

**APPENDIX H-2
ATTACHMENT 1:**

**TM-1 UNIT WATER DEMAND FACTOR
VERIFICATION AND WATER DEMAND
EVALUATION AND UPDATED BY MWH,
SEPTEMBER 2006**



**City of Roseville
Evaluation of Potential Water Supplies and
Water Delivery Strategy for the MOU Area**

TM 1 – Unit Water Demand Factor Verification and Water
Demand Evaluation and Update

September, 2006



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Section 1. EXECUTIVE SUMMARY

In 2005, the City of Roseville (City) initiated two new annexation plans in the City/Placer County Memorandum of Understanding Transition Area (MOU Area): the Creek View Specific Plan (CVSP) and Sierra Vista Specific Plan (SVSP). In order to implement the annexation plans, City staff was requested to evaluate the City's ability to provide long-term reliable water supplies to the annexed areas without negatively impacting the City's existing and future customers in terms of water supply reliability and the cost of water service delivery.

In response to the City's need for a water supply evaluation, the City initiated a study to re-confirm the unit water demand factors using the most recent meter data from City customers that includes a longer history than the previous analysis completed by MWH in February 2002. The purpose of this technical memorandum is to verify the unit demand factors established/adopted in the previous studies and to update the City's water demand estimates based on the findings from the recent meter data and the most recent land uses information. The information generated in this technical memorandum (TM) will be used to develop a reliable and sound water supply strategy for the annexation of the two new specific plans.

The new meter data covers the period from January 2001 to April 2005. Unit water demand factors were evaluated for various residential and commercial land use categories and compared to the unit factors developed/used in the past; see **Table 1-1** and the notes below the table for definitions of the land use categories. In summary, the analysis of the longer history of residential meter data compares fairly well to the unit water demand factors developed from the results of the one-year record of residential meter data obtained in year 2002 by MWH. The most noticeable differences between previous and current unit water demand factors were observed for the Commercial Land Use Category.

The unit demand factors used in the 2002 Phase II Report TM 7 (TM 7) were essentially a "compromise" between the MWH (2002) water demand factors developed from limited meter data and those documented in the City's 1993 Water Supply Master Plan, titled, *General Plan Update Water System Study* (Spink, 1993) (Spink Study). With State mandated plumbing devices installed in the homes constructed after year 1992 (post-92 homes) and the inception of the metering program in commercial and some residential properties in year 2000, the water demand factors developed from meter data were approximately 25 percent lower than predicted in the Spink Study. Later, the City asked MWH to compare these two sets of unit demand factors to the unit demand factors for the vicinity areas in the region. Statistical analyses were performed on the unit water demand factors for the vicinity areas, and resulted in a third set of water demand factors that were ultimately adopted by the City.

The methodology and process of developing the third set of the unit water demand factors were documented in the technical memorandum titled "Task 1 - Unit Demand Factors Revision" by MWH in November 2002. This set of unit water demand factors were used in TM 7 to evaluate the water demand for the City and MOU Area except for the pre-92 homes, whose demands were evaluated still using the Spink (1993) unit water demand factors to represent the higher water uses in older homes.

Using the same methodology in data handling, aggregation of customer accounts into primary land use categories and subsequent statistical analyses, the longer history meter data verifies and validates the unit water demand factors used in TM 7. Results also show that there is no significant difference in water demand factors between newer (post-92) and older (pre-92) homes as a result of the City’s meter retrofit program. As a result, this TM recommends using a composite set of residential unit water demand factors in place of the current system of having one set of unit water demand factors for pre-92 homes and another set for post-92 homes.

Using the TM 7 unit water demand factors, a “Conservative” Scenario was selected to evaluate the water demands for the City and MOU Area. The water demand estimates for the “Conservative” Scenario are included in **Table 1-2** (the WRSP has been annexed into the City boundary but its demand calculation is shown separately for the sake of comparison).

Table 1-1. Water Demand Factors Developed from Recent Meter Data and Those Developed/Adopted in Previous Studies

RESIDENTIAL LAND USE CATEGORY	DEVELOPED FROM RECENT METER DATA (GPD/DU) ¹	DEVELOPED/USED IN PREVIOUS STUDIES		
		Phase II Report TM 7 (GPD/DU)	MWH (2002) (GPD/DU) ²	Spink (1993) (GPD/DU)
LDR1 (<3.5 DU's/Acre)	833	728	818	922
LDR2 (3.5 to 5 DU's/Acre)	567	600	560	760
LMDR1 (>5.0 to 6.0 DU's/Acre)	501	521	515	685
LMDR2 (>6.0 to 8.0 DU's/Acre)	424	430	438	566
MDR (>8.0 to 12.0 DU's/Acre)	338	323	324	425
HDR1 (>12.0 to 16.0 DU's/Acre)	246	288	218	310
HDR2 (>16.0 DU's/Acre)	179	177	165	190
COMMERCIAL LAND USE CATEGORY	(GPD/Acre)	(GPD/Acre)	(GPD/Acre)	(GPD/Acre)
Commercial/Retail	2,063	2,598	2,294	2,678
Business Professional	2,429	2,598	3,207	2,678
Light Industrial	1,205	2,598	1,203	2,678
Industrial	2,232	2,562	2,597	3,124
Railroad Yard	116	109	131	122
Elementary Schools	1,705	3,454	2,143	3,881
High Schools	1,705	4,068	2,788	4,571
Public (Fire Station, etc)	1,705	1,780	2,249	2,000
Park/Recreation	2,554	2,988	2,377	3,881

Abbreviations:

- LDR – Low Density Residential
- LMDR – Low-Medium Density Residential
- MDR – Medium Density Residential
- HDR – High Density Residential
- GPD/DU – Gallon per Day/Dwelling Unit
- DPD/Ac – Gallon per Day/Acre

Notes:

1. Meter data recorded from Jan 2001 to April 2005.
2. Demand factors developed from approximately one year record of meter data from September 2000 to October 2001.

A second scenario, or “Aggressive” Scenario, was also evaluated but not included in the findings of this study because the results did not provide sufficient redundancy in the City’s water supply planning to account for uncertainties in the demand estimates due to the small population of a land

use category. The difference between the “Conservative” Scenario and “Aggressive” Scenario was the use of the lower commercial unit water demand factors developed in this study based on the more recent meter data as shown in **Table 1-1**.

Based on the results presented in **Table 1-2**, the total annual average projected water demand for the City and MOU Area is approximately 64,325 AF/Year. The demand for City only (including the WRSP) is estimated to be 57,689 AF/Year (50,056 AF/Year plus 7,633 AF/Year) as opposed to 59,111 AF/year in TM 7 (51,620 AF/Year plus 7,491 AF/Year). The 1,422 AF/Year of reduced water demand (59,111 AF/Year – 57,689 AF/Year = 1,422 AF/Year) can be attributed to the use of a lower water unit demand factor for pre 1992 homes, the meter retrofit program, extensive City water use efficiency efforts, and updated land uses within the City. The total annual average projected water demand for both the SVSP and CVSP areas is estimated to be 6,636 AF/Year (5,380 AF/Year plus 1,256 AF/Year) based on the most recent land use plan information as of May 2006.

Given the projected water demand summarized above and the City’s available surface water and groundwater entitlements, recycled water use, Aquifer Storage and Recovery (ASR) Program, and dry year water conservation efforts, a water supply portfolio and strategy will be developed for the City to provide long-term reliable water supplies to the City and the MOU Area. This water supply portfolio and strategy will be discussed in a separate technical memorandum, TM 2.

Table 1-2. City of Roseville and MOU Area Demand Estimate at Build-out – “Conservative Scenario”

Land Use	Gross Area (Acres)				Annual Average Demand (AF/Year)				Max Day Demand (MGD) ²			
	City ¹	West Roseville ¹	Sierra Vista	Creek View	City	West Roseville	Sierra Vista	Creek View	City	West Roseville	Sierra Vista	Creek View
LDR1 <3.5	1,675	661	-	-	3,684	1,454	-	-	6.8	2.6	-	-
LDR2 (3.5 to 5.0)	5,278	779	496	-	15,991	2,360	1,503	-	28.5	4.2	2.7	-
LMDR1 >5.0 to 6.0	807	38	-	-	2,591	121	-	-	4.6	0.2	-	-
LMDR2 >6.0 to 8.0	557	113	-	65	1,878	382	-	219	3.4	0.7	-	0.4
MDR >8.0 to 12.0	390	29	609	79	1,412	107	2,204	286	2.5	0.2	3.9	0.5
HDR1 >12.0 to 16.0	153	54	-	73	691	242	-	331	1.2	0.4	-	0.6
HDR2 >16.0	388	51	75	33	1,456	203	299	129	2.6	0.4	0.5	0.2
Commercial/Retail	1,859	48	-	-	5,409	139	-	-	9.7	0.2	-	-
Commercial Mixed Use ³	-	-	119	29	-	-	390	95	-	-	0.7	0.2
Business Professional	813	19	-	-	2,366	56	-	-	4.2	0.1	-	-
Light Industrial	1,320	80	-	-	3,842	233	-	-	6.9	0.4	-	-
Industrial	569	32	-	-	1,632	92	-	-	2.9	0.2	-	-
Railroad Yard	535	-	-	-	70	-	-	-	0.1	-	-	-
Schools	384	109	68	10	1,617	459	286	42	2.9	0.8	0.5	0.1
Public	427	16	2	10	851	32	4	20	1.5	0.1	0.0	0.0
Park/Recreation	1,512	278	176	33	5,059	931	589	109	9.0	1.7	1.1	0.2
Open Space	1,579	689	-	154	-	-	-	-	-	-	-	-
Road Right-of-way	397	114	-	53	-	-	-	-	-	-	-	-
Urban Reserve	-	-	31	-	-	-	-	-	-	-	-	-
Subtotal	18,622	3,120	1,577	538	48,548	6,810	5,274	1,231	86.7	12.2	9.4	2.2
System Losses (2%)					971	136	105	25	1.7	0.2	0.2	0.0
Demand Adjustment for Rezoned Areas ⁴					537	-	-	-	1.0	-	-	-
Demand for additional 1,000 units of homes in West Roseville ⁵					-	685	-	-	-	1.2	-	-
Total					50,056	7,633	5,380	1,256	89.4	13.6	9.6	2.2
Total Demand for City and MOU Area					64,325				114.8			

Notes:

1. The Sierra View Country Club golf course (192 acres) within the City and the proposed Roseville Energy Park (200 acres) in West Roseville are not included because they use insignificant amount of City's potable water.
2. Assume Maximum Day Demand/Average Day Demand = 2
3. For internal CMU parcels, 50% is assumed for residential, 20% for retail, and 30% for office. For CMU parcels along major roads, 40% is assumed for residential, 40% for retail, and 20% for offices. The composite demand factor for CMU is based on Sierra Vista Land Use information.
4. There are 19 rezoned areas in the City including HP/JMC, Riverside Corridor Redevelopment, Kaiser, Galleria Mall, and other areas.
5. Assume these units are low density single family homes.

Section 2. INTRODUCTION

Significant work has been completed in the evaluation and change in water demand factors for the City of Roseville (City) over the past 5 years. As a result, there is a concerted effort to maintain a vigilance in confirming the current water demand factors over the years to maintain a significant history as demands change over time due to hardened water conservation measures (e.g., low-flow plumbing, meter billing, etc) and changes in customer water use habits through education and awareness. This section provides the setting and objectives of the study.

2.1 BACKGROUND

In June 2005, the City initiated two new annexation and specific plans: Creek View Specific Plan (CVSP) and Sierra Vista Specific Plan (SVSP). These specific plans comprise the remainder area of the City/Placer County Memorandum of Understanding Transition Area (MOU Area). The annexation plans require the City to evaluate its ability to provide long-term reliable water supplies to the MOU Area while maintaining reliable and affordable water service to its existing and future customers within the City limits. The City has adopted the policy that the cost of delivering water supplies to new growth areas such as the MOU Area must not negatively impact the City's existing ratepayers.

In February 2002, in an effort to develop preliminary water supply alternatives for the West Roseville Specific Plan (WRSP) and MOU Area, MWH evaluated the water demand projections based on a limited amount of meter data recorded predominantly for homes built after 1992 (post-92 homes). The meter data indicated with a high level of confidence that water demand factors could be reduced from the City's Water Supply Master Plan completed in 1993 (Spink, August 1993) (Spink Study). In November 2002, the City's Environmental Utilities (EU) staff and MWH completed a water supply strategy memorandum (TM 7 of the Phase II Report) identifying water supply "portfolios" to meet the projected water demands of the WRSP and the adjacent MOU Area under a variety of hydrologic conditions. The water demand reductions were integrated into the water supply "portfolios" understanding that the water demand reductions did not create new water supplies by simply reducing the need for water, but a portion of the "supplies" derived through the water demand reduction can be kept in reserve as a safety factor to protect against the inherent uncertainty of such estimates.

Over the past several years, the City has gained additional operational history with respect to the customer water demands due to the longer period of meter billing data and the greater number of metering accounts. In addition, with meters also installed for homes built before 1992 (pre-92 homes) as a result of City's meter retrofit program, it allows EU staff and MWH to re-evaluate the water demands for older homes. Spink Study unit water demand factors were assumed for Pre-92 homes in the water demand estimate completed in TM 7 of the Phase II Report.

2.2 OBJECTIVE

The objective of this memorandum is to verify and validate the unit water demand factors developed in Task 1 (November 2002) and documented in TM7 based on a larger set of meter data.

The task does not intend to modify the previously established water demand factors, but to provide EU staff the level of confidence in water supply planning for the MOU Area on a near term and long term basis.

Section 3. UNIT WATER DEMAND FACTORS

Land use–based water demands are the preferred means of developing an estimated water demand for existing and new growth areas; the reason being that the demands are geographically placed where the demands are actually occurring. This becomes more apparent if computer modeling of the water distribution system occurs. This section discusses the development of the unit water demand factors.

3.1 OVERVIEW

A number of studies have been completed to evaluate the City’s land use water demand factors in the past. The 1993 Spink Study provides water planning criteria for calculating average annual, maximum day, and peak hour demands. The unit water demand factors were developed for a comprehensive list of land use categories. These planning criteria have provided the basis for design and construction of much of the City’s water distribution and supply infrastructure as well as the development of the needed water supplies.

In February 2002, MWH evaluated the unit water demand factors based on an approximate one-year record (June 2000 to September 2001) of meter data for post-92 homes and all commercial land uses for a longer period given that commercial accounts were, and still are, metered at the time of connection. The meter data was read and maintained by EU staff mainly for water demand evaluation purposes with the exception of commercial accounts where billing was actually performed based on metered amounts. The analysis indicated that the unit water demand factors were less than those identified in the Spink Study. On average, the residential land use categories showed a 25-percent decrease from the Spink Study unit water demand factors. The unit water demand factors for the commercial/industrial land use categories showed higher and lower values compared to the Spink Study, but the overall average commercial/industrial demand decreased. The variation was attributed to the smaller population of each commercial/industrial classification (i.e., one high water use industry can weight the data heavily) **Table 3-1** shows the unit water demand factors for both studies and then those used in the Phase II Report that were ultimately adopted.

Later, reductions in unit water demand factors for residential areas were confirmed with an extended period of meter data covering the period from June 2000 to Oct 2002¹. The unit water demand factors were further confirmed and refined by statistically analyzing those demand factors of vicinity areas with similar water demand methodologies in the Sacramento and Placer County areas. In TM 7 of the Phase II Report (November 2002), these revised unit water demand factors (listed in **Table 3-1**, last column) were used to estimate residential water demands for post-92 homes and commercial demands for the City, the WRSP, and the MOU Area. For pre-92 homes, the Spink Study numbers were used because the new unit water demand factors were based on meter data recorded for post-92 homes and considered not applicable to pre-92 homes.

¹ No monthly metering readings available from October 2001 to May 2002. Appropriate interpolation was used to calculate the monthly water consumption for these months.

Table 3-1. Unit Demand Factors Developed in Previous Studies

Land Use		MWH (2002)	Spink (1993)	Phase II Report TM 7
		(GPD/DU)	(GPD/DU)	(GPD/DU)
Residential	LDR1 (< 3.5 DU's/Ac)	818	922	728
	LDR2 (3.5 to 5.0 DU's/Ac)	560	760	600
	LMDR1 (>5.0 to 6.0 DU's/Ac)	515	685	521
	LMDR2 (>6.0 to 8.0 DU's/Ac)	438	566	430
	MDR (>8.0 to 12.0 DU's/Ac)	324	425	323
	HDR1 (>12.0 to 16.0 DU's/Ac)	218	310	288
	HDR2 (>16.0 DU's/Ac)	165	190	177
		(GPD / Ac)	(GPD / Ac)	(GPD / Ac)
Commercial	Commercial/Retail	2,294	2,678	2,598
	Business Professional	3,207	2,678	2,598
	Light Industrial	1,203	2,678	2,598
	Industrial	2,597	3,124	2,562
	Railroad Yard	131	122	109
	Elementary Schools	2,143	3,881	3,454
	High Schools	2,788	4,571	4,068
	Public (Fire Station, etc)	2,249	2,000	1,780
	Park/Recreation	2,377	3,881	2,988

Abbreviations:

- LDR – Low Density Residential
- LMDR – Low-Medium Density Residential
- MDR – Medium Density Residential
- HDR – High Density Residential
- GPD/DU – Gallon per Day/Dwelling Unit
- DPD/Ac – Gallon per Day/Acre

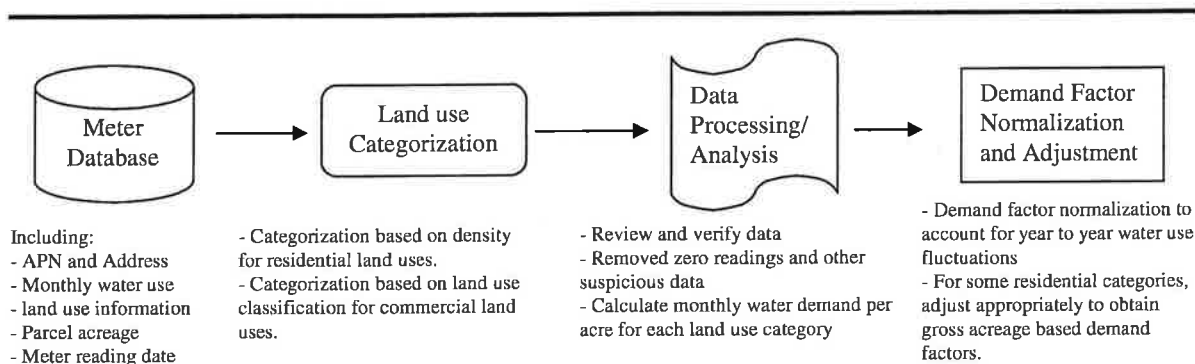
Since completion of the Phase II study in 2002, meters have been installed for homes built before 1992 as part of the City’s meter retrofit program. With an average of two years of customer use data, a similar study can be performed to evaluate the water demand factors for pre-92 homes. In 2006, City staff provided a new water use dataset including the meter records for both pre-92 and post-92 homes over the period from January 2001 to April 2005². Meter readings were provided by the City’s Department of Finance staff as part of their billing database.

3.2 UNIT WATER DEMAND FACTORS DEVELOPMENT PROCEDURE

The development of unit water demand factors applied the same “exact” methodology as used in the previous meter data analysis including data handling, land use categorization and unit water demand factor normalization. The general procedure for the development of unit water demand factors can be illustrated with the following diagram.

Figure 3-1. Unit Water Demand Factor Development Procedure

² Invalid and inconsistent data was found for the first several months during the process of data verification. Therefore, only the data between April 2001 ~ March 2005 was used for unit water demand factors calculation.



3.3 LAND USE CATEGORIZATION

The land use categorization in this study is consistent with previous studies of unit water demand factors. Each record in the meter dataset contains an Assessor Parcel Number (APN), address, existing land use, General Plan land use, parcel acreage, monthly water consumption, and meter reading date information. For the analysis of the existing meter data, the existing land use classification was used to avoid instances where the current use is not consistent with the General Plan (e.g., General Plan land use designation may have been changed or the use currently taking place is likely an older established use that in the future may change). Two large land use groups were divided first: Residential and Commercial.

The Residential group is further divided into seven categories based on the actual density of each parcel in dwelling units (DU's) per acre. Actual densities were calculated using net acreage for each parcel and adjusting the density downward by 20 percent to include right-of-way³. This adjustment is necessary because it will result in gross acreage based unit water demand factors that can be applied directly to the land use information of the City and the two specific plans to calculate their water demands in the subsequent tasks, recognizing that the land uses provided for the City and the two specific plans are gross acreage based. The residential categories and their classification criteria are also shown in **Table 3-1**.

Similarly, the commercial land uses are categorized into the land use groups shown in **Table 3-1**, and the existing land use designations were also used for commercial. **Table 3-2** shows the commercial land use categorization.

3.4 NORMALIZATION OF WATER DEMAND

The normalization of unit water demand factors is to account for year to year fluctuations in water demand based on hydrologic conditions and consumer water conservation awareness. Historical data indicates that water use is typically highest in a dry year after multiple wet years because of the time necessary to re-educate consumers. Normalization of data requires assessing what the potential extreme conditions might be and adjusting the factors accordingly to increase the level of confidence in the water system's long term performance.

³ Typically, the total area of right-of-way is approximately 20 percent of the total area of a single family residential subdivision in the City of Roseville.

Table 3-3 presents the City’s total annual water demand, population, and water demand per capita over the past 25 years. Bolded per capita water demands are chosen as the extreme years on which to base future design. Normalizing to the average of these years provides a design reliability to meet water demands in 90 percent of the years. Typically the cost effectiveness of water facilities is significantly reduced if the water system is designed to meet greater than 90 percent of the demand years.

Table 3-2. Land Use Grouping for Commercial Uses

Land Use Group for Unit Water Demand Factor	Existing Land Use Description	Land Use Group for Unit Water Demand Factor	Existing Land Use Description
Business Professional	Business Professional	Park/Recreation	Common Area
	Office Building		Utility Easement
Commercial	Automotive		Club
	Commercial		Fairgrounds
	Commercial Recreation		Golf Course
	Financial Building		Park
	Hotel		Creek Area
	Parking Lot		Landscape Easement
	Restaurant		Open Space
	Retail		Public
	Service Station	Church	
	Shopping Center	Convalescent Hospital	
	Small Food	Public Building	
	Residential and Office	Utility	
Residential and Retail	School		
Light Industrial	Light Industrial	Railroad Yard	Union Pacific Railroad
	Light Manufacturing		
	Self Storage		
Heavy Industrial	Heavy Industrial		

The average of water demand per capita in high water use years is 328 gallons per day per capita (gpd/capita) as shown in **Table 3-3**. Therefore, the normalization factors for year 2001 through 2005 are 1.11 (328/296=1.11), 1.06 (328/310=1.06), 1.12 (328/293=1.12), 1.10 (328/299=1.10) and 1.19 (328/274=1.19), respectively.

3.5 UNIT WATER DEMAND FACTORS CALCULATION

Once the meter data was grouped into different land use categories as identified in the previous section, unit water demand factors were developed by statistically analyzing historical water use data.

3.5.1 Unit Water Demand Factors for Residential Categories

This study provides two methods for aggregating residential meter accounts and developing unit water demand factors. The first is a composite scenario of developing water demand factors that does not differentiate between older and newer homes. The second evaluates one set of water demand factors for Pre-1992 homes and another set of water demand factors for Post-1992 homes.

3.5.1.1 Composite Residential Unit Water Demand Factors (Combined Pre and Post - 1992 Homes)

An averaging method was used to calculate the unit water demand factors for residential categories. First, the monthly water uses for each account were adjusted proportionally based on the actual number of days in each metering period. The total monthly water use for each land use category was then calculated, along with the total parcel net acreages. The total net parcel acreages (when summed) varied from month to month because the number of accounts increased significantly over time with the number of accounts with meters becoming greater with each year of new development and meter retrofit. Also, accounts with zero readings or erroneous readings were removed. The historical monthly water demand on a per unit acre basis was computed by dividing the total water use with the total parcel net acreages. **Appendix B** provides the resulting historical monthly water demand per acre, the total monthly water uses and parcel acreages, and the number of metering accounts for each residential category.

The resulting historical monthly water demands were normalized by applying the corresponding normalization factors from above (i.e., the normalization factor is 1.11 for year 2001, 1.06 for year 2002, 1.12 for year 2003, 1.10 for year 2004, and 1.19 for year 2005).

The normalized monthly water demands based on net parcel acreages were then adjusted to obtain gross acreage based water demand factors. For low and medium density residential categories, the normalized monthly data was decreased by 20 percent to obtain a land use-based water demand factor that can be applied to gross acreages. (Typically, the total area of streets accounts for approximately 20 percent of the total area of a residential subdivision by examining several residential subdivisions in the City). No such adjustment is needed for high density residential categories as right-of-way typically accounts for a minimal percentage of the total area of a subdivision.

Table 3-3. City of Roseville Historical Annual Water Demand, Population Data, and Water Demand Per Capita

Year	System Delivery (MG)	Population	Water Demand Per Capita (gpd/capita)
1980	2,621	24,347	295
1981	2,359	25,079	258
1982	2,612	26,127	274
1983	2,979	26,618	307
1984	3,360	27,750	332
1985	3,474	28,988	328
1986	3,797	29,897	348
1987	3,988	31,612	346
1988	3,968	34,468	315
1989	4,089	37,101	302
1990	4,641	43,900	290
1991	4,808	46,700	282
1992	5,253	49,500	291
1993	5,255	52,500	274
1994	5,818	54,400	293
1995	6,139	56,479	298
1996	6,890	59,804	316
1997	7,558	63,479	326
1998	6,664	67,338	271
1999	7,876	72,126	299
2000	8,356	80,069	286
2001	8,868	82,087	296
2002	9,683	85,533	310
2003	9,691	90,739	293
2004	10,532	96,600	299
2005	10,232	102,191	274
Mean			300
Maximum			348
Minimum			258
Average of High Water Use Years			328

Source: the City of Roseville

Lastly, an average was taken for the normalized and adjusted historical monthly demands to obtain the monthly demand factors. In addition, an average annual demand factor is also calculated based on the sum of demand factors for each of the twelve months in a year. The normalized average annual demand factors resulting from both pre-92 and post-92 homes meter records are shown in **Table 3-4**. **Figure 3-2** shows the monthly water demand factors for residential categories.

Table 3-4. Average Annual Water Demand Factor for Residential Categories

Land Use	Composite (AF/Year/Acre)	Pre-92 Homes Only (AF/Year/Acre)	Post-92 Homes Only (AF/Year/Acre)
LDR1 (< 3.5 DU's/Ac)	2.50	2.23	2.44
LDR2 (3.5 to 5.0 DU's/Ac)	2.86	2.86	2.90
LMDR1 (>5.0 to 6.0 DU's/Ac)	3.09	3.12	3.07
LMDR2 (>6.0 to 8.0 DU's/Ac)	3.32	3.34	3.54
MDR (>8.0 to 12.0 DU's/Ac)	3.78	3.68	3.79
HDR1 (>12.0 to 16.0 DU's/Ac)	3.85	3.85	3.85
HDR2 (>16.0 DU's/Ac)	4.01	4.01	4.01

3.5.1.2 Separate Residential Unit Water Demand Factors for Pre-92/Post-92 Homes Only

Since the meter data does not provide information to identify whether a home for a certain account was built before or after year 1992, a GIS tool was developed and utilized to create a separate table that contains APN numbers and a field indicating whether the home was built before or after 1992.

The separation of pre- and post-1992 home construction in GIS was done based on manually setting polygon boundaries of older and newer developed areas. The GIS tool provided the number of dwelling units of pre-92 and post-92 homes within the manually divided polygons. Although the tool did not identify the year each individual home was built, it did identify which polygon consists mainly of pre-92 homes or post-92 homes. If the number of pre-92 homes in a polygon was between 91 ~ 100 percent of the total number of dwelling units, that polygon was considered to consist of predominantly pre-92 homes. Similarly, if the number of post-92 homes is between 91 ~ 100 percent, that polygon was considered to consist predominantly post-92 homes. The distribution of pre-92/post-92 homes within the City is shown in **Figure 3-3**. The unit water demand factors for pre-92/post-92 homes based on the separately created meter data were developed and shown in **Table 3-4**.

Figure 3-2. Composite Residential Monthly Demand Factors (Pre-92 and Post-92 Homes)

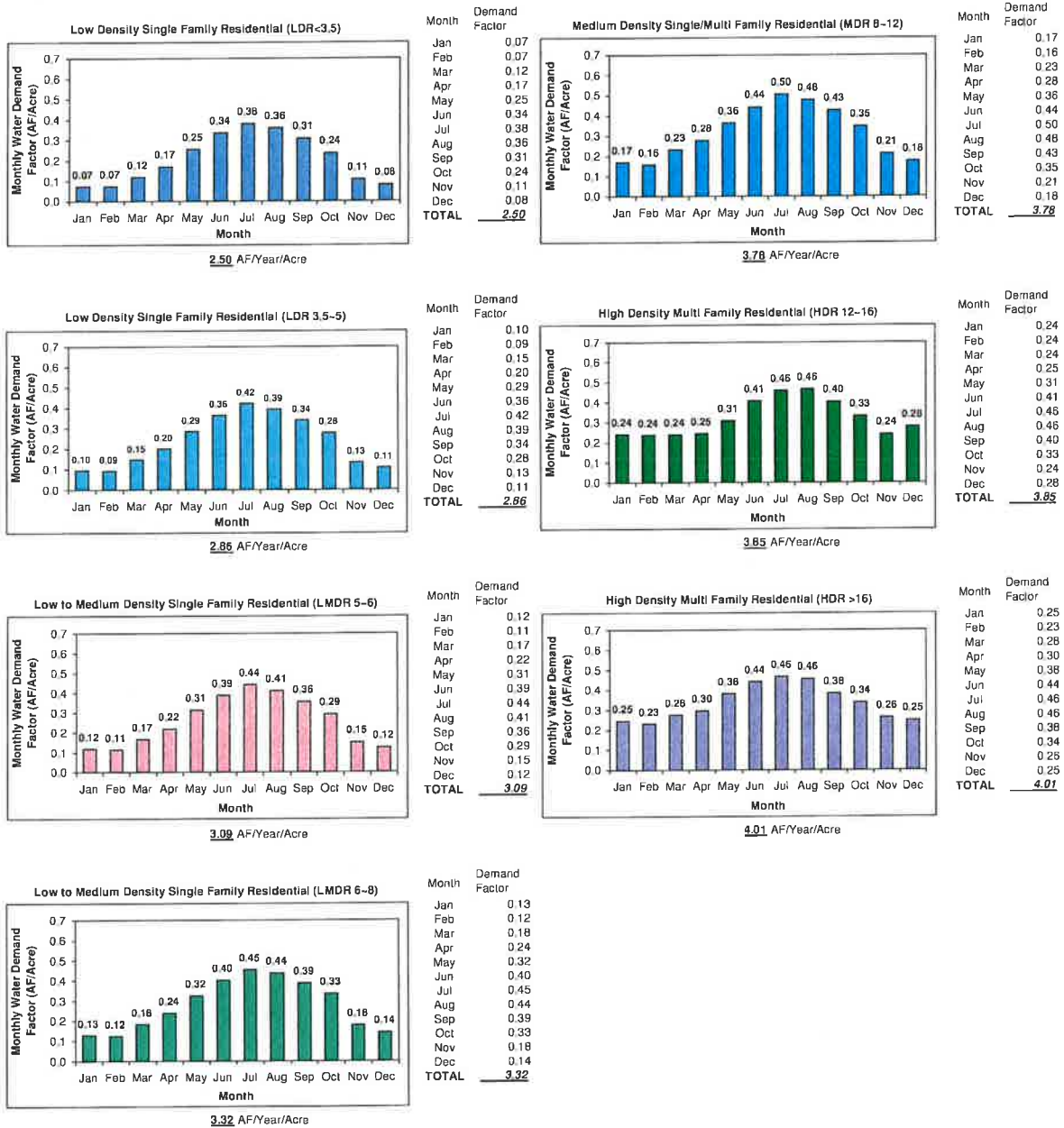
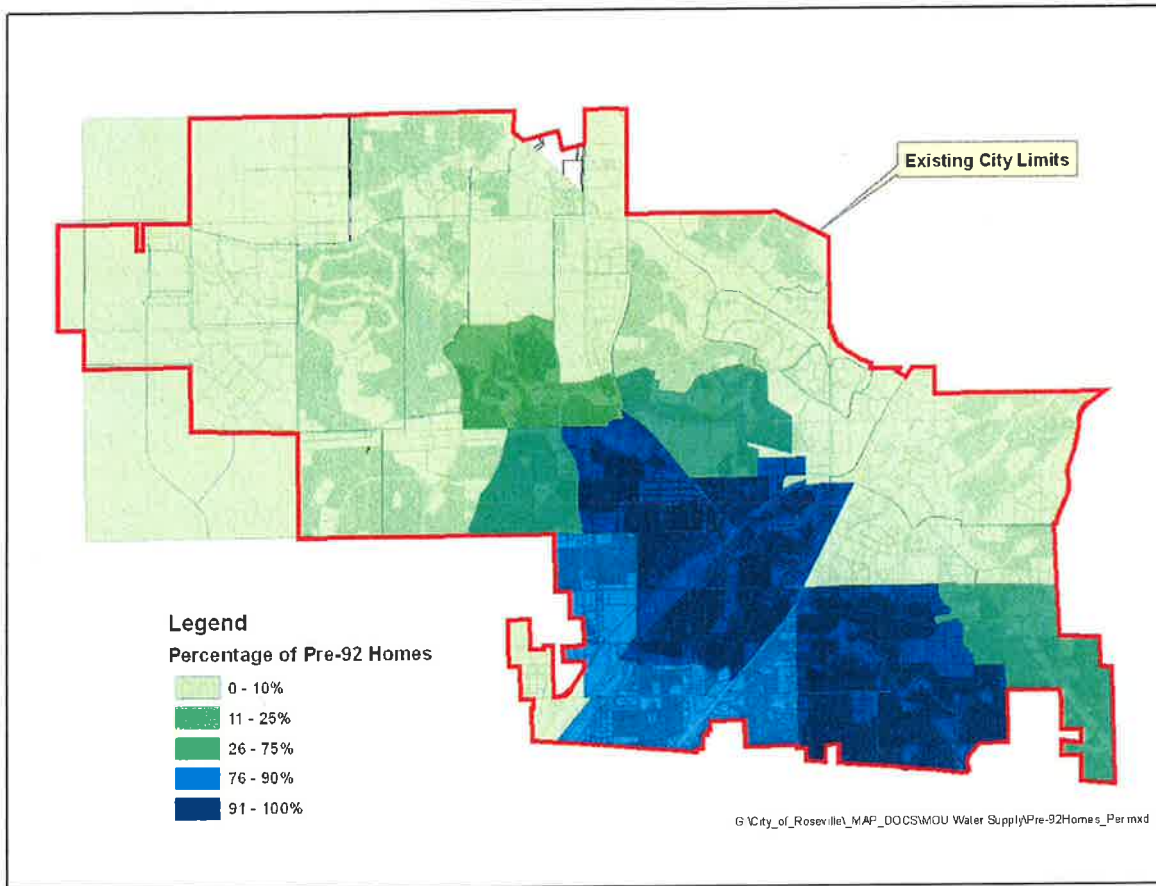


Figure 3-3. Distribution of Dwelling Units of Pre-92/Post-92 in City of Roseville



3.5.1.3 Discussion on Unit Water Demand Factor Results for Residential Categories

Table 3-4 shows that no significant difference exists in unit water demand factors between pre-92 homes and post-92 homes. In earlier studies, it was believed that because state and local building codes require mandatory water conservation plumbing devices to be installed for homes built after year 1992, newer homes use less water than older homes on a per acre basis. With meters installed in pre-92 homes as a result of the City’s meter retrofit program starting in July 2001, the water use was expected to decrease in pre-92 homes as well based on the inherent monetary incentive of using less water. The meter retrofit program projects to install meters in all unmetered homes by 2012 with an average installation by City crews of 1,514 meters per year. Therefore, the City’s ultimate demand estimate may have been overestimated by using the combination of lower demand factors for newer homes and higher ones (i.e. demand factors in Spink Study) for older homes as recommended in TM 7 and subsequently adopted by the City. Because there is no significant difference between pre-92 homes and post-92 homes in the unit water demand factors, the “Conservative” scenario (defined in the following section of this report) uses the unit water demand factors used for post-92 homes in TM 7 and applied to both pre-92 homes and post-92 homes.

The composite residential unit water demand factors based on this study are summarized in **Table 3-5** (converted from AF/year/acre in **Table 3-4** to GPD/DU) and compared with factors developed in other studies. **Table 3-5** indicates that the unit demand factors developed from the new meter data having a longer metering period are fairly close to those developed from meter data in year 2002. Since the City does not intend to modify the unit water demand factors at the present, the composite residential unit water demand factors were used to evaluate the water demand for the “Aggressive” scenario (defined in the following section of this report) and the results are included in **Appendix A**.

Table 3-5. Unit Water Demand Factors for Residential in GPD/DU

Land Use	This Study (GPD/DU)	Phase II Report TM 7 (GPD/DU)	MWH (2002) (GD/DU)	Spink (1993) (GPD/DU)
LDR1 (<3.5 DU's/Acre)	833	728	818	922
LDR2 (3.5 to 5 DU's/Acre)	567	600	560	760
LMDR1 (>5.0 to 6.0 DU's/Acre)	501	521	515	685
LMDR2 (>6.0 to 8.0 DU's/Acre)	424	430	438	566
MDR (>8.0 to 12.0 DU's/Acre)	338	323	324	425
HDR1 (>12.0 to 16.0 DU's/Acre)	246	288	218	310
HDR2 (>16.0 DU's/Acre)	179	177	165	190

3.5.2 Unit Water Demand Factors for Commercial Categories

Similar to the residential categories, averaging was the preferred method used to estimate unit water demand factors for commercial categories. Because of the great variance in water use within a commercial category and the significant number of “zero” reading records⁴, there was a need to exclude outlier readings from the average demand calculation. For each category a histogram curve was plotted to identify the distribution of accounts over pre-defined ranges of water uses for each month of a year. The histogram curves are included in **Appendix C**.

For each histogram curve, the weighted average was taken to calculate the average water use for that month. Extremely large readings were also excluded to avoid weighting the data to heavily one way or the other. For this reason, it should be noted that commercial development applications need to be examined on a case by case basis to see if there are any water intensive features such as a lake, other water feature, or high water use. The monthly weighted average was then normalized to obtain the monthly unit water demand factor⁵ for each commercial category. The normalized average annual water demand factors in “AF/Year/Acre” are shown in **Figure 3-4**. In **Table 3-6**, the normalized average day demand factors are compared to those obtained in previous studies with units converted to “GPD/Acre”.

⁴ It includes both domestic and irrigation water meter readings to evaluate the gross water demand. “Zero” reading does not mean the account does not record any water use in the past at all. Rather, it means that there is no reading for certain months of a year for some accounts. These zero readings were excluded to calculate the monthly water demand factors in order to avoid unrealistic results by using the averaging method.

⁵ Due to the limited number of metering accounts, the average was taken for all data for the same month over the metering period, regardless what year the data was recorded. Therefore, an average normalization factor (arithmetic average of all normalization factors) was applied for the demand factor normalization.

In general, the updated water demand factors for the commercial land uses show a certain degree of reduction for most commercial categories. However, since the updated unit water demand factors for commercial categories are based on a lower level of data resolution compared to residential categories (i.e., there are much fewer number of metered commercial accounts available and a statistically significant variance in water use among the customers within the same commercial category), it is prudent to use slightly more conservative water demand factors for commercial categories. Therefore, the demand factors used in Phase II Report TM 7 are considered valid.

Figure 3-4. Monthly Demand Factors for Commercial Categories

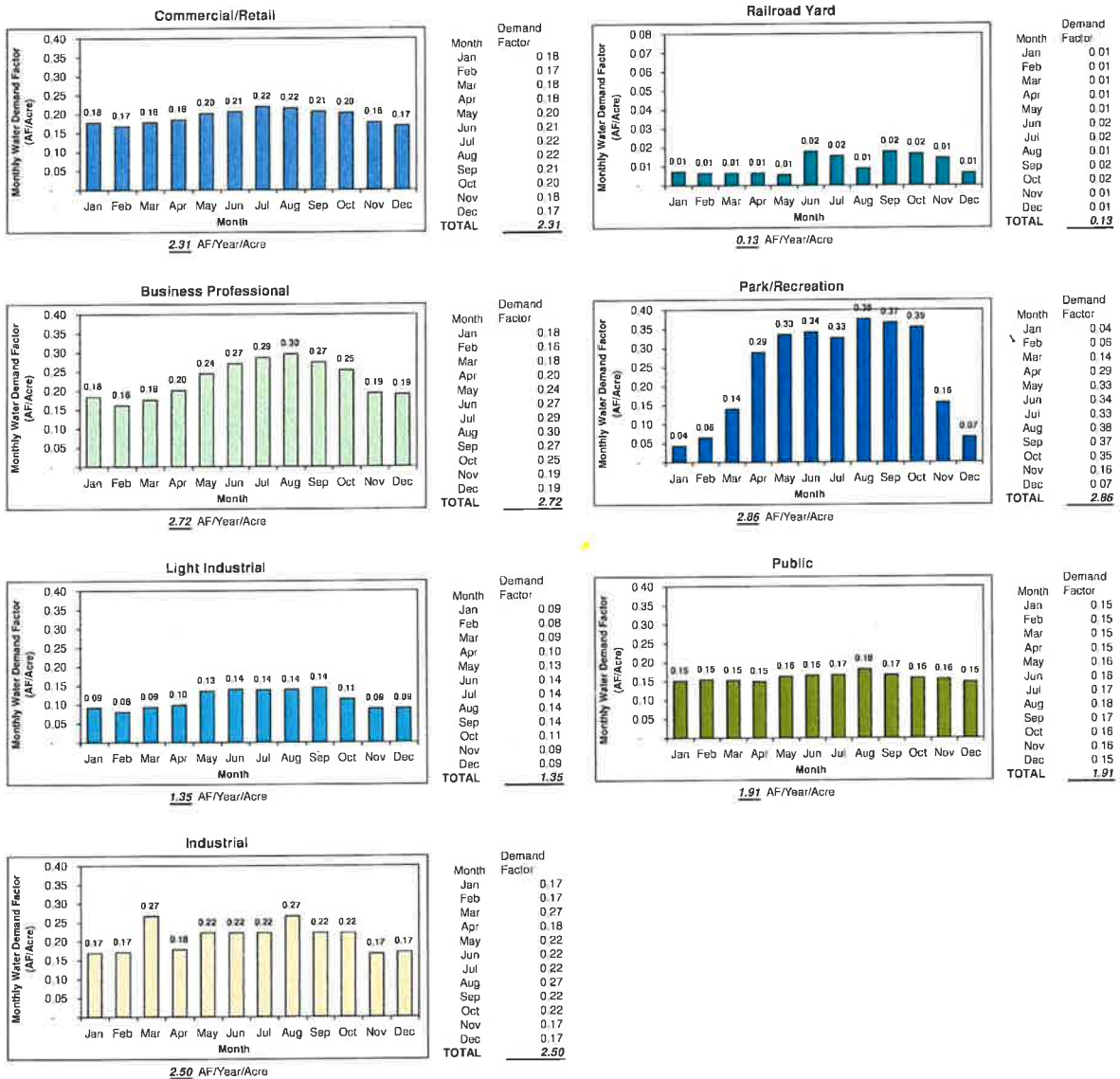


Table 3-6. Unit Water Demand Factor for Commercial Categories in GPD/Acre

Land Use	This Study (GPD/Acre)	Phase II Report TM 7 (GPD/Acre)	MWH (2002) (GPD/Acre)	Spink (1993) (GPD/Acre)
Commercial/Retail	2,063	2,598	2,294	2,678
Business Professional	2,429	2,598	3,207	2,678
Light Industrial	1,205	2,598	1,203	2,678
Industrial	2,232	2,562	2,597	3,124
Railroad Yard	116	109	131	122
Elementary Schools	1,705 ^[1]	3,454	2,143	3,881
High Schools	1,705 ^[1]	4,068	2,788	4,571
Public (Fire Station, etc)	1,705 ^[1]	1,780	2,249	2,000
Park/Recreation	2,554	2,988	2,377	3,881

Note:

[1] Schools are grouped with other "Public & Quasi-Public" land uses to evaluate the unit water demand factor for the reason that typically schools are included in the "Public & Quasi-Public" category in land use maps.

Section 4. WATER DEMAND PROJECTIONS

This section describes water demand estimates for the City and for the SVSP and CVSP at build out. The water demands described here refer to the gross water demand including potable and non-potable water demands. Water demand projections over the period from 2005 to 2030 (build out) are also presented in this section.

4.1 WATER DEMANDS AT BUILD-OUT

The City originally requested that two scenarios be investigated to evaluate the water demands for the City and MOU Area: “Conservative” Scenario and “Aggressive” Scenario. The “Conservative” Scenario uses the residential unit water demand factors that only used for post-92 homes in TM 7 and applies to both pre-92 homes and post-92 homes, as this study indicates that there is no significant difference in water use between pre-92 homes and post-92 homes. The “Conservative” scenario also uses the set of unit water demand factors for commercial used in TM 7. The “Aggressive” Scenario uses the composite residential water demand factors and the considerably lower commercial unit water demand factors developed in this study. This results in a significantly lower total water demand for the City.

After completing the water demand evaluation for the “Aggressive” Scenario, City staff decided to not include this scenario in the findings of this report. The conclusion was that the water demand estimates for the “Aggressive” Scenario did not provide sufficient redundancy in the planning of water supplies to account for uncertainties in the demand estimates. The results of the “Aggressive” Scenario are included in **Appendix A**.

The water demand estimates for the “Conservative” Scenario are included in **Table 4-1** (the WRSP has been annexed into the City boundary but its demand calculation is shown separately for the sake of comparison).

The total annual average demand for the City and the MOU Area is approximately 64,325 AF/Year. The demand for City only (including WRSP) is estimated to be 57,689 AF/Year (50,056 AF/Year plus 7,633 AF/Year) as apposed to 59,111 AF/year in TM 7 (51,620 AF/Year plus 7,491 AF/Year). The 1,422 AF/Year of reduced water demand (59,111 AF/Year – 57,689 AF/Year = 1,422 AF/Year) can be attributed to the meter retrofit program, updated land use applications, and the rezoning efforts in the City. For the rezoned areas, the water demands and demand changes from the original zoning are included in **Appendix A**.

The total annual average demand for both the SVSP and CVSP areas is estimated to be 6,636 AF/Year (5,380 AF/Year plus 1,256 AF/Year) based on the most recent land use information as of May 2006.

4.2 DEMAND GROWTH PROJECTIONS

Demand growth for the City and MOU area were estimated based on the population growth projection data. The City’s water supply and water distribution system should be adequate to meet both build-out and interim demands. Particularly, the City will have to provide a reliable long-term

and near-term water supply to the SVSP and CVSP areas without negatively impacting its customers within the City.

Table 4-1. City of Roseville and MOU Area Demand Estimates at Build-out – “Conservative Scenario”

Land Use	Gross Area (Acres)				Annual Average Demand (AF/Year)				Max Day Demand (MGD) ²				
	City ¹	West Roseville ¹	Sierra Vista	Creek View	City	West Roseville	Sierra Vista	Creek View	City	West Roseville	Sierra Vista	Creek View	
LDR1	<3.5	1,675	661	-	-	3,684	1,454	-	-	6.6	2.6	-	-
LDR2	(3.5 to 5.0)	5,278	779	496	-	15,991	2,360	1,503	-	28.5	4.2	2.7	-
LMDR1	>5.0 to 6.0	807	36	-	-	2,591	121	-	-	4.6	0.2	-	-
LMDR2	>6.0 to 8.0	557	113	-	65	1,878	382	-	219	3.4	0.7	-	0.4
MDR	>8.0 to 12.0	390	29	609	79	1,412	107	2,204	286	2.5	0.2	3.9	0.5
HDR1	>12.0 to 16.0	153	54	-	73	691	242	-	331	1.2	0.4	-	0.8
HDR2	>16.0	368	51	75	33	1,456	203	299	129	2.6	0.4	0.5	0.2
Commercial/Retail		1,859	48	-	-	5,409	139	-	-	9.7	0.2	-	-
Commercial Mixed Use ³		-	-	119	29	-	-	390	95	-	-	0.7	0.2
Business Professional		813	19	-	-	2,366	56	-	-	4.2	0.1	-	-
Light Industrial		1,320	80	-	-	3,842	233	-	-	6.9	0.4	-	-
Industrial		569	32	-	-	1,632	92	-	-	2.9	0.2	-	-
Railroad Yard		535	-	-	-	70	-	-	-	0.1	-	-	-
Schools		384	109	68	10	1,617	459	286	42	2.9	0.8	0.5	0.1
Public		427	16	2	10	851	32	4	20	1.5	0.1	0.0	0.0
Park/Recreation		1,512	278	178	33	5,059	931	589	109	9.0	1.7	1.1	0.2
Open Space		1,579	699	-	154	-	-	-	-	-	-	-	-
Road Right-of-way		397	114	-	53	-	-	-	-	-	-	-	-
Urban Reserve		-	-	31	-	-	-	-	-	-	-	-	-
Subtotal		18,622	3,120	1,577	538	48,548	6,810	5,274	1,231	86.7	12.2	9.4	2.2
System Losses (2%)						971	136	105	25	1.7	0.2	0.2	0.0
Demand Adjustment for Rezoned Areas ⁴						537	-	-	-	1.0	-	-	-
Demand for additional 1,000 units of homes in West Roseville ⁵						-	685	-	-	-	1.2	-	-
Total						50,056	7,633	5,380	1,256	89.4	13.6	9.6	2.2
Total Demand for City and MOU Area							64,325				114.8		

Notes:

1. The Sierra View Country Club golf course (192 acres) within the City and the proposed Roseville Energy Park (200 acres) in West Roseville are not included because they use insignificant amount of City's potable water.
2. Assume Maximum Day Demand/Average Day Demand = 2
3. For internal CMU parcels, 50% is assumed for residential, 20% for retail, and 30% for office. For CMU parcels along major roads, 40% is assumed for residential, 40% for retail, and 20% for offices. The composite demand factor for CMU is based on Sierra Vista Land Use information.
4. There are 19 rezoned areas in the City including HP/JMC, Riverside Corridor Redevelopment, Kaiser, Galleria Mall, and other areas. See demand calculation for these rezoned areas in Appendix A, Figure A-1.
5. Assume these additional units are low density single family homes.

The City's General Plan Fiscal Impact Analysis (MuniFinancial, 2006) provides the population projection for year 2006, 2015, and 2025 for the City and the SVSP and CVSP areas. The population projection for year 2010 and 2020 was interpolated in this report to estimate the City's interim water demand growth in five-year interval. The population and water demand projection were further stretched to 2030 to reconcile the difference in planning horizon for the General Plan and the region's water supply and WFA assuming the City reaches "near" build-out capacity by 2025 and then slowly grows through 2030. The demand growth projection for the City and the SVSP and CVSP areas included is shown in **Table 4-2** and plotted in **Figure 4-1**. Two water demand growth curves are presented in **Figure 4-1**, one is for the City (w/WRSP) only, and the other represents the total water demand growth if the SVSP and CVSP are annexed into the City's boundary. The difference between the two curves is the water demand for the SVSP and CVSP areas. The water demand growth projections will be used to develop the City's water supply strategy on a long-term and short-term basis.

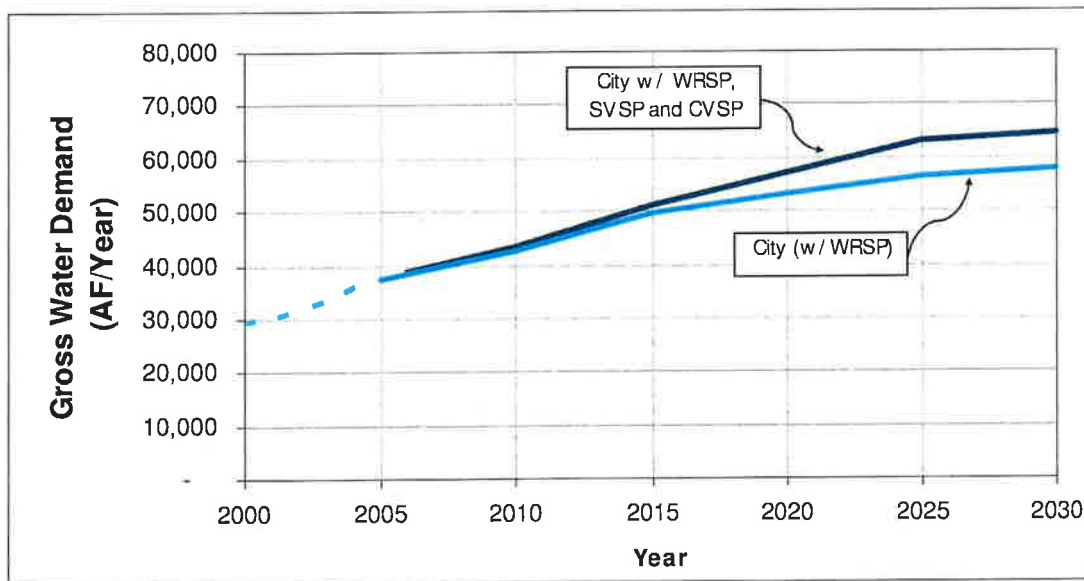
Table 4-2. Table of Water Demand Growth Projection for the City and MOU Area

YEAR	Population Projection ¹	Demand Growth Projection (AF/Year)		
		City (with WRSP)	SVSP and CVSP	TOTAL
2006	104,300	38,648	-	38,648
2010	121,722	42,713	558	43,271
2015	143,500	49,757	1,255	51,013
2020	160,450	53,158	3,881	57,038
2025	177,400	56,558	6,506	63,064
2030	180,948	57,689	6,636	64,325

Notes:

1. Based on the population projection in the City of Roseville’s General Plan Fiscal Impact Analysis, February 6, 2006. MuniFinancial.

Figure 4-1. Figure of Water Demand Growth Projection for the City and MOU Area



Section 5. CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the conclusions obtained from the new meter data analysis.

- A composite water demand factor methodology including both pre- and post- 1992 homes is recommended over the existing methodology of using a one set of water demand factors for pre-1992 homes and another set for post-1992 homes. This is the result of the implementation of the City's meter retrofit program by installing meters on older homes.
- The City's water demand was re-confirmed using the composite residential water demand factors and the adopted commercial demand factors in TM 7. Based on this revised set of unit water demand factors, the City's overall water demand decreases by approximately 1,048 AF/year benefiting from the meter retrofit program and some changes in land use applications.
- The City's water demand estimates using solely the unit demand factors for residential and commercial based on the new meter data in this study were considered to be too low and perceived as having an insufficient "safety margin" in the water supply planning for the City and the annexation plans including the SVSP and CVSP.

Section 6. REFERENCES

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Montgomery Watson Harza. 2002. Technical Memorandum 1 (Final). *Evaluation of Water System Capacity – Water Demands Evaluation*. February 26.

Montgomery Watson Harza. November 2002. Technical Memorandum : Task 1. *Unit Demand Factors Revision*. November 6.

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MuniFinancial. February 2006. *City of Roseville General Plan Fiscal Impact Analysis*.

Spink Corporation. 1993. *General Plan Update Water System Study*.

**APPENDIX A – OTHER RESULTS OF WATER DEMAND ESTIMATES
FOR “CONSERVATIVE” SCENARIO AND “AGGRESSIVE SCENARIO”**

Figure A-1. Demand Estimates for “Re-zoned” Area – “Conservative” Scenario

Rezone Area	APN	Parcel Area (ac.)	Original Zoning		Proposed Rezoning		Notes
			Land Use	Designation	Land Use	Designation	
1	017-115-083-000	17.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 100 DU	LMDR1	56.2
	017-115-084-000	14.3	LIGHT INDUSTRIAL	LI	RESIDENTIAL 81 DU	LMDR1	45.9
	017-115-085-000	24.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 139 DU	LMDR2	62.6
	017-115-086-000	39.2	LIGHT INDUSTRIAL	LI	RESIDENTIAL 224 DU	LMDR2	132.1
	017-115-016-000	44.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 142 DU	LDR1	97.9
	017-370-019-000	13.4	RESIDENTIAL 91 DU	LMDR2	RESIDENTIAL 96 DU	LMDR2	45.2
2	015-350-022-000	9.6	COMMERCIAL	COM	RESIDENTIAL 71 DU	LMDR2	32.4
	015-350-022-000	26.4	COMMERCIAL	COM	RESIDENTIAL 249 DU	MDR	95.6
	012-184-008-000	1.4	LIGHT INDUSTRIAL	LI	RESIDENTIAL 24 DU	HDR2	5.5
	012-184-009-000	1.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 24 DU	HDR2	5.9
	048-460-018-000	1.9	COMMERCIAL	COM	RESIDENTIAL 33 DU	HDR2	7.5
	048-460-019-000	7.3	COMMERCIAL	COM	RESIDENTIAL 130 DU	HDR2	28.9
7	048-460-020-000	7.8	COMMERCIAL	COM	RESIDENTIAL 139 DU	HDR2	30.9
	048-460-021-000	7.8	COMMERCIAL	COM	RESIDENTIAL 135 DU	HDR2	30.1
	048-460-022-000	7.8	COMMERCIAL	COM	RESIDENTIAL 138 DU	HDR2	30.9
	048-460-022-000	7.8	COMMERCIAL	COM	RESIDENTIAL 138 DU	HDR2	30.9
8	477-060-005-000	10.7	COMMERCIAL	COM	Boston Village	LMDR2 + COM	34.2
	363-010-011-000	20.4	COMMERCIAL	COM	RESIDENTIAL 244 DU	MDR	73.8
10 (HP/JMC)	017-230-051-000	287.5	HP	LI	Mixed	Mixed	850.9
	017-162-069-000	9.7	COMMERCIAL	COM	RESIDENTIAL 125 DU	HDR1	43.8
11	017-410-019-000	2.3	COMMERCIAL	COM	RESIDENTIAL 28 DU	HDR2	9.1
	017-410-020-000	2	COMMERCIAL	COM	RESIDENTIAL 24 DU	MDR	7.2
	017-410-021-000	2.2	COMMERCIAL	COM	RESIDENTIAL 26 DU	MDR	8.0
	017-410-022-000	2	COMMERCIAL	COM	RESIDENTIAL 24 DU	MDR	7.2
	017-410-035-000	5	COMMERCIAL	COM	RESIDENTIAL 59 DU	MDR	18.1
	017-410-041-000	1.6	COMMERCIAL	COM	RESIDENTIAL 19 DU	MDR	5.8
12	017-410-042-000	1.8	COMMERCIAL	COM	RESIDENTIAL 22 DU	HDR1	8.1
	017-115-032-000	19	COMMERCIAL	COM	RESIDENTIAL 286 DU	MDR+HDR1	77.3
13	017-115-032-000	19	COMMERCIAL	COM	RESIDENTIAL 286 DU	MDR+HDR1	77.3
	363-010-019-000	50	COMMERCIAL	COM	Convention Center	COM	415.7
15 (Riverside Redevelopment)	Multiple Parcels	17.3	COMMERCIAL	COM	CMU	CMU	56.6
	013-123-001-000	0.1	COMMERCIAL	COM	BP	BP	0.3
	013-123-002-000	0.1	COMMERCIAL	COM	BP	BP	0.3
	013-123-003-000	0.1	COMMERCIAL	COM	BP	BP	0.3
16	013-123-004-000	0.1	COMMERCIAL	COM	BP	BP	0.3
	013-123-004-000	0.1	COMMERCIAL	COM	BP	BP	0.3
17	017-122-001-000	67	HEAVY INDUSTRIAL	IND	PUBLIC/QUIET- PUBLIC	PUB	133.6
	048-010-030-000	49.2	Kaiser Hospital	COM	Kaiser Hospital	COM	178.4
18 (Galleria Mall)	Multiple Parcels	87	COMMERCIAL	COM	Galleria Mall	COM	424.9
	Multiple Parcels	869.8	COMMERCIAL	COM	Galleria Mall	COM	3,081.5
Subtotal							3,081.5
System Losses (2%)							61.6
Total Water Demand							3,143.2

Reasoning data source: South Placer Regional Wastewater and Recycled Water Systems Evaluation Project; City of Roseville Sanitary Sewer Aerial Development Project; TM for Methodology for Adjusting Land Use for Parcels with Approved or Near-Certain Zoning or Development Changes (“Rezone Parcels”) (TM No.36), October 24, 2005

Figure A-2. Demand Estimate for HP/JMC – “Conservative” Scenario

Land Use	Designated LU Code	Acreage	Unit Water Demand Factor (AF/Year/Acre)	Demand (AF/Year)
High Density Residential (HDR)	HDR1	62.1	4.52	280.7
Medium Density Residential (MDR)	MDR	88.4	3.62	320.0
Low Density Residential (LDR)	LDR2	0.7	3.03	2.1
Community Commercial (CC)	COM	11.0	2.91	32.0
Business Professional (BP) includes business park and/or new college campus	BP	50.0	2.91	145.5
Parks and Recreation (PR) includes neighborhood parks and parkettes	PARK	13.7	3.35	45.9
Public/Quasi Public (P/QP) includes elementary school, fire station, and municipal well site	PUB	12.4	1.99	24.7
Open Space	OS	45.7	0.00	0.0
Roads	ROW	13.5	0.00	0.0
Subtotal		297.5		850.9
Systeme Loss(2%)				17.0
Total Demand				867.9

Figure A-3. City of Roseville and MOU Area Demand Estimates at Build-out – “Aggressive Scenario”

Land Use	Gross Area (Acres)				Annual Average Demand (AF/Year)				Max Day Demand (MGD) ²			
	City ¹	West Roseville ¹	Sierra Vista	Creek View	City	West Roseville	Sierra Vista	Creek View	City	West Roseville	Sierra Vista	Creek View
LDR1 <3.5	1,675	661	-	-	4,187	1,652	-	-	7.5	2.9	-	-
LDR2 (3.5 to 5.0)	5,278	779	496	-	15,094	2,228	1,419	-	26.9	4.0	2.5	-
LMDR1 >5.0 to 6.0	807	38	-	-	2,494	117	-	-	4.5	0.2	-	-
LMDR2 >6.0 to 8.0	557	113	-	65	1,850	376	-	216	3.3	0.7	-	0.4
MDR >8.0 to 12.0	390	29	609	79	1,475	111	2,301	298	2.6	0.2	4.1	0.5
HDR1 >12.0 to 16.0	153	54	-	73	589	206	-	282	1.1	0.4	-	0.5
HDR2 >16.0	368	51	75	33	1,474	206	302	131	2.6	0.4	0.5	0.2
Commercial/Retail	1,859	48	-	-	4,294	110	-	-	7.7	0.2	-	-
Commercial Mixed Use ³	-	-	119	29	-	-	390	95	-	-	0.7	0.2
Business Professional	813	19	-	-	2,203	52	-	-	3.9	0.1	-	-
Light Industrial	1,320	80	-	-	1,783	108	-	-	3.2	0.2	-	-
Industrial	569	32	-	-	1,422	80	-	-	2.5	0.1	-	-
Railroad Yard	535	-	-	-	70	-	-	-	0.1	-	-	-
Schools	384	109	68	10	734	208	130	19	1.3	0.4	0.2	0.0
Public	427	16	2	10	815	31	4	19	1.5	0.1	0.0	0.0
Park/Recreation	1,512	278	176	33	4,323	795	503	94	7.7	1.4	0.9	0.2
Open Space	1,579	699	-	154	-	-	-	-	-	-	-	-
Road Right-of-way	397	114	-	53	-	-	-	-	-	-	-	-
Urban Reserve	-	-	31	-	-	-	-	-	-	-	-	-
Subtotal	18,622	3,120	1,577	538	42,805	6,281	5,049	1,154	76.4	11.2	9.0	2.1
System Losses (2%)					856	126	101	23	1.5	0.2	0.2	0.0
Demand Adjustment for Rezoned Area ⁴					1,228	-	-	-	2.2	-	-	0.0
Demand for additional 1,000 units of homes in West Roseville ⁵						648				1.2		
Total					44,890	7,055	5,150	1,177	80.1	12.6	9.2	2.1
Total Demand for City and MOU Area						58,272				104.0		

Notes:

1. The Sierra View Country Club golf course (192 acres) within the City and the proposed Roseville Energy Park (200 acres) in West Roseville are not included because they use insignificant amount of City's potable water.
2. Assume Maximum Day Demand/Average Day Demand = 2
3. For internal CMU parcels, 50% is assumed for residential, 20% for retail, and 30% for office. For CMU parcels along major roads, 40% is assumed for residential, 40% for retail, and 20% for offices. The composite demand factor for CMU is based on Sierra Vista Land Use information.
4. There are 19 rezoned areas in the City including HP/JMC, Riverside Corridor Redevelopment, Kaiser, Galleria Mall, and other areas. See Figure A-4.
5. Assume these units are low density single family homes.

Figure A-4. Demand Estimates for “Re-zoned” Area – “Aggressive” Scenario

Rezone Area	APN	Parcel Area (ac.)	Original Zoning		Proposed Rezoning		Notes
			Land Use	Designation	Land Use	Designation	
1	017-115-083-000	17.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 100 DU	LMDR1	64.1
	017-115-084-000	14.3	LIGHT INDUSTRIAL	LI	RESIDENTIAL 81 DU	LMDR1	44.2
	017-115-085-000	24.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 139 DU	LMDR2	81.3
	017-115-086-000	39.2	LIGHT INDUSTRIAL	LI	RESIDENTIAL 224 DU	LMDR2	130.1
	017-115-018-000	44.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 142 DU	LDR1	111.3
	017-370-019-000	13.4	RESIDENTIAL 91 DU	LMDR2	RESIDENTIAL 86 DU	LMDR2	44.5
2	015-350-022-000	9.6	COMMERCIAL	COM	RESIDENTIAL 71 DU	LMDR2	31.9
	363-020-038-000	26.4	COMMERCIAL	COM	RESIDENTIAL 249 DU	MDR	99.8
	012-184-009-000	1.4	LIGHT INDUSTRIAL	LI	RESIDENTIAL 24 DU	HDR2	5.6
	012-184-009-000	1.5	LIGHT INDUSTRIAL	LI	RESIDENTIAL 24 DU	HDR2	6.0
	048-460-018-000	1.9	COMMERCIAL	COM	RESIDENTIAL 33 DU	HDR2	7.6
	048-460-019-000	7.3	COMMERCIAL	COM	RESIDENTIAL 130 DU	HDR2	29.3
7	048-460-020-000	7.8	COMMERCIAL	COM	RESIDENTIAL 139 DU	HDR2	31.3
	048-460-021-000	7.8	COMMERCIAL	COM	RESIDENTIAL 135 DU	HDR2	30.5
	048-460-022-000	7.8	COMMERCIAL	COM	RESIDENTIAL 138 DU	HDR2	31.3
	477-080-005-000	10.7	COMMERCIAL	COM	Bretton Village	LMDR2 + COM	31.5
	363-010-011-000	20.4	COMMERCIAL	COM	RESIDENTIAL 244 DU	MDR	77.1
	017-230-051-000	297.5	HP	LI	Mixed	Mixed	799.5
11	017-162-069-000	9.7	COMMERCIAL	COM	RESIDENTIAL 125 DU	HDR1	37.3
	017-410-019-000	2.3	COMMERCIAL	COM	RESIDENTIAL 28 DU	HDR2	9.2
	017-410-020-000	2	COMMERCIAL	COM	RESIDENTIAL 24 DU	MDR	7.6
	017-410-021-000	2.2	COMMERCIAL	COM	RESIDENTIAL 26 DU	MDR	8.3
	017-410-022-000	2	COMMERCIAL	COM	RESIDENTIAL 24 DU	MDR	7.6
	017-410-035-000	5	COMMERCIAL	COM	RESIDENTIAL 59 DU	MDR	18.9
12	017-410-041-000	1.6	COMMERCIAL	COM	RESIDENTIAL 19 DU	MDR	6.0
	017-410-042-000	1.8	COMMERCIAL	COM	RESIDENTIAL 22 DU	HDR1	6.9
	017-115-032-000	19	COMMERCIAL	COM	RESIDENTIAL 286 DU	MDR+HDR1	72.5
	363-010-009-000	50	COMMERCIAL	COM	Convention Center	COM	330.0
	Multiple Parcels	17.3	COMMERCIAL	COM	CMUJ	CMUJ	56.6
	013-123-001-000	0.1	COMMERCIAL	COM	BP	BP	0.3
16	013-123-002-000	0.1	COMMERCIAL	COM	BP	BP	0.3
	013-123-003-000	0.1	COMMERCIAL	COM	BP	BP	0.3
	013-123-004-000	0.1	COMMERCIAL	COM	BP	BP	0.3
	017-122-001-000	67	HEAVY INDUSTRIAL	IND	PUBLIC/GOV/SI- PUBLIC	PUB	128.0
18	048-010-030-000	49.2	Keiser Hospital	COM	Keiser Hospital	COM	178.4
	Multiple Parcels	87	COMMERCIAL	COM	Galleria Mall	COM	337.3
Subtotal		869.8					2,852.5
System Loss (2%)							57.1
Total Water Demand							2,909.6

Expansion from 378 K to 1.08 M sq. ft. Demand calculation is based on the water meter reading for Kaiser 83,000 gpd (41,000 gpd domestic + 42,000 gpd irrigation). Assume irrigation demand does not change, the demand after expansion = (41,000/378,000)*1,080 = 115,000 gpd. (FAR 0.29) to 1.8 M sq. ft. (FAR 0.47)

Detail Demand Calculation for HP rezoned area is included in a separate table.

50% MDR plus 50% HDR1

Increase from 0.4 to 0.8 FAR

CMUJ Unit Demand Factor for Sierra Vista is assumed for Riverside Redevelopment Area

Expansion from 378 K to 1.08 M sq. ft. Demand calculation is based on the water meter reading for Kaiser 83,000 gpd (41,000 gpd domestic + 42,000 gpd irrigation). Assume irrigation demand does not change, the demand after expansion = (41,000/378,000)*1,080 = 115,000 gpd. (FAR 0.29) to 1.8 M sq. ft. (FAR 0.47)

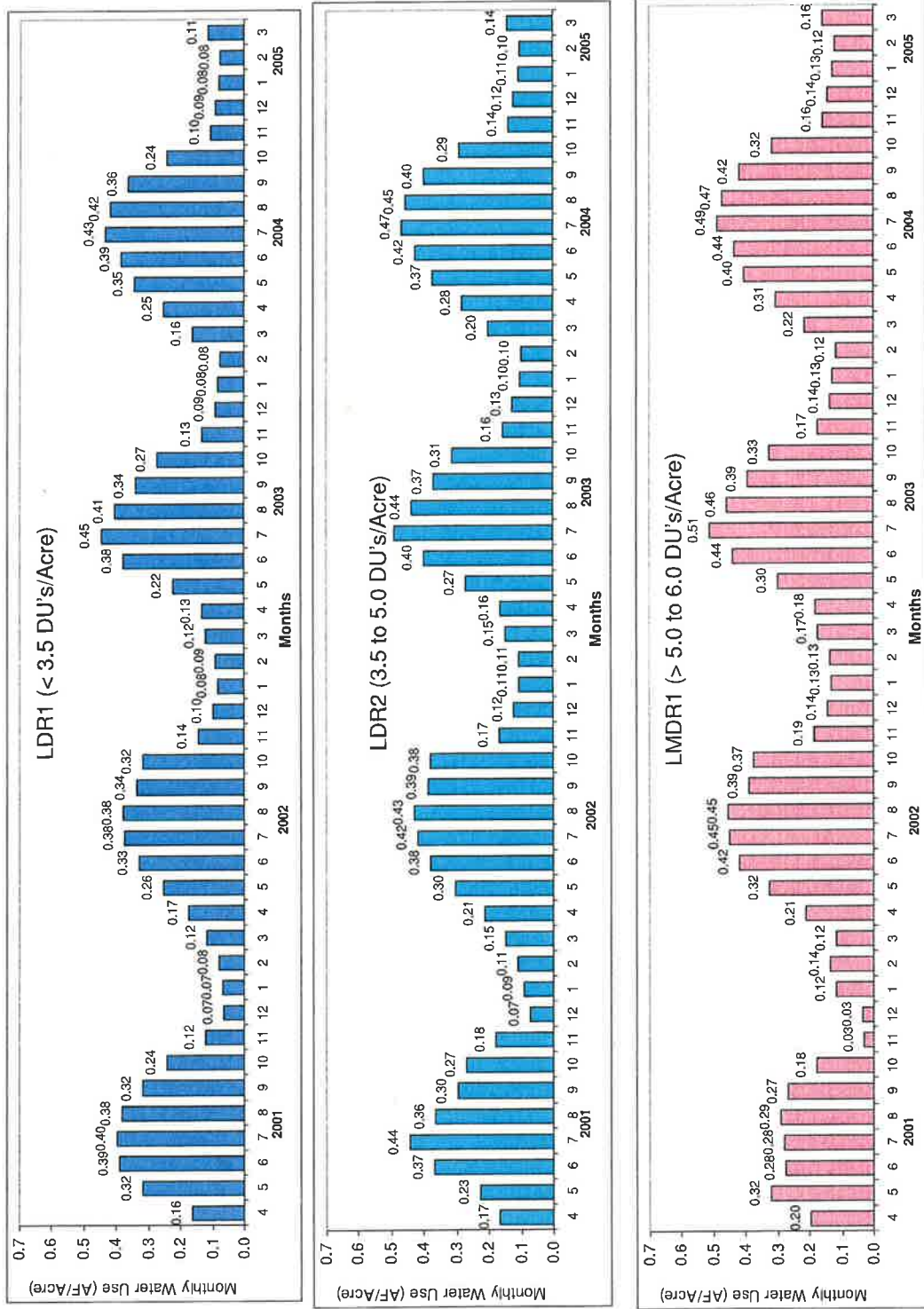
Rezonning data source: South Placer Regional Wastewater and Recycled Water Systems Evaluation Project, City of Roseville Sanitary Sewer Model Development Project TM for Methodology for Adjusting Land Use for Parcels with Approved or Near-Certain Zoning or Development Changes ("Rezone Parcel") (TM No.96), October 24, 2005

Figure A-5. Demand Estimate for HP/JMC – “Aggressive” Scenario

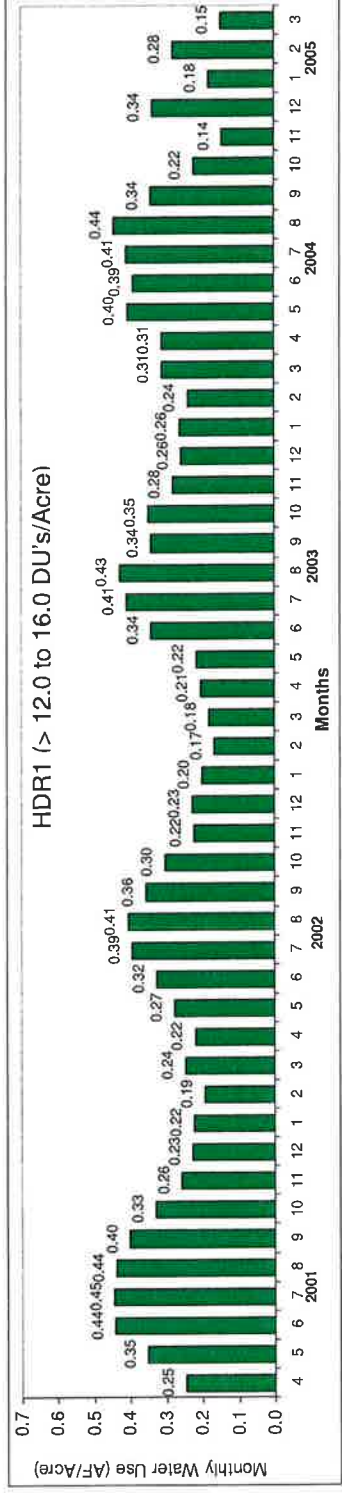
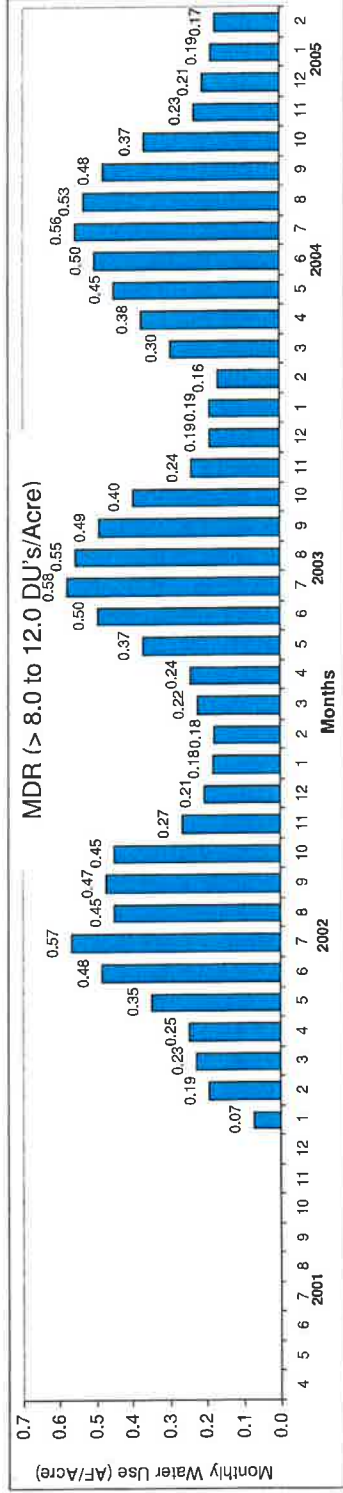
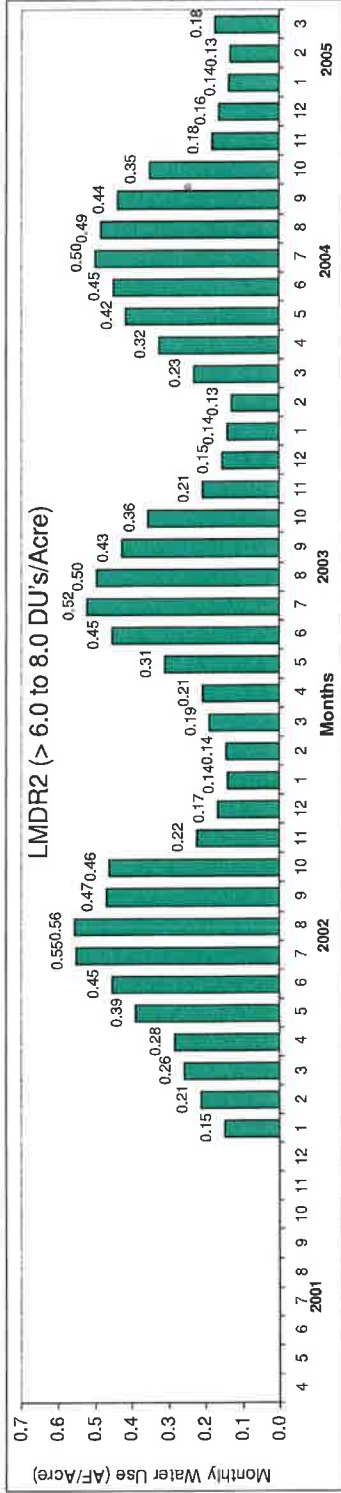
Land Use	Designated LU Code	Acreage	Unit Water Demand Factor (AF/Year/Acre)	Demand (AF/Year)
High Density Residential (HDR)	HDR1	62.1	3.85	239.1
Medium Density Residential (MDR)	MDR	88.4	3.78	334.2
Low Density Residential (LDR)	LDR2	0.7	2.86	2.0
Community Commercial (CC)	COM	11.0	2.31	25.4
Business Professional (BP) includes business park and/or new college campus	BP	50.0	2.71	135.5
Parks and Recreation (PR) includes neighborhood parks and parkettes	PARK	13.7	2.86	39.2
Public/Quasi Public (P/QP) includes elementary school, fire station, and municipal well site	PUB	12.4	1.95	24.2
Open Space	OS	45.7	0.00	0.0
Roads	ROW	13.5	0.00	0.0
Subtotal:		297.5		799.5
System Loss (2%)				16.0
Total Demand:				815.5

**APPENDIX B – RESIDENTIAL UNIT WATER DEMAND FACTORS
CALCULATION**

Figure B-1. Historic Monthly Water Demand for Various Residential Land Uses – Pre-92 and Post-92 Homes Combined (AF/Year/Acre)



TM 1 – Unit Water Demand Factor Verification and Water Demand Evaluation and Update



TM 1 – Unit Water Demand Factor Verification and Water Demand Evaluation and Update

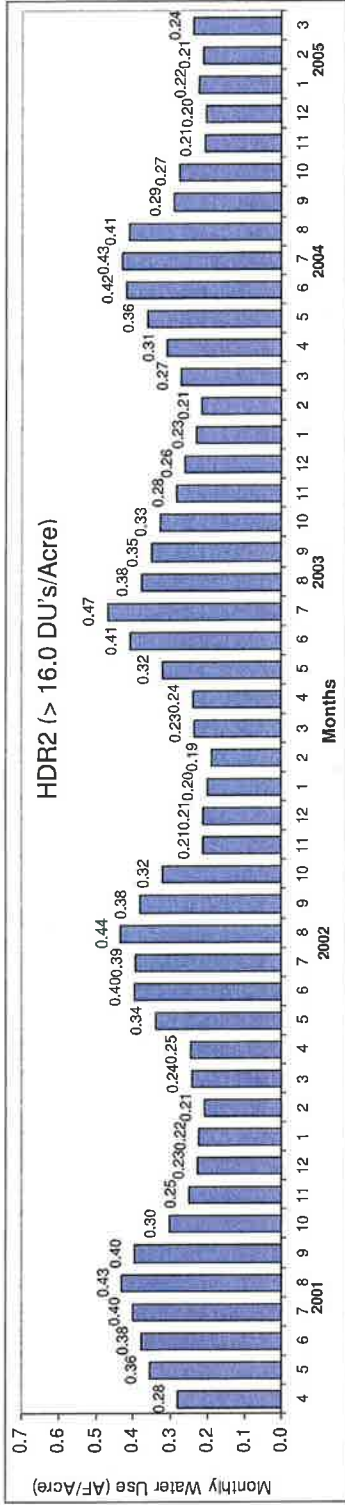


Figure B-2. Historical Monthly Water Use for LDR1 (Pre-92 and Post-92 Homes Combined)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	9.74	60.35	0.1614	161
2001.05	32.51	102.03	0.3186	271
2001.06	25.53	65.64	0.3890	179
2001.07	33.34	83.61	0.3987	219
2001.08	33.28	87.49	0.3804	234
2001.09	23.25	72.90	0.3189	193
2001.10	21.50	89.19	0.2410	237
2001.11	13.56	111.23	0.1219	296
2001.12	3.93	60.05	0.0655	163
2002.01	8.66	124.32	0.0697	339
2002.02	7.91	97.99	0.0807	266
2002.03	8.86	75.23	0.1178	208
2002.04	21.67	124.62	0.1739	352
2002.05	30.85	120.84	0.2553	340
2002.06	32.76	99.43	0.3294	283
2002.07	52.95	140.90	0.3758	404
2002.08	51.13	135.40	0.3776	395
2002.09	70.83	210.09	0.3371	678
2002.10	145.14	458.13	0.3168	1,532
2002.11	59.26	410.62	0.1443	1,382
2002.12	39.97	406.97	0.0982	1,370
2003.01	34.67	414.98	0.0836	1,395
2003.02	32.79	362.75	0.0904	1,236
2003.03	59.78	501.37	0.1192	1,711
2003.04	69.77	525.42	0.1328	1,787
2003.05	120.50	536.64	0.2245	1,833
2003.06	201.16	529.01	0.3803	1,803
2003.07	260.66	583.26	0.4469	1,981
2003.08	207.16	510.03	0.4062	1,754
2003.09	191.73	562.63	0.3408	1,913
2003.10	165.23	604.92	0.2732	2,059
2003.11	66.19	505.93	0.1308	1,751
2003.12	49.18	544.13	0.0904	1,848
2004.01	47.30	576.99	0.0820	1,954
2004.02	43.06	564.53	0.0763	1,926
2004.03	94.61	587.51	0.1610	2,005
2004.04	153.12	603.51	0.2537	2,062
2004.05	204.05	591.29	0.3451	2,017
2004.06	243.48	629.26	0.3869	2,147
2004.07	251.17	577.66	0.4348	1,988
2004.08	237.59	565.35	0.4202	1,932
2004.09	260.40	714.52	0.3644	2,431
2004.10	167.97	690.12	0.2434	2,362
2004.11	71.63	687.88	0.1041	2,357
2004.12	70.81	766.73	0.0924	2,627
2005.01	52.64	656.38	0.0802	2,247
2005.02	52.74	685.29	0.0770	2,349
2005.03	80.98	717.02	0.1129	2,460

Figure B-3. Historical Monthly Water Use for LDR2 (Pre-92 and Post-92 Homes Combined)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	0.25	1.52	0.1654	7
2001.05	0.66	2.91	0.2256	13
2001.06	0.73	1.99	0.3652	10
2001.07	1.02	2.32	0.4412	11
2001.08	0.99	2.73	0.3645	12
2001.09	0.71	2.38	0.2970	12
2001.10	0.68	2.55	0.2679	12
2001.11	0.59	3.31	0.1793	15
2001.12	0.22	3.01	0.0733	13
2002.01	1.88	20.73	0.0907	91
2002.02	2.75	25.09	0.1098	97
2002.03	3.96	26.98	0.1468	103
2002.04	10.20	47.78	0.2135	197
2002.05	17.41	57.50	0.3028	237
2002.06	23.32	61.38	0.3799	219
2002.07	37.63	90.00	0.4181	352
2002.08	41.92	97.67	0.4292	375
2002.09	145.81	378.36	0.3854	1,606
2002.10	345.97	916.51	0.3775	3,699
2002.11	142.49	851.50	0.1673	3,399
2002.12	101.79	834.29	0.1220	3,317
2003.01	91.64	862.72	0.1062	3,448
2003.02	83.82	783.66	0.1070	3,068
2003.03	151.25	1,025.98	0.1474	4,186
2003.04	177.42	1,082.71	0.1639	4,480
2003.05	296.41	1,110.37	0.2669	4,593
2003.06	440.81	1,108.57	0.3976	4,547
2003.07	577.76	1,181.19	0.4891	4,886
2003.08	481.86	1,105.12	0.4360	4,504
2003.09	431.07	1,168.93	0.3688	4,761
2003.10	383.01	1,231.94	0.3109	5,031
2003.11	179.43	1,153.96	0.1555	4,696
2003.12	126.87	1,014.07	0.1251	4,159
2004.01	123.59	1,193.55	0.1035	4,837
2004.02	120.70	1,227.75	0.0983	5,019
2004.03	254.24	1,269.25	0.2003	5,167
2004.04	365.12	1,306.04	0.2796	5,312
2004.05	483.94	1,304.82	0.3709	5,295
2004.06	568.24	1,339.03	0.4244	5,459
2004.07	598.47	1,285.34	0.4656	5,248
2004.08	543.06	1,198.58	0.4531	5,047
2004.09	517.42	1,300.49	0.3979	5,233
2004.10	404.25	1,413.65	0.2860	5,783
2004.11	193.70	1,409.09	0.1375	5,755
2004.12	194.33	1,593.79	0.1219	6,254
2005.01	146.64	1,386.50	0.1058	5,679
2005.02	137.63	1,350.35	0.1019	5,839
2005.03	210.20	1,487.84	0.1413	6,129

Figure B-4. Historical Monthly Water Use for LMDR1 (Pre-92 and Post-92 Homes Combined)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	0.03	0	0.1963	1
2001.05	0.05	0	0.3225	1
2001.06	0.05	0	0.2761	1
2001.07	0.05	0	0.2805	1
2001.08	0.05	0	0.2898	1
2001.09	0.04	0	0.2704	1
2001.10	0.06	0	0.1774	2
2001.11	0.01	0	0.0314	3
2001.12	0.03	1	0.0326	7
2002.01	0.54	5	0.1175	32
2002.02	0.90	7	0.1370	45
2002.03	1.15	10	0.1160	63
2002.04	3.67	17	0.2116	126
2002.05	7.30	22	0.3248	146
2002.06	11.63	28	0.4205	192
2002.07	16.22	36	0.4501	239
2002.08	21.43	47	0.4541	314
2002.09	87.70	224	0.3913	1,451
2002.10	138.51	371	0.3737	2,421
2002.11	67.20	360	0.1866	2,366
2002.12	51.98	359	0.1448	2,355
2003.01	48.55	367	0.1321	2,406
2003.02	46.91	349	0.1345	2,298
2003.03	72.73	418	0.1742	2,740
2003.04	80.41	440	0.1826	2,891
2003.05	134.77	448	0.3007	2,924
2003.06	195.77	445	0.4399	2,911
2003.07	243.17	477	0.5103	3,118
2003.08	207.28	453	0.4575	2,968
2003.09	188.80	479	0.3941	3,150
2003.10	158.16	486	0.3257	3,159
2003.11	74.85	429	0.1745	2,970
2003.12	63.45	464	0.1366	2,904
2004.01	61.37	480	0.1279	3,129
2004.02	54.77	473	0.1158	3,097
2004.03	105.88	489	0.2167	3,197
2004.04	153.62	502	0.3058	3,295
2004.05	199.25	494	0.4030	3,234
2004.06	219.48	504	0.4352	3,295
2004.07	241.76	496	0.4872	3,244
2004.08	206.27	437	0.4718	2,851
2004.09	178.21	423	0.4211	2,767
2004.10	164.22	520	0.3160	3,396
2004.11	81.75	514	0.1590	3,388
2004.12	81.65	573	0.1425	3,738
2005.01	62.17	486	0.1279	3,173
2005.02	64.57	530	0.1219	3,472
2005.03	85.12	538	0.1582	3,523

Figure B-5. Historical Monthly Water Use for LMDR1 (Pre-92 and Post-92 Homes Combined)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01	0.62	4.20	0.1466	36
2002.02	1.61	7.65	0.2106	64
2002.03	2.60	10.12	0.2571	83
2002.04	4.22	14.82	0.2846	122
2002.05	7.21	18.55	0.3888	152
2002.06	10.71	23.60	0.4538	200
2002.07	15.50	28.03	0.5530	254
2002.08	17.08	30.70	0.5564	248
2002.09	71.86	152.98	0.4697	1,259
2002.10	159.73	347.18	0.4601	2,844
2002.11	77.32	344.66	0.2243	2,837
2002.12	57.92	345.78	0.1675	2,844
2003.01	49.16	349.49	0.1407	2,871
2003.02	50.32	350.27	0.1437	2,887
2003.03	75.52	398.62	0.1895	3,266
2003.04	90.97	440.88	0.2063	3,628
2003.05	136.93	441.26	0.3103	3,629
2003.06	193.79	427.57	0.4532	3,523
2003.07	242.52	465.40	0.5211	3,823
2003.08	218.07	440.12	0.4955	3,613
2003.09	201.49	471.93	0.4270	3,877
2003.10	167.81	469.80	0.3572	3,846
2003.11	85.27	409.93	0.2080	3,745
2003.12	69.44	451.35	0.1538	3,354
2004.01	65.60	462.89	0.1417	3,788
2004.02	57.83	447.05	0.1294	3,682
2004.03	108.90	471.49	0.2310	3,860
2004.04	158.73	489.19	0.3245	4,032
2004.05	192.57	462.64	0.4163	3,790
2004.06	215.21	477.42	0.4508	3,909
2004.07	226.17	454.21	0.4979	3,739
2004.08	213.26	439.08	0.4857	3,597
2004.09	175.43	400.13	0.4384	3,258
2004.10	170.60	486.71	0.3505	3,996
2004.11	87.36	480.21	0.1819	3,945
2004.12	94.76	588.62	0.1610	4,830
2005.01	54.12	394.71	0.1371	3,243
2005.02	61.96	463.55	0.1337	3,808
2005.03	86.25	491.92	0.1753	4,016

Figure B-6. Historical Monthly Water Use for MDR (Pre-92 and Post-92 Homes Combined)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01	0.08	1.17	0.07	12
2002.02	0.32	1.67	0.19	17
2002.03	0.40	1.76	0.23	18
2002.04	0.66	2.68	0.25	27
2002.05	1.21	3.48	0.35	35
2002.06	2.16	4.47	0.48	45
2002.07	2.31	4.07	0.57	41
2002.08	2.37	5.27	0.45	53
2002.09	9.78	20.64	0.47	216
2002.10	12.62	28.14	0.45	296
2002.11	7.53	28.25	0.27	297
2002.12	5.85	28.49	0.21	299
2003.01	5.59	30.73	0.18	327
2003.02	5.81	32.57	0.18	353
2003.03	8.70	38.89	0.22	412
2003.04	10.21	41.86	0.24	457
2003.05	15.94	42.82	0.37	462
2003.06	21.09	42.41	0.50	451
2003.07	25.98	44.75	0.58	491
2003.08	23.86	43.03	0.55	459
2003.09	21.92	44.72	0.49	491
2003.10	18.64	46.75	0.40	504
2003.11	10.47	43.87	0.24	473
2003.12	8.13	43.25	0.19	468
2004.01	8.40	44.86	0.19	485
2004.02	7.45	45.21	0.16	482
2004.03	13.77	46.57	0.30	503
2004.04	17.84	47.43	0.38	519
2004.05	20.42	45.43	0.45	484
2004.06	23.36	46.49	0.50	502
2004.07	25.82	46.29	0.56	501
2004.08	23.01	43.04	0.53	468
2004.09	18.95	39.54	0.48	437
2004.10	20.98	57.05	0.37	633
2004.11	11.61	50.65	0.23	563
2004.12	11.75	56.62	0.21	628
2005.01	10.38	55.85	0.19	620
2005.02	9.95	57.56	0.17	637
2005.03	13.90	57.81	0.24	639

Figure B-7. Historical Monthly Water Use for HDR1 (Pre-92 and Post-92 Homes Combined)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	2.46	9.96	0.2465	24
2001.05	3.58	10.20	0.3514	25
2001.06	4.65	10.53	0.4412	27
2001.07	4.47	10.02	0.4456	24
2001.08	4.49	10.20	0.4404	25
2001.09	4.09	10.20	0.4008	25
2001.10	3.34	10.20	0.3277	25
2001.11	2.72	10.58	0.2573	27
2001.12	2.30	10.20	0.2257	25
2002.01	2.26	10.20	0.2219	25
2002.02	1.97	10.20	0.1927	25
2002.03	2.49	10.20	0.2445	25
2002.04	2.23	10.20	0.2192	25
2002.05	2.85	10.37	0.2747	26
2002.06	3.31	10.20	0.3250	25
2002.07	3.58	9.09	0.3943	23
2002.08	4.58	11.30	0.4050	27
2002.09	3.23	9.09	0.3552	23
2002.10	3.37	11.13	0.3031	26
2002.11	2.26	10.02	0.2250	24
2002.12	2.37	10.42	0.2280	26
2003.01	2.06	10.20	0.2022	25
2003.02	1.69	10.20	0.1653	25
2003.03	1.84	10.20	0.1805	25
2003.04	2.09	10.20	0.2052	25
2003.05	2.17	10.02	0.2163	24
2003.06	3.19	9.41	0.3392	25
2003.07	4.68	11.47	0.4077	28
2003.08	3.89	9.09	0.4283	23
2003.09	3.48	10.20	0.3409	25
2003.10	3.94	11.30	0.3489	27
2003.11	2.78	9.92	0.2805	23
2003.12	2.64	10.20	0.2589	25
2004.01	2.66	10.20	0.2606	25
2004.02	2.45	10.20	0.2402	25
2004.03	3.17	10.20	0.3106	25
2004.04	3.16	10.20	0.3099	25
2004.05	4.19	10.38	0.4035	26
2004.06	4.03	10.36	0.3888	26
2004.07	3.79	9.31	0.4074	24
2004.08	5.64	12.75	0.4421	40
2004.09	4.25	12.48	0.3402	31
2004.10	2.32	10.36	0.2244	26
2004.11	2.04	14.30	0.1430	26
2004.12	2.04	6.09	0.3354	24
2005.01	1.86	10.20	0.1825	25
2005.02	1.72	6.09	0.2816	24
2005.03	2.14	14.30	0.1494	26

Figure B-8. Historical Monthly Water Use for HDR2 (Pre-92 and Post-92 Homes Combined)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	7.51	26.99	0.2783	17
2001.05	9.65	26.99	0.3574	17
2001.06	10.26	26.99	0.3800	17
2001.07	10.78	26.99	0.3993	17
2001.08	11.69	26.99	0.4330	17
2001.09	10.77	26.99	0.3990	17
2001.10	9.21	30.51	0.3020	18
2001.11	6.73	26.99	0.2493	17
2001.12	6.11	26.99	0.2262	17
2002.01	6.00	26.99	0.2222	17
2002.02	5.63	26.99	0.2087	17
2002.03	6.53	26.99	0.2419	17
2002.04	6.67	26.99	0.2470	17
2002.05	9.20	26.99	0.3407	17
2002.06	10.69	26.99	0.3961	17
2002.07	10.65	26.99	0.3946	17
2002.08	11.78	26.99	0.4363	17
2002.09	12.17	31.76	0.3832	19
2002.10	8.68	27.11	0.3201	18
2002.11	5.73	26.99	0.2123	17
2002.12	5.76	26.99	0.2133	17
2003.01	5.43	26.99	0.2010	17
2003.02	5.08	26.99	0.1884	17
2003.03	6.29	26.87	0.2341	16
2003.04	6.50	27.11	0.2397	18
2003.05	8.73	26.99	0.3235	17
2003.06	10.94	26.87	0.4072	16
2003.07	12.68	27.11	0.4677	18
2003.08	10.15	26.87	0.3775	16
2003.09	9.51	27.11	0.3509	18
2003.10	8.91	26.99	0.3300	17
2003.11	7.68	26.99	0.2845	17
2003.12	7.03	26.99	0.2603	17
2004.01	6.19	26.99	0.2291	17
2004.02	5.78	26.99	0.2142	17
2004.03	7.39	26.99	0.2737	17
2004.04	8.41	26.99	0.3116	17
2004.05	9.85	26.99	0.3649	17
2004.06	11.29	26.99	0.4181	17
2004.07	11.59	26.87	0.4312	16
2004.08	11.17	26.99	0.4139	17
2004.09	13.37	45.70	0.2926	29
2004.10	7.41	26.99	0.2744	17
2004.11	5.57	26.99	0.2064	17
2004.12	5.49	26.99	0.2034	17
2005.01	6.07	26.99	0.2249	17
2005.02	5.76	26.99	0.2132	17
2005.03	6.41	26.99	0.2373	17

Figure B-9. Unit Demand Factors for Pre-92 Homes Only

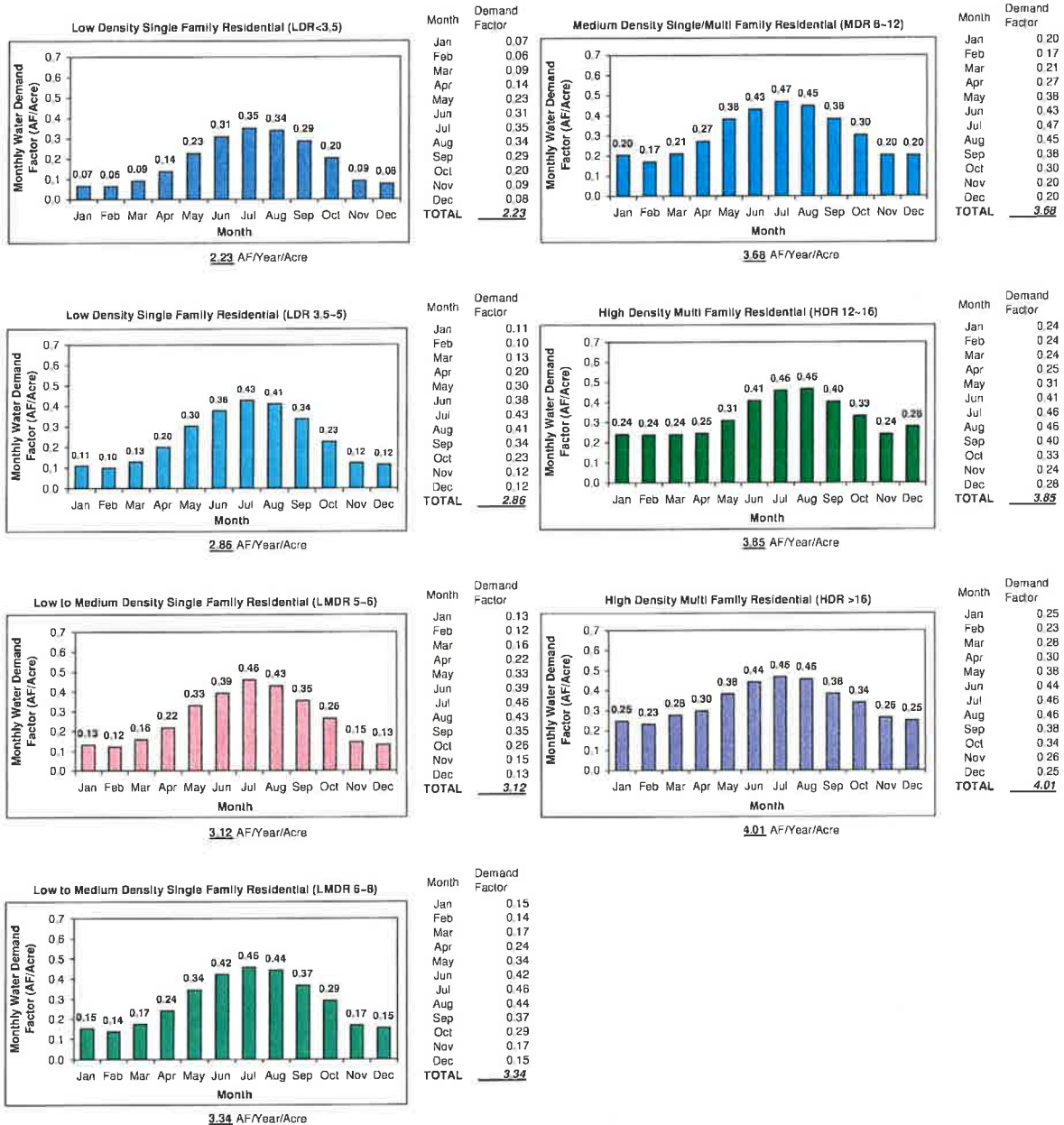


Figure B-10. Historical Monthly Water Use for LDR1 (Pre-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	3.98	35.04	0.1136	86
2001.05	13.95	51.25	0.2721	122
2001.06	13.56	37.81	0.3586	92
2001.07	15.13	41.78	0.3622	101
2001.08	15.29	44.09	0.3469	106
2001.09	11.99	36.67	0.3271	90
2001.10	9.43	39.12	0.2410	96
2001.11	6.07	55.41	0.1096	132
2001.12	2.38	35.05	0.0679	87
2002.01	2.85	50.69	0.0562	122
2002.02	2.61	42.49	0.0615	103
2002.03	2.82	35.71	0.0791	87
2002.04	7.24	46.96	0.1542	114
2002.05	10.52	42.85	0.2454	104
2002.06	11.73	38.00	0.3086	94
2002.07	16.05	44.80	0.3583	107
2002.08	16.95	46.93	0.3611	113
2002.09	13.29	42.17	0.3151	115
2002.10	15.54	62.31	0.2494	164
2002.11	7.25	60.11	0.1206	158
2002.12	4.13	50.98	0.0810	136
2003.01	3.96	60.04	0.0660	158
2003.02	3.51	53.00	0.0662	143
2003.03	5.66	67.76	0.0835	189
2003.04	7.35	75.53	0.0974	215
2003.05	12.56	74.84	0.1678	212
2003.06	22.12	67.14	0.3294	191
2003.07	34.41	85.24	0.4037	244
2003.08	27.06	73.63	0.3676	216
2003.09	26.21	88.56	0.2960	263
2003.10	21.77	90.16	0.2415	262
2003.11	8.82	79.19	0.1113	232
2003.12	8.57	84.55	0.1013	249
2004.01	6.08	86.65	0.0702	255
2004.02	5.39	85.62	0.0630	249
2004.03	10.38	94.54	0.1098	284
2004.04	22.26	105.21	0.2115	325
2004.05	33.93	107.13	0.3167	329
2004.06	56.66	155.40	0.3646	505
2004.07	78.66	190.48	0.4129	624
2004.08	67.62	166.09	0.4071	538
2004.09	100.06	298.95	0.3347	991
2004.10	48.88	225.28	0.2170	747
2004.11	20.15	220.61	0.0914	730
2004.12	19.17	226.67	0.0846	754
2005.01	17.82	229.76	0.0776	764
2005.02	17.04	231.11	0.0737	769
2005.03	24.20	239.95	0.1008	796

Figure B-11. Historical Monthly Water Use for LDR2 (Pre-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01				
2002.02				
2002.03				
2002.04				
2002.05				
2002.06				
2002.07				
2002.08				
2002.09	2.43	7.77	0.3124	41
2002.10	3.17	10.05	0.3154	54
2002.11	1.25	9.69	0.1291	52
2002.12	1.03	9.02	0.1140	48
2003.01	2.03	21.82	0.0932	122
2003.02	3.06	27.66	0.1108	155
2003.03	7.33	54.94	0.1333	306
2003.04	9.53	62.11	0.1535	344
2003.05	19.11	65.70	0.2908	363
2003.06	27.27	63.06	0.4325	349
2003.07	40.88	78.53	0.5206	430
2003.08	35.35	76.89	0.4597	422
2003.09	33.95	87.58	0.3877	477
2003.10	27.03	86.23	0.3135	472
2003.11	13.28	80.03	0.1660	437
2003.12	13.36	87.29	0.1531	478
2004.01	12.59	101.34	0.1243	558
2004.02	12.20	113.39	0.1076	629
2004.03	19.65	127.40	0.1543	701
2004.04	38.07	147.75	0.2577	806
2004.05	55.10	150.34	0.3665	820
2004.06	73.12	172.15	0.4247	927
2004.07	105.01	222.84	0.4712	1,190
2004.08	89.47	191.63	0.4669	1,026
2004.09	96.43	252.17	0.3824	1,327
2004.10	51.54	219.85	0.2344	1,170
2004.11	27.64	211.90	0.1304	1,125
2004.12	29.10	235.18	0.1237	1,251
2005.01	28.52	244.50	0.1166	1,301
2005.02	26.02	241.84	0.1076	1,284
2005.03	35.31	266.02	0.1327	1,415

Figure B-12. Historical Monthly Water Use for LMDR1 (Pre-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01				
2002.02				
2002.03				
2002.04				
2002.05				
2002.06				
2002.07				
2002.08				
2002.09	10.78	32	0.3324	221
2002.10	12.76	45	0.2867	303
2002.11	6.10	38	0.1592	261
2002.12	5.61	37	0.1517	252
2003.01	5.62	39	0.1452	263
2003.02	5.51	39	0.1401	267
2003.03	8.29	51	0.1630	341
2003.04	9.34	58	0.1609	388
2003.05	19.92	62	0.3227	413
2003.06	23.53	53	0.4443	352
2003.07	47.11	88	0.5374	587
2003.08	31.23	66	0.4705	442
2003.09	38.38	95	0.4035	637
2003.10	26.76	82	0.3280	545
2003.11	14.66	80	0.1839	533
2003.12	13.23	86	0.1533	574
2004.01	12.87	87	0.1471	582
2004.02	10.02	76	0.1319	503
2004.03	17.66	92	0.1916	613
2004.04	32.09	110	0.2905	735
2004.05	36.85	92	0.4027	602
2004.06	46.62	106	0.4410	698
2004.07	56.41	113	0.4998	738
2004.08	44.69	91	0.4914	597
2004.09	47.73	115	0.4158	755
2004.10	32.96	116	0.2845	764
2004.11	17.05	110	0.1548	727
2004.12	17.86	122	0.1459	806
2005.01	17.56	127	0.1386	834
2005.02	16.09	126	0.1274	831
2005.03	20.67	129	0.1597	851

Figure B-13. Historical Monthly Water Use for LMDR2 (Pre-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01				
2002.02				
2002.03				
2002.04				
2002.05				
2002.06				
2002.07				
2002.08				
2002.09	3.64	11.00	0.3304	87
2002.10	4.91	15.80	0.3110	126
2002.11	2.37	13.34	0.1779	106
2002.12	2.10	12.88	0.1629	102
2003.01	2.12	13.69	0.1546	109
2003.02	2.42	16.06	0.1509	129
2003.03	3.82	20.15	0.1896	161
2003.04	8.72	45.56	0.1913	377
2003.05	14.56	41.68	0.3493	342
2003.06	12.75	26.22	0.4863	211
2003.07	31.75	63.15	0.5027	520
2003.08	17.97	37.07	0.4849	296
2003.09	28.26	67.96	0.4159	557
2003.10	18.02	53.10	0.3393	432
2003.11	10.93	51.92	0.2104	422
2003.12	9.39	51.94	0.1807	422
2004.01	9.03	53.90	0.1676	439
2004.02	5.87	40.43	0.1451	325
2004.03	11.63	56.58	0.2055	461
2004.04	23.65	73.47	0.3219	603
2004.05	18.64	43.78	0.4257	351
2004.06	27.34	58.18	0.4700	473
2004.07	30.03	57.09	0.5260	465
2004.08	27.55	54.20	0.5082	441
2004.09	26.58	62.32	0.4265	508
2004.10	20.61	63.66	0.3237	516
2004.11	10.16	58.29	0.1743	473
2004.12	10.88	63.56	0.1712	515
2005.01	10.39	63.08	0.1647	511
2005.02	9.18	62.26	0.1474	505
2005.03	11.74	67.09	0.1751	543

Figure B-14. Historical Monthly Water Use for MDR (Pre-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01				
2002.02				
2002.03				
2002.04				
2002.05				
2002.06				
2002.07				
2002.08				
2002.09	0.92	2.04	0.45	24
2002.10	1.98	4.89	0.40	57
2002.11	0.96	3.56	0.27	42
2002.12	0.86	3.36	0.26	40
2003.01	0.87	3.87	0.23	46
2003.02	1.22	6.11	0.20	89
2003.03	1.36	5.14	0.26	62
2003.04	3.93	17.10	0.23	231
2003.05	7.15	17.21	0.42	210
2003.06	3.68	6.61	0.56	75
2003.07	15.20	28.41	0.54	353
2003.08	3.38	6.23	0.54	71
2003.09	12.13	28.27	0.43	351
2003.10	5.88	17.56	0.34	214
2003.11	3.95	16.77	0.24	204
2003.12	3.89	16.86	0.23	207
2004.01	4.27	17.78	0.24	218
2004.02	1.78	8.52	0.21	97
2004.03	5.01	19.28	0.26	234
2004.04	10.63	30.20	0.35	372
2004.05	3.99	8.68	0.46	99
2004.06	9.14	19.75	0.46	240
2004.07	10.57	20.48	0.52	247
2004.08	9.46	19.04	0.50	230
2004.09	10.50	26.03	0.40	322
2004.10	10.16	29.82	0.34	367
2004.11	6.02	26.79	0.22	335
2004.12	6.51	28.71	0.23	353
2005.01	6.07	28.92	0.21	355
2005.02	5.05	29.27	0.17	358
2005.03	6.12	30.06	0.20	367

Figure B-15. Historical Monthly Water Use for HDR1 (Pre-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	2.46	9.96	0.2465	24
2001.05	3.58	10.20	0.3514	25
2001.06	4.65	10.53	0.4412	27
2001.07	4.47	10.02	0.4456	24
2001.08	4.49	10.20	0.4404	25
2001.09	4.09	10.20	0.4008	25
2001.10	3.34	10.20	0.3277	25
2001.11	2.72	10.58	0.2573	27
2001.12	2.30	10.20	0.2257	25
2002.01	2.26	10.20	0.2219	25
2002.02	1.97	10.20	0.1927	25
2002.03	2.49	10.20	0.2445	25
2002.04	2.23	10.20	0.2192	25
2002.05	2.85	10.37	0.2747	26
2002.06	3.31	10.20	0.3250	25
2002.07	3.58	9.09	0.3943	23
2002.08	4.58	11.30	0.4050	27
2002.09	3.23	9.09	0.3552	23
2002.10	3.37	11.13	0.3031	26
2002.11	2.26	10.02	0.2250	24
2002.12	2.37	10.42	0.2280	26
2003.01	2.06	10.20	0.2022	25
2003.02	1.69	10.20	0.1653	25
2003.03	1.84	10.20	0.1805	25
2003.04	2.09	10.20	0.2052	25
2003.05	2.17	10.02	0.2163	24
2003.06	3.19	9.41	0.3392	25
2003.07	4.68	11.47	0.4077	28
2003.08	3.89	9.09	0.4283	23
2003.09	3.48	10.20	0.3409	25
2003.10	3.94	11.30	0.3489	27
2003.11	2.78	9.92	0.2805	23
2003.12	2.64	10.20	0.2589	25
2004.01	2.66	10.20	0.2606	25
2004.02	2.45	10.20	0.2402	25
2004.03	3.17	10.20	0.3106	25
2004.04	3.16	10.20	0.3099	25
2004.05	4.19	10.38	0.4035	26
2004.06	4.03	10.36	0.3888	26
2004.07	3.79	9.31	0.4074	24
2004.08	5.64	12.75	0.4421	40
2004.09	4.25	12.48	0.3402	31
2004.10	2.32	10.36	0.2244	26
2004.11	2.04	14.30	0.1430	26
2004.12	2.04	6.09	0.3354	24
2005.01	1.86	10.20	0.1825	25
2005.02	1.72	6.09	0.2816	24
2005.03	2.14	14.30	0.1494	26

Figure B-16. Historical Monthly Water Use for HDR2 (Pre-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	7.51	26.99	0.2783	17
2001.05	9.65	26.99	0.3574	17
2001.06	10.26	26.99	0.3800	17
2001.07	10.78	26.99	0.3993	17
2001.08	11.69	26.99	0.4330	17
2001.09	10.77	26.99	0.3990	17
2001.10	9.21	30.51	0.3020	18
2001.11	6.73	26.99	0.2493	17
2001.12	6.11	26.99	0.2262	17
2002.01	6.00	26.99	0.2222	17
2002.02	5.63	26.99	0.2087	17
2002.03	6.53	26.99	0.2419	17
2002.04	6.67	26.99	0.2470	17
2002.05	9.20	26.99	0.3407	17
2002.06	10.69	26.99	0.3961	17
2002.07	10.65	26.99	0.3946	17
2002.08	11.78	26.99	0.4363	17
2002.09	12.17	31.76	0.3832	19
2002.10	8.68	27.11	0.3201	18
2002.11	5.73	26.99	0.2123	17
2002.12	5.76	26.99	0.2133	17
2003.01	5.43	26.99	0.2010	17
2003.02	5.08	26.99	0.1884	17
2003.03	6.29	26.87	0.2341	16
2003.04	6.50	27.11	0.2397	18
2003.05	8.73	26.99	0.3235	17
2003.06	10.94	26.87	0.4072	16
2003.07	12.68	27.11	0.4677	18
2003.08	10.15	26.87	0.3775	16
2003.09	9.51	27.11	0.3509	18
2003.10	8.91	26.99	0.3300	17
2003.11	7.68	26.99	0.2845	17
2003.12	7.03	26.99	0.2603	17
2004.01	6.19	26.99	0.2291	17
2004.02	5.78	26.99	0.2142	17
2004.03	7.39	26.99	0.2737	17
2004.04	8.41	26.99	0.3116	17
2004.05	9.85	26.99	0.3649	17
2004.06	11.29	26.99	0.4181	17
2004.07	11.59	26.87	0.4312	16
2004.08	11.17	26.99	0.4139	17
2004.09	13.37	45.70	0.2926	29
2004.10	7.41	26.99	0.2744	17
2004.11	5.57	26.99	0.2064	17
2004.12	5.49	26.99	0.2034	17
2005.01	6.07	26.99	0.2249	17
2005.02	5.76	26.99	0.2132	17
2005.03	6.41	26.99	0.2373	17

Figure B-17. Unit Demand Factors for Post-92 Homes Only

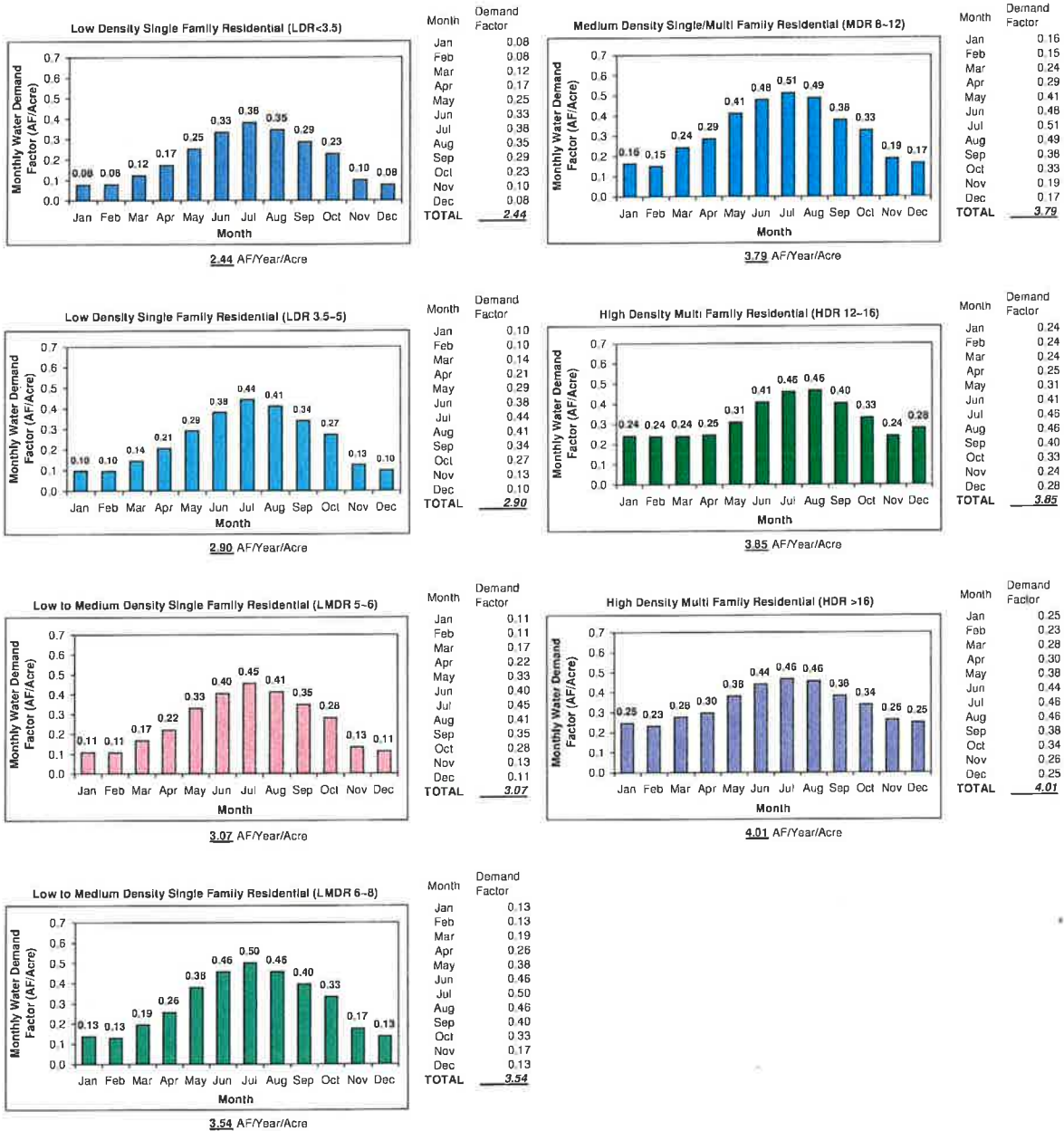


Figure B-18. Historical Monthly Water Use for LDR1 (Post-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	0.71	4.01	0.1772	11
2001.05	2.58	8.78	0.2944	23
2001.06	1.64	4.44	0.3699	12
2001.07	2.09	5.97	0.3508	16
2001.08	3.07	8.78	0.3494	23
2001.09	1.12	4.01	0.2783	11
2001.10	1.44	6.40	0.2245	17
2001.11	1.03	8.78	0.1178	23
2001.12	0.25	3.75	0.0668	10
2002.01	0.62	8.78	0.0703	23
2002.02	0.53	6.40	0.0831	17
2002.03	0.44	4.01	0.1084	11
2002.04	1.31	7.10	0.1842	19
2002.05	2.05	8.07	0.2545	21
2002.06	1.56	4.01	0.3877	11
2002.07	2.81	7.35	0.3823	20
2002.08	2.35	6.52	0.3603	18
2002.09	9.41	29.83	0.3156	104
2002.10	14.76	55.23	0.2673	192
2002.11	4.60	41.33	0.1113	145
2002.12	3.67	41.91	0.0877	147
2003.01	3.54	41.33	0.0856	145
2003.02	2.77	27.84	0.0996	99
2003.03	5.47	42.83	0.1276	150
2003.04	5.63	41.36	0.1362	145
2003.05	9.97	43.46	0.2295	153
2003.06	15.83	42.68	0.3707	150
2003.07	19.33	42.99	0.4497	151
2003.08	16.73	42.31	0.3954	149
2003.09	13.97	43.10	0.3242	151
2003.10	12.47	45.97	0.2713	161
2003.11	6.45	52.96	0.1218	185
2003.12	2.44	28.85	0.0846	103
2004.01	3.52	42.42	0.0829	149
2004.02	3.35	42.42	0.0790	149
2004.03	6.86	42.42	0.1617	149
2004.04	10.93	42.95	0.2544	151
2004.05	14.69	42.60	0.3448	150
2004.06	16.08	42.37	0.3795	149
2004.07	17.92	41.59	0.4310	146
2004.08	16.88	42.33	0.3988	149
2004.09	8.27	23.40	0.3532	81
2004.10	10.52	42.96	0.2448	151
2004.11	4.25	42.42	0.1002	149
2004.12	3.72	42.42	0.0876	149
2005.01	3.68	42.66	0.0862	150
2005.02	3.43	42.18	0.0812	148
2005.03	4.80	42.42	0.1131	149

Figure B-19. Historical Monthly Water Use for LDR2 (Post-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01	0.22	2.84	0.0779	13
2002.02	0.39	3.59	0.1092	14
2002.03	0.60	4.11	0.1461	16
2002.04	0.82	3.57	0.2285	14
2002.05	1.04	4.11	0.2534	16
2002.06	2.08	5.69	0.3661	23
2002.07	2.88	5.88	0.4901	25
2002.08	2.97	6.30	0.4706	25
2002.09	35.14	92.76	0.3788	366
2002.10	61.98	190.08	0.3261	714
2002.11	21.06	142.30	0.1480	520
2002.12	16.25	142.74	0.1138	521
2003.01	15.34	143.71	0.1067	530
2003.02	11.73	95.70	0.1225	354
2003.03	22.40	142.82	0.1569	555
2003.04	24.19	144.87	0.1670	573
2003.05	39.63	146.43	0.2706	586
2003.06	62.80	146.92	0.4275	593
2003.07	74.49	146.30	0.5092	594
2003.08	68.83	147.12	0.4678	579
2003.09	55.83	146.89	0.3801	564
2003.10	49.96	162.05	0.3083	617
2003.11	26.12	179.26	0.1457	681
2003.12	10.93	97.07	0.1126	358
2004.01	15.22	145.25	0.1048	554
2004.02	14.12	146.62	0.0963	559
2004.03	27.85	146.96	0.1895	567
2004.04	43.92	146.93	0.2989	570
2004.05	57.05	147.18	0.3876	565
2004.06	63.82	147.68	0.4322	560
2004.07	70.69	144.76	0.4883	548
2004.08	67.37	147.43	0.4570	552
2004.09	31.80	77.31	0.4114	293
2004.10	43.48	146.21	0.2974	548
2004.11	19.63	146.45	0.1340	558
2004.12	16.79	146.28	0.1148	573
2005.01	15.38	143.90	0.1069	586
2005.02	15.00	146.25	0.1026	599
2005.03	19.30	145.10	0.1330	590

Figure B-20. Historical Monthly Water Use for LMDR1 (Post-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01				
2002.02				
2002.03				
2002.04				
2002.05				
2002.06				
2002.07				
2002.08				
2002.09	21.46	57	0.3745	375
2002.10	24.83	76	0.3248	496
2002.11	10.61	68	0.1572	440
2002.12	8.65	67	0.1293	436
2003.01	8.23	68	0.1213	442
2003.02	7.52	58	0.1299	379
2003.03	11.74	68	0.1735	441
2003.04	11.34	67	0.1683	439
2003.05	22.23	69	0.3223	449
2003.06	31.30	68	0.4579	445
2003.07	35.75	69	0.5192	448
2003.08	31.71	69	0.4585	450
2003.09	27.05	69	0.3903	451
2003.10	23.74	77	0.3099	497
2003.11	10.34	70	0.1468	458
2003.12	6.78	59	0.1156	384
2004.01	7.76	68	0.1146	441
2004.02	7.08	68	0.1041	442
2004.03	15.13	69	0.2183	451
2004.04	22.58	69	0.3273	449
2004.05	28.90	69	0.4196	448
2004.06	31.23	69	0.4516	450
2004.07	34.59	69	0.5040	447
2004.08	32.17	69	0.4693	446
2004.09	11.60	25	0.4632	161
2004.10	22.25	69	0.3248	446
2004.11	10.20	68	0.1491	445
2004.12	9.34	68	0.1376	442
2005.01	8.16	67	0.1221	435
2005.02	8.00	68	0.1176	443
2005.03	10.43	68	0.1543	440

Figure B-21. Historical Monthly Water Use for LMDR2 (Post-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01				
2002.02				
2002.03				
2002.04				
2002.05				
2002.06				
2002.07				
2002.08				
2002.09	25.87	58.59	0.4415	481
2002.10	22.77	59.31	0.3839	487
2002.11	12.72	59.31	0.2144	487
2002.12	9.29	58.54	0.1588	481
2003.01	8.94	58.31	0.1534	479
2003.02	9.15	58.11	0.1575	477
2003.03	12.20	58.57	0.2083	481
2003.04	11.94	59.02	0.2023	485
2003.05	23.08	59.76	0.3862	491
2003.06	31.02	59.67	0.5199	490
2003.07	34.81	59.04	0.5897	485
2003.08	30.75	59.00	0.5211	485
2003.09	26.92	59.53	0.4522	489
2003.10	22.27	58.67	0.3795	482
2003.11	11.49	59.10	0.1944	485
2003.12	8.67	58.14	0.1491	478
2004.01	8.39	57.96	0.1447	476
2004.02	7.63	58.60	0.1301	481
2004.03	15.43	59.46	0.2595	488
2004.04	22.20	59.17	0.3752	486
2004.05	27.65	59.17	0.4673	486
2004.06	29.79	58.82	0.5064	483
2004.07	32.10	59.73	0.5375	490
2004.08	29.89	59.20	0.5049	486
2004.09	9.08	18.47	0.4918	150
2004.10	22.18	58.96	0.3762	484
2004.11	11.32	59.12	0.1915	485
2004.12	9.10	58.87	0.1545	483
2005.01	8.44	57.60	0.1465	473
2005.02	7.63	58.13	0.1313	477
2005.03	10.19	58.62	0.1738	481

Figure B-22. Historical Monthly Water Use for MDR (Post-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04				
2001.05				
2001.06				
2001.07				
2001.08				
2001.09				
2001.10				
2001.11				
2001.12				
2002.01				
2002.02				
2002.03				
2002.04				
2002.05				
2002.06				
2002.07				
2002.08				
2002.09	6.42	15.61	0.41	193
2002.10	6.35	15.61	0.41	193
2002.11	3.53	15.54	0.23	192
2002.12	2.92	15.37	0.19	190
2003.01	2.77	15.33	0.18	189
2003.02	2.65	15.26	0.17	189
2003.03	4.02	15.60	0.26	193
2003.04	3.82	15.75	0.24	195
2003.05	6.34	15.69	0.40	194
2003.06	8.24	15.08	0.55	187
2003.07	9.39	15.48	0.61	192
2003.08	8.60	15.26	0.56	189
2003.09	7.12	15.61	0.46	193
2003.10	6.11	15.32	0.40	190
2003.11	3.42	15.42	0.22	191
2003.12	2.81	15.42	0.18	190
2004.01	2.68	15.47	0.17	191
2004.02	2.44	15.42	0.16	191
2004.03	4.74	15.70	0.30	195
2004.04	6.31	15.70	0.40	194
2004.05	8.27	15.85	0.52	196
2004.06	8.26	15.56	0.53	193
2004.07	8.46	15.52	0.55	192
2004.08	8.32	15.58	0.53	194
2004.09	5.07	10.63	0.48	137
2004.10	4.99	15.51	0.32	192
2004.11	2.96	15.36	0.19	190
2004.12	2.95	15.20	0.19	188
2005.01	2.81	15.53	0.18	192
2005.02	2.53	15.37	0.16	190
2005.03	3.73	15.38	0.24	191

Figure B-23. Historical Monthly Water Use for HDR1 (Post-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	2.46	9.96	0.2465	24
2001.05	3.58	10.20	0.3514	25
2001.06	4.65	10.53	0.4412	27
2001.07	4.47	10.02	0.4456	24
2001.08	4.49	10.20	0.4404	25
2001.09	4.09	10.20	0.4008	25
2001.10	3.34	10.20	0.3277	25
2001.11	2.72	10.58	0.2573	27
2001.12	2.30	10.20	0.2257	25
2002.01	2.26	10.20	0.2219	25
2002.02	1.97	10.20	0.1927	25
2002.03	2.49	10.20	0.2445	25
2002.04	2.23	10.20	0.2192	25
2002.05	2.85	10.37	0.2747	26
2002.06	3.31	10.20	0.3250	25
2002.07	3.58	9.09	0.3943	23
2002.08	4.58	11.30	0.4050	27
2002.09	3.23	9.09	0.3552	23
2002.10	3.37	11.13	0.3031	26
2002.11	2.26	10.02	0.2250	24
2002.12	2.37	10.42	0.2280	26
2003.01	2.06	10.20	0.2022	25
2003.02	1.69	10.20	0.1653	25
2003.03	1.84	10.20	0.1805	25
2003.04	2.09	10.20	0.2052	25
2003.05	2.17	10.02	0.2163	24
2003.06	3.19	9.41	0.3392	25
2003.07	4.68	11.47	0.4077	28
2003.08	3.89	9.09	0.4283	23
2003.09	3.48	10.20	0.3409	25
2003.10	3.94	11.30	0.3489	27
2003.11	2.78	9.92	0.2805	23
2003.12	2.64	10.20	0.2589	25
2004.01	2.66	10.20	0.2606	25
2004.02	2.45	10.20	0.2402	25
2004.03	3.17	10.20	0.3106	25
2004.04	3.16	10.20	0.3099	25
2004.05	4.19	10.38	0.4035	26
2004.06	4.03	10.36	0.3888	26
2004.07	3.79	9.31	0.4074	24
2004.08	5.64	12.75	0.4421	40
2004.09	4.25	12.48	0.3402	31
2004.10	2.32	10.36	0.2244	26
2004.11	2.04	14.30	0.1430	26
2004.12	2.04	6.09	0.3354	24
2005.01	1.86	10.20	0.1825	25
2005.02	1.72	6.09	0.2816	24
2005.03	2.14	14.30	0.1494	26

Figure B-24. Historical Monthly Water Use for HDR2 (Post-92 Homes Only)

Month	Total Water Consumption (AF)	Total Parcel Acres	Unit Demand Factor	Total Number of Accounts
2001.04	7.51	26.99	0.2783	17
2001.05	9.65	26.99	0.3574	17
2001.06	10.26	26.99	0.3800	17
2001.07	10.78	26.99	0.3993	17
2001.08	11.69	26.99	0.4330	17
2001.09	10.77	26.99	0.3990	17
2001.10	9.21	30.51	0.3020	18
2001.11	6.73	26.99	0.2493	17
2001.12	6.11	26.99	0.2262	17
2002.01	6.00	26.99	0.2222	17
2002.02	5.63	26.99	0.2087	17
2002.03	6.53	26.99	0.2419	17
2002.04	6.67	26.99	0.2470	17
2002.05	9.20	26.99	0.3407	17
2002.06	10.69	26.99	0.3961	17
2002.07	10.65	26.99	0.3946	17
2002.08	11.78	26.99	0.4363	17
2002.09	12.17	31.76	0.3832	19
2002.10	8.68	27.11	0.3201	18
2002.11	5.73	26.99	0.2123	17
2002.12	5.76	26.99	0.2133	17
2003.01	5.43	26.99	0.2010	17
2003.02	5.08	26.99	0.1884	17
2003.03	6.29	26.87	0.2341	16
2003.04	6.50	27.11	0.2397	18
2003.05	8.73	26.99	0.3235	17
2003.06	10.94	26.87	0.4072	16
2003.07	12.68	27.11	0.4677	18
2003.08	10.15	26.87	0.3775	16
2003.09	9.51	27.11	0.3509	18
2003.10	8.91	26.99	0.3300	17
2003.11	7.68	26.99	0.2845	17
2003.12	7.03	26.99	0.2603	17
2004.01	6.19	26.99	0.2291	17
2004.02	5.78	26.99	0.2142	17
2004.03	7.39	26.99	0.2737	17
2004.04	8.41	26.99	0.3116	17
2004.05	9.85	26.99	0.3649	17
2004.06	11.29	26.99	0.4181	17
2004.07	11.59	26.87	0.4312	16
2004.08	11.17	26.99	0.4139	17
2004.09	13.37	45.70	0.2926	29
2004.10	7.41	26.99	0.2744	17
2004.11	5.57	26.99	0.2064	17
2004.12	5.49	26.99	0.2034	17
2005.01	6.07	26.99	0.2249	17
2005.02	5.76	26.99	0.2132	17
2005.03	6.41	26.99	0.2373	17

**APPENDIX C – COMMERCIAL UNIT WATER DEMAND FACTORS
CALCULATION**

Figure C-1. Histograms for Commercial/Retail

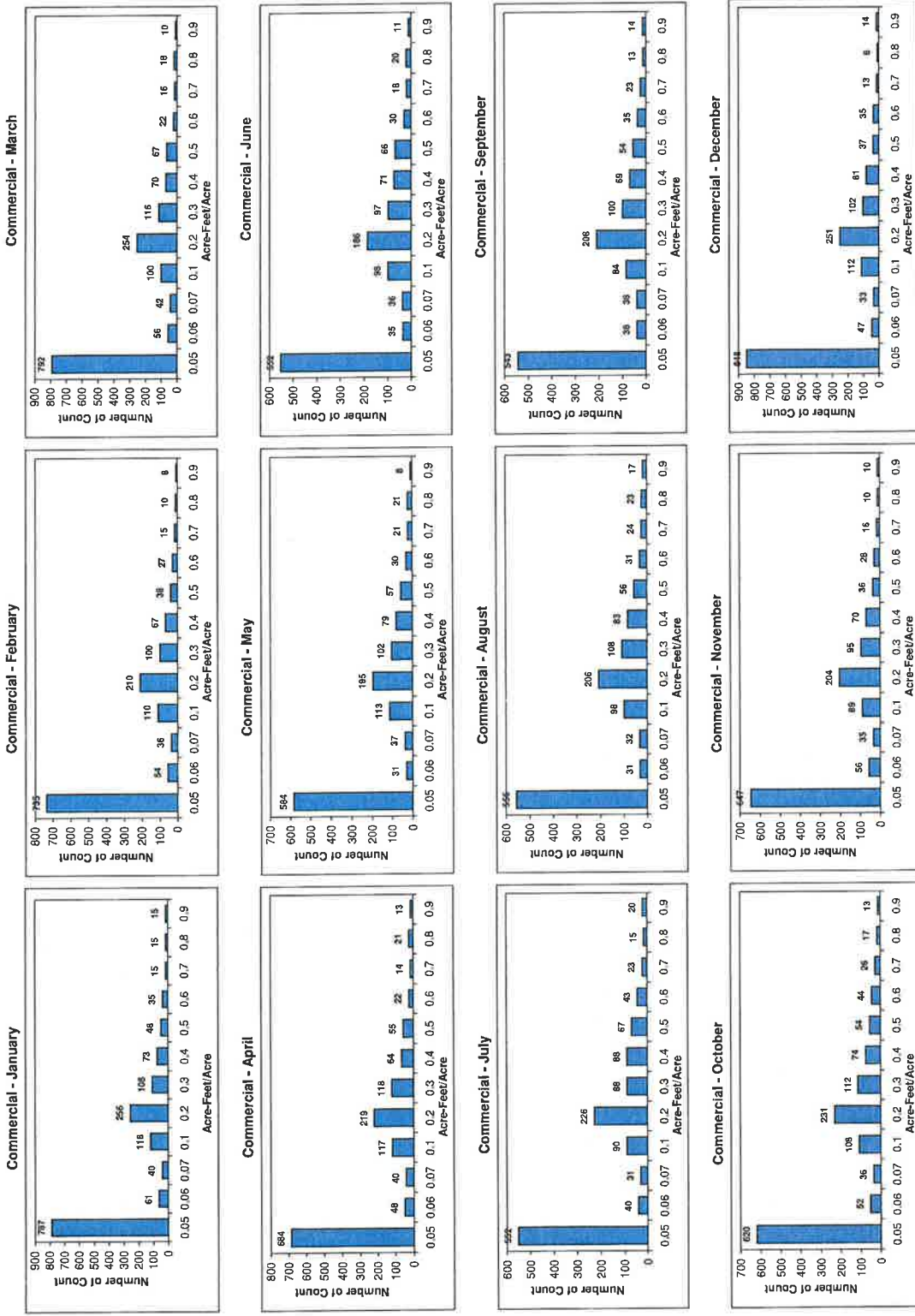


Figure C-2. Histograms for Business Professional

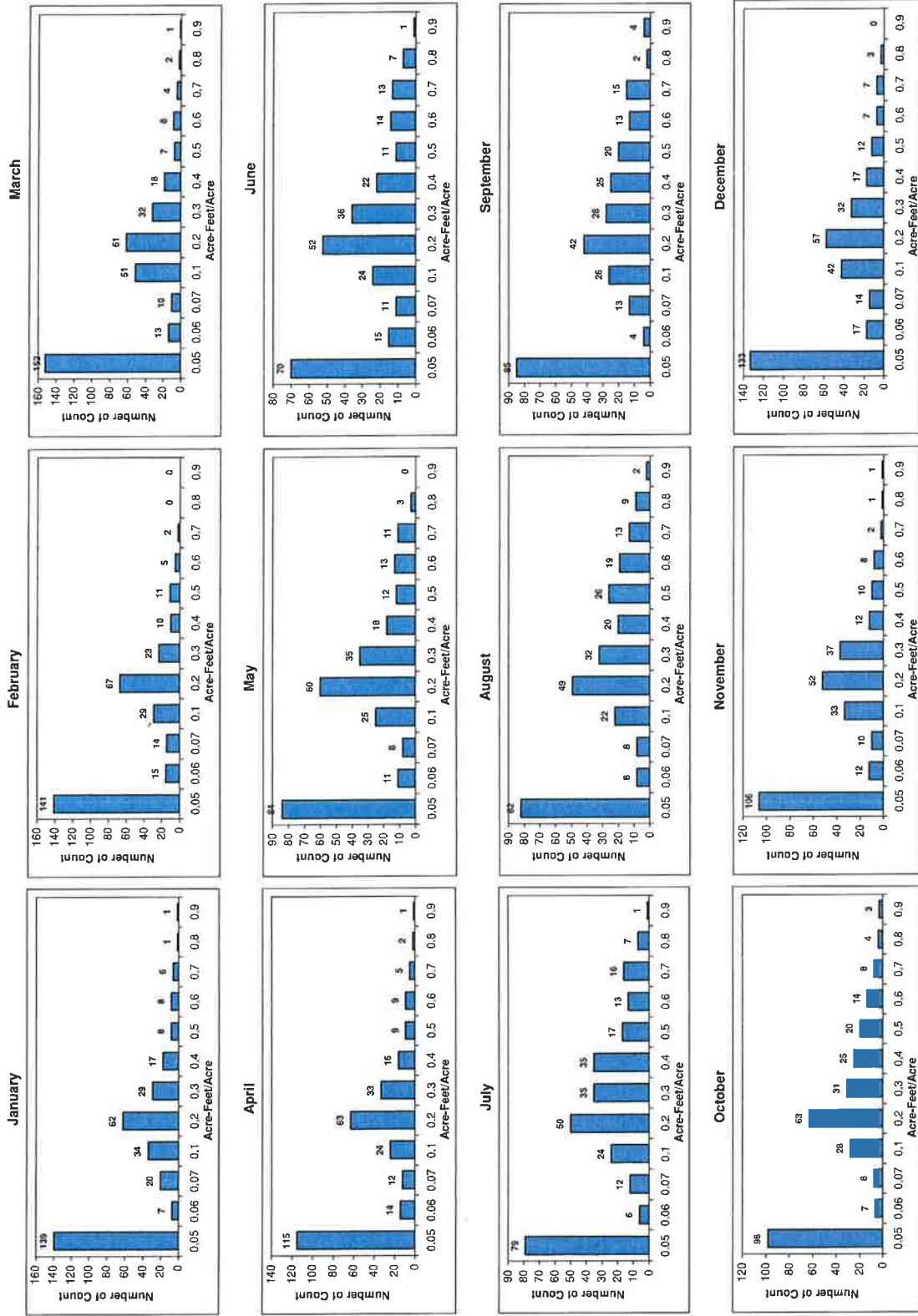


Figure C-3. Histograms for Light Industrial

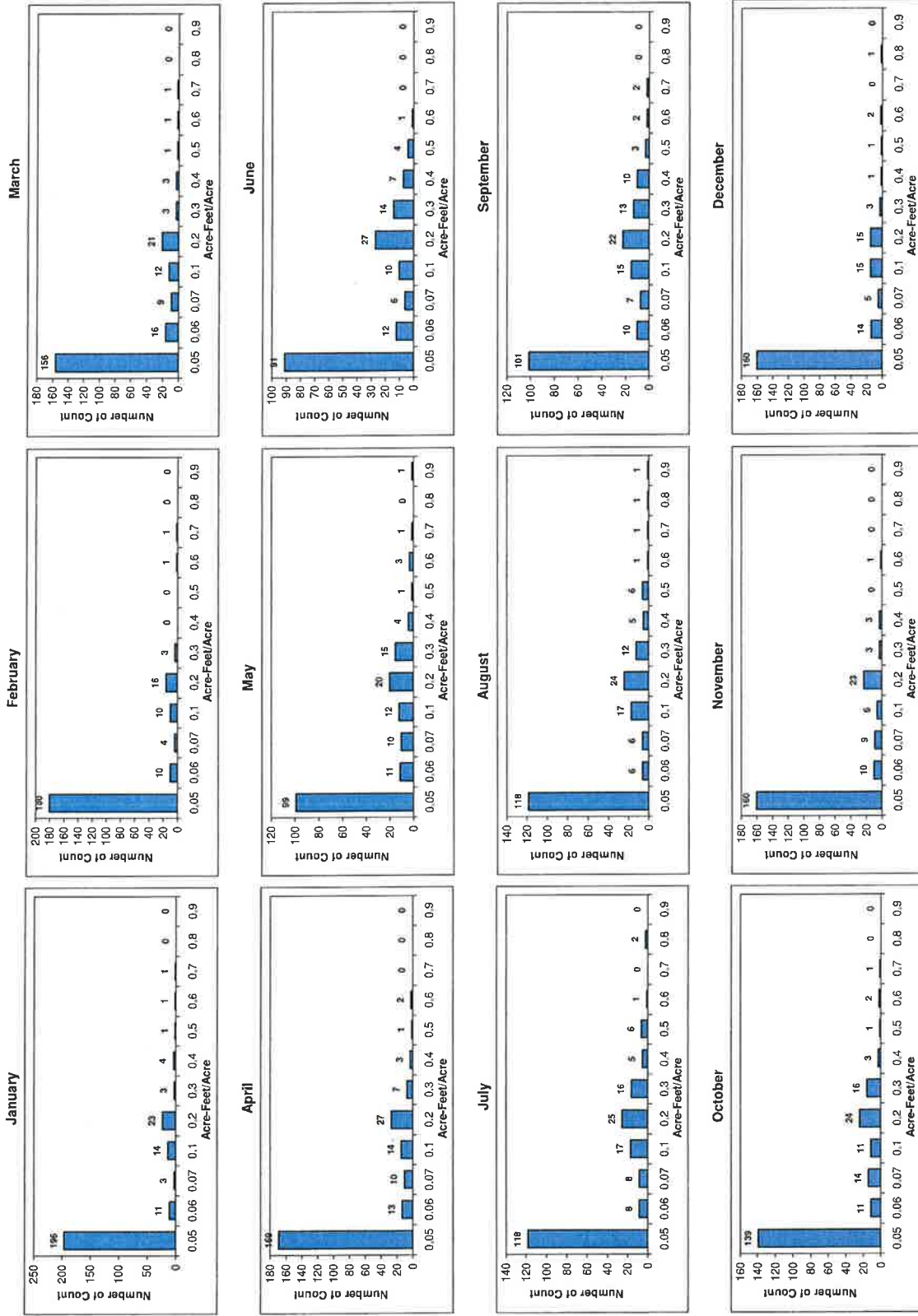


Figure C-4. Histograms for Heavy Industrial

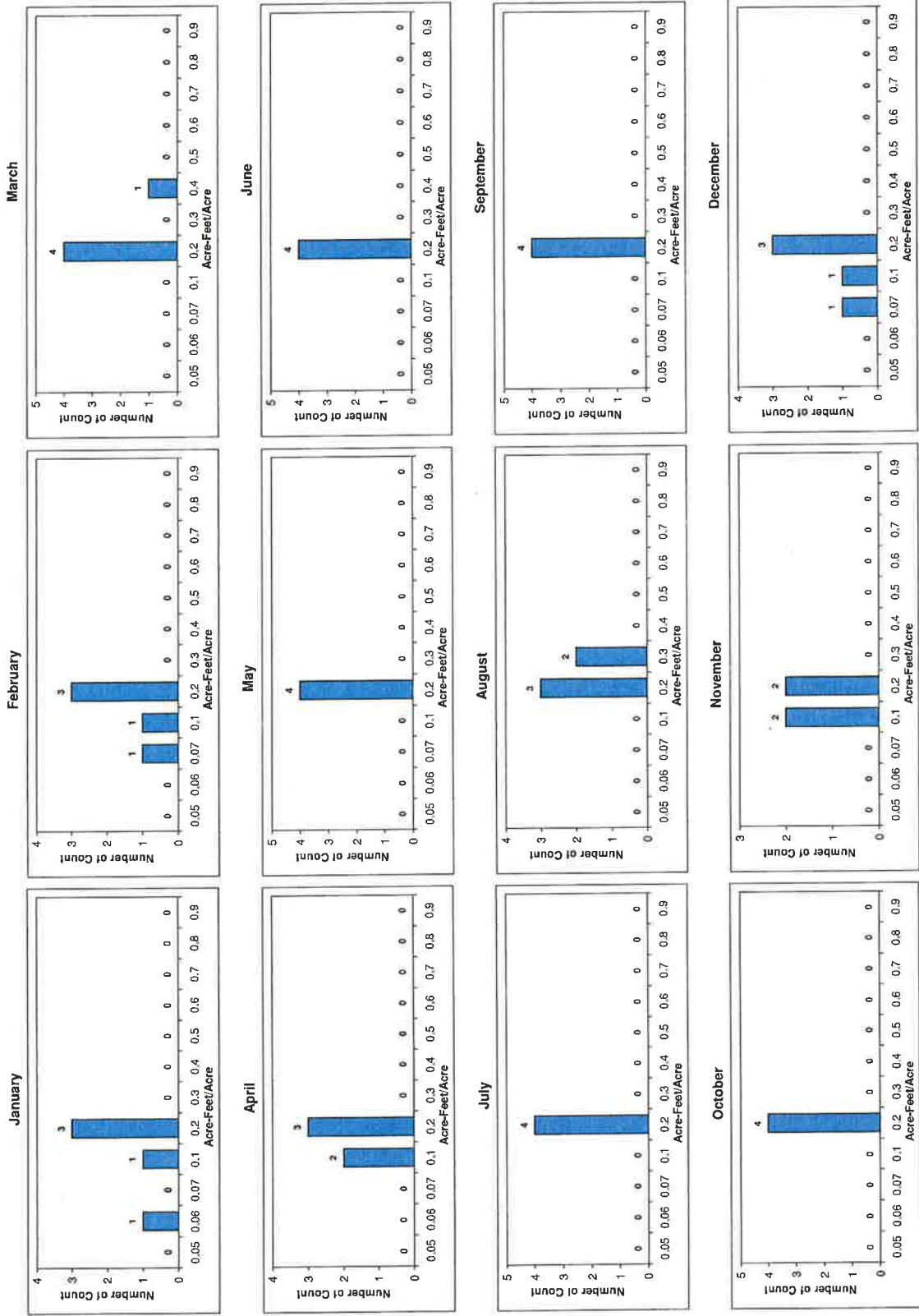


Figure C-5. Histograms for Railroad Yard

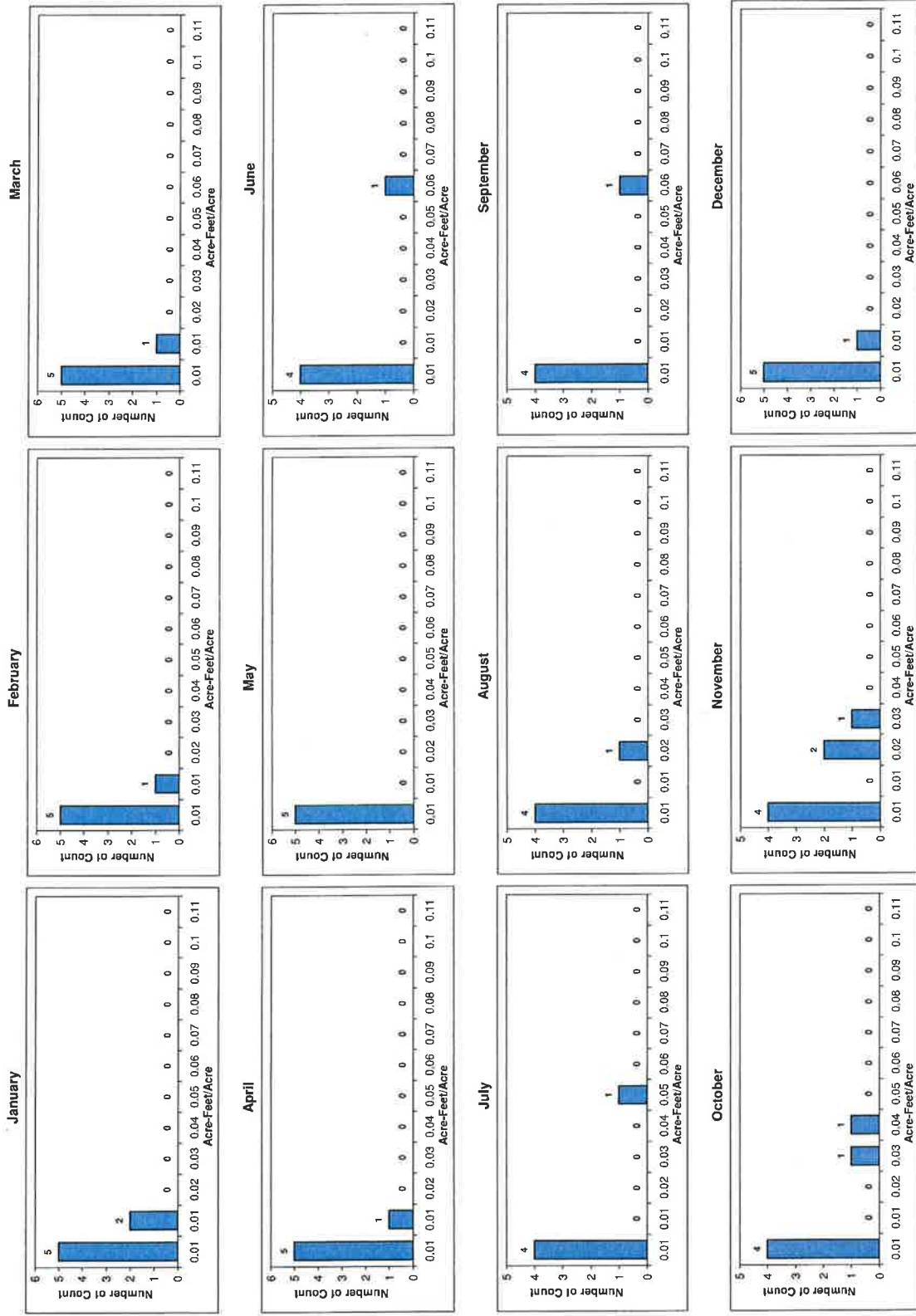


Figure C-6. Histograms for Public

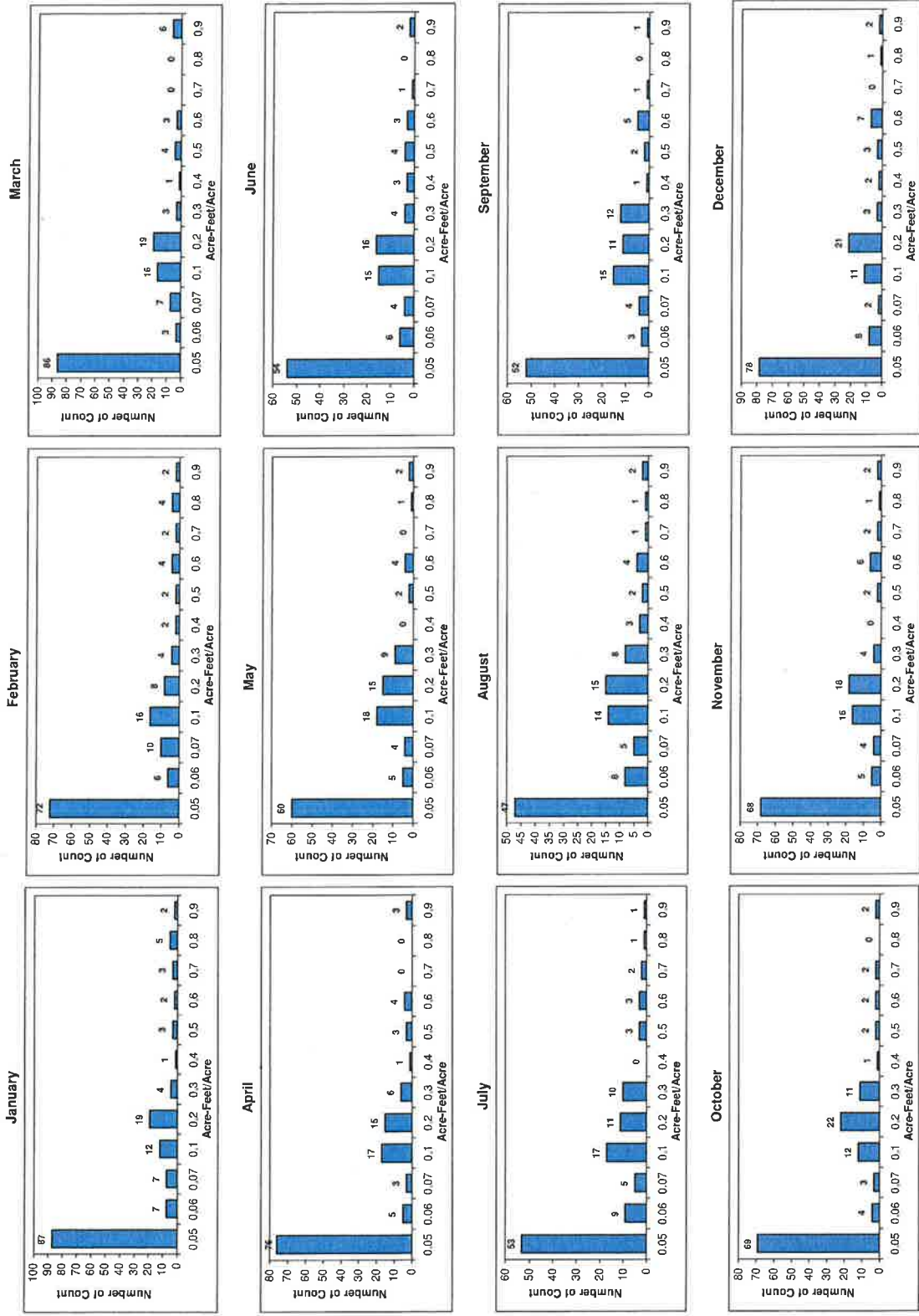


Figure C-7. Histograms for Parks/Recreation

