
Appendix I
Wastewater Calculations and Sewer Master Plan

PRELIMINARY INVESTIGATION
OF
WASTEWATER SYSTEM

WEST ROSEVILLE SPECIFIC PLAN

October 2003

MORTON & PITALO, INC.

1788 Tribute Road, Suite 200
Sacramento, CA 95815
(916) 927-2400

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I. PROJECT AREA DESCRIPTION

The West Roseville Specific Plan (WRSP), located between Watt Avenue and Fiddyment Road, and north of Pleasant Grove Boulevard. The plan includes approximately 3,161 acres of land with 8,430 residential units, 252 acres of parks, 685 acres of open space, 145 acres of schools, which include one high school and several elementary schools, and 184 acres for commercial, office and industrial use. All wastewater is to be routed to the City of Roseville's Pleasant Grove Creek Wastewater Treatment Plant located west of Phillip Road and on the south side of Blue Oaks Boulevard's future extension. All wastewater will be delivered to the treatment plant at the northeast corner of the plant (Exhibit 1 attached). Treatment plant inverts for Westpark and Fiddyment Ranch were given as 68.78 and 68.03 for north and south pipes (see Exhibit 2), respectively. Preliminary sewer grades were calculated using these values.

II. PIPE SIZING CRITERIA

Pipe designs followed City of Roseville Improvement Standards. Pipes with diameter 10 inches and smaller were designed to flow at 0.70 capacity while all other pipes were designed to flow full. A Manning's "n" of 0.013 was used in the calculations. The peaking factor was calculated from Figure SS-2 of the Standards (attached). The pipes were sized according to the following criteria per the Standards:

Single Family Dwellings	400 gpd
Multiple Family Dwellings	400 gpd
Parks	300 gpd/acre
Schools	
The greater of:	1600gpd/acre or:
Elementary School (1000 Capita)	0.025 gpd
Middle School (1500 Capita)	0.060 gpd
High School (2000 Capita)	0.080 gpd
Churches, Fire Station	1600 gpd/acre
Commercial/Industrial	Figure SS-1 (attached)

III. PIPE LAYOUT

The sewer pipes were laid out to accommodate existing ground elevations and allow for optimum cover where possible. The properties north of Kaseberg Creek were routed to the western portion of Fiddyment Ranch and crossed the creek at the west boundary utilizing a siphon. Those portions of the WRSP will tie into the WWTP at the northern connection given. The parcels on the northwestern portion of Westpark were also routed to the northern invert.

The properties in the area of Blue Oaks and Fiddyment will be tied into the existing sewer system built in the "Pleasant Grove and Kaseberg Trunk Sewer Project". This project shows an area designated R21 that encompasses a portion of the WRSP. The

sewer report for R21 assumed 3.5 mgd¹, wet weather flow, would be entering the 78" pipe north of Blue Oaks Boulevard from the WRSP. The tie-in for the WRSP will occur in the existing 36" trunk line that runs from Fiddymment Road towards the 78" trunk line, which was installed as part of the "Pleasant Grove and Kaseberg Trunk Sewer Project". An ultimate design flow of 11.1 mgd, wet weather flow, is expected for this trunk line². West Roseville Specific Plan proposed contribution is 1.3 mgd, wet weather flow (2.7 times less than previously projected), bringing the total flow of the 36" trunk line to 12.4 mgd. Flow calculations for this additional flow netted an increase in velocity from 3.9 fps to 4.0 fps. The pipe currently runs 60% full and will increase to 64% full with the additional flow. Therefore, the tie-in should not have an adverse effect on the existing sewer system.

This existing 78" trunk pipe crosses the proposed expansion to Blue Oaks Boulevard approximately 650 feet east of the treatment plant. Therefore, all Fiddymment Ranch properties east and southeast of the plant had to be routed parallel to this pipe to avoid conflicts. Those properties connect to the southeastern stub extending from the existing influent junction structure at the PGWWTP.

The major trunk lines have been designed at minimum slope to allow the greatest possible depth. In some cases the sewer is in excess of 25 feet. However, future grading will limit these areas. If after final grading the depth is greater than 20 feet then Extra Strength VCP, RCP or other high strength pipes approved by the Environmental Utilities Director shall be used. If RCP is used, the interior shall be equipped with lining for hydrogen sulfide protection.

All pipes with diameters less than 36" have been designed to have 0.1 foot drop every 500 feet in sewer manholes. Junction structures or sewer manholes using cast-in-place bases per Roseville Construction Standards 91-10 and 91-16 shall be used for pipes with diameters 36" and higher. The interiors of these structures shall be equipped with lining for hydrogen sulfide protection. In addition, all the pipes in Westpark west of Phillip Road will not have node drops in the straight runs to minimize cover problems in those areas. Cover will have to be addressed when developing some of these areas.

In order to determine whether cover was going to be a problem it was assumed that all pipes in the local neighborhood leading to the nodes were going to have a slope of 0.005. This slope was used when calculating the invert elevation at the furthest point from each affected reference node. The distance was measured following the longest possible route from this determined point. It was assumed that a minimum cover of 4 feet was necessary at these points.

The following table illustrates the parcels with cover problems and the amount of fill required to meet minimum cover requirements.

¹ Table A-2 of Pleasant Grove and Kaseberg Trunk Sewer Plan, dated June 2000.

² Table ES-4 of Executive Summary of Roseville Regional Wastewater Treatment Service Area Master Plan, dated May 1996.

PARCEL NUMBER	AMOUNT OF REQUIRED FILL (FT)
W-14	4

IV. PIPE OVERSIZING

Future development in the Memorandum of Understanding (MOU) Transition Area at the northwest and southwest boundaries of Westpark had to be taken into consideration when sizing the pipes downstream of these areas. There are three future connection locations. Wastewater flow is expected to increase by 0.72 MGD (average daily dry weather flow) in the northwest boundary at Blue Oaks Boulevard, 0.85 MGD (average daily dry weather flow) at Pleasant Grove Boulevard and 1.51 MGD average daily dry weather flow at the west boundary of the southernmost portion of the project. As a result, an increase in pipe diameters was required. Cover and flow velocity had to be considered when designing the pipes in these areas.

The pipes were sized exclusively for all MOU and non-MOU flow. Velocity fell below the minimum required scour velocity of 2 ft/s. at nodes 6, 18, 21, 22, 23, and 24 with the velocity at node 6 falling below 1.5 ft/s. The pipes from node 17 to 18 and from node 28A to 29 will be an empty pipe until MOU flows enter the system. The cost of the pipes for upsizing would be \$1,833,600.00 (See Table 1 attached).

The required pipe sizes to accommodate this expected flow increase are shown on Exhibits 3 and 4. The sizes in parenthesis show the pipe sizes required if there were no MOU flows contributing to the system. The quantities are as follows:

Lineal Feet	Node #'s	Pipe Size-no MOU	Pipe Size-MOU
2,100	W6, W7	8"	24"
1,260	W18	10"	18"
1,320	W21	10"	21"
3,060	W22, W23	10"	24"
400	W28A, W29	15"	18"
3,000	W30	15"	24"
1,380	W8	18"	30"
770	W13	21"	30"
3,910	W14, W15, W16	21"	33"
2,900	W24	24"	42"
1,505	W17	-	18"

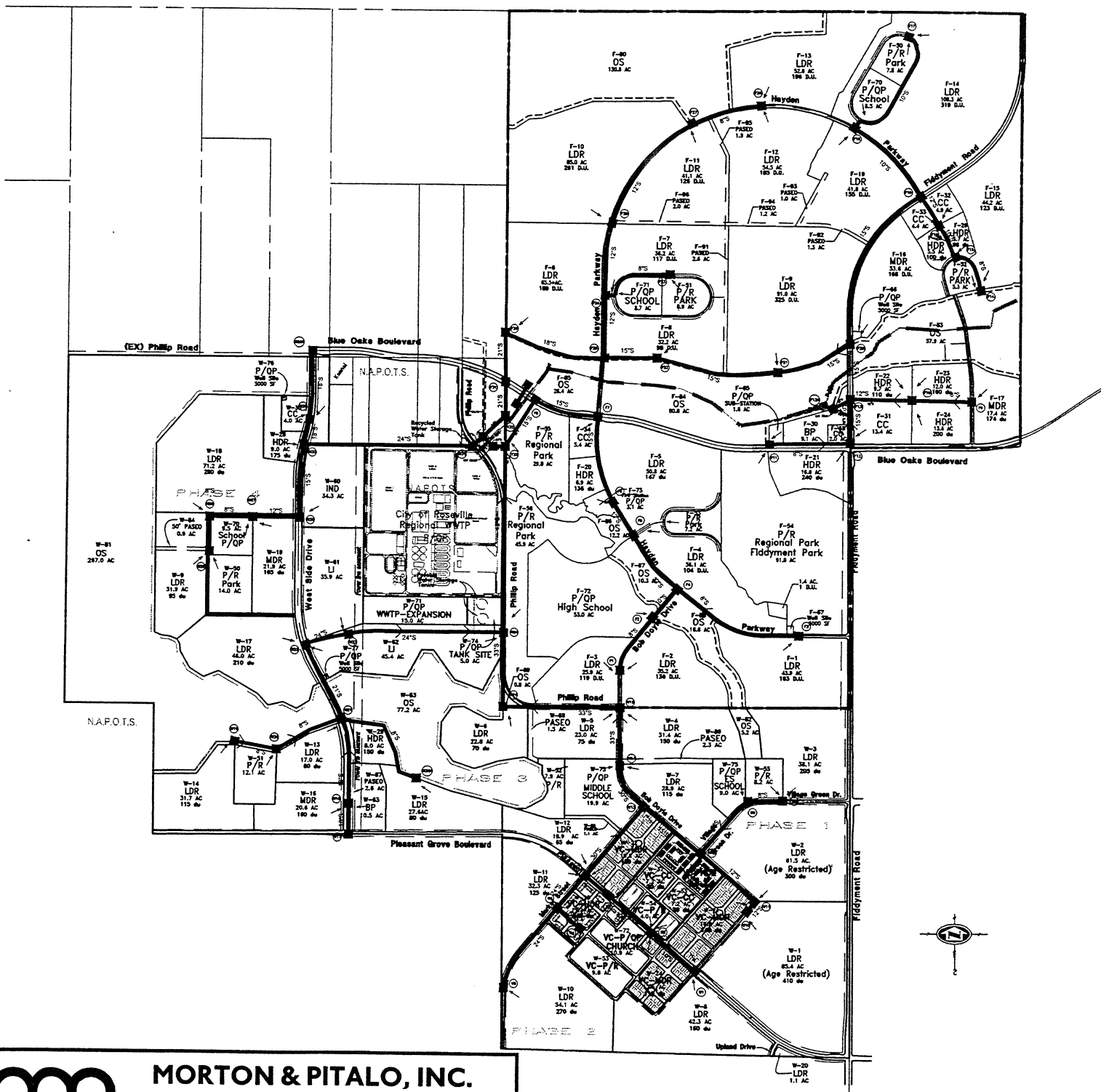
V. SIPHON

The sewer system crosses Pleasant Grove Creek at the west boundary of Fiddymont Ranch. The inverts for these pipes were higher than the inverts of the creek at this location.

The sewer pipe going from reference node F30 to reference node F31 has inverts of 71.5 and 69.8 respectively. The inverts at the beginning and end of the creek crossing were found to be 71.4 and 70.3, giving an available head of 1.1. The invert of the creek is 67.0 along this 222-foot alignment. It was determined that a double siphon would be needed to get across this obstruction (see Exhibit 5). The lower pipe was sized to carry the ADWF of 1.13 mgd while maintaining a minimum velocity of 3 ft/s. The velocity is required to ensure that solids stay suspended. A 10-inch pipe with a velocity of 3.3 ft/s. and slope of 0.0055 is required. However, the effect that this smaller pipe would have on the upstream HGL needed to be addressed. It was determined that 1.1 ft of head was necessary for the flow to be maintained at this slope. This never really occurs because the 12-inch upper pipe will pick up any excess flow. The available slope to avoid a backup of the system was found to be 0.00495. With this new slope it was determined that the 10-inch pipe at full flow capacity only carries 0.996 mgd. The 12-inch pipe would have to be capable of carrying the remaining flow of 1.621 mgd. The full flow calculations for this pipe rendered a slope of 0.00496. The head necessary to avoid an upstream backup of the system was determined to be 1.1 ft., which is exactly the amount of head available in the system.

EXHIBIT 1

WEST ROSEVILLE SPECIFIC PLAN MASTER SEWER PLAN



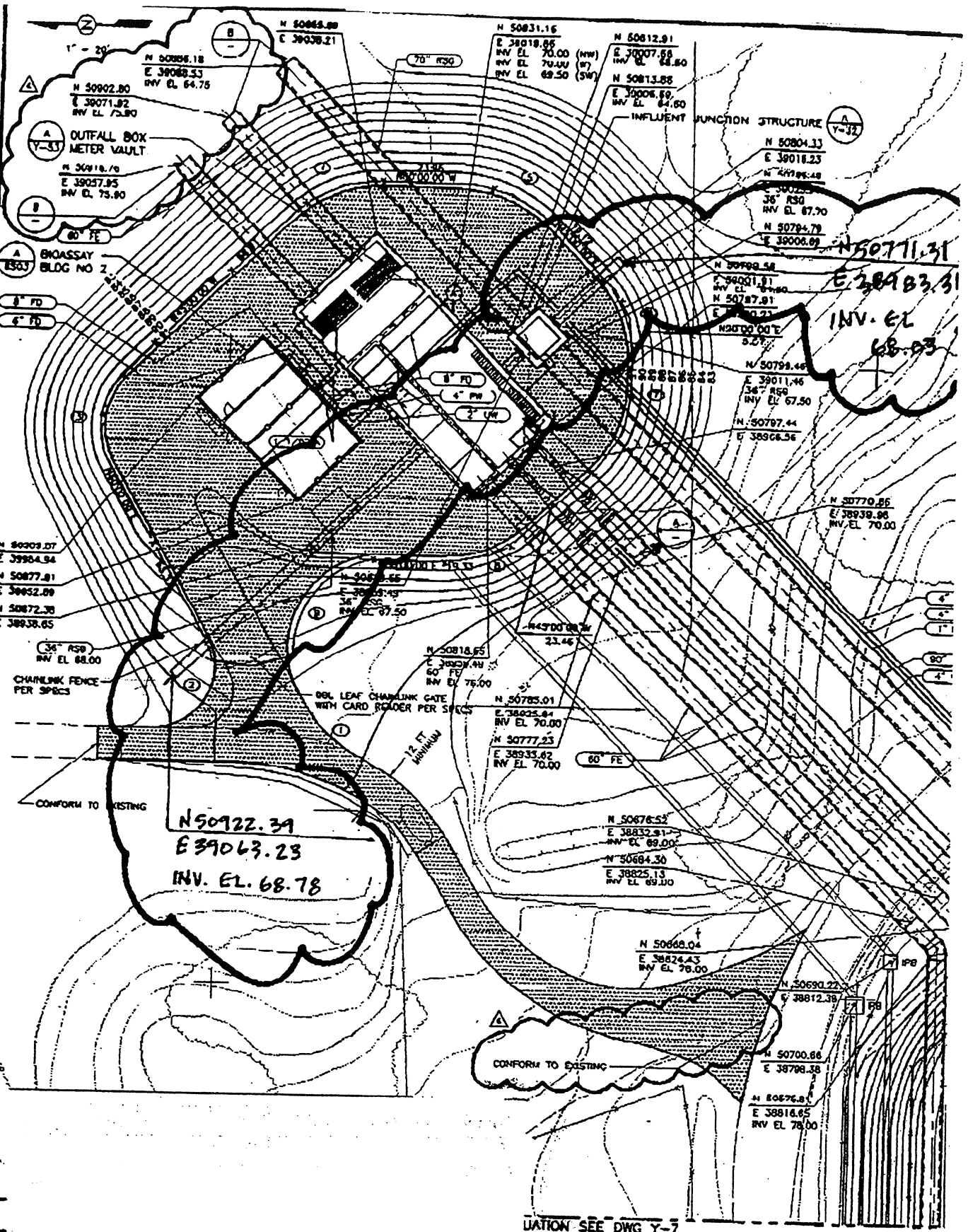
MORTON & PITALO, INC.

CIVIL ENGINEERING • PLANNING • SURVEYING

1788 Tribute Road, Suite 200 • Sacramento, CA 95815
phone: 916.927.2400 • fax: 916.567.0120 • survey fax: 916.927.1185
email: engr@mpengr.com • web: www.mpengr.com

EXHIBIT 2

H:\Client\Boswell_SAC\60964610\WV.CO. WCRV039C 01/21/00 16:29 Intermediaion SHEETS: RAUBOR, WCRV1000, WSRV102, WSRV104, WSRV105, WCRV101, WSRV216, 43RV213, WSRV236, (SRV206, CSRV110, CSRV111, SRV270, SRV231, CSRV101, SRV172, C:



LOCATION SEE DWG Y-7

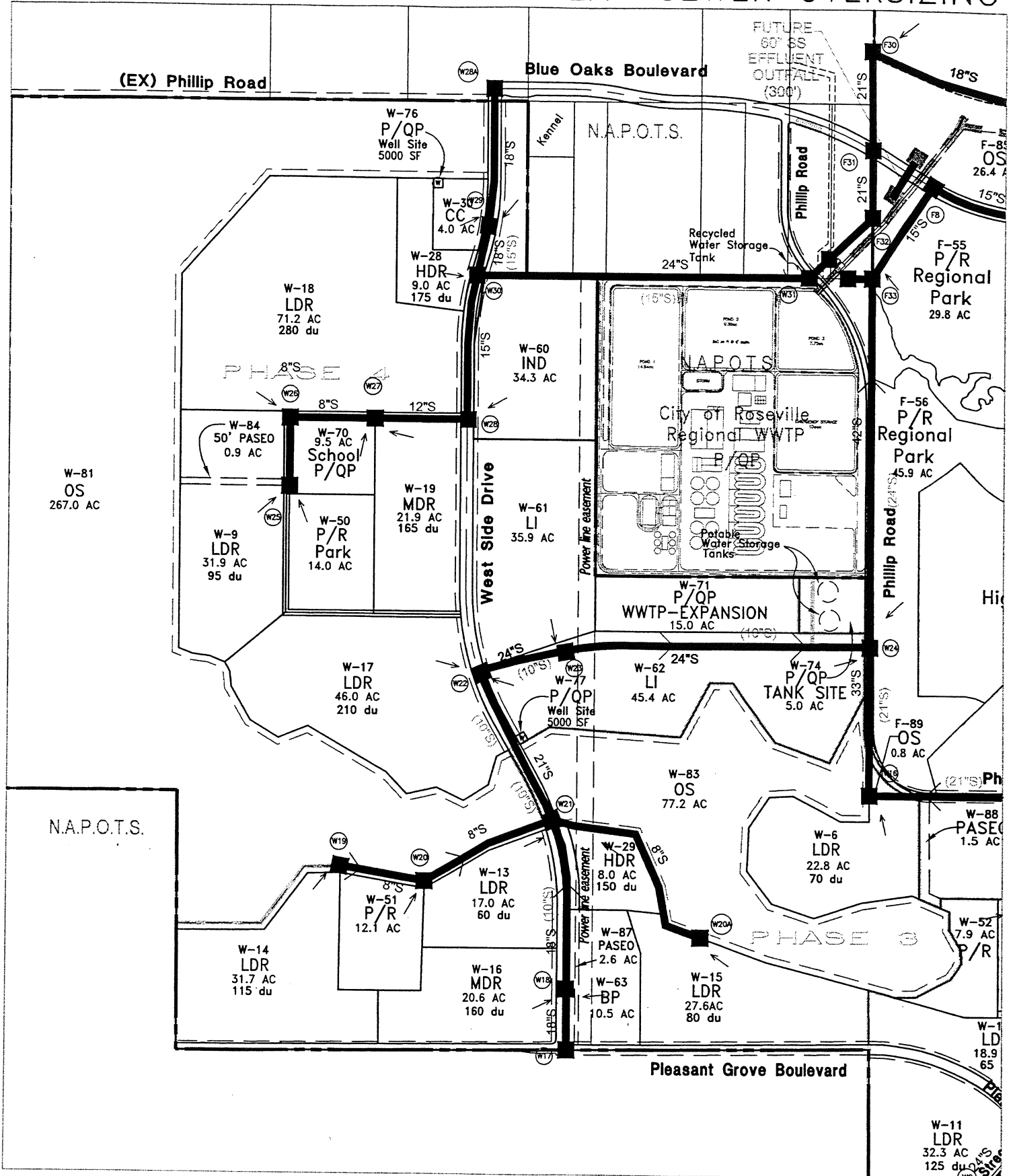
6/31/00	RHR	APPENDIX NO. 3	JER/DST
8/05/00	RHR	APPENDIX NO. 4	CHECKED
FILENAME: WCRV039C			WCL
			DATE
			MAR 2000
			DISCIPLINE ID

PROJECT ENGINEER

PRINCIPAL



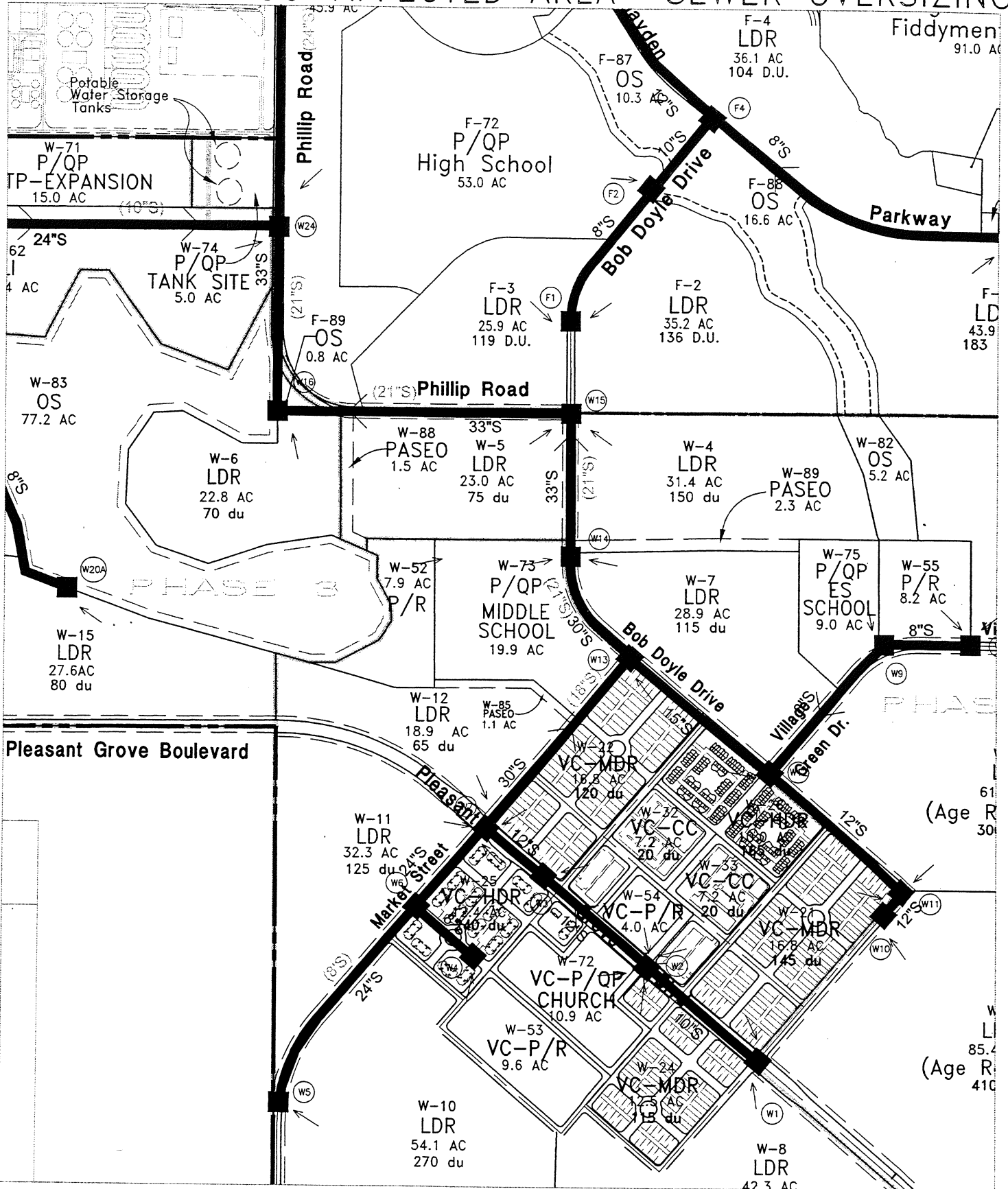
EXHIBIT 3 MOU-AFFECTED AREA SEWER OVERSIZING



NOTE:
PIPE SIZES IN PARENTHESIS ARE FOR
NON MOU CONDITIONS.

mp
MORTON & PITALO, INC.
 CIVIL ENGINEERING • PLANNING • SURVEYING
 1788 Tribuna Road, Suite 200 • Sacramento, CA 95815
 phone: 916.927.2400 • fax: 916.567.0120 • survey fax: 916.927.1185
 email: engr@mpengr.com • web: www.mpengr.com

EXHIBIT 4 MOU-AFFECTED AREA SEWER OVERSIZING

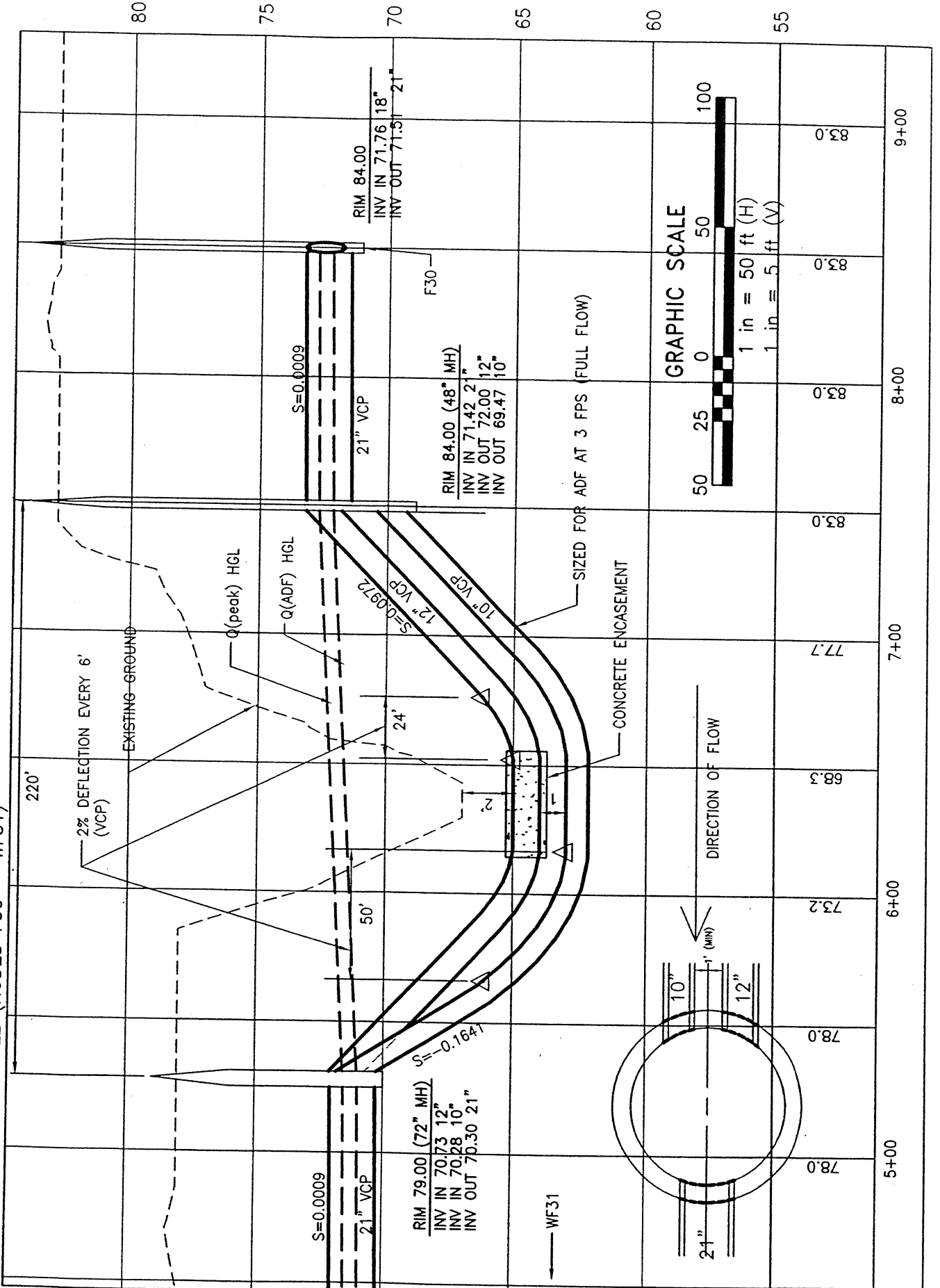


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 phone: 916.927.2400 • fax: 916.567.0120 • survey fax: 916.927.1185
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NOTE:
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 NON MOU CONDITIONS.

EXHIBIT 5

SIPHON PROFILE (NODES F30 - WF31)



Morton & Pitalo, Inc.

Planning - Engineering - Surveying
1788 Tribute Rd. Suite 200
Sacramento, California 95815
Telephone (916) 927-2400

TABLE 1

Prepared by: Z. Ruvalcaba
Project No: 010003
Date: March 26, 2003

WEST PARK
Preliminary Opinion of Construction Costs - Pipe Upsizing Cost
COST DISTRIBUTION BASED ON FLOW VOLUME

Node # 's	Pipe Size-no MOU	Unit Price	Pipe Size MOU	Unit Price	Lineal Feet	Total ADWF	MOU ADWF	Westpark ADWF	Unit Price	Total Price	MOU Reimbursement	Westpark Cost
W6	8"	\$ 45.00	24"	\$ 125.00	1,350	1.6052	1.510	0.095	\$ 125.00	\$ 168,750.00	\$ 158,741.90	\$ 10,008.10
W7	8"	\$ 45.00	24"	\$ 125.00	750	1.6056	1.510	0.096	\$ 125.00	\$ 93,750.00	\$ 88,167.97	\$ 5,582.03
W18	10"	\$ 47.00	18"	\$ 90.00	1,260	0.9497	0.846	0.104	\$ 90.00	\$ 113,400.00	\$ 101,017.58	\$ 12,382.42
W21	10"	\$ 47.00	21"	\$ 100.00	1,320	1.0582	0.846	0.212	\$ 100.00	\$ 132,000.00	\$ 105,530.15	\$ 26,469.85
W22	10"	\$ 47.00	24"	\$ 125.00	660	1.8148	0.846	0.969	\$ 125.00	\$ 82,500.00	\$ 38,458.78	\$ 44,041.22
W23	10"	\$ 47.00	24"	\$ 125.00	2,400	1.5584	0.846	0.712	\$ 125.00	\$ 300,000.00	\$ 162,859.34	\$ 137,140.66
W28A	0	\$ -	18"	\$ 90.00	1045	0.7200	0.720	0.000	\$ 90.00	\$ 94,050.00	\$ 94,050.00	\$ -
W29	15"	\$ 65.00	18"	\$ 90.00	390	0.8687	0.720	0.149	\$ 90.00	\$ 35,100.00	\$ 29,091.75	\$ 6,008.25
W30	15"	\$ 65.00	24"	\$ 125.00	2,535	1.4569	0.720	0.737	\$ 125.00	\$ 316,875.00	\$ 156,599.63	\$ 160,275.37
W8	18"	\$ 90.00	30"	\$ 150.00	1,380	2.3044	1.510	0.794	\$ 150.00	\$ 207,000.00	\$ 135,640.51	\$ 71,359.49
W13	21"	\$ 100.00	30"	\$ 150.00	770	2.6665	1.510	1.157	\$ 150.00	\$ 115,500.00	\$ 65,405.96	\$ 50,094.04
W14	21"	\$ 100.00	33"	\$ 175.00	880	2.7688	1.510	1.259	\$ 175.00	\$ 154,000.00	\$ 83,985.84	\$ 70,014.16
W15	21"	\$ 100.00	33"	\$ 175.00	1,810	2.8588	1.510	1.349	\$ 175.00	\$ 316,750.00	\$ 167,305.34	\$ 149,444.66
W16	21"	\$ 100.00	33"	\$ 175.00	1,220	2.8908	1.510	1.381	\$ 175.00	\$ 213,500.00	\$ 111,521.03	\$ 101,978.97
W24	24"	\$ 125.00	42"	\$ 200.00	2,900	4.6388	2.350	2.289	\$ 200.00	\$ 580,000.00	\$ 293,825.99	\$ 286,174.01
W17	-	\$ -	18"	\$ 90.00	460	0.8460	0.846	0.000	\$ 90.00	\$ 41,400.00	\$ 41,400.00	\$ -

Total Cost \$ 2,964,575.00
MOU Reimbursement \$ 1,833,601.79
Westpark Cost \$ 1,130,973.21

NOTES:

- Total price was calculated by taking the unit price of the larger pipe and multiplying it by the lineal feet.
- The MOU reimbursement was calculated by taking the ratio of MOU ADWF and total ADWF (MOU ADWF/Total ADWF)*Total Price).
- Westpark cost was calculated as the difference between the total cost and the MOU reimbursement.
(Example for node W6 - Westpark Cost = \$168,750.00-(1.510/1.6052)*\$168,750.00=\$10,008.10)

REFERENCE NODE	SINGLE FAMILY UNITS			MULTIPLE FAMILY UNITS			CHURCH/SCHOOL/FIRE STATION ⁽¹⁾				COMMERCIAL/IND/BP			PARK			TOTAL	PEAK	TOTAL	PIPE	PIPE	% FULL	VELOCITY			
	UNITS	CUM UNITS	Q _{AVE}	UNITS	CUM UNITS	Q _{AVE}	AREA	ALT1-Q _{AVE}	SCHOOL	ALT2-Q _{AVE}	Q _{AVE}	CUM-Q _{AVE}	AREA	RATE ⁽¹⁾	Q _{AVE}	CUM-Q _{AVE}	AREA	CUM AREA	Q _{AVE}	Q _{AVE}	FACTOR	Q _{PEAK}	SIZE	PIPE	SLOPE	Q _{PEAK}
#	#	MG/D		#	MG/D		ACRE	MG/D	TYPE	MG/D	MG/D	MG/D	GAL/AC/DAY	MG/D	MG/D		ACRE	MG/D	MG/D	MG/D	MG/D	MG/D	IN.	FT/FT	(d/D)	FT/S
1	255	255	0.102			0.000								0.000					0.0000	0.102	3.4	0.346	8	0.0035	64%	2.25
2		255	0.102			0.000	53	0.085	HS	0.0800	0.085	0.085		0.000					0.0000	0.187	3.0	0.553	10	0.0025	66%	2.23
3	184	184	0.074			0.000								0.000					0.0000	0.074	3.5	0.258	8	0.0035	53%	2.10
4		439	0.176			0.000						0.085		0.000					0.0000	0.260	2.8	0.718	12	0.0020	61%	2.19
5	104	543	0.217			0.000						0.085		0.000					0.0000	0.304	2.6	0.804	12	0.0020	66%	2.26
6	147	690	0.276	136	136	0.054	3.1	0.005			0.005	0.090		0.000			7.2	7.2	0.0022	0.422	2.5	1.046	15	0.0015	59%	2.17
7		690	0.276		136	0.054						0.090	5.4	10000	0.054	0.054		7.2	0.0022	0.476	2.4	1.154	15	0.0015	62%	2.22
8		690	0.276		136	0.054						0.090		0.000	0.054		7.2	0.0022	0.476	2.4	1.154	15	0.0015	62%	2.22	
9	174	174	0.070			0.000								0.000					0.0000	0.070	3.5	0.247	8	0.0035	52%	2.08
10		174	0.070	470	470	0.188								0.000					0.0000	0.258	2.8	0.713	12	0.0020	61%	2.19
11		0	0.000		0	0.000	1.6	0.003			0.003	0.003		0.000			91.0	91.0	0.0273	0.030	3.8	0.113	8	0.0035	34%	1.69
12		0	0.000	240	240	0.096						0.003	24.5	7000	0.172	0.172		91.0	0.0273	0.297	2.7	0.790	15	0.0015	49%	2.03
13		174	0.070		710	0.284						0.003		0.000	0.172			91	0.0273	0.555	2.4	1.332	15	0.0015	69%	2.27
13A		174	0.070		710	0.284						0.003		0.000	0.172			91	0.0273	0.555	2.4	1.332	15	0.0015	69%	2.27
14	123	123	0.049			0.000								0.000					0.0000	0.051	3.7	0.188	8	0.0035	44%	1.94
15		123	0.049	198	198	0.079								0.000			5.3	5.3	0.0016	0.130	3.3	0.424	10	0.0025	56%	2.10
16		123	0.049		198	0.079							9.3	9200	0.086	0.086		5.3	0.0016	0.216	2.9	0.625	12	0.0020	56%	2.12
17	319	319	0.128			0.000								0.000					0.0000	0.130	3.3	0.424	10	0.0025	56%	2.10
18	155	474	0.190			0.000	10	0.016	ES	0.0250	0.025	0.025		0.000			7.8	7.8	0.0023	0.217	2.9	0.629	10	0.0025	73%	2.27
19		597	0.239		198	0.079					0.000	0.025		0.000	0.086			7.8	0.0023	0.432	2.5	1.067	15	0.0025	51%	2.64
20	168	765	0.306		198	0.079						0.028		0.000	0.086			13.1	0.0039	0.502	2.4	1.205	15	0.0015	64%	2.24
21	325	1090	0.436		198	0.079						0.028		0.000	0.086			13.1	0.0039	0.632	2.4	1.513	15	0.0015	77%	2.32
22	98	1188	0.475		198	0.079						0.028		0.000	0.086			13.1	0.0039	0.671	2.4	1.602	15	0.0015	81%	2.32
23			0.000			0.000								0.000					0.0000	0.003	4.0	0.011	8	0.0100	8%	1.22
24	117	885	0.354		0	0.000	10	0.016	ES	0.0250	0.025	0.025		0.000			8.9	8.9	0.0027	0.382	2.5	0.954	12	0.0020	76%	2.30
25		2073	0.829		198	0.079						0.053		0.000	0.086			22.0	0.0066	1.053	2.3	2.443	18	0.0012	86%	2.34
26	381	381	0.152			0.000								0.000					0.0000	0.152	3.1	0.471	8	0.0035	84%	2.33
27	126	507	0.203			0.000								0.000					0.0000	0.203	2.9	0.591	12	0.0020	54%	2.10
28	261	768	0.307			0.000								0.000					0.0000	0.307	2.6	0.811	12	0.0020	67%	2.25
30	189	2262	0.905		198	0.079						0.053		0.000	0.086			22.0	0.0066	1.129	2.3	2.619	21	0.0021	53%	3.10
31		2262	0.905		198	0.079						0.053		0.000	0.086			22	0.0066	1.129	2.3	2.619	21	0.0009	71%	2.22
32		2262	0.905		198	0.079						0.053		0.000	0.086			22	0.0066	1.129	2.3	2.619	21	0.0009	71%	2.22
F33		3575	1.430		731	0.292						0.193		0.000	1		29.8	125	0.0374	2.812	2.3	6.524	42	0.0004	50%	2.10

Notes:

1. Sewer Flows Used in Calculations:

- Single Family | Single Family Dwelling Units: 400 gpcd (Roseville Standards, SS-1)
- Multi Family | Multi Family Dwelling Units (3 or more bedrooms): 400 gpcd (Roseville Standards, SS-1)
- Admin, Church | Admin, Church, Fire Station: 1,600 gpd per acre (Roseville Standards, SS-1)

Schools: The greater of the following two alternatives:

Alternative 1:

1,600 gal per acre per day (Roseville Standards, SS-1) or:

Alternative 2:

- Elementary School Site (ES): 0.025 mgd (1000 Capita) (Roseville Standards, Table on Page SS-2)
- Middle School Site (MS): 0.060 mgd (1000 Capita) (Roseville Standards, Table on Page SS-2)
- High School Site (HS): 0.080 mgd (2000 Capita) (Roseville Standards, Table on Page SS-2)

Commercial, Based on Contributing Area Graph, Roseville Standards, Figure SS-1

Park: 300 gal per acre per day

2. Manning's (n) = 0.013 as per Roseville Standards, SS-2.

3. Pipes 8" and 10" in diameter were sized assuming 0.70 capacity at peak flow. All other pipes were designed to flow full. (Roseville Standards, SS-5)

4. Twenty acres of public use were excluded from the calculations as they are part of the WWTP expansion and are not expected to generate sewer flows.

5. For areas that are zoned CC-R, the number of DU and the Acres are both used for sewer flows.

6. Multi-Family units include High Density Residential (HDR) and Community Commercial (CC-R).

7. The flow from node W24 was added to Total Q_{ave} for node F33 to include flows from Westpark.

REFERENCE NODE #	SINGLE FAMILY UNITS			MULTIPLE FAMILY UNITS			CHURCH/SCHOOL/FIRE STATION (1)						COMMERCIAL/IND/BP			PARK			MOU Q _{AVE} MG/D	TOTAL Q _{AVE} MG/D	PEAK FACTOR	TOTAL Q _{PEAK} MG/D	PIPE SIZE IN.	PIPE SLOPE FT/FT	% FULL (d/D)	VELOCITY Q _{PEAK} FT/S		
	UNITS	CUM UNITS	Q _{AVE} MG/D	UNITS	CUM UNITS	Q _{AVE} MG/D	AREA ACRE	ALT1-Q _{AVE} MG/D	SCHOOL TYPE	ALT2-Q _{AVE} MG/D	Q _{AVE} MG/D	CUM-Q _{AVE} MG/D	AREA GAL/AC/DAY	Q _{AVE} MG/D	CUM-Q _{AVE} MG/D	AREA ACRE	CUM AREA ACRE	Q _{AVE} MG/D										
1	232	232	0.0928		0	0.0000		0.0000		0.000	0.0000			0.0000	0.0000		0.0	0.0000		0.0928	3.43	0.318	10	0.0025	47%	2.0		
2	115	347	0.1388	20	20	0.0080	11.2	0.0179			0.018	0.0179	7.2	9500	0.0684	0.0684	4.0	4.0	0.0012	0.2343	2.86	0.669	12	0.0020	59%	2.2		
3		347	0.1388	20	40	0.0160		0.0000			0.0179	0.0179	7.2	10000	0.0720	0.1404		4.0	0.0012	0.3143	2.63	0.826	12	0.0020	68%	2.3		
4		0	0.0000	120	120	0.0480		0.0000							0.0000		9.6	9.6	0.0029	0.0509	3.69	0.188	8	0.0035	44%	1.9		
5	270	270	0.1080			0.0000		0.0000							0.0000				0.0000	1.51	1.6180	2.32	3.754	24	0.0008	76%	2.3	
6		270	0.1080		120	0.0480		0.0000							0.0000		9.6	0.0029	1.51	1.6689	2.32	3.872	24	0.0008	78%	2.3		
7	265	882	0.3528	120	280	0.1120		0.0000			0.0179				0.0000	0.1404		13.6	0.0041	1.51	2.1372	2.32	4.958	30	0.0010	55%	2.7	
8	205	205	0.0820		0	0.0000		0.0000							0.0000													
9		205	0.0820		0	0.0000	10.1	0.0162	ES	0.025	0.025	0.0250			0.0000	0.0000	8.2	8	0.0025	0.0845	3.46	0.292	8	0.0035	58%	2.2		
10	410	410	0.1640		0	0.0000		0.0000							0.0000	0.0000				0.1640	3.04	0.499	12	0.0020	49%	2.0		
11	445	855	0.3420	165	165	0.0660		0.0000				0.0000			0.0000	0.0000		0.0	0.0000	0.4080	2.49	1.017	12	0.0020	81%	2.3		
12	60	1120	0.4480		165	0.0660		0.0000				0.0250			0.0000	0.0000		0.0	0.0000	0.5415	2.40	1.300	15	0.0015	68%	2.3		
13	115	2117	0.8468		445	0.1780	19.6	0.0314	MS	0.060	0.060	0.1029			0.0000	0.1404	7.9	8.2	0.0025	0.5415	2.40	1.300	15	0.0015	68%	2.3		
14	225	2342	0.9368		445	0.1780		0.0000				0.1029			0.0000	0.1404		29.7	0.0089	0.00	1.2770	2.32	2.963	33	0.0010	36%	2.4	
15	70	2412	0.9648		445	0.1780		0.0000				0.1029			0.0000	0.1404		29.7	0.0089	0.00	1.3670	2.32	3.172	33	0.0055	24%	4.5	
16		2412	0.9648		445	0.1780		0.0000				0.1029			0.0000	0.1404		29.7	0.0089	0.00	1.3950	2.32	3.236	33	0.0054	24%	4.5	
17		0	0.0000		0	0.0000		0.0000							0.0000	0.0000												
18	160	160	0.0640		0	0.0000		0.0000							0.0000			0	0.0000	0.85	0.8460	2.34	1.976	18	0.0012	70%	2.3	
19		0	0.0000		0	0.0000		0.0000							0.0000													
20		115	0.0460		0	0.0000		0.0000							0.0000	0.0000				0.0460	3.72	0.171	8	0.0035	42%	1.9		
20A	65	65	0.0260		0	0.0000		0.0000							0.0000	0.0000	12.1	12.1	0.0036	0.0496	3.70	0.184	8	0.0035	44%	1.9		
21	60	400	0.1600	150	150	0.0600		0.0000							0.0000	0.0000		0.0	0.0000	0.0260	3.82	0.099	8	0.0035	31%	1.6		
22	210	610	0.2440		150	0.0600		0.0000							0.0000	0.0998		12.1	0.0036	0.85	1.1694	2.32	2.713	21	0.0009	73%	2.2	
23		610	0.2440		150	0.0600		0.0000					19.1	8200	0.1566	0.2564		12.1	0.0036	0.85	1.4100	2.32	3.271	21	0.0009	90%	2.2	
24		3022	1.2088		595	0.2380		0.0000				0.1029	19.2	8200	0.1574	0.8055	45.8	87.6	0.0263	0.85	3.2275	2.32	3.854	24	0.0008	78%	2.3	
25	95	95	0.0380		0	0.0000		0.0000							0.0000													
26	280	375	0.1500		0	0.0000		0.0000							0.0000		14.1	14.1	0.0042	0.0422	3.74	0.158	8	0.0035	40%	1.9		
27	165	540	0.2160		0	0.0000	7.9	0.0126	ES	0.025	0.0250	0.0250			0.0000	0.0000		14.1	0.0042	0.1542	3.08	0.476	10	0.0020	65%	2.0		
28		540	0.2160		0	0.0000		0.0000				0.0250	27.0	7800	0.2106	0.2106		14.1	0.0042	0.2452	2.82	0.691	12	0.0015	66%	2.0		
28A		0	0.0000		0	0.0000		0.0000							0.0000													
29		0	0.0000		0	0.0000		0.0000							0.0000					0.72	0.7200	2.37	1.709	18	0.0012	63%	2.2	
30		540	0.2160	175	175	0.0700		0.0000					11.3	10400	0.1175	0.1175		0	0.0000	0.72	0.8375	2.34	1.959	18	0.0015	64%	2.5	
31		540	0.2160		175	0.0700		0.0000				0			0.0000	0		14	0.0042	0.72	1.3634	2.32	3.163	24	0.0008	66%	2.2	
F32		540	0.2160		175	0.0700		0.0000			0.000	0.0250			0.000	0.3281		14.1	0.0042	0.72	1.3634	2.32	3.163	24	0.0008	66%	2.2	

Notes:

1. Sewer Flows Used in Calculations:

- Single Family Dwelling Units: 400 gpcd (Roseville Standards, SS-1)
- Multi Family Dwelling Units (3 or more bedrooms): 400 gpcd (Roseville Standards, SS-1)
- Admin, Church, Fire Station: 1,600 gpd per acre (Roseville Standards, SS-1)
- Schools: The greater of the following two alternatives:

Alternative 1:

1,600 gal per acre per day (Roseville Standards, SS-1)

Alternative 2:

Elementary School Site (ES): 0.025 mgd (1000 Capita) (Roseville Standards, Table on Page SS-2)

Middle School Site (MS): 0.060 mgd (1000 Capita) (Roseville Standards, Table on Page SS-2)

High School Site (HS): 0.080 mgd (2000 Capita) (Roseville Standards, Table on Page SS-2)

Commercial, Based on Contributing Area Graph, Roseville Standards, Figure SS-1

Park: 300 gal per acre per day

2. Manning's (n) = 0.013 as per Roseville Standards, SS-2.

3. Pipes 8" and 10" in diameter were sized assuming 0.70 capacity at peak flow. All other pipes were designed to flow full. (Roseville Standards, SS-5)

4. 19.7 acres of public use were excluded from the calculations as they are part of the WWTP expansion and are not expected to generate sewer flows.

5. For areas that are zoned CC-R, the number of DU and the Acres are both used for sewer flows.

6. Multi-Family units include High Density Residential (HDR) and Community Commercial (CC-R).

7. Nodes that have been bolded are discussed in the "MOU Affected Areas" spreadsheet.

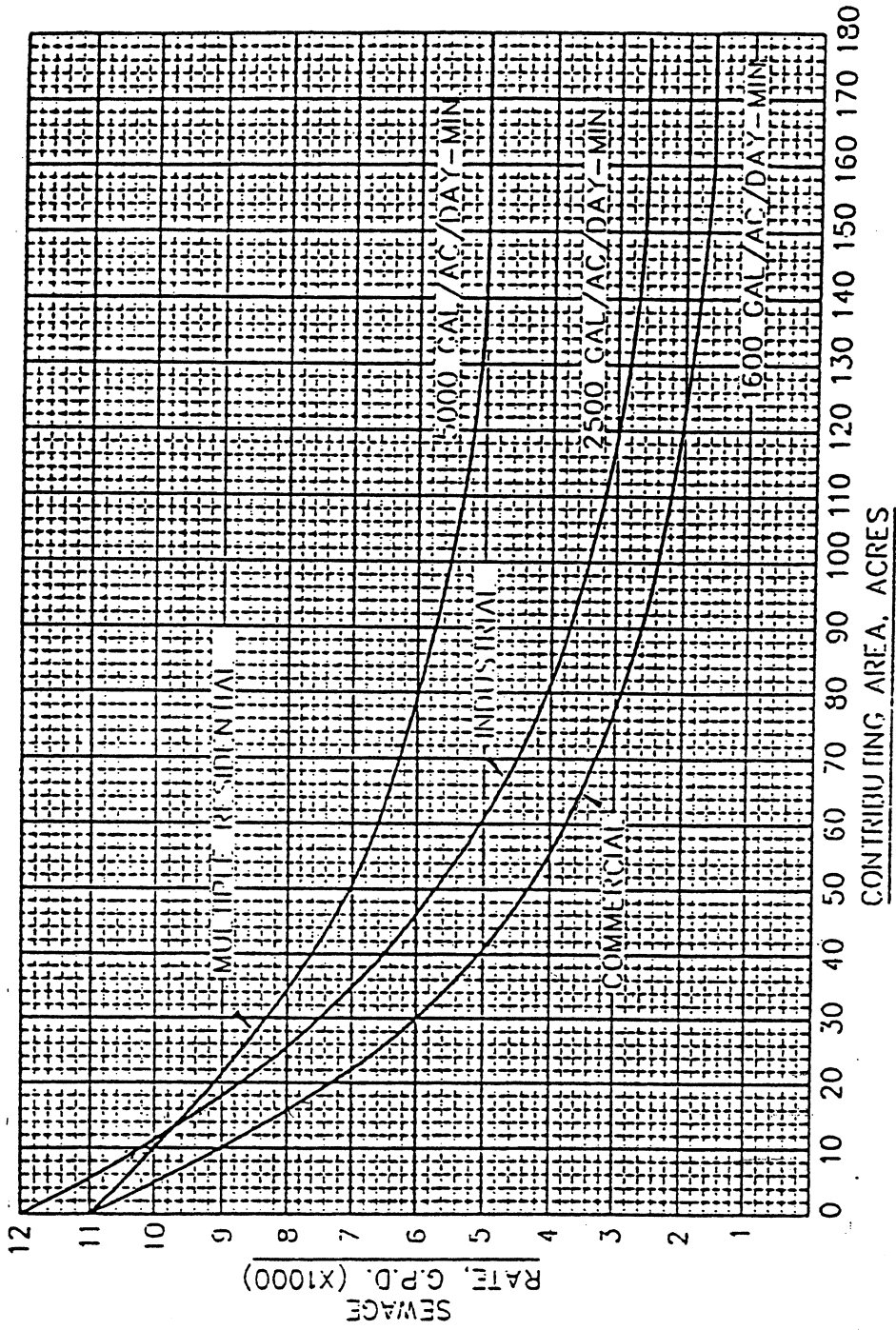


FIGURE SS-1

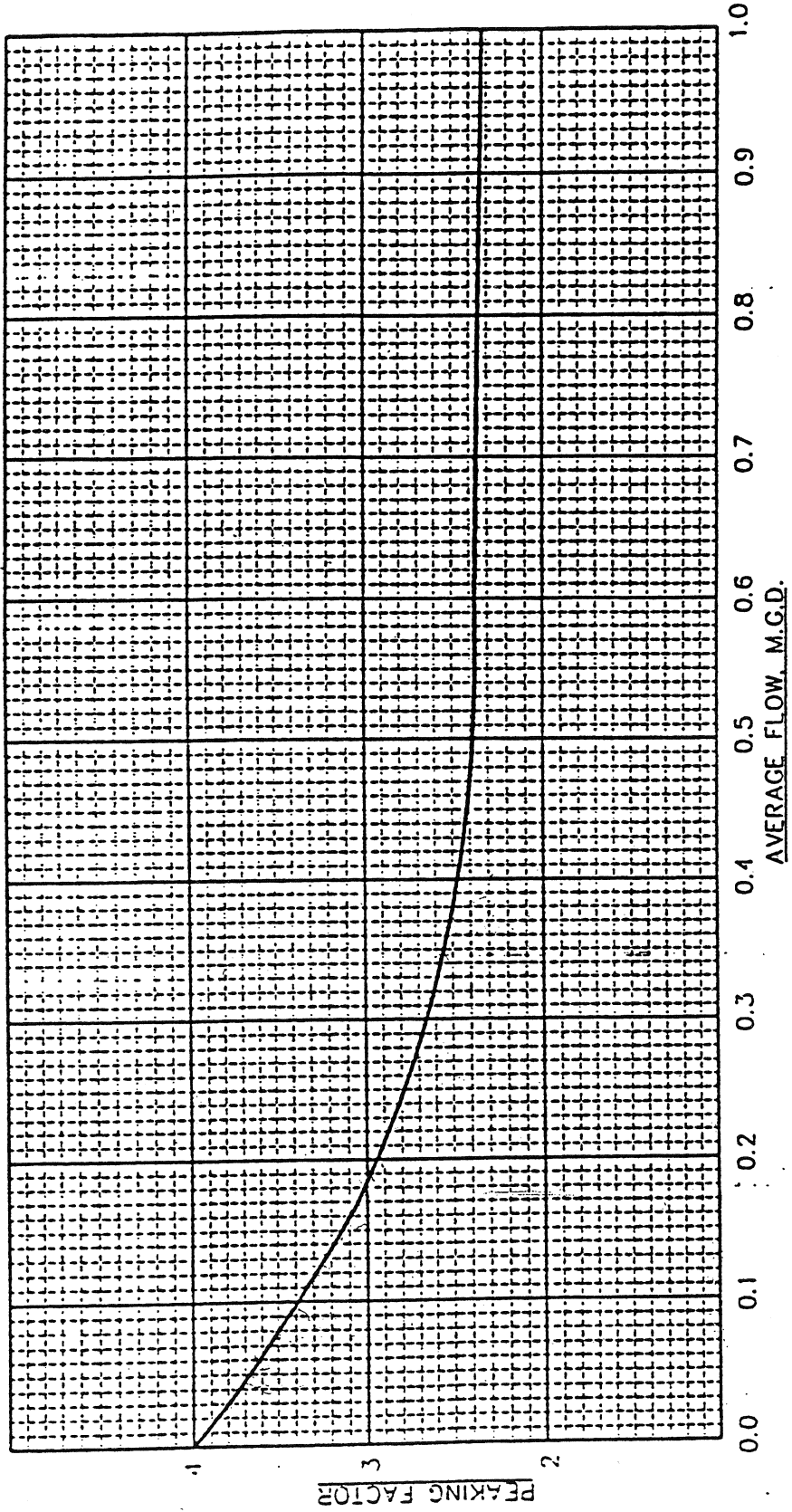


FIGURE SS-2

