# APPENDIX J

## Water Neutral Report

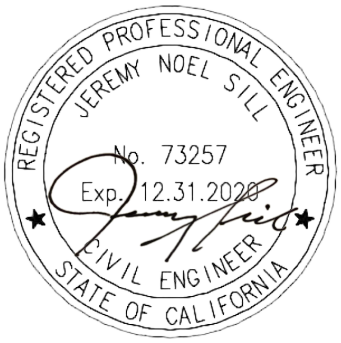
# WATER NEUTRAL REPORT

## Technical Memorandum
## Results of Preliminary Water Calculations

For:

Hunter Subdivision
St. Helena, CA

APN: 009-030-057




Project No. 4110047.0

September 10, 2020

1515 Fourth Street, Napa, CA 94559 www.rsacivil.com (707) 252-3301 v. (707) 252-4966 f.

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# ATTACHMENTS

1. Water Neutrality Calculations
2. Conceptual Landscape Water Use Calculations – Spatial Design Group
3. Municipal Water Saving Measures

## I. BACKGROUND

In order to comply with the City of St. Helena's Water Neutral Policy, RSA+ is submitting to you this water analysis for the proposed Hunter Subdivision. This analysis documents the theoretical proposed water consumption for the new development and the options for water off-set mitigation.

## II. EXISTING THEORETICAL DOMESTIC WATER DEMAND

There is no current connection to the City of St. Helena domestic water system. Therefore, the existing demand is zero gallons per day.

## III. PROPOSED THEORETICAL DOMESTIC WATER DEMAND

It is our understanding based on communications with the City of St. Helena that the assumed water demand has been established to its satisfaction. The basis is repeated here for continuity.

The proposed development consists of 51 lots with detached 4-bedroom single-family residences, and an additional 25 two-bedroom multi-family residential units will be included in the development. The proposed water demand is calculated based upon water usage from water fixtures and appliances based on the number of occupants as laid out by The City of St. Helena Water Neutral Policy for Development. A list of the water performance requirements for fixtures and appliances follows.

| | | |
|---|---|---|
| A. | Showerheads | 8 min/shower/day/occupant |
| B. | Lavatory faucets | 0.25 min/3 times/day/occupant |
| C. | Kitchen faucets | 4 min/day/occupant |
| D. | Toilets | 3 flushes/day/occupant |
| E. | Clothes Washer | 0.37 load/day/occupant |
| F. | Dish Washer | 0.1 load/day/occupant |

Water usage from water fixtures and appliances that meet the minimum requirements of the 2010 California Green Building Standards Code (Title 24, Part 11) and the City of St. Helena Water Neutral Policy.

| | | |
|---|---|---|
| A. | Showerheads | 2.0 gallons per minute |
| B. | Lavatory faucets | 1.5 gallons per minute |
| C. | Kitchen faucets | 1.8 gallons per minute |
| D. | Toilets | 1.3 gallons per flush |
| E. | Clothes Washer | 19.7 gallons per load |
| F. | Dish Washer | 6.3 gallons per load |

Following the guidelines of the City of St. Helena policy, the analysis is to be completed based on two occupants per bedroom. Based on the City of St. Helena Water Neutral Policy for Development we have calculated the theoretical domestic water demand to be 17,752 gallons

per day (19.88 acre-feet per year) for the total development. These calculations can be found attached.

## IV. LANDSCAPE WATER DEMAND

Landscape irrigation will be provided by an existing well located at the site, thus landscape usage will not be included in this water neutrality study, as provided for in Municipal Code Section 13.12.010. Preliminary landscape water usage calculations prepared by Spatial Design Group indicated that irrigation will require 17.16 acre-feet. See Conceptual Landscape Water Use Calculations by Spatial Design Group in Attachment 2.

## V. PROPOSED MITIGATION

A variety of specific water offset mitigations were listed in our 2017 Report in summary form. Attached here is the detailed Report with the supporting documentation cited. These may be items that are pursued.

City of St. Helena Staff has asked us to review alternatives similar to those in American Canyon. Some of these options are converting parks to recycled water and expanding recycled water to other areas are discussed in American Canyon, however we don't believe that these options are as readily available in the City of St. Helena.

We discussed alternative options with City of St. Helena Public Works Director, Erica Ahmann Smithies, and understand there may be a few projects that could drastically increase the water savings to the City, and provide the offset the project needs. These options include the following and would be funded by payment of the in-lieu fee provided for by City Ordinance:

1. Assist the City in fixing the leaking transmission line between the City and Rutherford. It's our understanding there is a substantial amount of water lost as part of the old pipeline.
2. Place/replace water meters that are not in place or functioning improperly.
3. Paying the in-lieu fee to be used by the City for any of the options identified in the attached Report or otherwise selected by the City.

## VI. IN-LIEU RETROFIT FEES

The proposed project will result in the use of approximately 17,752 gallons per day. Since the existing parcel had no existing water usage, conservation measures on the site will not be able to achieve neutrality. Therefore, the project proposes to pay an in-lieu retrofit fee equivalent to the cost of retrofitting showerheads, sink and kitchen faucets, and toilets in existing residences to achieve the required water savings.

The theoretical residential water usage for homes with old fixtures are summarized in the table below:

Table 1 - 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 Faucets | 2.2 | 4 | 1 | 6 | 52.8 |
| Toilet | 2.2 | 1 | 3 | 6 | 39.6 |
| | | | | **Total** | **222** |

The theoretical residential water usage for homes with retrofitted low flow fixtures are summarized in the table below:

Table 2 - 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 Faucets | 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 (gpd), while a residence that has been retrofitted with low fixtures will use 169 gpd. An overall savings of 53 gpd.

The calculation for number of residences which would need to be retrofitted based on the anticipated demand for The Hunter Subdivision are shown in the tables below:

Table 3 - Proposed Water Use Savings

| | Gallons | |
|---|---|---|
| | **Daily** | **Annual** |
| Theoretical Water Use with Old Fixtures | 222 | 81140 |
| Theoretical Water Use with Retrofits | 169 | 61681 |
| **Savings** | **53** | **19458** |

Table 4 – Retrofits Required for Hunter Subdivision

| | Gallons | |
|---|---|---|
| | **Daily** | **Annual** |
| Hunter Subdiv. New Water Demand | 17752 | 6479480 |
| Water Savings per Residence w/Retrofit | 53 | 19458 |
| **Number of Residences to Retrofit** | **333** | **333** |

In order to offset the anticipated water demand at The Hunter Subdivision, 333 residences will need to be retrofitted.

The anticipated material and installation costs to retrofit a residence are shown in the tables below:

Table 5 - Retrofit Material Costs Anticipated

| **Material Cost per Residence** | **Qty** | ***Cost per Unit** | **Total Cost** |
|---|---|---|---|
| Toilet | 2 | $265.68 | $531.36 |
| Lavatory Faucet | 2 | $140.40 | $280.80 |
| Kitchen Faucet | 1 | $150.12 | $150.12 |
| Shower Head | 1 | $309.96 | $309.96 |
| **Total Estimated Material Cost per Residence*** | | | **$1,272.24** |

Table 6 - Retrofit Installation Costs Anticipated

| **Installation Cost per residence** | **Hours** | **Qty** | ***Cost per hour** | **Total Cost** |
|---|---|---|---|---|
| Toilet | 1.5 | 2 | $65.00 | $195.00 |
| Lavatory Faucet | 1.5 | 2 | $65.00 | $195.00 |
| Kitchen Faucet | 1.5 | 1 | $65.00 | $97.50 |
| Shower Head | 0.5 | 1 | $65.00 | $32.50 |
| **Total Estimated Labor Cost per Residence*** | | | | **$520.00** |

Table 7 – Total Estimated Costs of Retrofits

| | |
|---|---|
| Total estimated cost to retrofit each residence * | $ 1,792.24 |
| Number of residences to retrofit | $333.00 |
| **Total Estimated In-Lieu Fee Retrofit Cost*** | **$596,808.19** |

Material costs cited in the tables above are based upon sources found on www.amazon.com on August 28, 2020 with an 8% markup for tax for the following fixtures:

- Toilet - Kohler Cimarron Comfort Height two-piece 1.28gpf with Aqua Piston Tech Model #K-3887-0
- Lavatory Faucet - American Standard Tropic Centerset Model #7038201
- Kitchen Faucet - American Standard Monterrey Model #6409170
- Shower Head - American Standard Berwick Model #T430501

Labor costs cited in Tables 5-7 above for cost per hour are based upon estimates found at http://www.angieslist.com/articles/how-much-does-it-cost-hire-handyman.htm

## VII. CONCLUSION

The proposed project will result in the use of approximately 17,752 gallons per day. The proposed development will use water efficient fixtures and conservation measures to the maximum extent practicable. The offset of the project water demands may be best met through assisting the City of St. Helena with existing water system improvements via in-lieu fees. The project will pay $596,808 as an in-lieu retrofit fee equal to the cost of retrofitting enough residences with low flow fixtures to achieve savings equal to the proposed use.

# ATTACHMENT 1

# WATER NEUTRALITY CALCULATIONS

# Hunter Subdivision
# Water Neutrality Calculations

1. Occupant Calculation:

Single Family Residences

| Total 51 units | 4 bedroom homes. Assume 2:1 ratio. | | Number of Bedrooms | Number of Occupants @ 2 per bedroom |
|---|---|---|---|---|
| | 4 bedroom units: | 51 | 204 | 408 |
| | | | Total number of occupants | **408** |

Apartment Units

| Total 25 units | 2 bedroom units. Assume 2:1 | | Number of Bedrooms | Number of Occupants @ 2 |
|---|---|---|---|---|
| | 2 bedroom units: | 25 | 50 | 100 |
| | | | Total number of occupants | **100** |

2. Proposed Water Usage:

Single Family Residences

| 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 | x | 8 | x | 1 | x | 408 | = | 6528 |
| Sink Faucets | 1.5 | x | 0.25 | x | 3 | x | 408 | = | 459 |
| Kitchen Faucet | 1.5 | x | 4 | x | 1 | x | 408 | = | 2448 |
| Toilet | 1.3 | x | 1 | x | 3 | x | 408 | = | 1591 |
| Clothes Waher | 19.7 | x | 1 | x | 0.37 | x | 408 | = | 2974 |
| Dish Washer | 6.3 | x | 1 | x | 0.1 | x | 408 | = | 257 |
| | | | | | | | | | 14257 |

Apartment Units

| 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 | x | 8 | x | 1 | x | 100 | = | 1600 |
| Sink Faucets | 1.5 | x | 0.25 | x | 3 | x | 100 | = | 113 |
| Kitchen Faucet | 1.5 | x | 4 | x | 1 | x | 100 | = | 600 |
| Toilet | 1.3 | x | 1 | x | 3 | x | 100 | = | 390 |
| Clothes Waher | 19.7 | x | 1 | x | 0.37 | x | 100 | = | 729 |
| Dish Washer | 6.3 | x | 1 | x | 0.1 | x | 100 | = | 63 |
| | | | | | | | | | 3494 |

**Total Development Daily Water Usage (gpd) = 17752**

# ATTACHMENT 2

## CONCEPTUAL LANDSCAPE WATER USE CALCULATIONS
## SPATIAL DESIGN GROUP

SDG

**SPATIAL DESIGN GROUP**

**Planning - Urban Design - Landscape Architecture**

August 2, 2019

Ben VanZutphen
237 Lorraine Ct.
Healdsburg, CA 95448

**RE: Hunter Residential Subdivision**
**Technical Memo - Conceptual Landscape Water Use Calculations**
**Adams Street & Starr Avenue, Saint Helena, CA (City File No. PL 10-040)**
*Job No.: 181002*

Spatial Design Group (SDG) is pleased to provide you with Conceptual Landscape Water Use Calculations and an Estimated Landscape Water Use Demand. Methodology is based on the State of California's Model Water Efficient Landscape Ordinance, adopted by the City of Saint Helena. Calculations are provided in the attached Appendix B and are based on hydrozones shown on the prepared Conceptual Water Use Plan.

**The estimated total landscape water use (ETWU) for the project is: 17.16 acre feet** (5,592,210 gal./ yr)

The following assumptions were used to estimate landscape water use:

1. The project will consist of single family residential homes and attached townhomes.
2. Street tree selections will be moderate or low water use varieties as shown on the TM.
3. Homes shown on the water use plans are worst case estimates , most likely smaller than the future homes. This results in a conservative estimate of total landscape areas.
4. Future landscape plan plant selections will be compliant with WELO and listed by WUCOLS. Plant factors used in the calculation are conservative and representative of climate adaptive and native plant species. Reference Evapotranspiration (ETo) for the project is 44.0 in/ yr.
5. Each single family home is estimated to have an approximate 200 sf lawn. Actual lawn sizes and locations to be determined and will comply with the City's WELO.

Sincerely,

Spatial Design Group

Dustin Maxam, RLA
Principal, Planner/ Landscape Architect

Joe Turner, PE
Principal, Engineer



325 Carrillo Street, Santa Rosa, CA 95401
Ph 707-569-6739

SpatialDG.com

## Appendix B – Water Efficient Landscape Worksheet.

### WATER EFFICIENT LANDSCAPE WORKSHEET

This worksheet is filled out by the project applicant and it is a required element of the Landscape Documentation Package.

**Reference Evapotranspiration (Eto)** 44.1 in./ year

| Hydrozone # /Planting Description[a] | Plant Factor (PF) | Irrigation Method[b] | Irrigation Efficiency (IE)[c] | ETAF (PF/IE) | Landscape Area (sq. ft) | ETAF x Area | Estimated Total Water Use (ETWU)[e] |
|---|---|---|---|---|---|---|---|
| **Regular Landscape Areas** | | | | | | | |
| | | | | | | | |
| 1 - Public Low | 0.3 | Drip | 0.81 | 0.37 | 31593 | 11701.11 | 319931.78 |
| 2 - Pulic Moderate | 0.6 | Bubbler | 0.81 | 0.74 | 23455 | 17374.07 | 475041.93 |
| 3 - Private Low | 0.3 | Drip | 0.81 | 0.37 | 236095 | 87442.59 | 2390855.37 |
| 4 - Private Mod | 0.6 | Bubbler | 0.81 | 0.74 | 103207 | 76449.63 | 2090285.77 |
| 5 - Private high | 0.9 | Spray | 0.75 | 1.20 | 9634 | 11560.80 | 316095.39 |
| | | | | | | | |
| | | | | Totals | **403984** | **204528.21** | |
| **Special Landscape Areas** | | | | | | | |
| 7 - Edibles (Beds) | | | | 1.00 | 0 | 0 | 0 |
| 8 - Orchard | | | | 1.00 | 0 | 0 | 0 |
| 9 - | | | | 1.00 | 0 | 0 | 0 |
| | | | | Totals | **0** | **0** | |
| | | | | | | **ETWU Total** | **5592210.25** |
| | | | | | | **Maximum Allowed Water Allowance (MAWA)[e]** | **6075151.79** |

*The ETWU is less than the MAWA, the proposed water budget complies with the Water Efficient Landscape Ordinance.*

***[a]Hydrozone #/Planting Description***
*E.g*
*1.) front lawn*
*2.) low water use plantings*
*3.) moderate water use planting*

***[b]Irrigation Method***
*overhead spray*
*or drip*
*or subsurface bubbler*

***[c]Irrigation Efficiency***
*0.75 for spray head*
*0.81 for drip*
*0.81 for subsruface bubbler well*

***[d]ETWU* (Annual Gallons Required) =**
*Eto x 0.62 x ETAF x Area*
where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year.

***[e]MAWA (Annual Gallons Allowed) = (****Eto) ( 0.62) [ (ETAF x LA) + ((1-ETAF) x SLA)]*
where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year, LA is the total landscape area in square feet, SLA is the total special landscape area in square feet,
and ETAF is .55 for residential areas and 0.45 for non-residential areas.

**ETAF Calculations**

Regular Landscape Areas

| | |
|---|---|
| Total ETAF x Area | 204528 |
| Total Area | 403984 |
| **Average ETAF** | **0.51** |

**Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.**

All Landscape Areas

| | |
|---|---|
| Total ETAF x Area | 204528.21 |
| Total Area | 403984 |
| **Average ETAF** | **0.51** |

## SUMMARY HYDROZONE TABLE

| HYDROZONE | Area (sq. ft.) | % of Landscape Area |
|---|---|---|
| PUBLIC AREAS | | |
| HIGH | 0 | 0.0% |
| MODERATE | 23,455 | 5.8% |
| LOW | 31,593 | 7.8% |
| SUBTOTAL: | 55,048 | |
| PRIVATE AREAS | | |
| HIGH | 9,634 | 2.4% |
| MODERATE | 103,207 | 25.5% |
| LOW | 236,095 | 58.5% |
| SUBTOTAL: | 348,936 | |
| IRRIGATED AREA | TOTAL: 403,984 | 100% |

(HIGH) HIGH WATER USE, (MODERATE) MODERATE WATER USE, (LOW) LOW WATER USE SEE APPENDIX B FOR MAXIMUM APPLIED WATER ALLOWANCE CALCULATION.

## HYDROZONE MAP LEGEND

H — HIGH WATER USE HYDROZONE
PERENNIALS, ANNUALS, LAWNS
WATER FEATURES

M — MODERATE WATER USE HYDROZONE
SHURBS, PERENNIALS, GROUNDCOVERS
TREES ON SEPARATE VALVES

L — LOW WATER USE HYDROZONE
SHURBS, PERENNIALS, GROUNDCOVERS
TREES ON SEPARATE VALVES

*P — INDICATES PUBLIC LANDSCAPE
ALL OTHER LANDSCAPE, INCLUDING PARKWAY STRIPS IN FRONT OF HOMES, TO BE PRIVATELY IRRIGATED.

0 20' 50' 100'
SCALE: 1"=50'

MATCHLINE

ADAMS STREET

STARR AVENUE

CITY OF SAINT HELENA
009-030-056

CITY OF SAINT HELENA
009-030-056

FUTURE STREET

CONCEPTUAL HYDROZONE MAP


SDG
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PLANNERS, ENGINEERS, LANDSCAPE ARCHITECTS
707-569-6739
325 CARRILLO STREET
SANTA ROSA, CA


APN: 009-030-057

CONCEPTUAL LANDSCAPE WATER USE PLAN

# HUNTER SUBDIVISION

ADAMS STREET AND STARR AVENUE
SAINT HELENA, CALIFORNIA

Submittal / Revision:

| | |
|---|---|
| Job No: | 18-1002 |
| Drawn By: | DM |
| Checked By: | JT |
| Date: | 08-02-2019 |

Sheet Number
WU 1
1 of 1

# ATTACHMENT 3

# MUNICIPAL WATER SAVING MEASURES

**Water saving measures for the City of St. Helena**

February 2017

The following outlines opportunities for the City of St. Helena to reduce water consumption and reliance on local water supplies. Measures include indoor and outdoor residential water efficiency upgrades, metering households, providing pre-rinse fixtures to restaurants and industrial kitchens, irrigation system audits and component replacements at public facilities, and aiding wine production facilities to reduce and recapture water used in production. These water saving measures would not only decrease St. Helena's water demand but would also reduce water and sewer bills. This may be particularly desirable given the February 2017 rate increases[1], which have on average increased a family's water bill annually by $432 or 24%.

Though water use in St. Helena has decreased in recent years, comparisons to nearby communities with similar weather patterns and use requirements suggests that there are likely opportunities for implementing water efficiency measures. The 2016 St. Helena Water and Wastewater Rate Study reports 2015 city water use at 502 million gallons or 1,540 acre-feet, well below the "safe yield water supply" of 1,950 acre-feet (AF)[2]. Given the City's population of around 6,000, the per capita water use for St. Helena in 2015 is approximately 220 gallons/day. According to California Regional Water Use Targets, the San Francisco Bay Region, of which St. Helena is included, has an interim water use target of 144 gallons per capita per day[3]. The Sonoma-Marin Saving Water Partnership has lead an effort over the past years to reduce per capita water use. This campaign has resulted an average 2015 per capita water use of 100 gallons/day among partner cities. Another comparison is average residential single-family home water use. The 2016 St. Helena Water & Wastewater Rate Study assumes average monthly water use in single family homes to be 8,228 gallons/month. The 2015 Santa Rosa Water Rate Study[4] estimates monthly water use in single family homes to be 7,000 gallons/month. All of this suggests that it is reasonable to assume that reducing water use St. Helena is an achievable goal.

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[1] City of St. Helena Water and Wastewater Rate Study. Hansford Economic Consulting. 2016. http://cityofsthelena.org/sites/default/files/2016%20Rate%20Study%20FINAL.pdf

[2] St. Helena General Plan Update 2030. http://www.ci.st-helena.ca.us/sites/default/files/04_Public%20Facilities%20and%20Services_040215_0.pdf

[3] Urban Water Management Plan, City of American Canyon. Figure 3-1: Region Water Use Targets. 2010. http://www.water.ca.gov/urbanwatermanagement/2010uwmps/American%20Canyon,%20City%20of/American%20Canyon%20Final%20UWMP%202010%20Volume%20I.pdf

[4] Santa Rosa Water, Water and Wastewater Study. The Reed Group. 2015. http://santa-rosa.granicus.com/MetaViewer.php?view_id=9&clip_id=763&meta_id=80712

This report provides descriptions of the most advantageous water saving projects for the City of St. Helena. A summary of these addressable water savings are listed below.

| Water Saving Measure | Annual Savings (AF) | Assumptions |
|---|---|---|
| Turf replacement | 16.7 | Assume 5 acres replaced |
| School/park Irrigation audits/upgrades | 5 | Assume 2 parks/schools upgraded |
| Greywater/rainwater harvesting residential | 0.65 | Assume systems installed at 20 homes |
| Swimming pool covers | 0.25 | Assume 10 covers installed |
| Residential household metering | 5.8 | Assume meters on 247 mobile homes |
| Indoor water efficiency upgrades, residential | 8.1 | Assume 200 homes upgraded |
| Pre-rinse valves for commercial/ industrial kitchens | 1.3 | Assume upgrades to 10% of commercial kitchens |
| Winery production water recapture | 4.6 | Assume moderate production facility |
| **Cumulative savings:** | 42.4 | |

**Outdoor Water Efficiency Upgrades & Landscape Conversion**

Replacing turf with water efficient landscaping and auditing existing irrigation systems can reduce peak water use in summer months, resulting not just water savings but also reducing the need for capital expenditures to meet future demand.

According to a 2015 California Urban Water Conservation Council report on Turf Removal & Replacement[5], average turf-replacement water savings in California rage from between 18-83%, depending largely on climate. California Drought Executive Order B-29-15[6] notes water savings from turf replacement projects can be between 13-70 gallons/year/square foot (sqft). For the City of Napa, projected savings from turf conversion projects was estimated at 25 gallons/year/sqft. Assuming a conservative water saving estimate of 25 gallons/sqft of lawn replaced, **replacing 5 acres of turf could save over 5 million gallons of water or 16.7 AF/ year.**

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[5] Turf Removal & Replacement, Lessons Learned. California Urban Water Conservation Council. Briana Seapy. March 2015. https://cuwcc.org/Portals/0/Document%20Library/Resources/Publications/Council%20Reports/Turf%20Removal%20_%20Replacement%20-%20Lessons%20Learned.pdf

[6] California Drought Executive Order B-29-15, Directive #3, April 1, 2015. average water savings per square foot turf conversion lawn. Accessed February 12 2017.

Landscape irrigation audits at commercial and institutional sites can identify the need for simple changes to controller scheduling or emitter maintenance that can save customers tens of thousands of gallons per year. Smart irrigation controllers, which utilize real time data to optimize irrigation schedules. In the City of Napa, a project installing smart controllers at 25 City parks and 21 school fields saved over 600 AF between 2005 and 2010 at city parks and schools[7]. This represents an average of over 2.5 AF of annual water savings at each park or school location. St. Helena Unified School District has 4 school campuses and a District Office, and there are 10 City parks that could potentially benefit from irrigation audits and improvements. Given the example from the City of Napa, it is not unreasonable to predict that the City of St. Helena could experience similar water savings. **Upgrading irrigation systems at just 2 parks or schools in St. Helena may realize 5 AF/year of water savings per year.**

Laundry to landscape systems that use greywater to irrigate landscapes can put to use the 60 gallons/day of water generated from the washing machine to save a family of 4 40,000 gallons of water per year[8]. Changes to local and California code[9] have made it simple to install basic residential greywater systems. **Installing greywater systems at 20 homes could save 800,000 gallons of water or 0.25 AF/year.**

Rainwater harvesting both at a residential level or for commercial applications also has potential to reduce City water use. The City of St. Helena provides a rebate program for rainwater barrels or cisterns installed over 100 gallons. A 530 gallon Bushman tank filled 6 months out of the year could save 3,000 gallons of water per year. **20 households so equipped could save 0.4 AF/ year.** Commercially, rainwater collected in cisterns can be used to augment water needed in landscaping and potentially wine production or other industrial washing purposes. The amount of water saved will depend on weather patterns and how many times the cisterns can be filled in a year, but the savings could be significant.

Covers on swimming pools can also result in water savings. Swimming pool evaporation is reduced by 50% when the pool is covered. Assuming an average sized pool (430 square feet) this coulee mean over 8,000 gallons of water savings per year per newly covered pool[10]. From a google map search, there appear to be over 100 outdoor pools in St. Helena. **Covering just 10 of these pools, therefore, could save 0.25 AF/year.**

**Metering Residential Households**

There is evidence that installing volumetric water meters on previously unmetered single-family homes can result in substantial water savings. In a recent study done on three Northern and

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[7] City of Napa Urban Water Management Plan. 2010. http://www.water.ca.gov/urbanwatermanagement/2010uwmps/Napa,%20City%20of/Napa,%20City%20of/UWMP%202010%20-%20NAPA.pdf

[8] http://watersprout.org/wp-content/uploads/2016/04/Integrated-GW-System-Info-Packet-1.pdf. Accessed February 12 2017.

[9] http://www.thegreywaterguide.com/california.html. Accessed February 12 2017.

[10] http://www.poolspanews.com/how-to/maintenance/evaporation-study-compares-water-savings-of-covers_o. Accessed February 14 2017.

Central California cities, monthly water consumption dropped by 13-21% after six months of metering on previously unmetered homes[11]. According to the 2016 Rate Study, there are 920 multi-family and mobile home units that are not individually metered, all with an average water use of 5,236 gallons/month. Installing individual meters across these accounts assuming a 13% reduction in water use could save over 23 AF of water per year. **Installing meters only at the 247 mobile homes could result in a water savings of 5.8 AF/year.**

**Indoor Residential Water Efficiency Upgrades**

Replacing old water fixtures and toilets is a proven technique for realizing lasting water savings. The 2016 residential toilet and water fixture program in Santa Rosa, CA, for example, provides a recent example of how homes in St. Helena could be quickly retrofitted. It is estimated that customers on average save 1,100 gallons of water per month after toilets, shower heads, and sink aerators are replaced with water efficient alternatives (assuming toilets replaced are 1.6gallons/flush or higher)[12]. In Santa Rosa, water efficient toilets, shower heads, and bathroom/kitchen faucet aerators were installed at 5,500 residential sites in 2016 to realize a water savings of approximately 72.6 million gallons/year[13].

Residential developments such as mobile home parks and multi-family dwellings would be particularly advantageous partners to benefit members of the community on on the lowest income scale. There are 920 multi-family and mobile home units in St. Helena. **Retrofitting 200 of these homes could realize a water savings of 2.64 million gallons, or 8.1 AF/year.**

**Pre-Rinse Valves for Commercial & Industrial Water Customers**

30% of water in restaurants and industrial kitchens is typically used to pre-rinse dishes. Water efficient pre-rinse valves save 60 gallons of water for every hour of use[14]. The City of Santa Rosa recently replaced 250 pre-rinse valves in restaurants and commercial kitchens, estimating a water savings of over approximately 36,000 gallons/year for each replaced nozzle[15]. Restaurants, schools, industrial kitchens, and tasting rooms in St. Helena could all benefit from water efficient pre-rinse valves. According to Yelp there are over 50 restaurants in St. Helena and over 115 public winery facilities. **Providing water efficient pre-rinse valves to just 10% of these facilities could save over 1.3 AF/year**.

**Water Recapture in Wine Production**

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[11] Impacts of Metering on Residential Water Use in California. Tanverakul, Stephanie A. Department of Civil and Environmental Engineering, San Jose State University. 2015.

[12] Santa Rosa Board of Public Utilities Memorandum Agenda Item 7.1, January 7 2016. http://santa-rosa.granicus.com/MetaViewer.php?view_id=9&clip_id=713&meta_id=68623

[13] Santa Rosa Board of Public Utilities Agenda Item 7.1 Presentation, January 7 2016. http://santa-rosa.granicus.com/MetaViewer.php?view_id=9&clip_id=713&meta_id=68626

[14] http://conserve.restaurant.org/Best-Practices/Save-Water/Pre-rinse-spray-valves

[15] Santa Rosa Board of Public Utilities Agenda for January 2 2016, Item 7.1. http://santa-rosa.granicus.com/GeneratedAgendaViewer.php?view_id=9&clip_id=713

Wineries in St. Helena are the biggest water users. Water use for wine production, particularly during the 60 days of harvest can be particularly high when tanks and vats are washed and sterilized. Between 2.6-6 gallons of water is typically used for each gallon of wine produced just during the wine production phase (does not include water used for irrigation or harvest).

Water purification techniques have been able to successfully recapture up to 99% of wine production process water, resulting in huge water savings. For example, Free Flow Wines in Napa, CA successfully installed a recapture system in 2015, realizing a savings of 1.5 million gallons of rinse water per year[16]. **Installing this type and size of rinse water recapture system could result in a savings of over 4.6 AF/year**. Wine industry municipal water customers in St. Helena such as Trinchero Family Estates could benefit from this type of water upgrade.

**Conclusion**

This is a preliminary investigation on the most feasible measures that could be taken to reduce water use in St. Helena. Further data and analysis would likely identify additional partnerships and opportunities. Though per capita water use in St. Helena has dropped significantly in recent years, comparisons to local counterparts show there are likely many opportunities to further reduce the City's water demand. This report outlines various water efficiency measures to cumulatively save 42 AF/year. All of this suggests that reducing water use by 12 acre-feet/year in St. Helena is a reasonable goal to achieve.

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[16] California's Wineyard Pressed to Turn Less Water Into Wine. Alastair Bland. October 1, 2015. http://www.npr.org/sections/thesalt/2015/10/07/446096090/california-s-vineyards-pressed-to-turn-less-water-into-wine. Accessed February 12 2017.