,500 gpd/acre
Offices		2,000 gpd/acre
Industrial (Light)		1,000 gpd/acre
Public Facilities: Institutional		2,500 gpd/acre
Public Facilities: Airport		1,000 gpd/acre
Open Space: Recreational		100 gpd/acre
Open Space: Natural		0 gpd/acre
Agricultural *		1,000 gpd/acre

* If future change in land use is possible

Per Table 2 of Appendix K.4 – Sewer Master Plan Update Report prepared by Bureau Veritas – Final Report November 2007 for the Edgewater SPA, the average daily flow for Service Area D was 270,837 gpd. With our revised definition for Rancho Miramonte SPA of land use, unit types, and area for Service Area D, the calculated average daily flow is reduced to 235,964 gpd.

This represents a reduction in average daily flows of 12.9%, or nominally 34,875 gpd.

The following table summarizes the sewer flow projections based on the proposed land use. The Sewer Line Segments are shown on Figure 4. A detailed routing by Sewer Line Segment is shown for Service Areas D-1 & D-2 in Appendix B.

Service Area D-1

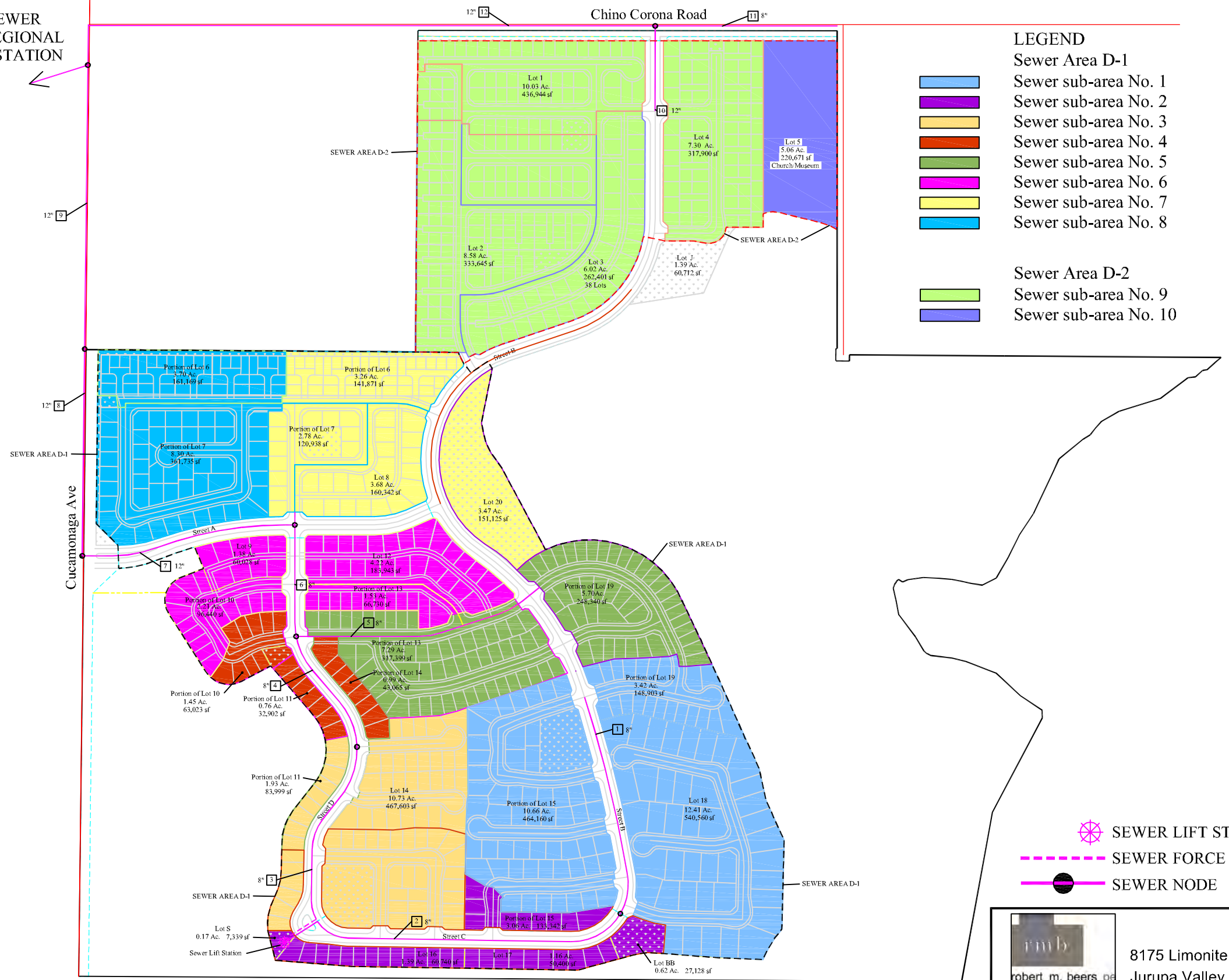
Cucamonga Avenue

	PEAK FLOW					
Segment Number	(CFS)	(MGD)	SLOPE (%)	D/d	V (fps)	Size (")
1	0.1279	0.083	0.75%	0.2363	2.03	8
2	0.1541	0.100	0.65%	0.2688	2.04	8
3	0.0796	0.051	1.10%	0.1700	2.02	8
4	0.1388	0.090	0.70%	0.2500	2.03	8
5	0.3272	0.211	0.40%	0.2500	2.04	12
6	0.4031	0.260	0.32%	0.3033	2.00	12
7	0.4625	0.299	0.32%	0.3258	2.08	12
8	0.4625	0.299	0.32%	0.3258	2.08	12

Service Area D-2

Chino Corona Road

	PEAK FLOW					
Segment Number	(CFS)	(MGD)	SLOPE (%)	D/d	V (fps)	Size (")
9	0.2355	0.152	0.50%	0.2067	2.01	12
10	0.0451	0.029	1.75%	0.1150	2.01	8
11	0.2759	0.178	0.50%	0.2233	2.11	12



Service Area D-1
Cucamonga Avenue

Segment Number	PEAK FLOW (CFS)	(MGD)	SLOPE (%)	D/d	V (fps)	Size (")
1	0.1279	0.083	0.75%	0.2363	2.03	8
2	0.1541	0.100	0.50%	0.2838	2.02	8
3	0.0628	0.041	1.50%	0.3488	2.06	8
4	0.2266	0.146	0.50%	0.3600	2.09	8
5	0.0644	0.042	1.50%	0.4650	2.12	8
6	0.3272	0.211	0.40%	0.2575	2.04	12
7	0.4031	0.260	0.40%	0.2867	2.17	12
8	0.4625	0.299	0.32%	0.3292	2.10	12
9	0.4625	0.299	0.32%	0.3292	2.10	12

Service Area D-2
Chino Corona Road

Segment Number	PEAK FLOW (CFS)	(MGD)	SLOPE (%)	D/d	V (fps)	Size (")
10	0.2355	0.152	0.50%	0.2067	2.01	12
11	0.0451	0.029	1.75%	0.1150	2.01	8
12	0.2759	0.178	0.50%	0.2233	2.11	12

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Rancho Miramonte SPA

Sewer Infrastructure

PREPARED BY: R.M.B. DATE: 09-05-15

DESIGN CRITERIA

Average flows were routed in the proposed sewer facilities. The proposed backbone facilities sizes are based on the tributary peak dry weather flows using the peaking factor formula developed in the City of Chino's Sewer Master Plan:

- Dry Weather Peaking Factor (DWPF) = 1.95 x (Average Flow [in cfs])^^-0.038
- Peak Dry Weather Flow = (DWPF) x (Average Flow)
- Hydraulic criteria for sizing pipes is based on Manning's Equation with a Manning's Coefficient n = 0.013.
- Pipe Material for Gravity Sewer: Extra Strength Vitrified Clay Pipe with rubber gaskets

Minimum velocity in gravity sewer: 2 feet per second *

Minimum slopes:	For 6-inch diameter pipe	0.0100
	For 8-inch diameter pipe	0.0040
	For 10-inch diameter pipe	0.0030
	For 12-inch diameter pipe	0.0024
	For 15-inch diameter pipe	0.0017
	For 18-inch diameter pipe	0.0014
	For 21-inch diameter pipe	0.0011
	For 24-inch diameter pipe	0.0010
	For 27-inch diameter pipe	0.0010

* or as approved by City of Chino

Maximum ratio of flow depth to pipe diameter (D/d ratio) for peak flows in gravity sewer is as follows:

- 0.60 for pipe diameter less than 12 inches
- 0.67 for pipe diameter equal to 12 inches
- 0.75 for pipe diameter greater than 12 inches

Sewer systems subject to high groundwater or impoundment of surface waters should be designed as sealed systems to mitigate the potential of high inflow and infiltration into the sewer system. All manhole covers and clean-out covers with elevations lower than 566 feet should have bolted covers and clean out covers with pressure plated assemblies. All sewer structures including wet wells, junction structures, flow splitters, and manholes that extend below 566-foot elevation shall be plastic lines, including water stops at all construction and expansion joints.

The proposed slopes for the Rancho Marimonte SPA sewer backbone infrastructure is nominally the same as the slopes of the Edgewater SPA.

BACKBONE FACILITIES

Proposed backbone facilities for the built-out condition of the Study Area are shown on Figure 4. Sizes and alignments for the recommended facilities are for master planning purposes, based on preliminary evaluation of the Study Area. Final design of the proposed facilities should incorporate design details and phasing of the future offsite facilities.

Sewers less than 12-inch diameter shown in backbone roads of the development are considered to be master planned backbone facilities.

COST ESTIMATE

SEWER INFRASTRUCTURE COST ESTIMATE

GLE Edgewater Properties, LLC - Chino

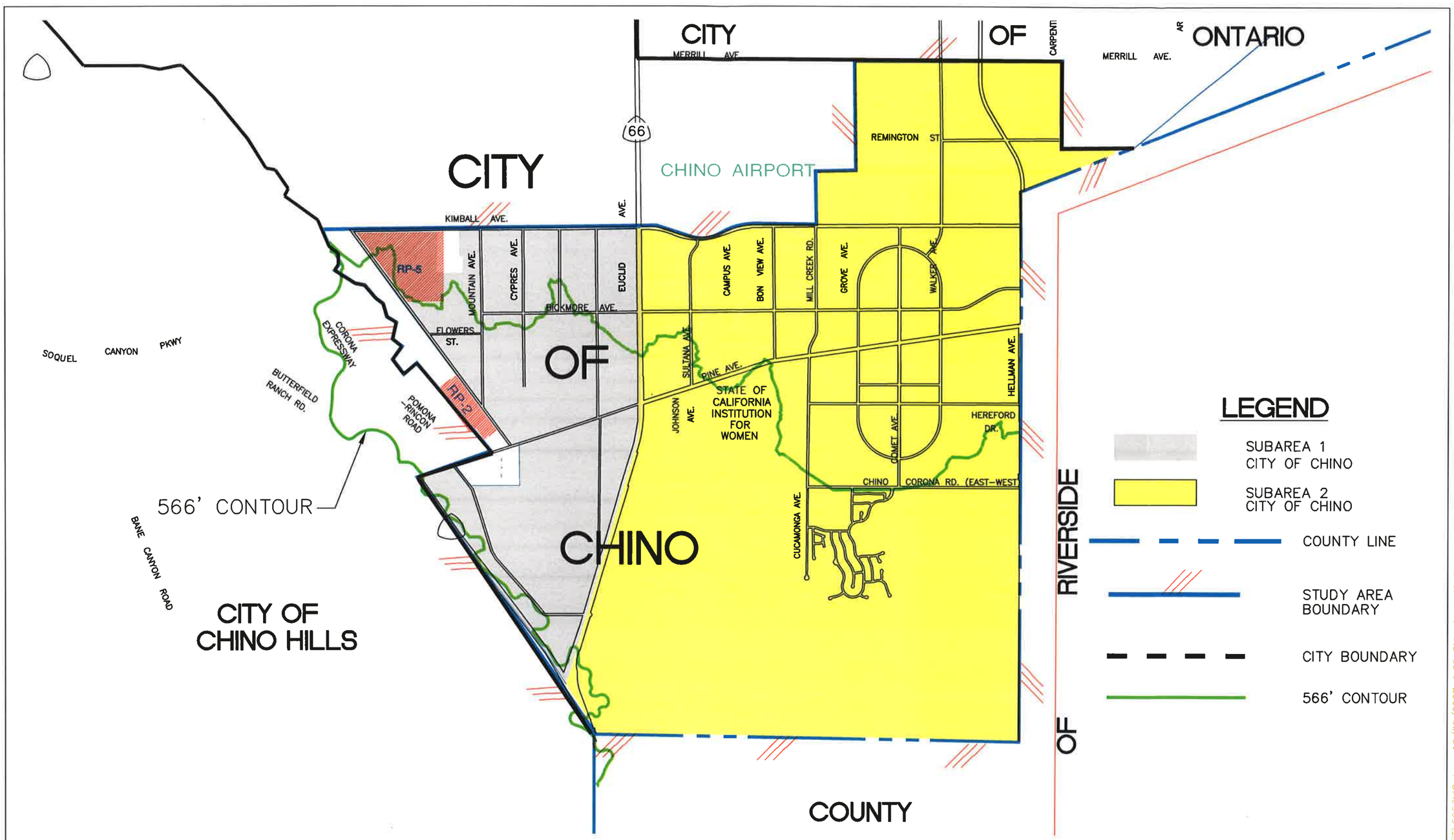
Page 1 of 1

Tract #:	**TTM 18846**	**Date:**	**Sept. 15, 2015**
Location:	**Chino - Edgewater**	**Time:**	
Designation:	**Lot Development**		
Phase:	**1**	**Prepared By:**	**R Beers**
# of Lots:	**20**	**Reviewed By:**	**D Montero**
Acreage:	**271**		
Contingency:		**Scenario:**	

SANITARY SEWER

Construction Items	Quantity	Unit	Amount	Cost
1. 8" VCP Sewer Main	7,301	LF	75.00	$547,575
1A. 8" VCP Sewer Main - deep	1,522	LF	100.00	$152,200
2. 12" VCP Sewer Main - Deep	2,927	LF	150.00	$439,050
2A. 21" VCP Sewer Main - deep (offsite to Lift Station)	5,073	LF	275.00	$1,395,075
2B. 18" VCP Sewer Main - deep (offsite - Chino Corona Road)	2,909	LF	225.00	$654,525
3. 48" Sewer Manhole	18	EA	4,725.00	$85,050
4. 48" deep Sewer Manhole with landing	18	EA	7,750.00	$139,500
5. 60" Sewer Manhole - Deep	45	EA	10,500	$472,500
6. Raise Manhole to Grade	81	EA	500.00	$40,500
7. Onsite Sewer Lift Station	1	LS	175,000	$175,000
8. 4" Sewer Force Main	1,550	LF	45.00	$69,750
9. R & R existing AC Paving	750	SF	12.00	$9,000
10. Video Inspection sewer main line	19,723	LF	5.00	$98,615
Sub-Total, Sanitary Sewer				**$4,278,340**

APPENDIX A



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www.us.bureauveritas.com

CITY OF CHINO SUBAREAS 1 AND 2	STUDY AREA MAPS
SEWER MASTER PLAN UPDATE REPORT	FIGURE NO. 1

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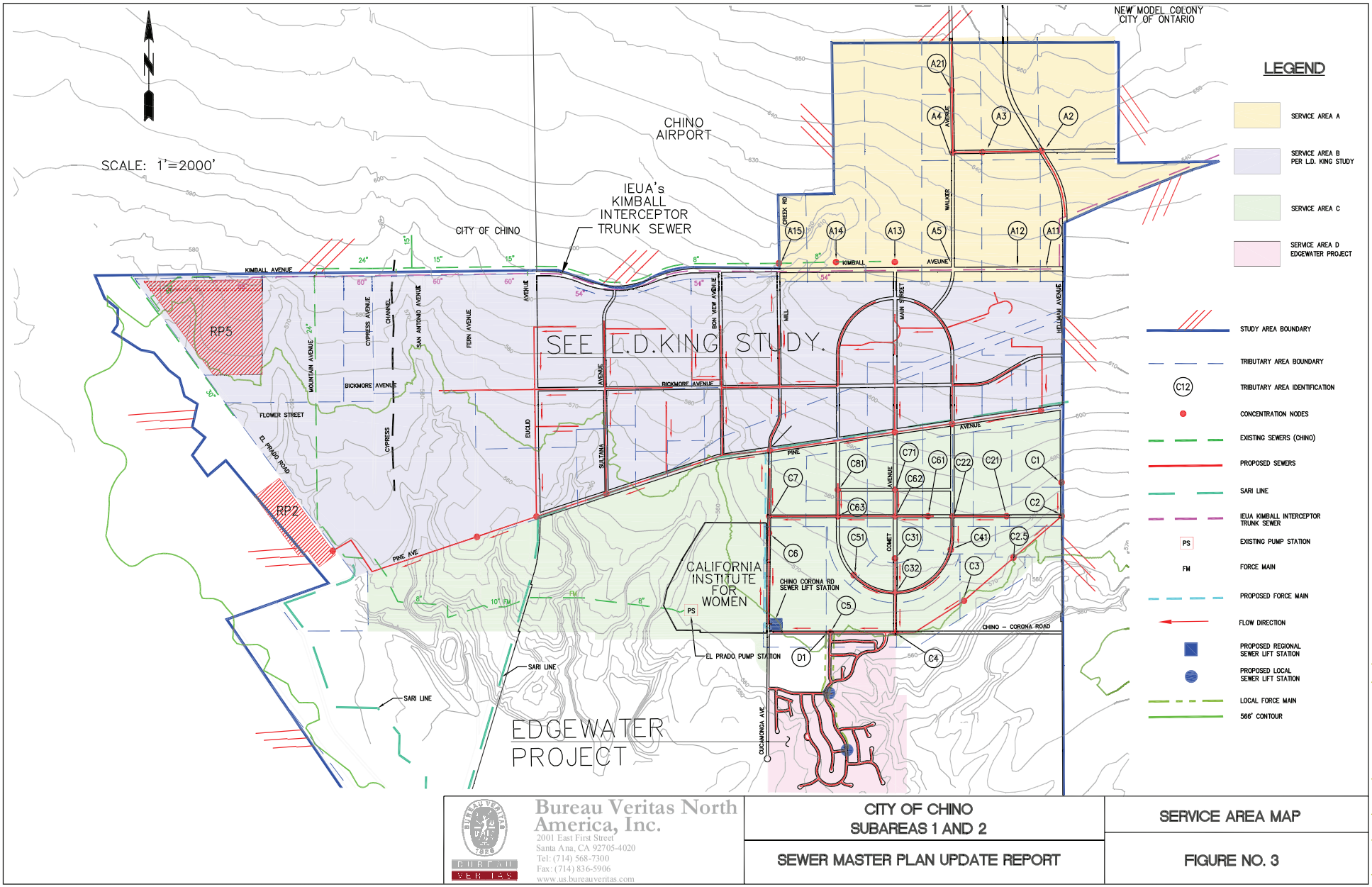

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www.us.bureauveritas.com

CITY OF CHINO
SUBAREAS 1 AND 2

SEWER MASTER PLAN UPDATE REPORT

SERVICE AREA MAP

FIGURE NO. 3

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APPENDIX B

Service Area D-1							Segment	Segment				1,000,000	
Cucamonga Ave	Tributary	Subarea		Subarea	Segment	Segment Total	Total	Total	Peaking Factor	Peak Flow		Peak Flow	D (in)
Segment	Lot No.	Area (Ac's)	Land Use	AWF (gpd)	Subarea (Ac's)	Trib. Area (Ac's)	AWF (GPD)	AWF (mgd)	PF = 1.95 (AWF) ^-0.038	mgd	Sewer Grade Rate	cfs	
1	Portion of Lot 19	3.42	LD	4,829	26.4900	26.4900	37,404	0.0374	2.2093	0.083	0.75%	0.1279	8
	Portion of Lot 15	10.66	LD	15,052									
	Lot 18	12.41	LD	17,523									
2	Portion of Lot 15	3.06	LD	4,321	6.4000	32.8900	45,404	0.0454	2.1931	0.100	0.65%	0.1541	8
	Lot 17	1.16	LD	1,638									
	Lot 16	1.39	LD	1,963									
	Lot "BB"	0.62	Park	62									
	Lot "S"	0.17	Park	17									
3	Portion of Lot 11	1.93	LD	2,725	12.6600	12.6600	17,876	0.0179	2.2722	0.041	1.50%	0.0628	8
	Lot 14	10.73	LD	15,151									
4	Portion of Lot 11	0.76	LD	1,073	3.2000	48.7500	67,799	0.0678	2.1600	0.146	0.50%	0.2266	8
	Portion of Lot 14	0.99	LD	1,398									
	Portion of Lot 10	1.45	LD	2,047									
5	Lot 19	5.70	LD	8,048	12.9900	12.9900	18,342	0.0183	2.2700	0.042	1.50%	0.0644	8
	Portion Lot 13	7.29	LD	10,293									
6	Portion Lot 10	2.21	LD	3,121	9.3400	71.0800	99,328	0.0993	2.1289	0.211	0.50%	0.3272	8
	Lot 9	1.38	LD	1,949									
	Portion of Lot 13	1.53	LD	2,160									
	Lot 12	4.22	LD	5,959									
7	Portion of Lot 6	3.26	MD	7,808	13.2800	84.3600	123,378	0.1234	2.1114	0.260	0.40%	0.4031	12
	Portion of Lot 7	2.78	LD	3,925									
	Lot 8	3.68	LD	5,196									
	Lot 20	3.56	COMM	7,120									
8	Portion of Lot 7	8.30	LD	11,720	11.3200	95.6800	142,330	0.1423	2.1000	0.299	0.32%	0.4625	12
	Portion of Lot 6	3.02	MD	7,233									
9	No Subarea added	0.00	LD	0	0.0000	95.6800	142,330	0.1423	2.1000	0.299	0.32%	0.4625	12
		`		**Service Area D-1**		**95.6800**							
Service Area D-2							Segment	Segment				1,000,000	
Chino Corona Road	Tributary	Subarea		Subarea	Segment	Segment Total	Total	Total	Peaking Factor	Peak Flow		Peak Flow	
Segment	Lot No.	Area (Ac's)	Land Use	AWF (gpd)	Area (Ac's)	Trib. Area (Ac's)	AWF (GPD)	AWF (mgd)	PF = 1.95 (AWF) ^-0.038	mgd	Sewer Grade Rate	cfs	
10	Lot 1	10.03	MD	24,022	10.0300	31.9300	70,555	0.0706	2.1567	0.152	0.50%	0.2355	12
	Lot 2	8.58	MD	20,549	8.5800								
	Lot 3	6.02	LD	8,500	6.0200								
	Lot 4	7.30	MD	17,484	7.3000								
11	Lot 5	5.06	COMM	12,650	5.0600	5.0600	12,650	0.0127	2.3023	0.029	0.70%	0.0451	8
12	No subarea added	0.00	MD	0	0.0000	36.9900	83,205	0.0832	2.1432	0.178	0.50%	0.2759	12
				Service Area D-2		**36.9900**							
				Developed Area		**132.6700**							

Segment No. 1

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 For: For Licensed CivilDesign User

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*****
          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.007500 (Ft./Ft.) =     -.7500 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.250 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .13 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.03
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .1279     (CFS)
        "      "     "  =    57.41     (GPM)
        "      "     "  =    .8266E-01 (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =      1.89 (In.)
   Flow top width inside pipe =      6.79 (In.)
   Area of flow =       9.0630 (In2)
   Wetted Perimeter =     8.12 (In.)
   Critical Depth in Pipe =       1.95 (In.)
   Total flow of pipe(s) =    .1279     (CFS)
     "     "   "    "    =    57.41     (GPM)
     "     "   "    "    =    .8266E-01 (MGD)
```

D/d = 1.89/8 = 0.2363

Segment No. 2

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.006500 (Ft./Ft.) =     -.6500 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.350 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .15 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.04
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .1541     (CFS)
        "      "     "  =    69.16     (GPM)
        "      "     "  =    .9960E-01 (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =      2.15 (In.)
   Flow top width inside pipe =      7.09 (In.)
   Area of flow =      10.8815 (In2)
   Wetted Perimeter =     8.72 (In.)
   Critical Depth in Pipe =       2.16 (In.)
   Total flow of pipe(s) =    .1541     (CFS)
     "     "   "    "    =    69.16     (GPM)
     "     "   "    "    =    .9960E-01 (MGD)
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D/d = 2.15/8 = 0.2688

Segment No. 3

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.015000 (Ft./Ft.) =    -1.5000 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       98.500 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .06 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.10
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .6280E-01 (CFS)
        "      "     "  =    28.19     (GPM)
        "      "     "  =    .4059E-01 (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =      1.12 (In.)
   Flow top width inside pipe =      5.56 (In.)
   Area of flow =       4.2997 (In2)
   Wetted Perimeter =     6.15 (In.)
   Critical Depth in Pipe =       1.36 (In.)
   Total flow of pipe(s) =    .6280E-01 (CFS)
     "     "   "    "    =    28.19     (GPM)
     "     "   "    "    =    .4059E-01 (MGD)
```

D/d = 1.12/8 = 0.1400

Segment No. 4

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*****
          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.005000 (Ft./Ft.) =     -.5000 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.500 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .23 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.07
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .2266     (CFS)
        "      "     "  =    101.7     (GPM)
        "      "     "  =    .1465     (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =      2.81 (In.)
   Flow top width inside pipe =      7.64 (In.)
   Area of flow =      15.7742 (In2)
   Wetted Perimeter =    10.16 (In.)
   Critical Depth in Pipe =       2.63 (In.)
   Total flow of pipe(s) =    .2266     (CFS)
     "     "   "    "    =    101.7     (GPM)
     "     "   "    "    =    .1465     (MGD)
```

D/d = 2.81/8 = 0.2725

Sewer Segment No. 5

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*****
          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.015000 (Ft./Ft.) =    -1.5000 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       98.500 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .06 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.12
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .6440E-01 (CFS)
        "      "     "  =    28.90     (GPM)
        "      "     "  =    .4162E-01 (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =      1.14 (In.)
   Flow top width inside pipe =      5.59 (In.)
   Area of flow =       4.3759 (In2)
   Wetted Perimeter =     6.19 (In.)
   Critical Depth in Pipe =       1.38 (In.)
   Total flow of pipe(s) =    .6440E-01 (CFS)
     "     "   "    "    =    28.90     (GPM)
     "     "   "    "    =    .4162E-01 (MGD)
```

D/d = 1.14/8 = 0.1425

Sewer Segment No. 6

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.004000 (Ft./Ft.) =     -.4000 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.600 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .33 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.10
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .3272     (CFS)
        "      "     "  =    146.9     (GPM)
        "      "     "  =    .2115     (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =      3.66 (In.)
   Flow top width inside pipe =      7.97 (In.)
   Area of flow =      22.3861 (In2)
   Wetted Perimeter =    11.88 (In.)
   Critical Depth in Pipe =       3.18 (In.)
   Total flow of pipe(s) =    .3272     (CFS)
     "     "   "    "    =    146.9     (GPM)
     "     "   "    "    =    .2115     (MGD)
```

D/d = 3.66/8 = 0.4575

Sewer Segment No. 7

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.004000 (Ft./Ft.) =     -.4000 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.600 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .40 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.17
   Given Pipe Diameter(In.) =     12.00
   Individual pipe flow =    .4031     (CFS)
        "      "     "  =    180.9     (GPM)
        "      "     "  =    .2605     (MGD)
   Total pipe area =       113.10 (In2)
   Total perimeter of pipe =        37.70 (In.)
   Normal flow depth in pipe =      3.44 (In.)
   Flow top width inside pipe =     10.85 (In.)
   Area of flow =      26.7609 (In2)
   Wetted Perimeter =    13.55 (In.)
   Critical Depth in Pipe =       3.13 (In.)
   Total flow of pipe(s) =    .4031     (CFS)
     "     "   "    "    =    180.9     (GPM)
     "     "   "    "    =    .2605     (MGD)
```

D/d = 3.44/12 = 0.2867

Sewer Segments No. 8 & 9

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.003200 (Ft./Ft.) =     -.3200 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.680 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .46 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.08
   Given Pipe Diameter(In.) =     12.00
   Individual pipe flow =    .4625     (CFS)
        "      "     "  =    207.6     (GPM)
        "      "     "  =    .2989     (MGD)
   Total pipe area =       113.10 (In2)
   Total perimeter of pipe =        37.70 (In.)
   Normal flow depth in pipe =      3.91 (In.)
   Flow top width inside pipe =     11.25 (In.)
   Area of flow =      31.9873 (In2)
   Wetted Perimeter =    14.58 (In.)
   Critical Depth in Pipe =       3.38 (In.)
   Total flow of pipe(s) =    .4625     (CFS)
     "     "   "    "    =    207.6     (GPM)
     "     "   "    "    =    .2989     (MGD)
```

D/d = 3.91/12 = 0.3258

Sewer Segment No. 10

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.005000 (Ft./Ft.) =     -.5000 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.500 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .24 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.01
   Given Pipe Diameter(In.) =     12.00
   Individual pipe flow =    .2355     (CFS)
        "      "     "  =    105.7     (GPM)
        "      "     "  =    .1522     (MGD)
   Total pipe area =       113.10 (In2)
   Total perimeter of pipe =        37.70 (In.)
   Normal flow depth in pipe =      2.48 (In.)
   Flow top width inside pipe =      9.72 (In.)
   Area of flow =      16.8610 (In2)
   Wetted Perimeter =    11.32 (In.)
   Critical Depth in Pipe =       2.39 (In.)
   Total flow of pipe(s) =    .2355     (CFS)
     "     "   "    "    =    105.7     (GPM)
     "     "   "    "    =    .1522     (MGD)
```

D/d - 2.48/12.00 = 0.2067

Sewer Segment No. 11

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.017500 (Ft./Ft.) =    -1.7500 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       98.250 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .05 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.01
   Given Pipe Diameter(In.) =      8.00
   Individual pipe flow =    .4510E-01 (CFS)
        "      "     "  =    20.24     (GPM)
        "      "     "  =    .2915E-01 (MGD)
   Total pipe area =        50.27 (In2)
   Total perimeter of pipe =        25.13 (In.)
   Normal flow depth in pipe =       .92 (In.)
   Flow top width inside pipe =      5.11 (In.)
   Area of flow =       3.2301 (In2)
   Wetted Perimeter =     5.55 (In.)
   Critical Depth in Pipe =       1.15 (In.)
   Total flow of pipe(s) =    .4510E-01 (CFS)
     "     "   "    "    =    20.24     (GPM)
     "     "   "    "    =    .2915E-01 (MGD)
```

D/d = 0.92/8.00 = 0.1150

Sewer Segment No. 12

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          ***** NON-PRESSURE, OPEN CHANNEL CALCULATIONS ****

   CALCULATE DEPTH OF FLOW GIVEN:
   Channel Slope =    -.005000 (Ft./Ft.) =     -.5000 %
   Invert elevation at pipe INLET =      100.000 (Ft.)
   Invert elevation at pipe OUTLET =       99.500 (Ft.)
   Length of pipe =      100.000 (Ft.)
   Given Flow Rate =      .28 Cubic Feet/Second



          *** PIPE OPEN CHANNEL FLOW ***


   Mannings "n" =  .013
   No. of pipes =   1   Velocity (Ft./Sec.) =     2.11
   Given Pipe Diameter(In.) =     12.00
   Individual pipe flow =    .2759     (CFS)
        "      "     "  =    123.8     (GPM)
        "      "     "  =    .1783     (MGD)
   Total pipe area =       113.10 (In2)
   Total perimeter of pipe =        37.70 (In.)
   Normal flow depth in pipe =      2.68 (In.)
   Flow top width inside pipe =     10.00 (In.)
   Area of flow =      18.8635 (In2)
   Wetted Perimeter =    11.82 (In.)
   Critical Depth in Pipe =       2.59 (In.)
   Total flow of pipe(s) =    .2759     (CFS)
     "     "   "    "    =    123.8     (GPM)
     "     "   "    "    =    .1783     (MGD)
```

D/d = 2.68/12.00 = 0.2233