Technical Memorandum

To: Rita Brandin – Newland Sierra, LLC

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Date: September 8, 2016

Re: Water Conservation Demand Study for Newland Sierra (San Diego County, California)

Executive Summary

This technical memorandum calculates the amount of water savings that can be achieved by implementing current water conservation measures for indoor and outdoor water uses inside Newland Sierra, a community planned in northern San Diego County, California by Newland Sierra, LLC (the Project applicant). Current water conservation regulatory measures consist of a series of state and local green building and irrigation standards that reduce indoor and outdoor water uses significantly compared with past requirements. The Project applicant will implement these standards into the designs of new buildings, landscaping, and other infrastructure that will be constructed as the Newland Sierra proposed community is developed.

Using recent state and local water conservation standards and pre-conservation water demands previously developed for Newland Sierra, GSI Water Solutions, Inc. (GSI) has calculated the amount of water savings that can be achieved by implementing the current standards in full across the Newland Sierra proposed community. As shown in Tables ES-1 and ES-2, total water demand in Newland Sierra under current conservation measures is calculated to be 776,980 gallons per day (gpd) on an average daily basis (Table ES-1) and 870 acre-feet per year (afy) on an annual basis (Table ES-2). This water demand is 673,180 gpd (or 754 afy) lower than the demand estimate presented in an August 2016 draft update to Table 3.2 of the Water Supply Assessment & Verification Report (WSA&V update) for the Newland Sierra proposed community (HDR, August 2016), and 852,220 gpd (or 955 afy) lower than the demand estimate associated with the County of San Diego's General Land Use Plan (General Plan). These decreases in water demand amount to 46 percent and 52 percent reductions, respectively, from the WSA&V update and General Plan water demand estimates.

1.0 Introduction

1.1 Background

This technical memorandum will be used in the Newland Sierra Draft Environmental Impact Report (EIR) to substantiate the water savings that can be achieved for the Newland Sierra proposed community by implementing current indoor and outdoor water conservation measures required by a series of state and local laws, regulations, and water conservation programs. In addition, this technical memorandum documents such water savings and will be independently reviewed by the Vallecitos Water District (VWD) and its consultant, HDR, which has been retained by VWD to prepare the Newland Sierra Water Supply Assessment and Verification (WSA&V). The Newland Sierra proposed community is situated within VWD's service area. VWD is a special district created and governed by a five-person Board of Directors; it also is the water retailer serving a 45-square mile area that includes San Marcos, parts of Escondido, Vista, Carlsbad, and surrounding unincorporated areas.

On October 20, 2015, the County of San Diego (County) requested that VWD complete a WSA&V report. The VWD Board of Directors approved the WSA&V on January 6, 2016.

On June 27, 2016, County staff requested that VWD revise the WSA&V report to include minor land use and water demand updates. VWD staff also took this opportunity to revise the WSA&V report in response to VWD's update to its Urban Water Management Plan (UWMP). The VWD Board of Directors unanimously approved VWD's 2015 UWMP as Resolution No. 1494 at its regular meeting on June 15, 2016. VWD staff directed HDR to update the WSA&V to reflect the new UWMP on July 11, 2016. Subsequently a draft version of four revised tables (Tables 3.1, 3.2, 3.3, and 3.4) to be used in the updated version of the WSA&V were provided to GSI Water Solutions, Inc. (GSI) in August 2016.

1.2 Overview

This technical memorandum calculates the amount of water savings that can be achieved by implementing current water conservation regulatory measures inside the future Newland Sierra development, a community planned in northern San Diego County, California by Newland Sierra, LLC (the Project applicant). Water demand forecasts for this proposed community are fully developed and documented in the draft WSA&V update tables issued in August 2016 by HDR for the Newland Sierra proposed community. The estimates to be included in the WSA&V update are updates of earlier estimates contained in the County's General Plan. The WSA&V update estimates, which are shown in Table 1, make use of water demand factors ("duty" factors) that were established in the 2014 Draft Water, Wastewater and Recycled Water Master Plan by VWD and that describe the average daily usage of water in units of gallons per day per acre (gpd/acre). These factors are averages over a full year and have different values corresponding to specific types of land uses. (See Table 2 for the land use details of the Newland Sierra proposed community, as presented in the Water Master Plan for Newland Sierra [Dexter Wilson Engineering, 2016a].) The water demand estimates are also reported in units of acre-feet per year

(afy) in the WSA&V update. Additionally, the estimates of associated indoor water demands are presented in the Sewer Master Plan for Newland Sierra (Dexter Wilson Engineering, 2016b); these demand estimates are listed in Table 3. GSI has calculated the outdoor component of the WSA&V demand estimates, by subtracting the indoor demands (contained in the Sewer Master Plan) from the total demand estimates presented in the WSA&V update; see Table 4. A listing of indoor, outdoor, and total water demands associated with the WSA&V update is presented in Table 5 for each land use category.

The WSA&V describes certain water conservation measures that will be implemented in the Newland Sierra proposed community, such as (1) the use of grey water systems to capture domestic water for reuse as outdoor landscaping irrigation supply, and (2) prohibitions on the use of turf in the front yards of single-family homes. However, the WSA&V states that for the purpose of providing a demonstration of the sufficiency of the water supply for Newland Sierra, the supply assessment is required to assume that no water conservation measures actually would be implemented. Nonetheless, the Project applicant will implement water-use efficiency measures into the designs of new buildings, landscaping, and other infrastructure that will be constructed as the Newland Sierra proposed community is developed, which will reduce water demands inside Newland Sierra below the demands estimated in the WSA&V update. Accordingly, GSI has conducted an analysis to calculate the reductions in water use (compared with the current water demand forecasts) that can be achieved as the Project applicant constructs indoor and outdoor water systems in compliance with the state and local laws and ordinances that promulgate current water conservation standards.

The remainder of this technical memorandum summarizes the current state and local water-conservation laws, regulations, and conservation programs (Section 2); discusses the approach for estimating water demand savings (Section 3); presents the analysis of reductions in indoor water demand factors (Section 4); presents the analysis of reductions in outdoor water demand factors (Section 5); presents the calculations of water savings that can be achieved by the current water conservation standards (Section 6); and lists the references cited in this technical memorandum (Section 7).

2.0 State and Local Laws, Regulations, and Conservation Programs

Dating back to 2006, a series of noteworthy state laws have been enacted that affect the types and implementation of various water conservation and water use reduction activities and programs that are ongoing throughout the state. Below are summaries of the state's laws (Section 2.1); the state's green building standards (Section 2.2) and landscape irrigation standards (Section 2.3) that implement these laws statewide; and local programs by the County and the San Diego County Water Authority (SDCWA) that implement these laws and promote conservation at the local level (Sections 2.4 through 2.6).

2.1 State Laws

Four laws were enacted by the California State Legislature from 2006 through 2009 to promote efforts to reduce water use state-wide in response to drought conditions and increasing population. These laws were accompanied by the passage of ordinances by state and local regulatory agencies to implement the legislation. Table 6 lists these laws and ordinances and identifies the entities and types of development activities to which they apply.

While three of the laws targeted specific uses, the fourth law (Senate Bill SBX7-7) is a much broader legislation that addresses urban water use on a state-wide scale. SBX7-7 requires the state to achieve a 20 percent reduction in urban per-capita water use by the end of 2020. Locally, this is implemented in the Urban Water Management Plans (UWMPs) prepared by VWD and SDCWA. The UWMPs contain demand-reduction targets and associated implementation programs involving Best Management Practices (BMPs) or Demand Management Measures (DMMs) in order to implement the required 20 percent reduction in urban per-capita water use by the end of 2020. Other implementation mechanisms that pertain to water use reductions statewide and locally are the state's CALGreen building standards, a state model ordinance for water-efficient landscaping, and various SDCWA and VWD incentive programs, each of which are discussed below.

2.2 California's Green Building Standards (CALGreen)

CALGreen is the state's green building standards code. It is formally known as Title 24, Part 11, the California Green Building Standards Code. CALGreen identifies mandatory and voluntary provisions that apply to the planning, design, operation, construction, use, and occupancy of every newly constructed building or structure on a statewide basis. Certain provisions that are under the jurisdiction of the California Department of Housing and Community Development (HCD) apply to "low-rise residential" facilities, which are defined by CALGreen as "[a] building that is of Occupancy Group R and is three stories or less, or that is a one- or two-family dwelling or townhouse." (HCD, 2010.) CALGreen also requires that each portion of a mixed occupancy building comply with the specific green building measures applicable to that occupancy. Therefore, if a building's design includes commercial and residential uses, then both the non-residential and residential provisions apply to appropriate portions of the building.

The California Building Standards Commission (CBSC) first published CALGreen in mid-2010 as part of the 2010 code adoption process (CBSC, 2010), and CALGreen became effective on January 1, 2011. A comprehensive update of CALGreen is conducted every 3 years. The 2013 California Building Standards Code, which includes the 2013 version of CALGreen, was published on July 1, 2013 (CBSC, 2013) and became effective on January 1, 2014. This update identified changes to certain mandatory measures for residences, including for indoor and outdoor water uses. Another update was issued on July 1, 2015 (CBSC, 2015).

2.3 California's Model Water Efficient Landscape Ordinance (MWELO)

In 2006, the California Assembly passed legislation (Assembly Bill [AB] 1881), which is known as the *Water Conservation in Landscaping Act of 2006*. AB 1881 requires cities and counties to develop and implement (1) guidelines for local landscape ordinances and water-efficient landscape design, and (2) regulations and performance standards for energy-efficient landscape materials (including controllers and soil moisture sensors). This legislation also required that water purveyors, after January 1, 2005, install separate water meters to measure the volume of water used exclusively for landscape purposes.

On September 10, 2009, the California Department of Water Resources (DWR) adopted its Model Water Efficient Landscape Ordinance (MWELO) in response to passage of AB 1881. This ordinance specified calculation methods and key input parameters (such as reference evapotranspiration rates [ETo values]) for determining the Maximum Applied Water Allowance (MAWA), which is the maximum amount of water that can be applied to an irrigated landscape. Local agencies were required to adopt the MWELO or an alternative local ordinance by January 2010. At that time, the County of San Diego notified DWR that it had enacted its own ordinance that would be at least as effective as the MWELO. This was promulgated by the County as Ordinance 10032 on January 13, 2010 and is incorporated into the San Diego County Code as Chapter 7 in Section 2, Title 8, Division 6.

DWR enacted new rules that updated the MWELO, effective September 2015. This update of the MWELO is contained in Sections 490 through 495, Chapter 2.7, Division 2, Title 23 in the California Code of Regulations. The 2015 MWELO applies to landscaping and irrigation systems at most new construction sites and in landscapes 500 square feet or larger that are being renovated. DWR enacted the 2015 MWELO in response to the Governor's Executive Order B-29-15 of April 1, 2015, which ordered further cuts in water use and included (in paragraph 11) a directive for DWR to update the MWELO to increase water efficiency standards for new and existing landscapes. Noteworthy aspects of the 2015 MWELO update include the following:

- Appendix A of the 2015 MWELO specifies the reference evapotranspiration rate (ETo) that is to be used for evaluating compliance with the MWELO. These rates were updated in some locations from values published in the prior version of the MWELO. In the vicinity of the Newland Sierra proposed community, Appendix A of the 2015 MWELO specifies an annual water demand for cool-season turf grass in Escondido to be 54.2 inches per year, which is equivalent to approximately 4.5 feet per year. This ETo value is based on long-term measurements of evapotranspiration rates from cool-season turf grass at the nearby Escondido SPV #153 automated weather station site, which is part of the California Irrigation Management Information System (CIMIS) evapotranspiration monitoring network maintained by DWR. This station is also cited by the County (2010) and SDCWA (2015) as a reference location for ETo when designing landscapes in this area.

- The 2015 MWELO update limits the maximum allowable water application rate on landscapes using potable water to 55 percent of ETo for residential landscapes and 45 percent of ETo for non-residential landscapes. In Escondido, this equates to 29.8 inches per year (approximately 2.5 feet per year) on residential landscapes and 24.4 inches per year (approximately 2.0 feet per year) on non-residential landscapes.
- For landscapes that meet the 2015 MWELO's definition of a Special Landscape Area (SLA), water application is allowed at rates up to 100 percent of ETo. SLAs include landscapes solely dedicated to edible plants; recreational areas outside of residential land parcels that are designated for active play, recreation, or public assembly; areas irrigated with recycled water; and water features that use recycled water.

2.4 San Diego County's Green Building Incentive Program

The County has implemented its voluntary Green Building Incentive Program through its Department of Planning and Development Services. This program is "designed to promote the use of resource-efficient construction materials, water conservation and energy efficiency in new and remodeled residential and commercial buildings." Incentives include a 7.5 percent reduction in plan check and building permit fees for meeting certain requirements. Installation of a grey water system in new or renovated buildings qualifies for the water conservation incentive. The program's website (at http://www.sandiegocounty.gov/content/sdc/pds/bldg/green.html) refers to the state's CALGreen standards for green building requirements.

2.5 San Diego County's Landscaping Ordinance and Regulations

As discussed in Section 2.3, San Diego County Ordinance 10032 (dated January 13, 2010) adopts water-efficient landscape regulations (County Code of Regulatory Ordinances Section 86.701 et seq.) for the County's unincorporated areas. These regulations include provisions for water conservation in landscaping, landscape water budgets, irrigation schedules, and soil management plans. The regulations also promote the use of recycled water for landscaping. On February 16, 2010, the County Department of Planning and Land Use issued its Water Efficient Landscape Design Manual (County of San Diego, 2010), which provides guidance on landscaping design and installation that encourages the efficient use and conservation of water. In cooperation with SDCWA, the County also has developed an in-depth homeowner's guide to creating a water-smart landscape (SDCWA, 2015), which incorporates the latest ETo values and other requirements of the state's 2015 MWELO.

Together, the ordinances, regulations, and guidance require an outdoor water use authorization as part of the permitting process for a number of specific industrial, commercial, civic, and single-family and multi-family residential use projects. A water use authorization establishes the Maximum Applied Water Allowance (MAWA) value for the property. Permitting requires a landscaping and irrigation plan. Irrigation systems must be designed to meet or exceed an average landscape irrigation efficiency of 0.71. A number of additional requirements are provided in the ordinance, including formulas for the calculation of the MAWA and the

Estimated Total Water Use (ETWU) values (both in units of gallons per year) for the total landscaped area, given its specific attributes (i.e., the specific plantings, irrigation systems, and type of source water [potable versus reclaimed]).

2.6 San Diego County Water Authority

As described in Section 3.2.2 of SDCWA's 2015 UWMP (SDCWA, 2016), SDCWA has a Public Outreach and Conservation Department with 19 full-time staff members who among their many activities (1) design, implement, and manage regional water-use efficiency programs; (2) develop and support water-use efficiency policy; and (3) provide technical assistance to SDCWA's 24 member water agencies. Recent and ongoing SDCWA water-use efficiency programs have included its Regional WaterSmart Turf Replacement program, the WaterSmart Landscape Makeover program, the Sustainable Landscapes program, the Public Agency Landscape program, the Fitness Center program, the Water Savings Incentive program, the on-site recycled water conversion program, and the Agricultural Irrigation Efficiency program.

SDCWA is also a member of the Metropolitan Water District of Southern California's SoCal Water$mart regional programs, which are focused on reducing residential and non-residential water use. As described in Section 3.2.5 of SDCWA's 2015 UWMP (SDCWA, 2016), these programs focus on water use efficiencies that can be gained through changes to plumbing fixtures, food equipment, medical and dental equipment, HVAC equipment, and landscape irrigation equipment.

3.0 Approach for Estimating Water Demand Savings

GSI conducted separate analyses of the amount of water savings at the Newland Sierra proposed community that can be achieved by implementing current water conservation standards for:

- Indoor water uses in single-family and multi-family residences and in non-residential facilities
- Outdoor water uses that include landscape irrigation and non-landscape outdoor uses (primarily swimming pools) in public and private spaces

Methods for evaluating indoor and outdoor water demand savings are discussed in Section 3.1 (indoor water uses) and Section 3.2 (outdoor water uses).

3.1 Methodology for Evaluating Indoor Water Use Savings

GSI's methodology for calculating the amount of indoor water use savings that can be achieved by implementing indoor water conservation standards was as follows:

- **Identify and review available literature quantifying residential indoor water use details for historical time periods prior to 2000 (i.e., 1990s and earlier).** Publications and prior studies by the American Water Works Association Research Foundation (AWWARF, 1999), the U.S. Environmental Protection Agency, (EPA, 1997), and the

California Homebuilding Foundation (CONSOL, 2015) quantify historical water usage rates of individual indoor plumbing fixtures from the 1970s through the 1990s. Some of these studies also discuss the frequency of the use of each fixture and appliance. GSI used this information to calculate bulk indoor residential per-capita indoor water use rates for representative communities in southern California prior to the year 2000. See Table 7 for these details.

- **Convert the WSA&V sewer generation factors to equivalent per-capita indoor demand factors.** The Sewer Master Plan for the Newland Sierra proposed community (Dexter Wilson Engineering, 2016b) provides unit flow factors (in units of gpd/acre), acreages for different types of dwelling units, and dwelling unit densities. In addition, the Project applicant provided total population estimates. GSI derived WSA&V-equivalent per-capita water demand factors from that information for comparison with the historic AWWARF per-capita survey results. This step was necessary to confirm that the AWWARF fixture-by-fixture water use values (1) produce similar rates of total indoor water use as those presented in the Sewer Master Plan, and (2) therefore are appropriate for use as pre-conservation values of per-capita indoor use (from which future water conservation water demand savings can be calculated). See the first three columns of Table 8 for these details.

- **Calculate per-capita indoor residential demand factors incorporating conservation measures.** The State of California's Green Building Standards published in 2010 and 2013 (CBSC, 2010 and 2013) and updated/supplemented in 2015 (CBSC, 2015) list conservation requirements for specific plumbing fixtures (e.g. fixture-specific flow rates). GSI used these fixture-specific per-capita conservation standards as the basis for calculating a total indoor use demand factor for single-family residences with conservation measures in place. See Table 7. A past study of indoor water use in rural versus urban households (EPA, 1997) was then used as a basis to extrapolate the rate for single-family residences to a rate for multi-family residences (see Table 8).

- **Conduct a comparison of pre-conservation and post-conservation consumption rates.** Separate calculations were conducted for residential and non-residential indoor water use.

    - For residential development, reductions in indoor water demand factors were calculated as the difference between (1) the indoor demand factors contained in the Sewer Master Plan (see Table 3) and (2) the post-conservation per-capita uses presented in Tables 7 and 8 that reflect the fixture-specific requirements of the CALGreen building standards. See Table 8 for these calculations, which are presented in units of gallons per capita per day (gpcpd) and gpd/acre.

- For non-residential development, reductions in indoor water demand factors were developed by referencing back to the reductions calculated for residential indoor water demand factors. The average reduction for residential areas was applied as a scaling factor to calculate the reductions in indoor demand factors for parks, commercial buildings and schools. (See Table 9). This reflects the Project applicant's plan to conform to CALGreen standards for plumbing fixtures in each type of residential and non-residential use inside the Newland Sierra proposed community.

- See Table 10 for a comparison of indoor demand factors with and without implementation of current water conservations measures.

3.2 Methodology for Evaluating Outdoor Water Use Savings

GSI's methodology for calculating the amount of outdoor water use savings that can be achieved by implementing current outdoor water conservation standards was as follows:

- **Calculate the expected reduction in water demands for outdoor uses other than irrigation in residential and non-residential areas in Newland Sierra.** These demands primarily consist of maintaining full swimming pools in three community parks (Mesa Park, Peak's Park, and Valley Green Park) and in some large residential lots where homeowners may elect to install a pool. Water demands are assumed to be twice the value of reference evapotranspiration rates to account for evaporative losses and losses during use of each pool. See Table 11.

- **Calculate the irrigation water demands associated with the WSA&V's 2014 duty factors.** This step subtracts the indoor water use and non-irrigation outdoor use from the 2014 duty factors for total use, thereby providing irrigation demand factors for each land use.

- **Calculate the allowable irrigation limits under the 2015 MWELO requirements.** Reference evapotranspiration (ETo) values published in the MWELO for Escondido were used to calculate the annual limits of water that can be applied to residential and non-residential landscape areas. See Table 12.

- **Confirm the typical acreages to be irrigated within Newland Sierra.** Irrigation needs are calculated based in part on the percentage of land that requires irrigation. This is identified separately for each type of residential development, non-residential development, and other land uses. For example, as shown in the first two columns of Table 13, each type of residential development currently is planned to have between 38 and 56 percent of its total acreage consist of landscaping that requires irrigation. In contrast, commercial facilities and schools are designed to have 25 percent of their total acreage require irrigation, while parks and irrigated slopes have the highest percentages

of irrigated acreage (65 percent and 93 percent, respectively). See the first nine columns in Table 13 for details regarding acreages and the percentages of each planning area that are comprised of irrigated acreage, turf, and non-turf areas.

- **Calculate the expected rates of outdoor water use that account for the 2015 MWELO requirements.** This effort consists of calculating the ETWU values (irrigation demand factors) for each land use category and adding the swimming pool demand factors to derive a total outdoor water use demand factor. See Table 13 for the ETWU calculations and Table 14 for the individual and total components of the outdoor demand factors for each planning area. See Table 15 for a comparison of the total outdoor demand factors that occur with and without implementation of current water conservations measures.

4.0 Reductions in Indoor Water Demand Factors

The process of estimating reductions in indoor water demand factors is described below on a step-by-step basis, consisting of: a review of the details of historical indoor residential water use studies from the 1990s for two southern California area water districts (Section 4.1); an evaluation of current water conservation standards for residential indoor water use and a comparison of the current standards against the historical water use factors for residences (Section 4.2); a discussion of the methods used to differentiate the indoor consumption rates and conservation-related water use reductions for single-family dwellings versus multi-family dwellings (Section 4.3); a discussion of the community-wide population density and the differences for single-family versus multi-family dwellings (Section 4.4); a comparison of the historical and conservation-related per-capita water use values with VWD's sewer generation rates used to date in the sewer and water master planning process for Newland Sierra (Section 4.5); a discussion of indoor consumption rates for non-residential development (Section 4.6); and a summary of the changes in indoor water demand factors that can occur with implementation of current water conservation measures (Section 4.7).

4.1 Studies of Historical Indoor Residential Water Use in Nearby Communities

The AWWA Research Foundation (AWWARF, 1999) conducted a study of indoor water uses in single-family residences that served as the primary source of data and details for evaluating historical indoor residential water demand factors. The AWWARF study estimated indoor residential water use for nine water utilities across the United States. The estimates were calculated in two ways: (1) from surveys of residents living in single-family homes inside each water utility service area, and (2) from models of different indoor uses in single-family homes, using data from each water utility. GSI reviewed the study's data for three southern California water utilities – the City of San Diego, the Las Virgenes Municipal Water District in Calabasas, and the Walnut Valley Water District in West Covina.

The AWWARF report identified that its findings were based on a total of 1,265 usable water use survey responses from customers served by these three particular water utilities. The data from the AWWARF report for these water utilities are presented in Table 7 and include two sets of per-capita water use estimates: (1) values listed in the AWWARF report that were based on their modeling of utility-provided data, and (2) GSI's calculations of per-capita consumption using the reported individual components of residential water use (as derived from customer survey data provided in the AWWARF report). As shown in Table 7, indoor residential use based on these two methods ranges from 58.2 to 73.3 gpcpd in the City of San Diego and from 68.7 gpcpd to 82.1 gpcpd in the case of the Las Virgenes /Walnut Valley averages. In noting that the per-capita usage was distinctly lower in the City of San Diego than in the two other water districts, the AWWARF report found in its study statistics that the City of San Diego had several characteristics that explained its lower water use during the 1990s: (1) smaller houses; (2) much more aggressive implementation of indoor plumbing fixture upgrades and replacements; (3) inclusion of sewer charges in its water bills (unlike the other two water districts at that time); and (4) a higher percentage of study participants who were likely to pay attention to their water use because they perceive that the region at times experiences some level of drought conditions.

4.2 Indoor Residential Consumption Rates and Use Reductions under Current Conservation Standards

The State of California has promulgated in its building code mandatory water conservation standards for new buildings, in order to conserve water (CBSC, 2015). These standards include fixture-specific updates and restrictions on water flow. To quantify the effect of implementing conservation measures in single-family residences in the Newland Sierra proposed community, GSI applied the historical water use behavior patterns for the Las Virgenes/Walnut Valley average condition in the AWWARF (1999) study to the current flow rates for indoor fixtures that are specified in CALGreen, then recalculated the indoor water demands on a per-capita basis. The resulting estimates for indoor residential water use under CALGreen are shown in Table 7 for each indoor activity, along with a comparison to the historical per-capita use rates derived from the AWWARF (1999) study. As shown in Table 7, the conservation-based residential indoor water demand is estimated to be 49.1 gpcpd, which is a 19.6 gpcpd to 33.1 gpcpd decrease from the historical rates of 68.7 gpcpd to 82.1 gpcpd that are reflective of historical (1990s-era) water uses in the two southern California communities which had only minimal implementation of indoor water conservation measures.

4.3 Indoor Consumption Rates for Single-Family versus Multi-Family Dwellings

The AWWARF (1999) residential indoor water use study was performed on single-family residences. However, the Newland Sierra proposed community will contain a number of different housing types and variable densities. To estimate the per-capita water use rates for multi-family dwellings, GSI consulted the EPA Exposure Factors Handbook (EPA, 1997) to develop a scaling factor for water use based on housing density. In this handbook, water use in urban homes was reported to be 0.93 times the water use in rural homes.

For the purposes of estimating per-capita demands in multi-family housing in Newland Sierra, GSI assumed that (1) higher-density housing (greater than 4 dwelling units per acre) will be equivalent to the EPA-described urban homes and (2) lower-density housing (equal to or less than 4 dwelling units per acre) will be equivalent to the EPA-described rural homes. The 49.1 gpcpd water use based on conservation measures calculated in Table 7 is deemed by GSI to apply to low-density housing developments. By multiplying the low-density residential water use by the scaling factor of 0.93, GSI estimates that implementing the CALGreen standards in multi-family dwellings inside Newland Sierra will result in an indoor water use rate of approximately 45.7 gpcpd. Accordingly, compared with 1990s-era water usage rates, current indoor water conservation measures can provide a 19.6 gpcpd to 33.1 gpcpd water use reduction in lower-density housing, and an 18.2 gpcpd to 30.1 gpcpd water use reduction in higher-density housing.

4.4 Population Densities for Single-Family versus Multi-Family Dwellings

The population of the Newland Sierra proposed community and its distribution amongst single-family versus multi-family dwellings was needed in order to translate the per-capita water use reductions to volumes of water savings that can be achieved indoors across all residences in Newland Sierra upon implementing water conservation standards. The Project applicant has used the San Diego Association of Governments (SANDAG) average population density of 2.84 persons per household (PPHH) for its planning activities. Because GSI identified separate per-capita indoor use rates for single-family versus multi-family dwellings, GSI developed separate PPHH estimates for single-family and multi-family dwellings using the findings of a 2016 review of census data for recently-constructed housing in another southern California community (Valencia, located in the Santa Clarita Valley in northern Los Angeles County). That census review, which supported water demand estimates for the Castaic Lake Water Agency's 2015 Urban Water Management Plan (Kennedy/Jenks and others, 2016), found that typical PPHH values in three newly-constructed communities were 3.29 PPHH for single-family dwellings, 2.37 PPHH for condominiums and townhomes, and 2.10 PPHH for apartments. For Newland Sierra, where single-family homes, cluster homes, and townhomes will be built, GSI calculated that similar PPHH values (3.26 for single-family dwellings and 2.36 for multi-family dwellings) can reproduce the Project applicant's population estimate of approximately 6,063 residents when applying the SANDAG average density of 2.84 PPHH. See Table 2 for details.

4.5 Comparison of Calculated Per-Capita Rates with Sewer Generation Rates

For residential developments, Table 8 compares the calculated per-capita indoor water use rates for historical conditions and current water conservation standards against the indoor water demand factors that have been used to date as sewer generation rates in the WSA&V update (HDR, 2016) and the Sewer Master Plan (Dexter Wilson Engineering, 2016b) for the Newland Sierra proposed community. As shown in the third column of Table 8, the sewer generation rates in the WSA&V update are equivalent to per-capita indoor water use rates ranging from 74.2 gpcpd to 94.7 gpcpd.

Based on the calculations described in Sections 4.1 through 4.3, the indoor water demand factors under current water conservation standards are calculated to be 49 gpcpd for the lowest-density housing category and 46 gpcpd for the remaining housing categories. However, these rates do not account for system losses, including leakage in the area-wide distribution system and failure of plumbing fixtures in built structures as they age. Accordingly, these per-capita use rates have been multiplied by 1.036, to add a 3.6 percent leakage rate to the calculated indoor uses, which is the rate identified by VWD (2016) as the average system loss it experiences for the potable water deliveries it receives from SDCWA. Accordingly, the leakage-adjusted indoor per-capita use rates are 50.9 gpcpd for the low-density residential categories and 47.3 gpcpd for the remaining residential categories. Table 8 compares these rates with the indoor water consumption rates that are used in the Sewer Master Plan for the Newland Sierra proposed community. As shown at the bottom of Table 8, the average indoor per-capita water use rate for all residences under current water conservation standards is approximately 0.57 times the indoor per-capita rates that do not account for modern-day standards.

4.6 Indoor Consumption Rates for Non-Residential Development

Sections 4.1 through 4.5 describe in detail the methods that were used to (1) evaluate previously modeled water demand factors for indoor residential water use in Newland Sierra and (2) calculate the savings that can be achieved from the current water conservation standards. Other indoor uses of potable water are those in non-residential facilities, as well as smaller amounts of indoor use in recreational and other public spaces. These non-residential land use types also have a set of state green building code requirements (including water conservation standards) that will be implemented for water fixtures that are used within any indoor structures that are present on these land parcels.

The indoor demand factors for residences were scaled to provide calculations of water savings for indoor water uses in non-residential planning areas. As shown in Table 9, GSI used the 0.57 average value of the new-to-historical indoor water use rates for residences (as listed at the bottom of Table 8) as the reduction factor that likely can be achieved under current conservation standards for indoor water uses in parks, commercial developments, and schools. (As shown in Table 9, VWD's duty factors for interior demands in irrigated fuel modification zones and at public facilities [water tanks] have not been changed, on the assumption that they will pertain to actual on-the-ground uses of water in those areas.)

4.7 Comparison of Indoor Demand Factors With and Without Conservation Measures

For each land use category, Table 10 compares the indoor demand factors with and without implementation of current water conservation measures. The comparison is shown as reductions in the gpd/acre indoor demand factor values, and also as the percentage reduction in indoor use compared with the sewer generation factors used in the WSA&V update for the Newland Sierra proposed community. A summary is as follows:

- **Residential land uses.** The reductions range from 275 gpd/acre to 1,545 gpd/acre, corresponding to a 36 percent to 48 percent reduction in indoor use. Across the aggregate group of all residential planning areas (combined), the average reduction is 750 gpd/acre, which corresponds to an average reduction of 43 percent compared with the WSA&V update.
- **Parks.** The reduction is 105 gpd/acre, which is a 42 percent reduction compared with the WSA&V update.
- **Commercial.** The reduction is 515 gpd/acre, which is a 43 percent reduction compared with the WSA&V update.
- **Schools.** The reduction is 340 gpd/acre, which is a 43 percent reduction compared with the WSA&V update.
- **Other Areas.** The analysis assumes that no reductions in the indoor demand factors will occur in irrigated fuel modification areas and at public facilities (water tanks). Backbone roads, open spaces, and non-irrigated fuel modification areas have no indoor water use under the WSA&V update.

5.0 Reductions in Outdoor Water Demand Factors

The primary uses of water outdoors will consist of maintaining full swimming pools and irrigating landscapes. This section of the technical memorandum presents water demand factors for swimming pools (Section 5.1) and irrigation (Section 5.2); summarizes the changes in outdoor water demand factors that can occur with implementation of current water conservation measures (Section 5.3); and discusses "land use deductions" that eliminate water demands in open spaces and non-irrigated field modification zones because of the Project applicant's plan to dedicate these areas to the County (Section 5.4).

5.1 Demand Factors for Non-Irrigation Outdoor Water Uses

Demand factors for swimming pools are not explicitly defined in VWD's water duty factors and hence required an independent evaluation for the Newland Sierra proposed community. Pools will be present in certain residential lots and in certain parks as follows:

- **Residential Lots.** According to the Project applicant, the installation of swimming pools on residential lots will occur at a homeowner's discretion either as part of the primary purchase or after the house has been constructed and sold. Based on the design standards for residential lots that are presented in the Newland Sierra Specific Plan (Dudek and Newland Sierra, LLC, 2016), only certain lots will have sufficient backyard space to allow for installation of a pool, including moving heavy equipment between the house and the side lot line to allow for excavation of the pool. Accordingly, the Project applicant has estimated that no more than half (and likely fewer) of the lowest-density lots (2 to 4 dwelling units per acre) and no more than one-quarter to one-third of the next

lowest-density lots (4 to 8 dwelling units per acre) are likely to have pools installed. On each of these lots, the setbacks of lot lines from the housing structure likely will limit the size of a pool to an average of about 200 square feet, which is equivalent to a rectangular pool that is 20 feet long and 10 feet wide. Lots with 8 or more dwelling units per acre will not have pools installed because of space constraints on these lots.

- **Community Parks.** The design specifications presented in the Specific Plan (Dudek and Newland Sierra, LLC, 2016) identify the installation of pools in three community parks (Mesa Park, Peak's Park, and Valley Green Park). Concept plans for Mesa Park and Peak's Park suggest that the pools could be on the order of 2,000 to 2,500 square feet in size at their largest, which is equivalent to a rectangular pool that is on the order of 25x100 feet or 30x80 feet at its largest. These sizes are larger than pools commonly found in hotels and apartment complexes, but are reasonable for neighborhood recreation centers and community gathering spaces. The concept plan for Valley Green Park suggests that its pool will be much smaller. GSI has assumed that the pool sizes will be approximately 2,250 square feet at Mesa Park and Peak's Park and half that size at Valley Green Park.

Using these pool sizes, annual and average daily water demands were calculated by applying a demand factor to the surface area of each pool. The demand factor (in units of feet per year per square foot of swimming pool size) was defined as being twice the annual reference evapotranspiration rate of 54.2 inches/year for Escondido, and rounded upwards to the nearest 1 foot of water demand. This corresponds to a value of 120 inches per year, or 10 feet per year, and is based on the assumption that swimming, splashing, and maintenance activities will require more water use than is due solely to evaporation from the water surface of the pool. This demand factor then was applied to each of the large-lot residential land use categories and the community parks to derive demand values in units of gpd and gpd/acre; see Table 11 for these details.

5.2 Demand Factors for Landscape Irrigation

As discussed in Section 2.3, the 2015 MWELO specifies the reference evapotranspiration (ETo) rates for healthy turf grass in Escondido that must be used at Newland Sierra as the basis for calculating maximum allowable irrigation application rates (MAWA values) for landscapes being irrigated with potable water.[1] Using the 2015 MWELO-specified ETo value of 54.2 inches per year for Escondido (which is based on data from CIMIS station Escondido SPV #153), landscapes inside the Newland Sierra proposed community must limit annual irrigation volumes of potable water to MAWA values of 29.8 inches per year in residential landscapes (based on 55 percent of ETo), and 24.4 inches per year in non-residential landscapes (based on 45 percent of

[1] Section 491.mmm of the rule defines reference evapotranspiration as an estimate of the amount of evapotranspiration occurring from a large field of 4-inch to 7-inch tall cool-season grass that is well watered. ETo differs from one location to another, as listed in Appendix A of the 2015 MWELO.

ETo). Table 12 summarizes the annual and monthly ETo values for Escondido, as listed in Appendix A of the 2015 MWELO ordinance.

For each land use category, Table 13 presents details regarding the landscape design, including:

- The percentage of each land use category that is comprised of irrigated landscape and the percentage that is turf versus other plantings;
- The acreage details (gross, irrigated, turf, SLAs, and other plantings);
- The MAWA calculations for SLAs, turf, and other plantings (in units of acre-feet per year and gallons per year); and
- The ETWU values (the actual irrigation demand factors) for each landscape, based on the specific designs and plant selections developed by the Project applicant and Schmidt Design Group; see Attachment 1 for details.

Inherent in the calculation of irrigation-specific outdoor water demand factors is the assumption that no recycling of water supplies will occur to provide irrigation water supplies inside Newland Sierra. However, as discussed in Section 3.4.3 of the Specific Plan (Dudek and Newland Sierra, LLC, 2016), the design of the Newland Sierra proposed community specifies that grey water systems will be plumbed into detached homes (i.e., single-family residences), to provide grey water for re-use in yards. These systems can reduce sewage flow by 70 percent, and include installation of in-ground collection tanks and a grey water treatment system that is NSF/ANSI-350 certified. Nonetheless, as is the case with the WSA&V demand calculations, the calculations of irrigation water demands assume that raw potable water supplies will be necessary for all residential landscape irrigation. If at a future time the County has permitting mechanisms in place to allow activation of the plumbed grey water systems, then irrigation water demands will be lower than assumed in the demand calculations presented in the WSA&V update and in this study.

5.3 Comparison of Outdoor Demand Factors With and Without Conservation Measures

For each land use category, Table 14 shows the two individual outdoor water demand factors (swimming pools and irrigation) and the total outdoor water demand factors. Table 15 compares the total outdoor demand factors with and without the implementation of current water conservation measures. The comparison is shown as reductions in the gpd/acre outdoor demand factor values, and also as the percentage reduction in outdoor use compared with the outdoor demand factors used in the WSA&V update. A summary is as follows:

- **Residential land uses.** The reductions range from 45 gpd/acre to 1,560 gpd/acre, corresponding to a 6 percent to 78 percent reduction in outdoor use. Across the aggregate group of all residential lands (combined), the average reduction is 540 gpd/acre, which corresponds to an average reduction of 35 percent compared with the WSA&V update.

- **Parks.** The reduction is 135 gpd/acre, which is an 11 percent reduction compared with the WSA&V update.
- **Commercial.** An increase of 20 gpd/acre occurs, which is a 7 percent increase compared with the WSA&V update.
- **Schools.** An increase of 320 gpd/acre occurs, which is a 160 percent increase compared with the WSA&V update.
- **Backbone roads.** An increase of 180 gpd/acre occurs, which is a 90 percent increase compared with the WSA&V update.
- **Irrigated fuel modification areas.** The reduction is 170 gpd/acre, which is a 14 percent reduction compared with the WSA&V update.
- **Other Areas.** The analysis assumes that water uses at public facilities (water tanks) will be the same as estimated in the WSA&V update (200 gpd/acre), thereby corresponding to no reduction in this water demand factor.

5.4 Land Use Deductions

Because no outdoor water use will occur in open spaces and non-irrigated fuel modification areas, a reduction of 200 gpd/acre (100 percent) occurs in their outdoor water use factors.

The Project applicant will dedicate 1,587.2 acres of open space to the County. Of that, 1,209 acres will be put into an open space easement to the County or a third party entity with an endowment to be managed by a conservancy as a biological open space preserve. This leaves 378.2 acres that will be a 250 foot wide buffer zone of fuel modification for fire protection purposes. The first 100 feet (Zone 1), or 131 acres, of that fuel modification zone will be irrigated. The remaining 150 feet (Zone 2), or 272.2 acres will be native habitat that is thinned 50 percent. This area is not irrigated.

VWD's Master Plan assigns a duty factor of 200 gpd/acre for open space as a general place-holder in their estimate of water demand. When the land use plan for the Newland Sierra proposed community is adopted by the County Board of Supervisors through the EIR and other entitlement documents, the Project applicant will be required by the County to dedicate this open space and fuel management zone **prior to occupancy of the first home**.

Therefore it is appropriate to not include an estimated water demand of 200 gpd/acre (291,240 gpd) for the permanent 1,209 acres of biological open space and the 272.2 acres in Zone 2 that are non-irrigated fuel modification zones in the estimate of total water demand for the Newland Sierra proposed community.

6.0 Calculated Volumes of Water Saved Under Current Water Conservation Standards

Table 16 shows the new indoor, outdoor, and total water demand factors for each land use category that reflect the implementation of current water conservation measures. The water demands and concurrent water savings that result from implementing current water conservation measures were calculated for two separate settings that involve differences in the assumptions regarding water use needs in open spaces and in non-irrigated fuel modification zones. The specific settings are as follows:

1. In the WSA&V setting, both of these planning areas (open spaces and non-irrigated fuel modification zones) have indoor water uses but no outdoor water uses. Together, these two planning areas comprise 1,456.2 acres, with demand factors of 200 gpd/acre and a corresponding combined water demand of 291,240 gpd (or 326 afy). See Table 17 for the resulting water demand calculations, which show a total demand in Newland Sierra of 1,068,220 gpd (or 1,196 afy) for this setting.

2. The second setting involves taking "land use deductions" in which the outdoor water uses are eliminated for open spaces and non-irrigated fuel modification zones (as discussed in Section 5.4), resulting in no water demands and hence a corresponding removal of 291,240 gpd (or 326 afy) from the water demand estimates. See Table 18 for the resulting water demand calculations, which show a total demand in Newland Sierra of 776,980 gpd (or 870 afy) for this setting when coupled with conservation measures.

Table 19 compares the demand calculations for these two settings with the demands presented in the WSA&V update and the demands that are based on the County's General Plan (and presented in VWD's 2015 UWMP [VWD, 2016] and its 2014 Draft Water, Wastewater and Recycled Water Master Plan). Table 19 presents this comparison on an average daily basis (in units of gpd), and Table 20 presents the same comparison on an annual basis (in units of afy). Key observations from these comparisons are as follows:

- Compared with the WSA&V update's demand estimate of 1,450,160 gpd (or 1,624 afy):
    - The Newland Sierra water demand of 1,068,220 gpd (or 1,196 afy) produced by water conservation alone is 381,940 gpd (or 428 afy) lower, which is a reduction of approximately 26 percent compared with the WSA&V update estimate.
    - By accounting for the land use deductions, which eliminate an additional 291,240 gpd (or 326 afy) of water demand from open spaces and non-irrigated fuel modification zones, the calculated water demand in Newland Sierra (776,980 gpd, or 870 afy) is 673,180 gpd (or 754 afy) lower, which is a reduction of approximately 46 percent compared with the WSA&V update estimate.

- Compared with the estimates that are based on the County's General Plan:
    - The WSA&V update has 179,040 gpd (or 201 afy) less water use (11 percent lower than the General Plan).
    - The land use deductions produce an additional 18 percent reduction in water demand, for a total 29 percent reduction compared with the General Plan.
    - The implementation of current water conservation measures produces a 560,980 gpd (or 629 afy) reduction in water demand, without considering the effects of the land use deductions.
    - The combined effect of the water conservation measures and the land use deductions is to decrease water demands by 852,220 gpd (or 955 afy), which is a 52 percent reduction from the estimate contained in the General Plan.

In summary, through implementation of water conservation measures and removal of irrigation from open spaces and non-irrigated fuel modification zones, total water demand in Newland Sierra is calculated to be 776,980 gpd on an average daily basis (Table 19) and 870 afy on an annual basis (Table 20), which reduces water demands by 673,180 gpd (or 754 afy) compared with the WSA&V update and by 852,220 gpd (or 955 afy) compared with the General Plan. These decreases in water demand amount to 46 percent and 52 percent reductions, respectively, from the WSA&V update and General Plan water demand estimates.

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TABLES

Table ES-1
Water Demand Comparison for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Water Demand Planning Document	Land Use	Current Conservation Measures?	Total Demand (gallons/day)	Volumetric Reduction (gallons/day) Compared With VWD's 2015 UWMP	Volumetric Reduction (gallons/day) Compared With WSA&V Update for Newland Sierra	Percent Reduction Compared With VWD's 2015 UWMP	Percent Reduction Compared With WSA&V Update for Newland Sierra
VWD 2015 UWMP / Draft 2014 Master Plan	San Diego County General Plan	No	1,629,200	---	---	---	---
Newland Sierra WSA&V	Newland Sierra Specific Plan		1,450,160	179,040	---	11%	---
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		1,158,920	470,280	291,240	29%	20%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan without deductions[1]	Yes	1,068,220	560,980	381,940	34%	26%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		776,980	852,220	673,180	52%	46%

Notes

[1] Deductions consist of eliminating water uses in open spaces and non-irrigated fuel modification zones, equating to 1,456.2 acres at 200 gallons/day/acre = 291,240 gallons/day.

Abbreviations

UWMP = Urban Water Management Plan VWD = Vallecitos Water District WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table ES-2
Annual Water Demand Comparison for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Water Demand Planning Document	Land Use	Current Conservation Measures?	Annual Total Demand (afy)	Annual Volumetric Reduction (afy) Compared With VWD's 2015 UWMP	Annual Volumetric Reduction (afy) Compared With WSA&V Update for Newland Sierra	Percent Reduction Compared With VWD's 2015 UWMP	Percent Reduction Compared With WSA&V Update for Newland Sierra
VWD 2015 UWMP / Draft 2014 Master Plan	San Diego County General Plan	No	1,825	---	---	---	---
Newland Sierra WSA&V	Newland Sierra Specific Plan		1,624	201	---	11%	---
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		1,298	527	326	29%	20%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan without deductions[1]	Yes	1,196	629	428	34%	26%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		870	955	754	52%	46%

Notes

[1] Deductions consist of eliminating water uses in open spaces and non-irrigated fuel modification zones, equating to 1,456.2 acres at 200 gallons/day/acre = 291,240 gallons/day = 326 afy.

Abbreviations

afy = acre-feet per year UWMP = Urban Water Management Plan VWD = Vallecitos Water District WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 1
WSA&V Update of Estimated Water Demands for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Planning Area	Planning Area Acreage	2014 Unit Water Demand Factor Used in the WSA&V Update (Gallons Per Day Per Acre)[1]	WSA&V Update of Total Water Demand Estimate (Gallons Per Day)	WSA&V Update of Total Water Demand Estimate (Acre-Feet Per Year)
Single Family (2-4 du/ac)	35.4	1,800	63,720	71.3
Single Family (4-8 du/ac)	192.7	2,500	481,750	539.6
Multi-Family (2-4 du/ac)	14.9	1,800	26,820	30.0
Multi-Family (4-8 du/ac)	4.8	2,500	12,000	13.5
Multi-Family (8-12 du/ac)	6.1	2,800	17,080	19.1
Multi-Family (12-15 du/ac)	31.0	4,500	139,500	156.2
Multi-Family (15-20 du/ac)	28.4	5,000	142,000	159.1
Parks	35.9	1,500	53,850	60.3
Commercial	7.4	1,500	11,100	12.4
School	3.6	1,000	3,600	4.0
Open Space	1,209.0	200	241,800	270.8
Backbone Roads	34.0	200	6,800	7.6
Fuel Modification - Irrigated	131.0	1,500	196,500	220.1
Fuel Modification - Non-Irrigated	247.2	200	49,440	55.4
Public Facilities (Water Tanks)	4.2	1,000	4,200	4.7
TOTAL	**1,985.6**		**1,450,160**	**1,624.1**

[1] As defined in the Vallecitos Water District 2014 Draft Water, Wastewater and Recycled Water Master Plan.

Note: du/ac = dwelling units per acre WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 2

Detailed Land Use Plan and Detailed WSA&V Update of Water Demand Estimates

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

Planning Area	Neighborhood	Planning Area Acreage	Total Acreage by Planning Area Category	No. of DU's	No. of Persons	WSA&V Update of Total Demand Factor (gpd/ac)	WSA&V Update of Total Water Demands (gpd)	WSA&V Update of Indoor Demand Factor (gpd/ac)	WSA&V Update of Indoor Water Demands (gpd)	WSA&V Update of Outdoor Demand Factor (gpd/ac)	WSA&V Update of Indoor Water Demands (gpd)
Single Family (2-4 du/ac)	Summit	35.4	35.4	101	329	1,800	63,720	750	26,550	1,050	37,170
Single Family (4-8 du/ac)	Valley	32.0	192.7	188	613	2,500	80,000	1,300	41,600	1,200	38,400
	Hillside	36.5		241	786	2,500	91,250	1,300	47,450	1,200	43,800
	Mesa	53.6		265	864	2,500	134,000	1,300	69,680	1,200	64,320
	Lower Knoll	44.5		203	662	2,500	111,250	1,300	57,850	1,200	53,400
	Upper Knoll	26.1		139	453	2,500	65,250	1,300	33,930	1,200	31,320
Multi-Family (2-4 du/ac)	Summit	14.9	14.9	50	118	1,800	26,820	750	11,175	1,050	15,645
Multi-Family (4-8 du/ac)	Lower Knoll	4.8	4.8	30	71	2,500	12,000	1,300	6,240	1,200	5,760
Multi-Family (8-12 du/ac)	Mesa	6.1	6.1	60	142	2,800	17,080	2,100	12,810	700	4,270
Multi-Family (12-15 du/ac)	Town Center	7.2	31.0	95	224	4,500	32,400	2,500	18,000	2,000	14,400
	Valley	23.8		317	748	4,500	107,100	2,500	59,500	2,000	47,600
	Terraces	0				4,500	0	2,500	0	2,000	0
Multi-Family (15-20 du/ac)	Terraces	28.4	28.4	446	1,053	5,000	142,000	3,300	93,720	1,700	48,280
Parks	Town Center	5.7	35.9			1,500	8,550	250	1,425	1,250	7,125
	Valley	12.3				1,500	18,450	250	3,075	1,250	15,375
	Hillside	2.3				1,500	3,450	250	575	1,250	2,875
	Mesa	4.1				1,500	6,150	250	1,025	1,250	5,125
	Lower Knoll	8.9				1,500	13,350	250	2,225	1,250	11,125
	Upper Knoll	0.6				1,500	900	250	150	1,250	750
	Summit	2.0				1,500	3,000	250	500	1,250	2,500
Commercial	Town Center	7.4	7.4			1,500	11,100	1,200	8,880	300	2,220
School	Town Center	3.6	3.6			1,000	3,600	800	2,880	200	720
Open Space	Twin Oaks Zone	195.7	1,209.0			200	39,140	0	0	200	39,140
	North 1228 Zone	349.0				200	69,800	0	0	200	69,800
	Proposed 1475 Zone	200.9				200	40,180	0	0	200	40,180
	Coggan 1608 Zone	463.4				200	92,680	0	0	200	92,680
Backbone Roads	Twin Oaks Zone	4.5	34.0			200	900	0	0	200	900
	North 1228 Zone	9				200	1,800	0	0	200	1,800
	Proposed 1475 Zone	15.8				200	3,160	0	0	200	3,160
	Coggan 1608 Zone	4.7				200	940	0	0	200	940
Fuel Modification - Irrigated	Deer Springs 1235 Zone	32.4	131.0			1,500	48,600	250	8,100	1,250	40,500
	Proposed 1475 Zone	72.4				1,500	108,600	250	18,100	1,250	90,500
	Coggan 1608 Zone	26.2				1,500	39,300	250	6,550	1,250	32,750
Fuel Modification - Non-Irrigated	Deer Springs 1235 Zone	60.5	247.2			200	12,100	0	0	200	12,100
	Proposed 1475 Zone	147.8				200	29,560	0	0	200	29,560
	Coggan 1608 Zone	38.9				200	7,780	0	0	200	7,780
Public Facilities (Water Tanks)	Proposed 1475 Zone	1.3	4.2			1,000	1,300	800	1,040	200	260
	Summit	2.9				1,000	2,900	800	2,320	200	580
TOTAL		**1,985.6**	**1,985.6**	**2,135**	**6,063**		**1,450,160**		**535,350**		**914,810**

DU = dwelling unit gpd = gallons per day gpd/ac = gpd per acre PPHH = persons per household

WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

2.84 Average Population Density, PPHH

3.26 Average Population Density for Single-Family, PPHH

2.36 Average Population Density for Multi-Family, PPHH

Table 3

Indoor-Use Component of the WSA&V Update of Estimated Water Demands for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

Planning Area	Planning Area Acreage	2014 Sewer Generation Factor (Gallons Per Day Per Acre)[1]	Estimated Indoor Water Demand (Gallons Per Day)	Estimated Indoor Water Demand (Acre-Feet Per Year)
Single Family (2-4 du/ac)	35.4	750	26,550	29.7
Single Family (4-8 du/ac)	192.7	1,300	250,510	280.6
Multi-Family (2-4 du/ac)	14.9	750	11,175	12.5
Multi-Family (4-8 du/ac)	4.8	1,300	6,240	7.0
Multi-Family (8-12 du/ac)	6.1	2,100	12,810	14.3
Multi-Family (12-15 du/ac)	31.0	2,500	77,500	86.8
Multi-Family (15-20 du/ac)	28.4	3,300	93,720	105.0
Parks	35.9	250	8,975	10.0
Commercial	7.4	1,200	8,880	9.9
School	3.6	800	2,880	3.2
Open Space	1,209.0	0	0	0.0
Backbone Roads	34.0	0	0	0.0
Fuel Modification - Irrigated	131.0	250	32,750	36.6
Fuel Modification - Non-Irrigated	247.2	0	0	0.0
Public Facilities (Water Tanks)	4.2	800	3,360	3.8
TOTAL	**1,985.6**		**535,350**	**599.6**

[1] As defined in the Newland Sierra Sewer Master Plan, which references the Vallecitos Water District 2008 Water, Wastewater and Recycled Water Master Plan Update.

Note: du/ac = dwelling units per acre WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 4

Outdoor-Use Component of the WSA&V Update of Estimated Water Demands for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

Planning Area	Planning Area Acreage	2014 Outdoor Water Demand Factor (Gallons Per Day Per Acre)[1]	Estimated Outdoor Water Demand (Gallons Per Day)	Estimated Outdoor Water Demand (Acre-Feet Per Year)
Single Family (2-4 du/ac)	35.4	1,050	37,170	41.6
Single Family (4-8 du/ac)	192.7	1,200	231,240	259.0
Multi-Family (2-4 du/ac)	14.9	1,050	15,645	17.5
Multi-Family (4-8 du/ac)	4.8	1,200	5,760	6.5
Multi-Family (8-12 du/ac)	6.1	700	4,270	4.8
Multi-Family (12-15 du/ac)	31.0	2,000	62,000	69.4
Multi-Family (15-20 du/ac)	28.4	1,700	48,280	54.1
Parks	35.9	1,250	44,875	50.2
Commercial	7.4	300	2,220	2.5
School	3.6	200	720	0.8
Open Space	1,209.0	200	241,800	270.8
Backbone Roads	34.0	200	6,800	7.6
Fuel Modification - Irrigated	131.0	1,250	163,750	183.4
Fuel Modification - Non-Irrigated	247.2	200	49,440	55.4
Public Facilities (Water Tanks)	4.2	200	840	0.9
TOTAL	**1,985.6**		**914,810**	**1,024.7**

[1] Calculated as the difference between the Vallecitos Water District's 2014 Duty Factor (for total demands) and Sewer Generation Factor (for indoor demands and sewer generation rates).

Note: du/ac = dwelling units per acre WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 5

WSA&V Update of Estimated Indoor, Outdoor, and Total Water Demands for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

Planning Area	Planning Area Acreage	WSA&V Estimate of Indoor Water Demand (Gallons Per Day)	WSA&V Estimate of Outdoor Water Demand (Gallons Per Day)	WSA&V Estimate of Total Water Demand (Gallons Per Day)
Single Family (2-4 du/ac)	35.4	26,550	37,170	63,720
Single Family (4-8 du/ac)	192.7	250,510	231,240	481,750
Multi-Family (2-4 du/ac)	14.9	11,175	15,645	26,820
Multi-Family (4-8 du/ac)	4.8	6,240	5,760	12,000
Multi-Family (8-12 du/ac)	6.1	12,810	4,270	17,080
Multi-Family (12-15 du/ac)	31.0	77,500	62,000	139,500
Multi-Family (15-20 du/ac)	28.4	93,720	48,280	142,000
Parks	35.9	8,975	44,875	53,850
Commercial	7.4	8,880	2,220	11,100
School	3.6	2,880	720	3,600
Open Space	1,209.0	0	241,800	241,800
Backbone Roads	34.0	0	6,800	6,800
Fuel Modification - Irrigated	131.0	32,750	163,750	196,500
Fuel Modification - Non-Irrigated	247.2	0	49,440	49,440
Public Facilities (Water Tanks)	4.2	3,360	840	4,200
TOTAL	**1,985.6**	**535,350**	**914,810**	**1,450,160**

Note: du/ac = dwelling units per acre WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 6

State and Local Laws, Codes, and Other Requirements for Water-Use Efficiency Enacted Since 2006

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

Year	Who	Description	What	Applicable To	Compliance Date or Effective Date
STATE					
2006	California State Assembly	AB 1881	Water Conservation in Landscaping Act of 2006	Local agencies (cities, counties, and/or water purveyors)	1/1/2010 compliance date
2007	California State Assembly	AB 715	Toilets and urinals	New sales and new installations	1/1/2014 effective date
2009	California State Senate	SB 407	Toilets, urinals, showerheads, and interior faucets	Buildings constructed on or before January 1, 1994	1/1/2017 compliance date for single-family residences 1/1/2019 compliance date for multi-family residences and commercial properties
2009	California State Senate	SBX7-7	Reductions in gallons per capita per day	Statewide water use	12/31/2020 compliance date
2009	California Department of Water Resources (DWR)	Updated Model Water Efficient Landscape Ordinance (MWELO)	Landscape irrigation (system design, scheduling, and application rates); plant selection; landscape maintenance	Landscapes that require a building or landscape permit	9/10/2009 adoption date
2010	California Building Standards Commission	CALGreen Building Standards Code	Indoor and outdoor water use standards	New construction	1/1/2011 effective date
2013	California Building Standards Commission	Update to CALGreen Building Standards Code	Indoor and outdoor water use standards	New construction	1/1/2014 effective date
2015	Governor	Executive Order B-29-15	Drought-related order that included a directive to DWR to update the MWELO	Landscapes that require a building or landscape permit	4/1/2015 issuance date
2015	California Department of Water Resources (DWR)	Updated Model Water Efficient Landscape Ordinance (MWELO)	Landscape irrigation (system design, scheduling, and application rates); plant selection; landscape maintenance	Landscapes that require a building or landscape permit	7/15/2015 adoption date 9/15/2015 effective date
LOCAL					
2010	San Diego County	Landscaping Ordinance	Water conservation requirements in landscaping	City of San Diego Water Department Service Area	1/13/2010 effective date
2013	San Diego County Water Authority	WaterSmart Program	Voluntary program promoting water conservation tips and incentives; focus on water fixtures and landscaping	Existing buildings	N/A
2016	San Diego County	Local Amendments to 2013 California Codes	Water conservation requirements in landscaping	City of San Diego Water Department Service Area	5/6/2016 effective date
N/A	San Diego County	Green Building Incentive Program	Voluntary green building incentives, gray water system incentives	New construction	N/A

Abbreviations

SBX7 = Senate Bill during Extended Session 7 of the 2009 Session SB = Senate Bill AB = Assembly Bill

N/A = Not Available.

Table 7

Indoor Residential Water Use Details for Single-Family Dwellings[a]

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

		City of San Diego				Las Virgenes MWD and Walnut Valley WD						
Description	**Units**	**1997/1998 Calculated Use** (Calculated by GSI from User Survey)[c]	*Source*	**1997/1998 Literature Value** (Modeled From Utility Data)[b]	*Source*	**1997/1998 Calculated Use** (Calculated by GSI from User Survey)[c]	*Source*	**1997/1998 Literature Value** (Modeled From Utility Data)[b]	*Source*	**Modern-Day Plumbing Code Values With Conservation** (CALGreen)[d]	*Source*	**Reductions Arising From Plumbing Code** Compared with 1997/98 Calculated Use in Las Virgenes and Walnut Valley[e]
Toilet												
flush volume	gal per flush	2.88	*1*			3.35	*1*			1.28	*4*	
flushes	per capita per day	5.20	*1*			4.71	*1*			[h]		
Toilet total	***gpcpd***[f]	***15.0***	*3*	***15.8***	*1*	***15.8***	*3*	***16.85***	*1*	***6.0***	*3*	***-9.7 to -10.8***
Showers and Baths												
frequency	per capita per day	0.63	*1*			0.74	*1*			[h]		
duration	minutes per event	7.90	*1*			8.15	*1*			[h]		
flow rate	gpm[g]	2.0	*1*			2.1	*1*			2.0	*4*	
Bathing total	***gpcpd***	***9.7***	*3*	***9.5***	*1*	***12.9***	*3*	***12.70***	*1*	***12.1***	*3*	***-0.8 to -0.6***
Faucet												
duration	minutes per capita per day	8.1	*1*			8.6	*1*			[h]		
flow rate	gpm	2.5	*2*			2.5	*2*			1.5	*4*	
Faucet total	***gpcpd***	***20.3***	*3*	***10.8***	*1*	***21.5***	*3*	***11.75***	*1*	***12.9***	*3*	***-8.6 to 1.2***
Dishwasher												
frequency	per capita per day	0.10	*1*			0.08	*1*			[h]		
volume	gal per cycle	40.9	*2*			40.9	*2*			4.25	*4*	
Dishwasher total	***gpcpd***	***4.1***	*3*	***0.9***	*1*	***3.3***	*3*	***0.85***	*1*	***0.3***	*3*	***-2.9 to -0.5***
Clothes washer machine												
frequency	cycle per capita per day	0.42	*1*			0.37	*1*			[h]		
volume	gal per cycle	42.7	*1*			47.6	*1*			18	*4*[i]	
Washer total	***gpcpd***	***17.9***	*3*	***16.3***	*1*	***17.6***	*3*	***15.45***	*1*	***6.7***	*3*	***-11.0 to -8.8***
Other indoor use												
other domestic use	gpcpd	1.7	*1*	0.3	*1*	1.7	*1*	1.7	*1*	[h]		
leaks	gpcpd	4.6	*1*	4.6	*1*	9.4	*1*	9.4	*1*	[h]		
Other Indoor Total	***gpcpd***	***6.3***	*3*	***4.9***	*3*	***11.1***	*3*	***11.1***	*3*	***11.1***		***0.0 to 0.0***
Total Indoor Water Use	**gpcpd**	**73.3**	*1*	**58.2**	*1*	**82.1**	*1*	**68.7**	*1*	**49.1**	*3*	**-33.1 to -19.6**

Notes

a All values presented are based on averages of data from the Las Virgenes Municipal Water District (in Calabasas, CA) and the Walnut Valley Water District (in West Covina, CA).
b Totals from individual uses are as presented in AWWARF (1999), as modeled from utility data. Values are for single family houses.
c Totals from individual uses are calculated from flow and user behavior as indicated in the report (AWWARF, 1999). Values are for single family houses.
d Totals from individual uses are calculated from user behavior as indicated in the report (AWWARF, 1999), and flow data in CALGreen building standards (CBSC, 2015). Values are for single family houses.
e Difference is between values calculated in the same way (from behavior and flow data).
f gpcpd = gallons per capita per day
g gpm = gallons per minute
h Assumes fixtures have changed since 1990's, but indoor water use behavior has not. Calculation uses 1997/1998 behavior data.
i Based on energy-star high efficiency appliance. Not required by CALGreen, but assumed to be average use of modern-day appliance.

Sources

1 Average of data collected in 1997 and 1998 from Walnut Valley, CA and Las Virgenes, CA, published in a study sponsored by the AWWA Research Foundation (AWWARF, 1999).
2 Standards from 1992, as published by the California Homebuilding Foundation (CONSOL, 2015).
3 Calculated value.
4 Value listed in the 2015 supplement to the CALGreen 2013 Green Building Code (CBSC, 2015).

Table 8

Indoor Water Demand Factors for Residential Development at Newland Sierra, With and Without Current Conservation Measures

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

	Without Current Conservation Measures			With Current Conservation Measures		Comparison		
Planning Area	Historic Indoor Water Use Factors From AWWARF Studies and Building Standards (Residential Only)[a] (gpcpd)	VWD 2014 Sewer Generation Factors (Residential Only)[b] (gpcpd)	VWD 2014 Sewer Generation Factors (Residential Only)[b] (gpd/acre)	New Indoor Water Use Factors With Conservation Measures (Residential Only)[c] (gpcpd)	New Indoor Water Use Factors With Conservation Measures (Residential Only)[c] (gpd/acre)	Difference Between VWD and New Indoor Use Factors (Savings, gpcpd)	Difference Between VWD and New Indoor Use Factors (Savings, gpd/acre)	Ratio of New to VWD Indoor Use Factors
Single Family (2-4 du/ac)	67-82	80.7	750	50.9	475	29.8	275	0.63
Single Family (4-8 du/ac)	62-76	74.2	1,300	47.3	830	26.9	470	0.64
Multi-Family (2-4 du/ac)	67-82	94.7	750	50.9	405	43.8	345	0.54
Multi-Family (4-8 du/ac)	62-76	87.9	1,300	47.3	700	40.6	600	0.54
Multi-Family (8-12 du/ac)	62-76	90.2	2,100	47.3	1,100	42.9	1,000	0.52
Multi-Family (12-15 du/ac)	62-76	79.7	2,500	47.3	1,485	32.4	1,015	0.59
Multi-Family (15-20 du/ac)	62-76	89.0	3,300	47.3	1,755	41.7	1,545	0.53
					Average:	**36.9**	**750**	**0.57**

Notes

[a] Historical estimates from literature are based on AWWARF surveys of single family homes in the Walnut Valley Water District and the Las Virgenes Municipal Water District, 1997/1998.

[b] 2014 indoor water use factors are based on VWD's sewer generation factors as presented in the Newland Sierra Master Sewer Plan (Dexter Wilson Engineering, August 3, 2016).

[c] Modern day use is based on mandatory flow restrictions for plumbing fixtures in the 2013 CALGreen Code (including the 2015 supplement [CBSC, 2015]).
Values have been multiplied by 1.036 to account for a 3.6% system and billing loss rate reported by VWD (2016) for its potable water delivered by SDCWA, as reported in VWD's 2015 Urban Water Management Plan.

Abbreviations

AWWARF = American Water Works Association Research Foundation
CBSC = California Building Standards Commission
gpcpd = gallons per capita per day
gpd/acre = gallons per day per acre
SDCWA = San Diego County Water Authority
VWD = Vallecitos Water District

Table 9

Indoor Water Demand Factors for Non-Residential Development at Newland Sierra, With and Without Current Water Conservation Standards

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

	VWD DEMAND FACTORS (Without Current Conservation Measures)		NEW DEMAND FACTORS (With Current Conservation Measures)			
	Interior Use		Interior Use		Ratio	
Planning Area	Units	Factor	Units	Factor	(New / VWD)	Rationale
Parks	gpd/acre	250	gpd/acre	145	58.0%	Similar to 57% Ratio for Residences
Commercial	gpd/acre	1,200	gpd/acre	685	57.1%	Similar to 57% Ratio for Residences
School	gpd/acre	800	gpd/acre	460	57.5%	Similar to 57% Ratio for Residences
Open Space	gpd/acre	0	gpd/acre	0	---	No Interior Water Use
Backbone Roads	gpd/acre	0	gpd/acre	0	---	No Interior Water Use
Fuel Modification - Irrigated	gpd/acre	250	gpd/acre	250	100%	No Change
Fuel Modification - Non-Irrigated	gpd/acre	0	gpd/acre	0	---	No Interior Water Use
Public Facilities (Water Tanks)	gpd/acre	800	gpd/acre	800	100%	No Change

gpd/acre = gallons per day per acre

Table 10
Reduction in Indoor Water Demand Factors Arising from Conservation Measures

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Planning Area	2014 Sewer Generation Factor Used in the WSA&V Update (Gallons Per Day Per Acre)[1]	Indoor Water Demand Factor with Water Conservation Measures (Gallons Per Day Per Acre)	Reduction Arising From Water Conservation Measures (Gallons Per Day Per Acre)	Reduction as a Percentage of 2014 Indoor Water Demand Factor
Single Family (2-4 du/ac)	750	475	275	37%
Single Family (4-8 du/ac)	1,300	830	470	36%
Multi-Family (2-4 du/ac)	750	405	345	46%
Multi-Family (4-8 du/ac)	1,300	700	600	46%
Multi-Family (8-12 du/ac)	2,100	1,100	1,000	48%
Multi-Family (12-15 du/ac)	2,500	1,485	1,015	41%
Multi-Family (15-20 du/ac)	3,300	1,755	1,545	47%
Parks	250	145	105	42%
Commercial	1,200	685	515	43%
School	800	460	340	43%
Open Space	0	0	0	0%
Backbone Roads	0	0	0	0%
Fuel Modification - Irrigated	250	250	0	0%
Fuel Modification - Non-Irrigated	0	0	0	0%
Public Facilities (Water Tanks)	800	800	0	0%

[1] Calculated as the difference between the Vallecitos Water District's 2014 Duty Factor (for total demands) and Sewer Generation Factor (for indoor demands and sewer generation rates).

Note: du/ac = dwelling units per acre WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 11
Estimated Water Demand Factors for Swimming Pools at Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Planning Area	Demand Factors (gpd)	Demand Factors (gpd/acre)	Rationale and Assumption
Single Family (2-4 du/ac)	2,120	60	Assume 50 dwelling units (50% of all dwelling units) have pools
Single Family (4-8 du/ac)	9,130	48	Assume 215 dwelling units (25% of all dwelling units) have pools
Multi-Family (2-4 du/ac)	1,060	72	Assume 25 dwelling units (50% of all dwelling units) have pools
Multi-Family (4-8 du/ac)	420	88	Assume 10 dwelling units (33% of all dwelling units) have pools
Multi-Family (8-12 du/ac)	0	0	No Pools
Multi-Family (12-15 du/ac)	0	0	No Pools
Multi-Family (15-20 du/ac)	0	0	No Pools
Parks	1,190	34	Pools in Mesa Park, Peak's Park, and Valley Green Park
Commercial	0	0	No Pools
School	0	0	No Pools (K-8 Charter School)
Open Space	0	0	No Pools
Backbone Roads	0	0	No Pools
Fuel Modification - Irrigated	0	0	No Pools
Fuel Modification - Non-Irrigated	0	0	No Pools
Public Facilities (Water Tanks)	0	0	No Pools

Notes

gpd = gallons per day

du/ac = dwelling units per acre

Demand factors include a distribution system and billing loss rate of 3.6%.

Table 12
Reference Evapotranspiration (ETo) Water Demands and MWELO-Allowed Water Demands at Escondido, California

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Month	Estimated Monthly Turf ET Demand as Percent of Annual Demand*	Reference ET (For Turf Grass) (ETo, inches)	MWELO Annual Limit (inches)	
			Residential (55% of ETo)	Nonresidential (45% of ETo)
January	4.4%	2.4	1.3	1.1
February	4.8%	2.6	1.4	1.2
March	7.2%	3.9	2.1	1.8
April	8.7%	4.7	2.6	2.1
May	10.9%	5.9	3.2	2.7
June	12.0%	6.5	3.6	2.9
July	13.1%	7.1	3.9	3.2
August	12.5%	6.8	3.7	3.1
September	9.8%	5.3	2.9	2.4
October	7.2%	3.9	2.1	1.8
November	5.2%	2.8	1.5	1.3
December	4.2%	2.3	1.3	1.0
Annual (inches)		**54.2**	**29.8**	**24.4**
Annual (feet)		**4.5**	**2.5**	**2.0**

MWELO = Model Water Efficient Landscape Ordinance (2015)

ET = evapotranspiration

ETo = reference evapotranspiration for turf grass = 54.2 inches/year in Escondido per the 2015 MWELO.

* Percentage values are calculated by GSI Water Solutions using the monthly and annual ETo values listed for the Escondido SPV CIMIS station in Appendix A of the 2015 MWELO.

Table 13

Irrigation Landscape Types, Maximum Applied Water Allowances, and Estimated Total Water Use at Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

MAWA = (ETo)(0.62)[(ETAFxLA)+((1-ETAF)xSLA)]

ETo = 54.2 inches/year

ETAF res = 0.55 unitless

ETAF non-res = 0.45 unitless

ETAF SLA = 1.00 unitless

	Landscape Design			Acreages					Maximum Applied Water Allowance (MAWA)					Estimated Total Water Use (ETWU)		
Planning Area	Irrigated Landscaping Area As a Percentage of Gross Acreage	Non-Turf Area As a Percentage of Gross Acreage	Turf Area As a Percentage of Gross Acreage	Gross Acreage	Irrigated Landscape	SLA (ETAF>0.55)	Turf	Other Irrigated Landscape	MAWA (afy) for SLA Areas	MAWA (afy) for Other Areas	MAWA (afy) for Whole Landscape Area	MAWA (gal/yr) for Whole Landscape Area	MAWA (gal/day) for Whole Landscape Area	ETWU (gal/yr)	ETWU (gal/day)	ETWU (afy)
Residential Development																
Single Family (2-4 du/ac)	53%	44%	9%	35.4	18.65	0	3.08	15.57	0	46.33	46.33	15,097,666	41,363	9,264,610	25,382	28.43
Single Family (4-8 du/ac)	56%	46%	10%	192.7	108.35	0	20.17	88.18	0	269.16	269.16	87,711,804	240,306	55,565,924	152,235	170.51
Multi-Family (2-4 du/ac)	51%	42%	9%	14.9	7.60	0	1.34	6.26	0	18.88	18.88	6,152,470	16,856	4,279,007	11,723	13.13
Multi-Family (4-8 du/ac)	54%	43%	11%	4.8	2.59	0	0.53	2.06	0	6.43	6.43	2,095,359	5,741	1,554,685	4,259	4.77
Multi-Family (8-12 du/ac)	53%	52%	1%	6.1	3.22	0	0.07	3.15	0	8	8	2,606,979	7,142	1,458,238	3,995	4.47
Multi-Family (12-15 du/ac)	38%	36%	2%	31.0	11.65	0	0.58	11.07	0	28.94	28.94	9,430,746	25,838	4,930,623	13,509	15.13
Multi-Family (15-20 du/ac)	49%	46%	3%	28.4	13.78	0	0.77	13.01	0	34.23	34.23	11,154,611	30,561	5,858,982	16,052	17.98
Total				**313.3**	**165.84**	**0**	**26.54**	**139.30**	**0.00**	**411.97**	**411.97**	**134,249,636**	**367,807**	**82,912,069**	**227,156**	**254.43**
Non-Residential Development (Commercial, Schools, and Public Facilities)																
Commercial	25%	25%	0%	7.4	2.14	0	0	2.14	0	4.35	4.35	1,417,545	3,884	854,752	2,342	2.62
School	25%	20%	5%	3.6	1.19	0	0.17	1.02	0	2.42	2.42	788,611	2,161	681,619	1,867	2.09
Public Facilities (Water Tanks)	0%	0%	0%	4.2	0	0	0	0	0	0	0	0	0	0	0	0
Total				**15.2**	**3.33**	**0**	**0.17**	**3.16**	**0.00**	**6.77**	**6.77**	**2,206,156**	**6,044**	**1,536,371**	**4,209**	**4.71**
Recreation, Arterials, Open Space, and Fuel Modification Zones																
Parks	65%	48%	17%	35.9	23.39	0.33	6.15	16.91	1.49	46.87	48.36	15,759,187	43,176	14,107,137	38,650	43.29
Open Space	0%	0%	0%	1,209.0	0	0	0	0	0	0	0	0	0	0	0	0
Backbone Roads	27%	27%	0%	34.0	9.33	0	0	9.33	0	18.96	18.96	6,178,540	16,928	4,673,557	12,804	14.34
Fuel Modification Zone 1 - Irrigated	93%	93%	0%	131.0	121.30	20.30	0	101.00	91.69	205.28	296.97	96,774,315	265,135	51,530,063	141,178	158.13
Fuel Modification Zone 2 - Non-Irrigated	0%	0%	0%	247.2	0	0	0	0	0	0	0	0	0	0	0	0
Total				**1,657.1**	**154.02**	**20.63**	**6.15**	**127.24**	**93.18**	**271.11**	**364.29**	**118,712,042**	**325,238**	**70,310,757**	**192,632**	**215.76**
GRAND TOTAL				**1,985.6**	**323.19**	**20.63**	**32.86**	**269.70**	**93.18**	**689.85**	**783.03**	**255,167,834**	**699,090**	**154,759,197**	**423,998**	**474.91**

Abbreviations: MAWA = maximum applied water allowance; ETAF = ET adjustment factor; ETo = reference evapotranspiration; ETWU = estimated total water use; SLA = special landscape area; gal = gallons; afy = acre-feet per year; gpd = gallons per day; VWD = Vallecitos Water District; WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Notes: (1) A 6.2-acre area of vineyards in fuel modification zone 2 will require irrigation and therefore is included in the irrigated acreage value of 20.3-acre SLA acreage for fuel modification zone 1. Similarly, a 0.3-acre portion of a drainage basin/swale in fuel modification zone 2 has its irrigation counted as "other irrigated landscape" in fuel modification zone 1. Note that the gross acreages of both fuel modification zones are unchanged in this table, in order to facilitate comparison with the WSA&V.
(2) Irrigation is not shown in this table for public facilities (water tanks). However, some irrigation may occur, based on VWD's duty factors which indicate 200 gpd/acre of outdoor water use will occur on these lands (as listed on Table 1).

Table 14

Outdoor Water Demand Factors Under Current Water Conservation Standards at Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

Planning Area	Planning Area Acreage	Swimming Pool Demand Factors		Irrigation Demand Factors		Total Outdoor Demand Factors	
		(gpd)	(gpd/acre)	(gpd)	(gpd/acre)	(gpd)	(gpd/acre)
Single Family (2-4 du/ac)	35.4	2,120	60	25,382	720	27,502	780
Single Family (4-8 du/ac)	192.7	9,130	50	152,235	790	161,365	840
Multi-Family (2-4 du/ac)	14.9	1,060	70	11,723	790	12,783	860
Multi-Family (4-8 du/ac)	4.8	420	90	4,259	890	4,679	980
Multi-Family (8-12 du/ac)	6.1	0	0	3,995	655	3,995	655
Multi-Family (12-15 du/ac)	31.0	0	0	13,509	440	13,509	440
Multi-Family (15-20 du/ac)	28.4	0	0	16,052	565	16,052	565
Parks	35.9	1,190	35	38,650	1,080	39,840	1,115
Commercial	7.4	0	0	2,342	320	2,342	320
School	3.6	0	0	1,867	520	1,867	520
Open Space	1,209.0	0	0	0	0	0	0
Backbone Roads	34.0	0	0	12,804	380	12,804	380
Fuel Modification - Irrigated	131.0	0	0	141,178	1,080	141,178	1,080
Fuel Modification - Non-Irrigated	247.2	0	0	0	0	0	0
Public Facilities (Water Tanks)	4.2	0	0	840	200	840	200

Notes

gpd/acre = gallons per day per acre

The gpd/acre demand factor values are rounded to the nearest 5 gpd/acre.

Table 15
Reduction in Outdoor Water Demand Factors Arising from Conservation Measures

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Planning Area	2014 Outdoor Water Demand Factor Used in the WSA&V Update (Gallons Per Day Per Acre)[1]	Outdoor Water Demand Factor with Water Conservation Measures (Gallons Per Day Per Acre)	Reduction Arising From Water Conservation Measures (Gallons Per Day Per Acre)	Reduction as a Percentage of 2014 Outdoor Water Demand Factor[2]
Single Family (2-4 du/ac)	1,050	780	270	26%
Single Family (4-8 du/ac)	1,200	840	360	30%
Multi-Family (2-4 du/ac)	1,050	860	190	18%
Multi-Family (4-8 du/ac)	1,200	980	220	18%
Multi-Family (8-12 du/ac)	700	655	45	6%
Multi-Family (12-15 du/ac)	2,000	440	1,560	78%
Multi-Family (15-20 du/ac)	1,700	565	1,135	67%
Parks	1,250	1,115	135	11%
Commercial	300	320	-20	-7%
School	200	520	-320	-160%
Open Space	200	0	200	100%
Backbone Roads	200	380	-180	-90%
Fuel Modification - Irrigated	1,250	1,080	170	14%
Fuel Modification - Non-Irrigated	200	0	200	100%
Public Facilities (Water Tanks)	200	200	0	0%

[1] Calculated as the difference between the Vallecitos Water District's 2014 Duty Factor (for total demands) and Sewer Generation Factor (for indoor demands and sewer generation rates).

[2] A negative value means the demand factor under current conservation measures is higher than the factor that has been derived by GSI from the WSA&V.

Note: du/ac = dwelling units per acre WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 16
Indoor, Outdoor, and Total Water Demand Factors When Implementing Current Water Conservation Standards at Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)

September 2016

Planning Area	Planning Area Acreage	Indoor Demand Factors (gpd/acre)	Outdoor Demand Factors (gpd/acre)	Total Demand Factors (gpd/acre)
Single Family (2-4 du/ac)	35.4	475	780	1,255
Single Family (4-8 du/ac)	192.7	830	840	1,670
Multi-Family (2-4 du/ac)	14.9	405	860	1,265
Multi-Family (4-8 du/ac)	4.8	700	980	1,680
Multi-Family (8-12 du/ac)	6.1	1,100	655	1,755
Multi-Family (12-15 du/ac)	31.0	1,485	440	1,925
Multi-Family (15-20 du/ac)	28.4	1,755	565	2,320
Parks	35.9	145	1,115	1,260
Commercial	7.4	685	320	1,005
School	3.6	460	520	980
Open Space	1,209.0	0	0	0
Backbone Roads	34.0	0	380	380
Fuel Modification - Irrigated	131.0	250	1,080	1,330
Fuel Modification - Non-Irrigated	247.2	0	0	0
Public Facilities (Water Tanks)	4.2	800	200	1,000

Notes

gpd/acre = gallons per day per acre

Table 17
Calculated Water Demands Arising from Implementation of Conservation Measures (With No Land Use Deductions)

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Planning Area	Planning Area Acreage	Conservation Demand Factor (Gallons Per Day Per Acre)[1]	Estimated Total Water Demand (Gallons Per Day)	Estimated Total Water Demand (Acre-Feet Per Year)
Single Family (2-4 du/ac)	35.4	1,255	44,430	49.7
Single Family (4-8 du/ac)	192.7	1,670	321,810	360.4
Multi-Family (2-4 du/ac)	14.9	1,265	18,850	21.1
Multi-Family (4-8 du/ac)	4.8	1,680	8,065	9.1
Multi-Family (8-12 du/ac)	6.1	1,755	10,705	12.0
Multi-Family (12-15 du/ac)	31.0	1,925	59,675	66.8
Multi-Family (15-20 du/ac)	28.4	2,320	65,890	73.8
Parks	35.9	1,260	45,235	50.7
Commercial	7.4	1,005	7,440	8.3
School	3.6	980	3,530	4.0
Open Space	1,209.0	200	241,800	270.8
Backbone Roads	34.0	380	12,920	14.5
Fuel Modification - Irrigated	131.0	1,330	174,230	195.2
Fuel Modification - Non-Irrigated	247.2	200	49,440	55.4
Public Facilities (Water Tanks)	4.2	1,000	4,200	4.7
TOTAL	**1,985.6**		**1,068,220**	**1,196.5**

[1] As defined by GSI Water Solutions.

Note: du/ac = dwelling unit per acre.

Table 18
Calculated Water Demands Arising from Implementation of Conservation Measures (With Land Use Deductions)

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Planning Area	Planning Area Acreage	Conservation Demand Factor (Gallons Per Day Per Acre)[1]	Estimated Total Water Demand (Gallons Per Day)	Estimated Total Water Demand (Acre-Feet Per Year)
Single Family (2-4 du/ac)	35.4	1,255	44,430	49.7
Single Family (4-8 du/ac)	192.7	1,670	321,810	360.4
Multi-Family (2-4 du/ac)	14.9	1,265	18,850	21.1
Multi-Family (4-8 du/ac)	4.8	1,680	8,065	9.1
Multi-Family (8-12 du/ac)	6.1	1,755	10,705	12.0
Multi-Family (12-15 du/ac)	31.0	1,925	59,675	66.8
Multi-Family (15-20 du/ac)	28.4	2,320	65,890	73.8
Parks	35.9	1,260	45,235	50.7
Commercial	7.4	1,005	7,440	8.3
School	3.6	980	3,530	4.0
Open Space	1,209.0	0	0	0.0
Backbone Roads	34.0	380	12,920	14.5
Fuel Modification - Irrigated	131.0	1,330	174,230	195.2
Fuel Modification - Non-Irrigated	247.2	0	0	0.0
Public Facilities (Water Tanks)	4.2	1,000	4,200	4.7
TOTAL	**1,985.6**		**776,980**	**870.3**

[1] As defined by GSI Water Solutions.

Note: du/ac = dwelling unit per acre.

Table 19
Water Demand Comparison for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Water Demand Planning Document	Land Use	Current Conservation Measures?	Total Demand (gallons/day)	Volumetric Reduction (gallons/day) Compared With VWD's 2015 UWMP	Volumetric Reduction (gallons/day) Compared With WSA&V Update for Newland Sierra	Percent Reduction Compared With VWD's 2015 UWMP	Percent Reduction Compared With WSA&V Update for Newland Sierra
VWD 2015 UWMP / Draft 2014 Master Plan	San Diego County General Plan	No	1,629,200	---	---	---	---
Newland Sierra WSA&V	Newland Sierra Specific Plan		1,450,160	179,040	---	11%	---
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		1,158,920	470,280	291,240	29%	20%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan without deductions[1]	Yes	1,068,220	560,980	381,940	34%	26%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		776,980	852,220	673,180	52%	46%

Notes

[1] Deductions consist of eliminating water uses in open spaces and non-irrigated fuel modification zones, equating to 1,456.2 acres at 200 gallons/day/acre = 291,240 gallons/day.

Abbreviations

UWMP = Urban Water Management Plan VWD = Vallecitos Water District WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

Table 20
Annual Water Demand Comparison for Newland Sierra

Water Conservation Demand Study for Newland Sierra (San Diego County, California)
September 2016

Water Demand Planning Document	Land Use	Current Conservation Measures?	Annual Total Demand (afy)	Annual Volumetric Reduction (afy) Compared With VWD's 2015 UWMP	Annual Volumetric Reduction (afy) Compared With WSA&V for Newland Sierra	Percent Reduction Compared With VWD's 2015 UWMP	Percent Reduction Compared With WSA&V for Newland Sierra
VWD 2015 UWMP / Draft 2014 Master Plan	San Diego County General Plan	No	1,825	---	---	---	---
Newland Sierra WSA&V	Newland Sierra Specific Plan		1,624	201	---	11%	---
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		1,298	527	326	29%	20%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan without deductions[1]	Yes	1,196	629	428	34%	26%
Newland Sierra Water Demand Conservation Study	Newland Sierra Specific Plan with deductions[1]		870	955	754	52%	46%

Notes

[1] Deductions consist of eliminating water uses in open spaces and non-irrigated fuel modification zones, equating to 1,456.2 acres at 200 gallons/day/acre = 291,240 gallons/day = 326 afy.

Abbreviations

afy = acre-feet per year UWMP = Urban Water Management Plan VWD = Vallecitos Water District WSA&V = Water Supply Assessment and Verification Report (HDR, 2016)

ATTACHMENT 1

Detailed Irrigation Water Demand Calculations for Newland Sierra

Prepared by Schmidt Design Group

September 2016

Sierra Specific Plan - Landscape Water Use Calculations

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Date: September 2, 2016

SDG Project No. 13-202
Based on Specific Plan Submittal Dated Jan. 2016 with revisions to Parks

Landscape Water Use Calculation Definitions:

Reference Evapotranspiration Rate (Eto): 54.2 (in/vear)
Annual evapotranspiration rate for Escondido, based on the 2015 CA Model Water Efficient Landscape Ordinance, Appendix A

Estimated Total Water Use (ETWU): (Eto)(0.62)(PF x HA*43560/IE)
The estimated total of the project's water usage.

Maximum Applied Water Allowance (MAWA): Commercial: (Eto)(0.62)([0.45*HA)+(0.55*SLA])

Residential: (Eto)(0.62)([0.55*HA)+(0.45*SLA])
The maximum amount of water allowed for the project per County requirements.

1. Water Use Calculation - Parks

ITEM DESCRIPTION	BASINS + SWALES	LOW WATER SHRUBS	TURF	COMMUNITY GARDEN	TOTAL IRRIGATED AREA ETWU	TOTAL SITE ETWU	
Plant Factor (PF)	0.35	0.20	0.60	0.60	(ac)	(ac)	
Irrigation Efficiency (IE)	0.70	0.90	0.70	0.90	(gal/yr)	(gal/yr)	(GPD/acre)
PARK 1 - OAK GROVE							
Total Park Area: 1.95 ac							
Irrigated Area (ac)	0.19	1.6	0.0	0.0	1.80	1.95	
ETWU	139,060	523,712	0	0	662,772	662,772	**931**
PARK 2 - VILLAGE GREEN							
Total Park Area: 0.89 ac							
Irrigated Area (ac)	0.00	0.04	0.6	0.0	0.67	0.89	
ETWU	0	13,815	783,453	0	797,268	797,268	**2454**
PARK 3 - JOINT USE PARK							
Total Park Area: 2.92 ac							
Irrigated Area (ac)	0.05	1.0	0.9	0.0	1.91	2.92	
ETWU	36,595	309,022	1,142,056	0	1,487,673	1,487,673	**1396**
PARK 4 - HILLSIDE MINI PARK							
Total Park Area: 0.3 ac							
Irrigated Area (ac)	0.00	0.1	0.0	0.02	0.14	0.3	
ETWU	0.00	40,175	0	18,818	58,994	58,994	**539**
PARK 5 - HILLSIDE HEIGHTS							
Total Park Area: 1.99 ac							
Irrigated Area (ac)	0.10	0.5	0.8	0.0	1.41	1.99	
ETWU	32,529	365,948	1,012,441	0	1,410,917	1,410,917	**1942**
PARK 6 - MESA MINI PARK							
Total Park Area: 0.52 ac							
Irrigated Area (ac)	0.00	0.3	0.0	0.03	0.30	0.52	
ETWU	0.00	89,237	0	29,123	118,361	118,361	**624**
PARK 7 - MESA PARK							
Total Park Area: 3.23 ac							
Irrigated Area (ac)	0.10	1.2	0.7	0.0	2.01	3.23	
ETWU	73,190	390,344	888,586	0	1,352,119	1,352,119	**1147**
PARK 8 - SUMMIT MINI PARK							
Total Park Area: 0.56 ac							
Irrigated Area (ac)	0.00	0.4	0.0	0.0	0.37	0.56	
ETWU	0	121,198	0	0	121,198	121,198	**593**
PARK 9 - SADDLEBACK PARK							
Total Park Area: 1.42 ac							
Irrigated Area (ac)	0.05	0.7	0.0	0.0	0.70	1.42	
ETWU	36,595	211,436	0	0	248,031	248,031	**479**
PARK 10 - KNOLL MINI PARK							
Total Park Area: 0.37 ac							
Irrigated Area (ac)	0.00	0.3	0.03	0.0	0.30	0.37	
ETWU	0	89,237	33,124	0	122,361	122,361	**906**
PARK 11 - PEAK'S PARK							
Total Park Area: 8.86 ac							
Irrigated Area (ac)	0.10	2.8	2.6	0.0	5.49	8.86	
ETWU	73,190	910,803	3,251,907	0	4,235,899	4,235,899	**1310**

Sierra Specific Plan - Landscape Water Use Calculations

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1. Water Use Calculation - Parks Continued

ITEM DESCRIPTION	BASINS + SWALES	LOW WATER SHRUBS	TURF	COMMUNITY GARDEN	TOTAL IRRIGATED AREA ETWU	TOTAL SITE ETWU	
Plant Factor (PF)	0.35	0.20	0.60	0.60	(ac)	(ac)	
Irrigation Efficiency (IE)	0.70	0.90	0.70	0.90	(gal/yr)	(gal/yr)	(GPD/acre)
PARK 12 - VALLEY GREEN							
Total Park Area: 2.0 ac							
Irrigated Area (ac)	0.10	1.1	0.0	0.05	1.25	2.00	
ETWU	73,190	357,815	0	45,925	476,930	476,930	**653**
PARK 13a - CREEKSIDE PARK (public)							
Total Park Area: 2.18 ac							
Irrigated Area (ac)	0.40	0.7	0.4	0.0	1.53	2.18	
ETWU	292,758	227,701	541,504	0	1,061,963	1,061,963	**1335**
PARK 13b - CREEKSIDE PARK (private)							
Total Park Area: 0.69 ac							
Irrigated Area (ac)	0.20	0.4	0.0	0.0	0.60	0.69	
ETWU	146,379	130,115	0	0	276,494	276,494	**1098**
PARK 14 - SIERRA FARMS							
Total Park Area: 7.39 ac							
Irrigated Area (ac)	0.12	4.1	0.05	0.23	4.50	7.39	
ETWU	87,827	1,333,676	62,734	224,448	1,708,685	1,708,685	**633**
PARK 15 - POCKET PARKS							
Total Park Area: 0.63 ac							
Irrigated Area (ac)	0.00	0.4	0.0	0.0	0.40	0.63	
ETWU	0	130,115	0	0	130,115	130,115	**566**
Totals	1.41	15.50	6.15	0.33	**23.38**	**35.90**	
ETWU	1,031,972	5,041,045	7,715,805	318,315	**14,107,137**	**14,107,137**	**1077**

2. Water Use Calculation - Site Landscape

ITEM DESCRIPTION	LOW WATER SHRUBS + DRIP	LOW WATER SHRUBS + SPRAY	BASINS + SWALES	VINEYARD	TOTAL IRRIGATED AREA ETWU	TOTAL SITE ETWU	
Plant Factor (PF)	0.20	0.20	0.35	0.25	(ac)	(ac)	
Irrigation Efficiency (IE)	0.90	0.70	0.70	0.90	(gal/yr)	(gal/yr)	(GPD/acre)
BACKBONE ROADS							
Streetscape planting and irrigation +/- 10' wide parkways. Assumes additional 10-13' wide swale within parkway. 9.33 total acres of parkway and swale landscape.	5.30	0.0	4.03	0.0	9.33	34.0	
ETWU	1,724,020	0	2,949,537	0	4,673,557	4,673,557	**377**
FUEL MODIFICATION ZONE 1							
Zone 1 Area (ac) (assumes 50% of cut slopes untreated (131-20=111 ac.) Assumes irrigation, hydroseed, and minimal 1-gal container stock)	0.0	97.70	3.30	20.30	121.30	131.0	
ETWU	0	40,860,659	2,415,254	8,254,151	51,530,063	51,530,063	**1078**
FUEL MODIFICATION ZONE 2 *							
ZONE 2 Area (ac) (assumes permanent irrigation for vineyards and basins)	0.0	0.0	0.0	0.0	0.0	247.2	
ETWU	0	0	0	0	0	0	**0**
OPEN SPACE							
Open Space	0.0	0.0	0.0	0.0	0.0	1,209.0	
ETWU	0	0	0	0	0	0	**0**
PUBLIC LANDS							
Area around Water tanks	0.0	0.0	0.0	0.0	0.0	4.2	
ETWU	0	0	0	0	0	0	**0**
Totals	5.3	97.7	7.3	20.3	130.6	**1,621.2**	
ETWU	1,724,020	40,860,659	5,364,791	8,254,151	56,203,620	**56,203,620**	**95**

* Includes permanent irrigation only.

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3. Water Use Calculation - Land Use

ITEM DESCRIPTION	BASINS	INTERNAL SLOPES + BUFFERS	RESIDENTIAL LANDSCAPE	TURF	TOTAL IRRIGATED AREA ETWU	**TOTAL SITE ETWU**	
Plant Factor (PF)	0.35	0.20	0.20	0.80	(ac)	(ac)	
Irrigation Efficiency (IE)	0.70	0.70	0.90	0.70	(gal/yr)	(gal/yr)	(GPD/acre)
SINGLE FAMILY (2-4 DU/AC)							
Total area 35.4 ac Assumes that residential landscape is 49% hardscape, 42% landscape, 9% turf	0.72	0.50	14.36	3.08	18.65	35.4	
ETWU	524,639	210,949	4,669,520	3,859,502	9,264,610	9,264,610	**717**
SINGLE FAMILY (4-8 DU/AC)							
Total area 192.7 ac Assumes that residential landscape is 46% hardscape, 43% landscape, 11% turf	2.26	7.07	78.85	20.17	108.35	192.7	
ETWU	1,652,959	2,955,059	25,649,381	25,308,525	55,565,924	55,565,924	**790**
MULTI-FAMILY (2-4 DU/AC)							
Total area 14.9 ac Assumes that residential landscape is 49% hardscape, 42% landscape, 9% turf	0.00	0.00	6.26	1.34	7.60	14.9	
ETWU	0	0	2,035,644	2,243,363	4,279,007	4,279,007	**787**
MULTI-FAMILY (4-8 DU/AC)							
Total area 4.8 ac Assumes that residential landscape is 46% hardscape, 43% landscape, 11% turf	0.00	0.00	2.06	0.53	2.59	4.8	
ETWU	0	0	671,392	883,293	1,554,685	1,554,685	**887**
MULTI-FAMILY (8-12 DU/AC)							
Total area 6.1 ac Assumes that residential landscape is 78% hardscape, 20% landscape, 2% turf	0.28	2.12	0.74	0.07	3.22	6.1	
ETWU	208,051	885,934	240,544	123,709	1,458,238	1,458,238	**655**
MULTI-FAMILY (12-15 DU/AC)							
Total area 31 ac Assumes that residential landscape is 67% hardscape, 31% landscape, 2% turf	0.53	1.59	8.95	0.58	11.65	31	
ETWU	388,621	663,003	2,912,605	966,394	4,930,623	4,930,623	**436**
MULTI-FAMILY (15-20 DU/AC)							
Total area 28.4 ac Assumes that residential landscape is 57% hardscape, 40% landscape, 3% turf	0.27	2.48	10.26	0.77	13.78	28.4	
ETWU	195,474	1,039,029	3,337,253	1,287,226	5,858,982	5,858,982	**565**
SCHOOL							
Total area 3.6 ac Assumes that school landscape is 75% hardscape, 20% landscape,5% turf	0.15	0.00	0.86	0.17	1.19	3.6	
ETWU	113,269	0	280,173	288,177	681,619	681,619	**519**
COMMERCIAL							
Total area 7.4 ac Assumes that commercial landscape is 75% hardscape, 25% landscape,0% turf	0.39	0.0	1.75	0.0	2.14	7.4	
ETWU	284,593	0	570,159	0	854,752	854,752	**316**
Site Totals	4.60	13.76	124.10	26.71	169.16	324.3	
ETWU	3,367,606	5,753,974	40,366,671	34,960,189	84,448,440	84,448,440	**713**

4. Water Use Calculation - Totals

Grand Total			
	Total ETWU	**154,759,197 (gal/yr)**	**214 GDP/acre**