3. Water Requirements And Water Supplies

Current water requirements and water supplies in the SMVMA, including discussion of agricultural land use and crop water requirements, which were the basis for estimation of agricultural water requirements and groundwater supply in 2008, are described in the following sections of this Chapter. Municipal water requirements and the components of water supply to meet those requirements, including groundwater and imported water from the State Water Project (SWP), are also described in the following sections.

3.1 Agricultural Water Requirements and Supplies

All agricultural water requirements in the Santa Maria Valley are supplied by local groundwater pumping, essentially all of which is neither directly metered nor otherwise indirectly measured. Consequently, agricultural water requirements, which represent by far the largest part of overall water requirements in the Valley, need to be indirectly estimated. Historically, and for this annual report, agricultural water requirements were estimated by quantifying land use (crop types and acreages), computing applied water requirements for each crop type, and summing total water requirements for the aggregate of various crops throughout the Valley. Reflected in this report are results specifically for 2008, combined with historical estimates previously reported through 1997. It is intended that future annual reporting will fill intervening years to describe both long-term and recent trends in agricultural land and water use.

3.1.1 Land Use

Crop acreages for 2008 were determined from review of Santa Barbara and San Luis Obispo County Agricultural Commissioner's Offices Pesticide Use Report (PUR) databases and mapped agricultural parcels permitted for pesticide application. The mapped parcels were identified by the Counties under the following crop types: 1) Rotational Vegetable, 2) Strawberry, 3) Wine Grape, 4) Miscellaneous Truck (e.g., Pea, Squash, and Blueberry), 5) Pasture, 6) Grain, 7) Nursery, and 8) Avocado. Review of the PUR records indicated that "Rotational Vegetable" primarily consisted of lettuce, celery, broccoli, cauliflower, and spinach crops. Some Broccoli and Spinach parcels were mapped and identified individually, and these acreages were combined with the Rotational Vegetable acreage in this assessment. Verification of agricultural cropland distribution was conducted through review of monthly satellite images of the SMVMA, which are shown in Appendix C (USGS, 2008). The distribution of irrigated acreage for 2008, both by crop type identified by the Counties as well as by crop category utilized by the California DWR in its periodic land use studies, is listed in Table 3.1-1a. In addition, the crop parcel locations in 2008 are shown in a map of agricultural land use throughout the SMVMA (Figure 3.1-1a).

In 2008, a total of approximately 50,000 acres in the Santa Maria Valley were irrigated cropland, with the large majority in truck crops, specifically Rotational Vegetables (32,000 ac), Miscellaneous Truck Crops (1,250 ac), and Strawberries (11,100 ac). Vineyard comprised the next largest category (4,000 acres), with Pasture, Grain, Nursery, and Citrus in descending order of acreage (710, 580, 160, and 35 acres, respectively). Cropland occupies large portions of the Santa Maria Valley floor, Orcutt Upland, Oso Flaco area, and Sisquoc plain and terraces.

Total irrigated acreage of about 50,000 acres in 2008 is within the reported historical range between roughly 34,000 acres in 1945 to 53,000 acres in 1995, as shown in Table 3.1-1b (USGS, Worts, G.F., 1951; California DWR, 1959, 1968, 1977, 1985, and 1995; LSCE, 2000). The 2008 cropland locations continue the historical trend of agricultural expansion onto portions of the Orcutt Upland and Sisquoc Valley as urban land use expands into former cropland near the central portions of the Santa Maria Valley and Orcutt Upland. Further, the 2008 crop type distribution continues the historical trend of increased truck crop acreage and decline in pasture (including alfalfa), field, and citrus acreages, as illustrated by the bar chart of historical crop type distribution from DWR land use survey years and for 2008 (Figure 3.1-1b). In order to provide consistency with the historical land use data, the 2008 crop acreages reported here are "land" acreages; i.e., the land area used for growing crops regardless of whether it is used for single or multiple cropping throughout any given year.

3.1.2 Applied Crop Water Requirements

Applied crop water requirements were developed for the eight crop categories described above, and the approach used in their development depended on information available for each individual category. In the case of Rotational Vegetables (primarily lettuce, celery, broccoli, cauliflower, and spinach), Strawberries, and Pasture, values for their evapotranspiration of applied water (ETaw) were developed using a CIMIS-based approach where reference evapotranspiration data (ETo) were coupled with crop coefficients (Kc) to first estimate the evapotranspirative water requirements of the crops (ETc). Those requirements were then factored to consider any effective precipitation in 2008 that would have reduced the need for applied water to meet the respective evapotranspirative water requirements, which in turn provided the ETaw values for those three categories.

In the case of the remaining crop categories, for which information were insufficient to utilize a CIMIS-based approach, reported values of ETaw were used (California DWR, 1975). Specifically, these were values measured and developed for different rainfall zones in the central California coastal valleys, and a review of the reported values indicated that they accommodated multiple cropping. The values in turn had previously been used to develop a relationship between ETaw values and the annual rainfall amounts within the Santa Maria Valley groundwater basin by crop type (LSCE, 2000). The rainfall total for 2008 in the SMVMA was 12.48 inches, and the previously developed ETaw values corresponding to 12 inches of precipitation were selected for this assessment.

For the three crop categories utilizing the CIMIS-based approach, daily ETo data for 2008 from the nearest CIMIS station (Nipomo, see Table 2.4-2) were used in conjunction with Kc values from the following sources to develop ETc values. The Rotational Vegetable value was based on reported values for lettuce derived from an agricultural leaflet for estimating ETc for vegetable crops (Univ. of California Cooperative Extension, 1994); the Strawberry values were derived from a paper reporting the results of a study on drip irrigation of strawberries in the Santa Maria Valley (Hanson, B., and Bendixen, W., 2004); and the Pasture values were directly based on ETo values measured on the reference surface (grass) at the Nipomo Station. The resulting ETc values for the three crop categories are shown in Table 3.1-1c.

The amounts of effective precipitation (P_E) that contributed to meeting the ETc of these crops were based on review of the precipitation data for 2008, during which rain occurred in January, February, March, and December only. In the month of January, the rainfall total of 7.39 inches greatly exceeded the January ETc for all three crops and, thus, the P_E equaled the crop ETc values (each crop's January ETc was completely met by precipitation). For Strawberries, the February precipitation completely met the February ETc, but for Rotational Vegetables and Pasture, February rainfall was less than the ETc and half of the precipitation was arbitrarily considered to be effective in meeting the ETc. This was similarly the case for those crops in the months of March and December as well. Consequently, in 2008, the precipitation that occurred in January was considered to fully meet crop water requirements, and one-half of the rainfall during February, March, and December was considered to have been available to meet some of the crops water requirements (with the exception that all February rainfall was considered available to Strawberries). These amounts were considered to be effective precipitation contributing to meeting the ETc of the crops and, thus, reduce applied water requirements. The calculated ETaw values for the Rotational Vegetables, Strawberries, and Pasture, as well as the developed values for the remaining crop categories (and value for Nursery from NMMA TG), are shown in Table 3.1-1c.

Values of ETaw were then converted to applied crop water requirements (AW) by considering estimated irrigation system distribution uniformity (DU) values for each crop. For Strawberries grown in the Santa Maria Valley, DU values have been reported to range from 80 and 94 percent (Hanson, B., and Bendixen, W., 2004), and an intermediate DU value of 85 percent was selected for this assessment. For the remaining crops, DU values have not been specifically reported for the Santa Maria Valley; for this assessment, values of 80 percent (Rotational Vegetables, Miscellaneous Truck, Grain, and Pasture), 85 percent (Citrus), and 95 percent (Vineyard and Nursery) were utilized. The resulting AW values for each of the eight crop categories are shown in Table 3.1-1c; they range from a highest applied water rate of 4.33 af/ac for Pasture, to intermediate rates of 2.50 af/ac for Rotational Vegetables and 1.55 af/ac for strawberries, to a low of 0.30 af/ac for Grain.

The AW values calculated for crops grown in the SMVMA are similar to those for crops grown in the NMMA (NMMA Technical Group, April 2009). Between the two adjacent management areas, crops in common are Rotational Vegetables, Strawberries, Pasture, and Citrus, and the estimated applied crop water requirements are 2.50, 1.55, 4.33, and 2.90 af/ac, respectively, in the SMVMA, compared to 2.9, 1.6, 4.0, and 2.6 af/ac, respectively, in the NMMA.

3.1.3 Total Agricultural Water Requirements

The AW values for each SMVMA crop category were coupled with their respective crop acreages from 2008 to produce estimates of the individual crop and total agricultural water requirements for 2008, as shown in Table 3.1-1c. The resultant estimated total water requirement was almost 108,800 af, with Rotational Vegetables comprising by far the greatest component, almost 80,000 af, primarily because about 60 percent of the total acreage was dedicated to those crops. Strawberries comprised the next largest crop acreage and had an associated next largest water requirement, over 17,000 af. Miscellaneous Truck Crops,

Vineyard, and Pasture each had applied water requirements less than 5,000 af; and Grain, Nursery, and Citrus were each below 1,000 af.

In the context of historical estimates of total agricultural water requirements, the estimated 2008 agricultural water use is in the range of applied water requirements over the last four decades, as illustrated in a graph of historical irrigated acreage and agricultural groundwater pumping (the sole source of irrigation water in the Valley and, thus, equal to applied water requirements) (Figure 3.1-1c). For reference, agricultural water requirements were previously estimated to be around 80,000 afy during the 1940's and 1950's, gradually increasing to over 100,000 afy by the 1970's; since then, agricultural water requirements have fluctuated from year to year, as a function of weather variability, but water requirements have generally remained within a fairly constant range (LSCE, 2000). Since the 1970's, maximum and minimum agricultural water requirements, respectively, were about 126,000 af in 1990 and about 87,000 af in 1995. Estimated agricultural water requirements in 2008 are midway in that range.

3.1.4 Agricultural Groundwater Pumping

As mentioned above, the sole source of water for agricultural irrigation in the SMVMA is groundwater, so groundwater pumping for agricultural irrigation in 2008 is estimated to be the same as the total estimated agricultural water requirement of 108,800 af. This amount is also, of course, midway within the historical range of estimated groundwater pumping for agricultural irrigation in the Valley over the last four decades. Proportions of groundwater pumping from the shallow and deep aquifer zones of the SMVMA are not known because a comprehensive understanding of individual irrigation well depths and completion intervals is lacking.

3.2 Municipal Water Requirements and Supplies

Prior to the late 1990’s, all municipal water requirements in the SMVMA were met by local groundwater pumping. Since the advent of State Water Project (SWP) availability in 1998, deliveries of SWP water have replaced some of the local groundwater pumping for municipal supply. All municipal pumping and imported (SWP) water deliveries in the SMVMA are metered; consequently, the following summaries of municipal water requirement and supplies derive from those measured data.

3.2.1 Municipal Groundwater Pumping

Municipal purveyors in the SMVMA include the Cities of Santa Maria and Guadalupe and the Golden State Water Company (GSWC, formerly Southern California Water Company). The latter provides water to suburban areas in the southern portion of the SMVMA, specifically the towns of Orcutt and Sisquoc and the Lake Marie and Tanglewood developments. With the exception of small pumping in Guadalupe and Sisquoc, municipal pumping is from numerous water supply wells in individual wellfields located between the Santa Maria Airport and the town of Orcutt (see Figure 1.3-1a). The municipal water supply wells are completed in the shallow and/or deep aquifer zones with, in general, newer wells having been constructed to produce from deeper portions of the aquifer system with better water quality. Monthly and total annual

groundwater pumping for 2008 are tabulated by individual well, by purveyor, and for each water system in Table 3.2-1a.

In 2008, 16,350 af of groundwater were pumped for municipal water supply in the SMVMA. GSWC pumping was the largest, nearly 9,100 af, of which the great majority (8,700 af) was for the GSWC Orcutt system and less than 500 af for the other GSWC systems. The City of Santa Maria pumped slightly more than 6,600 af and the City of Guadalupe pumped about 650 af.

Compared to historical municipal pumping, 2008 pumping for municipal supply was substantially less than a decade ago, immediately prior to the initial deliveries of supplemental imported SWP water, as shown in a graph of historical municipal groundwater pumpage for the SMVMA (Figure 3.2-1). Most notably, the City of Santa Maria has reduced pumping to nearly one-half the amount recorded for 1996 and 1997, specifically from 12,500 to 6,600 afy. Equally notable is that total municipal pumping has been reduced to about two-thirds the 1997 amount, from over 23,000 af in 1997 to 16,350 af in 2008 (municipal pumping data for intervening years 1998 through 2007 will be incorporated into the database, and into future annual reports, as data are made available).

3.2.2 Imported Water

The three municipal purveyors in the SMVMA have entitlements to delivery of imported water from the State Water Project (SWP) through the Central Coast Water Authority (CCWA). Their respective entitlements are 16,200 af for the City of Santa Maria, 550 af for the City of Guadalupe, and 500 af for Southern California Water Company (now Golden State Water Company). CCWA also retains a "drought buffer", nominally equal to ten percent of the total entitlement of SWP project participants in Santa Barbara County. The drought buffer is retained for potential use by SWP project participants, including all three municipal purveyors in the SMVMA, during years when the availability of SWP water exceeds project participants' water demand. It is intended that the drought buffer be used via some form of groundwater banking to firm up the overall reliability of supplemental SWP deliveries. As a result of the drought buffer, the "contracts" or "entitlements" of the municipal purveyors in the SMVMA have occasionally been expressed as quantities that include a combination of their base entitlements as delineated above and a ten percent drought buffer; one such location is in Exhibit F to the Stipulation. Such as the Stipulation also specifies certain minimum importation of SWP water, as a function of its availability in any given year and also as a function of individual purveyor entitlement, the following assessment of imported water use in 2008 is related to base entitlements, and not drought buffers.

In 2008, total deliveries of SWP water to the SMVMA were nearly 8,200 af. The great majority of those deliveries, 7,600 af, were to the City of Santa Maria; a small portion of the Santa Maria deliveries, 48 af, were transferred to GSWC, which also took delivery of 180 af of its own entitlement. The City of Guadalupe took delivery of the balance of imported SWP water, 360 af. Deliveries of SWP water to the SMVMA in 2008 are summarized in Table 3.2-1b. SWP water data for years 1998 through 2007 will be incorporated into the database and future annual reports as data are made available.

The Stipulation designates minimum amounts of SWP water to be imported and used in the SMVMA in any year as a function of individual entitlement and SWP availability. Santa Maria is to import and use not less than 10,000 afy of available SWP water, or the full amount of available SWP water when it is less than 10,000 af. Guadalupe is to import and use a minimum of 75 percent of its available SWP water; and GSWC is to import and use all its available SWP water. In 2008, overall SWP water availability was 35 percent of entitlements. For the municipal purveyors in the SMVMA, that availability converts to the following individual availability of SWP water: Santa Maria, 5,775 af; Guadalupe, 192.5 af; and GWCD, 175 af. Actual imports of SWP water by all three municipal purveyors, summarized in Table 3.2-1b, approximately equaled or exceeded all those amounts, and thus satisfied the specification in the Stipulation for importation and use of SWP water in the SMVMA for 2008.

3.2.3 Total Municipal Water Requirements

The total water requirements for municipal purposes in 2008 were the sum of municipal groundwater pumping and imported SWP water use, about 24,500 af. Compared to historical municipal water requirements, the total for 2008 reflects an increase in municipal water demand over the last decade, specifically from about 23,000 af in 1996 and 1997 (municipal water requirements for intervening years 1998 through 2007 will be calculated as groundwater pumping and SWP water data are made available).

3.3 Total Water Requirements and Supplies

The total water requirement for 2008 in the SMVMA, the combination of agricultural and municipal water requirements, was approximately 133,300 af. That total demand was predominately met by slightly more than 125,000 af of groundwater pumping. The balance, nearly 8,200 af, was met by delivery of imported water from the State Water Project as seen in Table 3.3-1. Groundwater met 100 percent of the agricultural water requirement (108,000 af), about 67 percent of the municipal water requirements (24,500 af), and 94 percent of the total water requirements in the SMVMA (133,300 af).