Water Use Analysis Report

FOR

Farmstead at Long Meadow Ranch Lodging

1000 Mills Lane

St. Helena, CA 94574

PREPARED FOR:

CITY OF ST. HELENA DEPARTMENT OF PUBLIC WORKS

1480 MAIN STREET

ST. HELENA, CA 94574

PREPARED BY:

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I. Background & Introduction

The Farmstead at Long Meadow Ranch Lodging project is the proposed construction of lodging and related amenities on a 10-acre parcel fronting on Mills Lane. LMR Property Acquisition Partners LLC is applying for a use permit to allow for the proposed uses of the project.

The property slated for improvements, formerly known as the Doumani parcel, is currently vacant land. The proposed project will include 65 guest rooms and suites, a multi-purpose building, including meeting, kitchen, reception, and housekeeping uses, and a fitness center with a pool and spa.

Guests will have access to a daily breakfast as well as room and pool food service. A demonstration kitchen that will double as a service kitchen for room service and events will be housed in the multi-purpose building. A portion of the parcel is zoned for agricultural use and will be operated as a production vegetable farm. Two small barns will be constructed to serve as the farming facility.

Per the City of St. Helena Water Neutral Policy for Development, all new development must be water-neutral from the City-delivered water system. Water neutrality may be achieved through on-site water conservation measures, well water, and/or off-site retrofitting. The following water use analysis includes identification of the baseline existing demand and the proposed water demand.

II. Water Use Analysis

A. Baseline Water Use

The existing parcel to be developed is vacant and does not have a water connection to the City of St. Helena municipal system, so the baseline water use from the City-delivered system is **0 gallons per day**.

B. Proposed Water Demand

The following tables summarize the water use for proposed project by category. Sources for data used include EPA's WaterSense program, LEED standards, and published research of water use in the hotel sector. Calculations use the assumption of 80% average occupancy.

Landscape irrigation water will be provided by an existing on-site water well, so it will not be included in the following analysis. Preliminary water use estimates prepared by the project landscape architect indicate approximately 3.6 acre-feet will be required. See Landscape Water Use Statement included with this submittal.

Guest Rooms Water Usage

Fixture	Number of Rooms	Number of People/Room	Flow[1]	Unit	Duration (min)[2]	Daily Uses/ Person[2]	Total Water Use (gal/day)
Toilet	65	2	1.28	gal	N/A	5	832
Lavatory Faucet	65	2	0.8	gpm	1	5	520
Showerhead	65	2	1.5	gpm	8	1	1,560
SUBTOTAL							2,912
SUBTOTAL	80%	occupancy					**2,330**

Employee Water Usage

Fixture	Number of Employees (FTE)	Flow[1]	Unit	Duration (min)[2]	Daily Uses/Person[2]	Total Water Use (gal/day)
Toilet	38	1.28	gal	N/A	3	146
Lavatory Faucet	38	0.8	gpm	0.5	3	45.6
SUBTOTAL						**192**

Multi-purpose Building Water Usage

Meal	Avg Number of Covers/Day[8]	Water Use/Cover (gal)[6,7]	Total Water Use (gal/day)
Buffet Breakfast	49	13	637
Chef's Table	40	15	600
Room/Pool Service	33	13	429
Culinary Classes	8	13	104
SUBTOTAL			1,770

Laundry Water Usage

Number of Rooms	Lbs of Laundry /Room /Day[3]	Percent Laundry Done On Site[9]	Water Use (gal) /Lb Laundry[3]	Total Water Use (gal/day)
65	8	5%	2.5	65
SUBTOTAL	80%	80%	occupancy	**52**

Cooling Water Usage

Number of Rooms	Number of Cooling Degree Days/year[4]	CCD/day	Water Use/ CDD/Room[3] (gal)	Total Water Use (gal/day)
65	683	1.87	5.6	681
SUBTOTAL	80%	occupancy		**545**

Fitness Center Water Usage

Users/Day[5]	Water Use/Person[7] (gal)	Total Water Use (gal/day)
26	10	**260**
SUBTOTAL		**260**

Summary

Category	Water Use (gal/day)	Water Use (gal/year)	Water Use (acre-ft/year)
Guest Rooms	2,330	850,304	2.609
Employees	192	69,905	0.215
Multi-Purpose Bldg	1,770	646,050	1.983
Laundry	52	18,980	0.058
Cooling	545	198,890	0.610
Fitness Center	260	94,900	0.291
TOTAL	**5,148**	**1,879,028**	**5.767**

Sources:

[1]Flow taken to be min allowable per Water Sense specifications for each product category under assumption that the most efficient fixtures available will be used. See Appendix B for excerpts from Water Sense specifications.

[2]Duration and Daily Uses taken from LEED Indoor Water Use Reduction Calculator for residential use, see Appendix C.

[3]Source (see Appendix D): Pacific Institute. *Waste Not, Want Not: The Potential for Urban Water Conservation in California, Appendix E: Details of Commercial Water Use and Potential Savings, by Sector*. November 2003.

[4]Based on St. Helena data with 65 degrees as the base temperature, see Appendix E. Source: Western Regional Climate Center.

[5]Assumes a quarter of guests use the pool/spa each day.
[6]Assumes Breakfast, room/pool service, and culinary classes treated are short orders. Chef's Table meals treated as conventional sit down. All meals assumed to use multi-use utensils.
[7]Source (see Appendix A): Napa County Alternative Sewer Treatment System Standards, Table 4.
[8]The number of uses per day for the multi-purpose building is based on anticipated sales forecasts prepared by the owner. The following information was used to estimate the number of uses per day for each of the different meals provided in the multi-purpose building:

- The Chef's Table is planned to provide food and wine pairings at lunch and dinner for up to 20 people per sitting.
- The Buffet Breakfast will serve 17,900 guests annually. Averaged over 365 days per year, this results in the use of 49 covers per day.
- Room & Pool Service will serve 12,200 guests annually. Averaged over 365 days per year, this results in the use of 33 covers per day.
- Culinary Classes are planned to be held for 25 people up to 10 times a month, which equals 250 covers per month. Averaged over 30 days per month, the results in the use of 8 covers/day.

[9] Only 5% of laundry will be done on-site, with the remaining 95% of laundry being done off-site, outside of St. Helena, by a professional laundry service.

III. In-Lieu Retrofit Fees

The proposed project will result in the use of approximately 5,148 gallons of water per day. The project is already planning to use water efficient fixtures and water conservation practices to the maximum extent possible, but given that the existing parcel is vacant and thus has no existing water use, no amount of on-site water conservation measures would be sufficient to achieve neutrality. Therefore, the project proposes to pay an in-lieu retrofit fee equivalent to the cost of retrofitting the showerheads, sink faucets, kitchen faucets, and toilets in enough residences to achieve water savings of 5,148 gallons per day.

The theoretical residential water use for residences with old fixtures and with new retrofitted low flow fixtures is summarized in the following tables:

Theoretical Water Use with Old Fixtures

Fixture	Flow rate (gal/min or gal/flush)	Flow duration (min, flush, load, etc)	Daily Uses per Occupant	Number of Occupants	Gallons per day
Showerheads	2.5	8	1	6	120
Sink Faucets	2.2	0.25	3	6	9.9
Kitchen Faucet	2.2	4	1	6	52.8
Toilet	2.2	1	3	6	39.6
TOTAL					**222**

Theoretical Water Use with Retrofitted Low Flow Fixtures

Fixture	Flow rate (gal/min or gal/flush)	Flow duration (min, flush, load, etc)	Daily Uses per Occupant	Number of Occupants	Gallons per day
Showerheads	2	8	1	6	96
Sink Faucets	1.5	0.25	3	6	6.75
Kitchen Faucet	1.8	4	1	6	43.2
Toilet	1.28	1	3	6	23.04
TOTAL					**169**

A residence with old fixtures uses 222 gallons per day, while a residence with retrofitted low flow fixtures uses 169 gallons per day, resulting in a savings of 53 gallons per day. To offset 5,148 gallons per day, 97 residences will need to be retrofitted.

The material and installation costs to retrofit a residence are summarized in the following tables:

Material Cost per Retrofitted Residence

Fixture	Qty	Cost per Unit[1]	Total Cost
Toilet	2	$ 229.00	$ 458.00
Lavatory Faucet	2	$ 113.91	$ 227.82
Kitchen Faucet	1	$ 133.19	$ 133.19
Shower Head	1	$ 175.00	$ 175.00
Clothes Washer	0	$ 547.20	$ -
Dish Washer	0	$ 278.00	$ -
TOTAL			**$ 994.01**

Installation Cost per Retrofitted Residence

Fixture	Hour	Qty	Cost per Hour[2]	Total Cost
Toilet	1.5	2	$ 60.00	$ 180.00
Lavatory Faucet	1.5	2	$ 60.00	$ 180.00
Kitchen Faucet	1.5	1	$ 60.00	$ 90.00
Shower Head	0.5	1	$ 60.00	$ 30.00
Clothes Washer	0	1	$ 60.00	$ -
Dish Washer	0	1	$ 60.00	$ -
TOTAL				**$ 480.00**

Sources:

[1]Materials costs taken be cost of the following appliances as shown on 5/2/17

- Energy Star Certified Clothes Washer - Home Depot Samsung 4.2 front loader Model #WF42H5000AW = $547.20
- Energy Star Certified Dish Washer - Home Depot Amana Front Control Dishwasher Model #ADB1400AGS = $278.00
- Water Sense Certified Toilet - Home Depot Kohler Cimmaron Comfort Height two-piece 1.28gpf with Aqua Piston Tech Model #K-3887-0 = $229.00
- Water Sense Certified Lavatory Faucet - Home Depot American Standard Copeland 4 in. 2-Handle Bathroom Faucet in Polished Chrome with Metal Speed Connect Pop-Up Drain Model #7005.201.002 = $113.91
- Water Sense Certified Kitchen Faucet - American Standard Monterrey Model #6409170 = $133.19
- Water Sense Certified Shower Head - American Standard Estate Pressure Balance Bath and Shower Fitting with Water-Saving Shower Head Model #T722.508 = $175.00

[2]Cost per hour for installation based on http://www.angieslist.com/articles/how-much-does-it-cost-hire-handyman.htm

The cost of materials for a retrofit is equal to $994.01 and the installation cost for a retrofit is equal to $480.00, resulting in the total cost of $1,474.01 to retrofit a residence with low flow fixtures.

The total in-lieu retrofit fee will then be $1,474.01 per residence multiplied by 97 residences, equaling $142,341.73.

IV. Conclusion

The proposed project will result in the use of approximately 5,148 gallons of water per day. The proposed project will use water efficient fixtures and water conservation practices to the maximum extent possible. In addition, the project will pay an in-lieu retrofit fee of $142,341.73, equal to the cost of retrofitting enough residences with low flow fixtures to result in a water savings equal to the proposed project water use.

V. Appendix

Appendix A – Napa County Alternative Sewer Treatment Standards, Table 4
Appendix B – Water Sense Fixture Specifications
Appendix C – LEED Indoor Water Use Reduction Calculator
Appendix D – Pacific Institute. *Waste Not, Want Not: The Potential for Urban Water Conservation in California, Appendix E: Details of Commercial Water Use and Potential Savings, by Sector*. November 2003.
Appendix E – St. Helena Cooling Degree Days Data

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Appendix A

Napa County Alternative Sewer Treatment System Standards, Table 4

TABLE 4

TYPE OF OCCUPANCY	GALLONS PER DAY
Airports	5 per passenger
Campgrounds: Campground with central comfort station Campground with flush toilet, no showers Day Camps (no meals) Luxury Camp, private bath Summer and seasonal	 35 per person 25 per person 15 per person 100 per person 50 per person
Churches (sanctuary) With kitchen wastes	5 per seat 7 per seat
Country Club	125 per person
Factories	35 per person per shift
Hospitals Kitchen waste only Laundry waste only	250 per bed space 25 per bed 40 per bed
Hotels/Motels with private bathroom (no kitchen waste) Hotels/Motels without private bathroom (no kitchen waste) Hotel/Motel with private bath and kitchen	60 per two person room 50 per two person room 75 gallons per person
Institutions other than hospitals	125 per bed space
Movie Theaters	5 per seat
Offices	20 per employee
Picnic parks with toilets and showers Picnic parks with toilet waste only	10 per person 5 per person
Resort camps with limited plumbing	50 gallons per person
Restaurants: Kitchen waste (multi-use utensils) Kitchen waste (disposable utensils) And add the following for type of facility present: Conventional sit down Short Order Bar and Cocktail	 5 per meal served 3 per meal served 10 per person 8 per person 3 per person
School (non-boarding With gym and showers add With cafeteria using disposable utensils	20 per student 5 per student 3 per meal served
Self service laundries	50 gallons per wash
Service station	10 gallons per vehicle served
Retail stores For public restrooms add	20 per employee 1 per 10 square feet
Swimming pools and bathhouses	10 per person
Tourist camps or mobile home parks with individual bath units Tourist camps or trailer parks with central bathhouse	100 per person 75 per person
Work or construction camps (semi-permanent)	50 per person
Wine tasting facility (no meals served)	3 per person
Employee	15 per employee

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Appendix B

Water Sense Fixture Specifications

WaterSense® Specification for Tank-Type Toilets

1.0 Scope and Objective

This specification establishes the criteria for a tank-type high-efficiency toilet under the U.S. Environmental Protection Agency's (EPA's) WaterSense program. It is applicable to:

- Single-flush, tank-type gravity toilets
- Dual-flush, tank-type gravity toilets
- Dual-flush, tank-type flushometer tank (pressure-assist) toilets
- Tank-type, flushometer tank (pressure-assist) toilets
- Tank-type electrohydraulic toilets
- Any other tank-type technologies that meet these performance specifications

The specification is designed to ensure both sustainable, efficient water use and a high level of user satisfaction with flushing performance.

2.0 General Requirements

2.1 The toilet shall conform to applicable water closet requirements in ASME A112.19.2/CSA B45.1,[1] except as otherwise indicated in this specification.

2.2 If the toilet has dual-flush capabilities, it shall conform to requirements in ASME A112.19.14.

3.0 Water Efficiency Criteria

3.1 Single-flush toilets: The effective flush volume shall not exceed 1.28 gallons (4.8 liters) when evaluated in accordance with the sampling plan contained in 10 CFR 429.30. For single-flush toilets, the effective flush volume is the average flush volume when tested in accordance with ASME A112.19.2/CSA B45.1.

3.2 Dual-flush toilets: The effective flush volume shall not exceed 1.28 gallons (4.8 liters) when evaluated in accordance with the sampling plan contained in 10 CFR 429.30. For dual-flush toilets, the effective flush volume is the average flush volume of two reduced flushes and one full flush. Flush volumes shall be tested in accordance with ASME A112.19.2/CSA B45.1 and ASME A112.19.14.

3.3 Samples with average flush volume in excess of 0.10 gallon (0.4 liter) greater than their rated flush volume shall be deemed to fail testing requirements due to excessive flush volume.[2]

[1] References to this and other standards apply to the most current version of that standard.
[2] For example, fixtures rated at 1.28 gallons per flush (the maximum flush volume) but flushing at greater than 1.38 gallons (5.2 liter) when adjusted in accordance with the water consumption test procedure in ASME A112.19.2/CSA B45.1 shall be deemed to have "failed" the requirements of this specification.

High-Efficiency Lavatory Faucet Specification

1.0 Scope and Objective

This specification establishes the criteria for high-efficiency lavatory faucets and faucet accessories[1] under the U.S. Environmental Protection Agency's (EPA's) WaterSense® program. It is applicable to lavatory faucets, lavatory faucet accessories specifically designed to control the flow of water, and any other lavatory faucet technologies that meet these performance specifications.

This specification applies to lavatory faucets in private use, such as in residences, and private restrooms in hotels and hospitals. Metering faucets, lavatory faucets in public use, and residential kitchen faucets are not covered by this specification.

The specification is designed to ensure both sustainable, efficient water use and a high level of user satisfaction with lavatory faucet and lavatory faucet accessory performance.

2.0 Water Efficiency and Performance Criteria

2.1 Lavatory faucets and lavatory faucet accessories must conform to applicable requirements in ASME A112.18.1/CSA B125.1 and NSF/ANSI Standard 61, Section 9.[2]

2.2 The flow rate of the lavatory faucet or the lavatory faucet accessory shall be tested in accordance with the procedures in ASME A112.18.1/CSA B125.1 and shall meet the following criteria:

- The maximum flow rate shall not exceed 1.5 gallons per minute (gpm)[3] (5.7 liters per minute [L/min]) at a pressure of 60 pounds per square inch (psi) at the inlet, when water is flowing; and
- The minimum flow rate shall not be less than 0.8 gpm (3.0 L/min) at a pressure of 20 psi at the inlet, when water is flowing.

A lavatory faucet is also considered to meet this flow rate requirement if equipped with a lavatory faucet accessory that meets this requirement.

2.3 The flow rate, tested in accordance with the procedures in ASME A112.18.1/CSA B125.1, shall meet the testing verification protocol as described in 10 *CFR* 430 Subpart F, Appendix B.

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[1] Accessory, as defined in ASME 112.18.1/CSA B125.1, means a component that can, at the discretion of the user, be readily added, removed, or replaced, and that, when removed, will not prevent the fitting from fulfilling its primary function. For the purpose of this specification, an accessory can include, but is not limited to lavatory faucet flow restrictors, flow regulators, aerator devices, and laminar devices.
[2] References to ASME/CSA and NSF/ANSI standards apply to the most current version.
[3] The maximum flow rate has been established as 1.5 gpm, which is a 32 percent reduction from the 2.2 gpm standard codified under 10 *CFR* Part 430 (63 FR 13307; March 18, 1998).

WaterSense® Specification for Showerheads

1.0 Scope and Objective

This specification establishes the criteria for showerheads labeled under the U.S. Environmental Protection Agency's (EPA's) WaterSense® program. It is applicable to showerhead fixture fittings, inclusive of:

- Fixed showerheads that direct water onto a user (excluding body sprays) for bathing purposes; and
- Hand-held showers, a subset of showerheads that are moveable devices for directing water onto a user. Hand-held showers can be installed on a support to function as a fixed showerhead.

When used in this document the term "showerhead" shall also include hand-held showers.

This specification is designed to ensure sustainable, efficient water use and a high level of user satisfaction with showerhead performance.

2.0 General Requirements

2.1 The showerhead shall conform to applicable requirements in ASME A112.18.1/CSA B125.1.[1]

2.2 If the showerhead has more than one mode, all modes must meet the maximum flow rate requirement outlined in Section 3.1.1 and at least one of the modes, as specified by the manufacturer, must meet all of the requirements outlined in this specification.

2.3 The showerhead shall not be packaged, marked, or provided with instructions directing the user to an alternative water-use setting that would override the maximum flow rate, as established by this specification. Any instruction related to the maintenance of the product, including changing or cleaning showerhead components, shall direct the user on how to return the product to its intended maximum flow rate.

3.0 Water-Efficiency Criteria

3.1 The flow rate of the showerhead shall be tested in accordance with the procedures in ASME A112.18.1/CSA B125.1 and shall meet the following criteria:

3.1.1 The manufacturer shall specify a maximum flow rate value (rated flow) of the showerhead. This specified value must be equal to or less than 2.0 gallons per minute (gpm) (7.6 liters per minute [L/min]).

[1] References to this and other standards apply to the most current version of those standards.

3.1.2 The maximum flow rate shall be the highest value obtained through testing at flowing pressures of 20, 45, and 80 ± 1 pounds per square inch (psi) (140, 310, and 550 ± 7 kilopascal [kPa]), when evaluated in accordance with 10 CFR 430 Subpart F, Appendix B, Step 6(b). This maximum flow rate shall not exceed the maximum flow rate value specified in Section 3.1.1.

3.1.3 The minimum flow rate, determined through testing at a flowing pressure of 20 ± 1 psi (140 ± 7 kPa) and when evaluated in accordance with 10 CFR 430 Subpart F, Appendix B, Step 6(a), shall not be less than 60 percent of the maximum flow rate value specified in Section 3.1.1.

3.1.4 The minimum flow rate shall be the lowest value obtained through testing at flowing pressures of 45 and 80 ± 1 psi (310 and 550 ± 7 kPa), when evaluated in accordance with 10 CFR 430 Subpart F, Appendix B, Step 6(a). This minimum flow rate shall not be less than 75 percent of the maximum flow rate value specified in Section 3.1.1.

4.0 Spray Force Criteria

4.1 The spray force of the showerhead shall be tested in accordance with the procedures outlined in Appendix A and shall meet the following criteria:

4.1.1 The minimum spray force shall not be less than 2.0 ounces (0.56 newtons [N]) at a pressure of 20 ± 1 psi (140 ± 7 kPa) at the inlet when water is flowing.

5.0 Spray Coverage Criteria

5.1 The spray coverage of the showerhead shall be tested in accordance with the procedures outlined in Appendix B and shall meet the following criteria:

5.1.1 The total combined maximum volume of water collected in the 2- and 4-inch [in.] (50-, 101-millimeter [mm]) annular rings shall not exceed 75 percent of the total volume of water collected, and;

5.1.2 The total combined minimum volume of water collected in the 2-, 4-, and 6-in. (50-, 101-, 152-mm) annular rings shall not be less than 25 percent of the total volume of water collected.

6.0 Marking

In addition to the marking requirements in ASME A112.18.1/CSA B125.1, the following markings shall apply:

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Appendix C

LEED Indoor Water Use Reduction Calculator

Indoor Water Use Reduction Calculator

LEED v4 for D+C and O+M - WE Prerequisite/Credit Indoor Water Use Reduction
LEED v4 for ND - GIB Prerequisite/Credit Indoor Water Use Reduction and GIB Credit Wastewater Management

Step 1.
Enable macros.

Note: This calculator is for use with Excel for Mac 2011 and Excel 2007 or later.

Step 2.
Unit of measurement: IP units

Note: This selection must match the unit of measurement chosen during project registration.

Step 3.
The project is LEED for Neighborhood Development: Yes

Note: This selection must match the rating system chosen during project registration.

Step 4.
Complete the Flush and/or Flow tables on the Group tab.

Note: Projects with extremely complex occupancy and/or fixture usage patterns (such as where different types of occupants have different annual days of operation and use fixtures with differing flush and flow rates within the building) may complete a separate calculator tab to represent the usage for complex scenarios.

Step 6.
Upload the completed spreadsheet to LEED Online. Complete any related summary fields in the LEED credit form with the results of the calculator.

Assumptions

Fixture Type	Maximum Installed Flush/Flow Rate		Duration (sec)	Default Uses per Day				
	IP	SI		Employees (FTE)	Visitors	Retail Customers	Students (K-12)	Residential
Toilet (male)	1.60 gpf	6.00 lpf	n/a	1	0.1	0.1	1	5
Toilet (female)	1.60 gpf	6.00 lpf	n/a	3	0.5	0.2	3	5
Urinal	1.00 gpf	3.80 lpf	n/a	2	0.4	0.1	2	0
Public lavatory (restroom) faucet	0.50 gpm	1.90 lpm	30	3	0.5	0.2	3	0
Private (residential) lavatory faucet	2.20 gpm	8.30 lpm	60	0	0	0	0	5
Kitchen faucet	2.20 gpm	8.30 lpm	15	1	0	0	0	0
Residential kitchen faucet	2.20 gpm	8.30 lpm	60	0	0	0	0	4
Showerhead	2.50 gpm	9.50 lpm	300	0.1	0	0	0	0
Residential showerhead	2.50 gpm	9.50 lpm	480	0	0	0	0	1

V02

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Appendix D

Pacific Institute. *Waste Not, Want Not: The Potential for Urban Water Conservation in California, Appendix E: Details of Commercial Water Use and Potential Savings, by Sector*. November 2003.

Go to

http://www.pacinst.org/app/uploads/2013/02/waste_not_want_not_full_report3.pdf

for full report on average water use in the hotel industry and other sectors and information on data sources used in analysis.

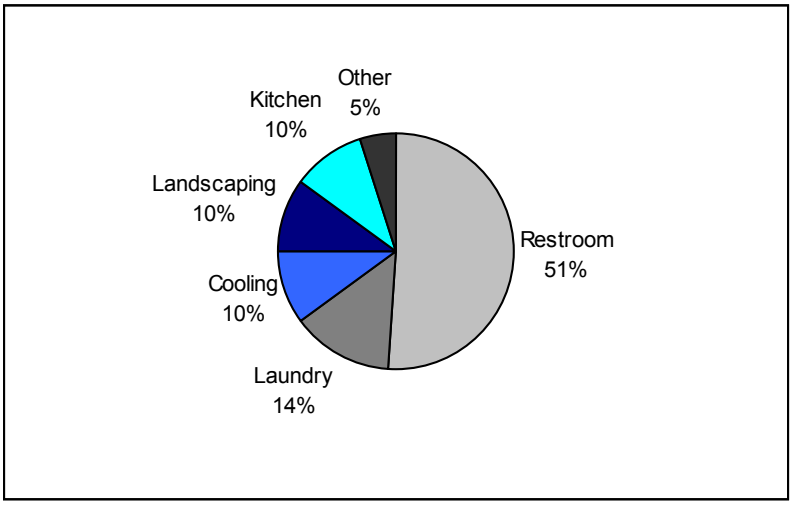
Hotels (SIC codes 701 and 704)

Sub-industries under SIC code 70 include hotels, motels, rooming and boarding houses, recreational vehicle parks, camp sites, and a variety of other types of lodging establishments. Because the literature focuses primarily on water use in hotels, motels, and bed and breakfasts (SIC codes 701 and 704), we limited our focus to these three types of lodging establishments, which we refer to collectively as hotels.

Table E-4
Employment and Water Use in the Hotel Industry (2000)

Industry	SIC codes	GED	Employees	Annual Use (TAF)
Hotels	701,704	240	182,640	30.3

Figure E-2
Water Use, by End Use, in the Hotel Industry



Source: Calculated from MWD audit data of 93 hotels (MWD 2002).

Comparison of GED-derived Estimate to Modeled Water Use

We modeled the water use in hotels, using published estimates of restroom visits, showers, faucet use by guests and employees, irrigated turf area, cooling requirements etc. We converted our GED-derived estimate of water use per employee into water use per occupied room per day and then compared it to that predicted by the water use model. The end use calculations in the GED-derived estimate are from Figure E-2 and the model's assumptions are based on the end use data in Appendix D and a study of water use in the hotel industry (Redlin and deRoos 1990).

Table E-5
Modeled Water Use in Hotels (2000)

		Typical Use/Occupied Room/Day			
	Measurement Unit	Rate/Unit	Number of Units	Water Use (gal/day)	GED-derived Use (gal/day)
Showers[1]	gal/minute	2.2	16.0	35.2	
Faucets[1]	gal/minute	1.3	0.4	0.6	
Toilets[1]	gal/flush	3.0	4.0	12.0	
Laundry[2]	gal/lb.	2.5	8.0[3]	20.0	
Kitchen	gal/meal	7.6[4]	2.2[5]	17.0	
Icemakers	gal/meal	0.5[6]	2.2[5]	1.1	
Misc.	gal			25.0	

INDOOR				**111.0**	
Cooling[7]	gal/CDD	5.6	1.4	8.0	
COOLING				**8.0**	
Irrigation[8]	gal/sq. ft.	0.2	50.0	10.0	
Pool				0.5	
OUTDOOR				**10.5**	
TOTAL				**130**	**117**[9]

[1] See Appendix D.
[2] See Appendix D.
[3] Pounds/occupied room/day of laundry is obtained from the average of the 12 hotels in Redlin and de Roos (1990). Eighty-nine percent of hotels have in-house laundries (Redlin and de Roos 1990).
[4] Average gal/meal is obtained from the restaurant sector. Seventy-six percent of hotels have restaurants (Redlin and de Roos 1990).
[5] Meals/occupied room (Redlin and de Roos 1990)
[6] 0.5 lbs/meal * 1 gal/lb : lbs/meal taken from 1994 ASHRAE Refrigeration Handbook, 1 gal/lb estimated from Pike 1995.
[7] Nearly 50 percent of the hotels surveyed in Redlin and de Roos (1990) had central cooling. Average annual Cooling Degree Days (CDD) in California was 1035. Therefore Cooling Degrees per day = 1035*50%/365 = 1.4 gal/CDD obtained from Redlin and de Roos (1990).
[8] See Appendix D.
[9] We used information on the total number of occupied hotel rooms and total water used by the hotel sector in 2000. When we divided 2000 water use (30.3 TAF) by 350,000 rooms times the average occupancy rate for the year (66%), the water use/occupied room/day was about 117 gallons.

Estimate of Potential Savings

By applying the conservation potential calculated in the end use studies (see Appendix D) to our GED-derived estimates of water use, we estimated potential water savings (shown in Table E-6).

Table E-6
Potential Water Savings in the Hotel Industry (2000)

End Use	Water Use (TAF)	Conservation Potential (percent)			Conservation Potential (TAF)		
		Low	High	Best	Low	High	Best
Restrooms	16.7	31%	31%	31%	5.3	5.3	5.3
Laundry	4.2	42%	66%	54%	1.8	2.8	2.3
Cooling	3.0	9%	41%	26%	0.3	1.3	0.8
Landscaping	3.0	47%	53%	50%	1.1	1.6	1.5
Kitchen	2.4	20%	20%	20%	0.5	0.5	0.5
Other	0.9	0%	0%	0%	0.0	0.0	0.0
Total Savings	**30.3**	**30%**	**38%**	**34%**	**9.0**	**11.4**	**10.3**

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Appendix E

Saint Helena, California Cooling Degree Days Data

SAINT HELENA, CALIFORNIA

Period of Record General Climate Summary - Cooling Degree Days

Station:(047643) SAINT HELENA													
From Year=1931 To Year=2006													
Cooling Degree Days for Selected Base Temperature (F)													
Base	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
55	4	13	43	106	244	381	501	483	390	215	45	5	2430
57	2	6	25	72	190	322	439	421	330	163	26	2	1998
60	1	1	9	36	121	235	346	328	243	96	10	0	1427
65	0	0	1	9	45	111	194	177	115	29	2	0	683
70	0	0	0	1	12	39	72	61	38	6	0	0	230

Cooling Degree Day units are computed as the difference between the daily average temperature and the base temperature. (Daily Ave. Temp. - Base Temp.) One unit is accumulated for each degree Fahrenheit the average temperature is above the base temperature. Negative numbers are discarded. Example: If the days high temperature was 95 and the low temperature was 51, the base 60 heating degree day units is ((95 + 51) / 2) - 60 = 13. This is done for each day of the month and summed.
Table updated on Jul 28, 2006
Months with 5 or more missing days are not considered
Years with 1 or more missing months are not considered

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