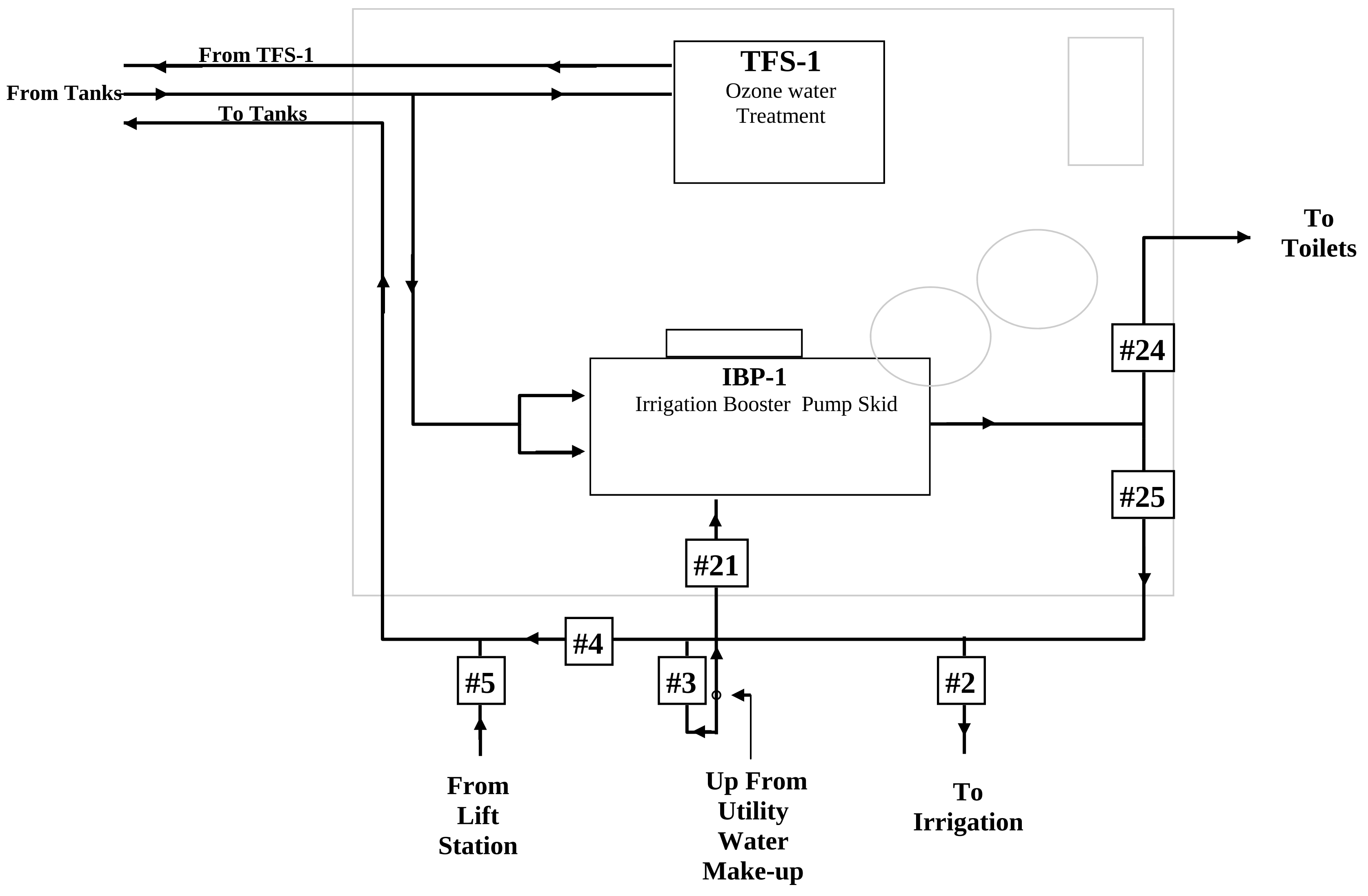
Rainwater Harvest System

Valve Configurations



Normal Operation

<u>At Tanks:</u>

All valves at storage tanks are full open except PVC (Ozone return) valves which are cracked to allow 10 gpm of circulation.

<u>At Irrigation Booster Pump Skid:</u>

#5: Open	#2: Open
#4: Closed	#24: Open
#3: Closed	#25: Open

Add Make-up Utility Water to Tanks: ***<u>Water level is low but has not reached pump shutoff level</u>.***

1. Close #025
2. Open #003
3. Partially Open #4 (partially open this valve to maintain pressure to irrigation outlet)

Add Make-up Utility Water to Tanks: ***<u>Irr. Booster Pumps have shut down due to low water</u>***

1. Open #21 (by unscrewing small screw on top of solenoid valve. Note that water will leak out of valve while open. This is ok.)
2. <u>Partially</u> open valve #4 (to maintain water pressure to bathrooms and irrigation.)

Alarm/Shutoff Setpoints (10/1/10)

Low Water alarm (to controls shop): 3ft - 6in
Low Low Water Pump Shutoff: 2ft - 0in

RAINWATER COLLECTION/DISTRIBUTION SYSTEM

Lift Station (LS-1…near SE corner of building) will operate automatically (via its packaged system of floats in the sump) to maintain sump level. Rainwater will be pumped to either the Rain Water Collection Tanks (RWCT) for storage or the site storm drain (at the street). Siemens will monitor the RWC Tank levels via an analog level sensor and high alarm and low alarm level float switches. When the tank level (monitored by the analog tank level sensor) reaches “storm drain” setpoint (adjustable and initially set to 17 feet), the Lift Station diverter valves will be positioned to the “storm drain” position and all water will be pumped to the storm drain. When the tank level drops to a “Tank” setpoint (adjustable and initially set to 16 feet), the Lift Station diverter valves will be repositioned to the “Tank” position and all water will be pumped to Rain Water Collection Tanks.

The Irrigation Pump System will operate automatically to maintain pressure setpoint (via the packaged pressure controller). If the level of the Rain Water Collection Tank drops below the low level float switch alarm, the Irrigation Pump System will be disabled (via hardwire interlock). Normally, the tanks will never be allowed to drop to this low level (due to alarms explained below).. Please note that high and low level float switches and analog level are located in the <u>eastern most tank only</u> (1 of 4 or primary tank) and that all tanks should be interconnected and at the same level. (So if the eastern tank is drained for cleaning, the Irrigation Pump will be disabled.)

The Tank Filter System (TFS-1: OZONE Treatment) will operate automatically to filter the water in the RWC Tanks. If the level of the Rain Water Collection Tank drops below the low level float switch alarm, the Tank Filter System will be disabled (via hardwire interlock). Normally, the tanks will never be allowed to drop to this low level due to alarm contacts provided to UCD (described below). As before please note that high and low level float switches and analog level are located in the eastern tank (1 of 4) and that all tanks are normally interconnected and at the same level. When the eastern tank is drained for cleaning, the Tank Filter System will be disabled.

The Siemens system will provide four tank level contacts (from sensors on the primary tank) for monitoring by others: Two contacts function as indications of a malfunction in the operation of the Rain Water Collection Tank System. The Tank Full contact functions as normal status in the operation of the Rain Water Collection Tank System. The Tank Empty contact functions as abnormal status in the operation of the Rain Water Collection Tank System (that should initiate action).

1. There is a contact from the high alarm level float switch (that indicates a malfunction in the operation of the Rain Water Collection Tank System and that the tanks may overflow soon).

2. There is analog-level driven contact that functions to notify staff that the tank is full. When the tank level (…monitored by the analog tank level sensor) reaches a “Full Tank” setpoint (adjustable and initially set to 17 feet), the Full Tank contact will switch and be maintained until the tank level drops 0.5 feet (adjustable).

3. There is also an analog-level driven contact that functions to notify staff that the tank is empty (but still operational) and that immediate action should be taken to add water to the tanks. When the tank level (monitored by the analog tank level sensor) reaches a Empty Tank setpoint (adjustable and initially set to 1.5 feet), the Empty Tank contact will switch and be maintained until the tank level raises 1.0 feet (adjustable).

4. There is a contact from the low alarm level float switch (that indicates of a malfunction in the operation of the Rain Water Collection Tank System, that the tanks are completely empty, and that no water is available for flushing and irrigation).

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Overall System Design and Operation Guide

MEMORANDUM

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Date: September 29, 2009 ***(revised July 26, 2010)***
To: Julianne Nola, Senior Project Manager, UCD DCM
From: David Campbell / HLA
Re: University of California at Davis
Brewery, Winery, and Food Pilot Facility
Rainwater Harvesting System: Description of Design
HLA Project #: 83006.03

The rainwater harvesting system has been designed to meet the program objectives outlined in the February 28, 2008 Approval of Capital Improvements for the project, which identified sustainable features to be included with the project, such as zero landscaping irrigation, a rainwater capture system, and a graywater recycling system. Additionally, the rainwater harvesting system is integral to several LEED points, including WE 1.2 (No Potable Water Use), SS 6.1 and 6.2 (stormwater quantity reduction and quality, as described in the attached hydrology memo), and potentially an Innovation in Design credit. The additional points gained are crucial to achieving the Platinum goal identified by project sponsors. The system was originally designed to only supply irrigation water, and was subsequently expanded to include capacity for interior lavatory flushing at the University's request.

Relevant Examples:

The project offered the opportunity to demonstrate a large-scale rainwater harvesting system for both purposes, a first in the central valley. Similar systems have been implemented in other climates and locations, as listed below[1]:

Oregon[1]:

State code allows interior commercial use of rainwater, including lavatory flushing, with appropriate cross connection prevention and system marking.

- Gresham, Oregon: the American Honda Motor Co. Plant uses a rainwater catchment system to provide toilet flushing water and high-efficiency irrigation.
- Portland, Oregon: Epler Hall at Portland State University uses collected rainwater for flushing and irrigation.
- Portland, Oregon: Station Place, a 13-story affordable tower, uses collected rainwater for toilet flushing.[2]

Washington:

State code has similar allowances and requirements as Oregon.

California:

The use of captured rainwater as a method to reduce potable water use in buildings is included in California's Green Building Standards (CBGS), effective August 1, 2009:

[1] Not an exhaustive list, see references.
[2] All three Oregon examples from the City of Portland Bureau of Planning and Sustainability, http://www.portlandonline.com/bps/index.cfm?c=ecbbd&a=bbehfa.

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CGBS 603.4 Wastewater reduction. *Each building shall reduce the generation of wastewater by one of the following methods:*

1. *The installation of water-conserving fixtures (water closets, urinals) meeting the criteria established in sections 603.2 or 603.3 or*
2. *Utilizing non-potable water systems (captured rainwater, graywater, and municipally treated wastewater (recycled water),*

Local jurisdictions have also developed their own standards or review applications on a discretionary basis:

- Oakland: Mills College, visited by the design team, uses a rainwater catchment system to supplement city water for toilet flushing in two on-campus buildings permitted by the City of Oakland. A single stream 5-micron filter and UV sterilization unit is used to treat water entering each building.
- San Francisco: allows rainwater harvesting for toilet flushing applications with a dual plumbing system and a separate permit.[3] The EcoCenter at Heron's Head Park is a 100% "off-grid" facility, including rainwater harvesting for toilet flushing.
- Folsom: Office building owned and built by Glumac includes a rainwater harvesting and toilet flushing system similar to this project.
- Santa Barbara: similar requirements to San Francisco.

Alternative Strategies:

For this project, alternative strategies were considered, including the following:

- Zero water use landscaping. In the Central valley, which experiences high temperatures and limited rainfall, this requires almost exclusive use of perennial native bunch grasses. These grasses are generally dormant from May through November and do not harmonize with the adjacent landscape at the RMI building or parking lot. While some native grasses are included in the landscape area to minimize water use, they are restricted to the South service area and west perimeter of the site.
- Use of University utility water for landscape irrigation. A review of online USGBC Credit Interpretation Requests (CIRs) revealed that water supplied by a well generally has to be offset by equal infiltration, essentially using the ground as a storage device. A soils percolation test would first need to be performed to determine feasibility. However, pumped water in the local area, especially from shallow depths, has demonstrated quality issues including high levels of boron, salt, and minerals. Directly capturing rainwater avoids these issues.

Water Supply and Demand

Water demand is a function of the amount of water required to sustain the landscape during a typical year, based on the average reference evaoptransipration (ETo) recorded over the past ten years. This data is combined with other factors, such as plant water use, microclimate, and density, as described in the Water Use Classification of Landscape Species (WUCOLS), to develop an estimated water demand by month. Overall landscape water demand was reduced

[3] San Francisco Public Utilities Commission,
http://www.greenhome.com/services/earthday/Rainwater_Harvesting_Fact_Sheet.pdf.
http://sfwater.org/mto_main.cfm/MC_ID/14/MSC_ID/361/MTO_ID/559

through the specification of low water use plants and trees (approximately 1/2 acre), non-irrigated native grass (approximately 1/2 acre), subsurface irrigation instead of overhead spray, and use of the University's ET-based central irrigation control system. Demand for interior lavatory flushing water, provided by FM Booth and based on the estimated occupant load is also included in the overall water demand calculation.

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Water supply is estimated by using ten-year historical average precipitation, by month, multiplied by the site area, and includes adjustments for usable rainfall, taking into account contact evaporation and absorption of initial rainfall. The water supply estimate is believed to be conservative in that, for the purpose of this calculation, only the rainfall available from hard surfaces such as paving and the roof was used. Runoff from non-paved areas is believed to be significant, but was not included because losses over non-paved areas due to infiltration were not known. Other inputs, such as condensate from mechanical units, are included in the calculation. Graywater reuse was excluded from the design because the volume of graywater available from the building was not significant enough to warrant a separate drainage system (consisting only of bathroom sink wash-water). Winery process water may also be a significant source of water in the future, however, the quantity and quality of such water is currently unknown.

The maximum required storage capacity is derived by calculating the volume of water required during the summer months when demand exceeds available supply. Because calculations of both water demand and water supply are derived from 10-year historical averages, actual demand and supply during any single given year is certain to deviate from this baseline. Due to the relatively high cost of water storage, reserve water storage is not included in the design. In the case of complete drawdown, the University's utility water can be used to supply the tanks in a back-up capacity via a manual valve.

System Description:

The rainwater system consists of several components including; (1) surface and underground drainage, (2) a vegetated bioswale, (3) lift station, (4) storage tanks and piping, and (5) treatment system.

The total watershed is slightly more than the 116,981sf project site area due to surface drainage from the west side of the RMI building. With the exception of two drain inlets in the service yard which outfall directly to the lift station sump due to grading constraints, all stormwater is directed into the bioswale, which provides detention, phytoremediation for water that is in contact with vegetation or infiltrates through the plant root zone, and particle filtration (to approximately 200 mircons) through the subdrain. During a large storm event, a high-flow bypass will allow stormwater to flow directly into the lift station. The lift station pumps water directly into storage tanks. When the tanks are full, a sensor operates a diverter valve which directs stormwater from the lift station into the University's storm drainage system. Although the proposed system requires the use of pumps and an associated energy cost as opposed to routing water directly from the roof to the storage tanks, a "single path" is believed to be the least maintenance intensive. Direct roof drainage would have required a mechanism and piping to divert first flush water, as well as overspill once the tanks were full, which would also be less likely to be maintained compared to ground level screens and piping.

Storage consists of four 44,000 gallon galvanized steel tanks with PVC membrane liners, for a total capacity of 176,000 gallons. The steel tanks are covered by a 5 year warranty, and the liners have a 10-year prorated warranty. Tanks of this type typically are in service for 30-50 years, and the liners last, on average, 15-20 years. Rigid steel tanks with applied liners were also considered, but were not selected due to their higher cost and problems with applied liners due to movement and thermal expansion. The liner system specified is frequently used to retro-fit failed

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tanks of other types.[4] Each tank has separate manual inlet and outlet valves for isolation, however, they are self-equalizing through both inlet and outlet headers during normal operation.

To prevent large scale biological growth within the tanks, water is continuously circulated via a sidestream skid, consisting of a dedicated pump, ozone generation unit, and mixer, which continuously draws water from each tank and mixes ozone into the water to provide a minimum level of bacteriological control. While suitable for controlling organic growth, and providing a short-term residual effect, this system is not intended to provide complete bacteriological control or sterilization. The side-stream treatment skid incorporated into the design has been used by the manufacturer (Ozone Water Systems) on many similar installations.

Water required by the irrigation system or for interior flushing is drawn by a VFD/dual booster pump equally from each storage tank through a screened floating inlet and through a 50-micron self-flushing filter. Two pressure tanks maintain continuous pressure for both the interior flushing water and irrigation system. The booster pumps and pressure tanks are sized to provide adequate water pressure and flow for both demands, up to 60 gpm, with both pumps running. This maximum flow is not anticipated during any normal operation, and would only occur momentarily in the event that all interior lavatory fixtures are flushed simultaneously. During normal operation, combined flows are not expected to exceed 20 gpm. Each individual booster pump is rated for 30gpm, and can thus provide redundancy. The booster pumps are controlled via a Variable Frequency Drive (VFD) to extend pump life and conserve power. An internal thermal switch, including a fault light and manual reset button, protects the pumps from continued dry operation.

Controls and Automation

Controls and automation for the rainwater harvesting system were kept to a minimum per comments received on initial design submittals. Dedicated high and low water level alarms are connected to the University's Building Monitoring System (BMS). An analog level sensor provides input to the dedicated building automation panel. If a low water tank level condition occurs, this panel sends a shutoff signal to the dedicated booster pump Programmable Logic Controller (PLC). Similarly, if a high water tank level occurs, a signal is sent to the lift station diverter valves directing water to the University's storm drainage system. The lift station is operated via a separate packaged control panel. A water column gauge has been included on the primary (easterly) tank for a visual indication of tank water level.

Additional options were considered for automation during design, including analog tank level reporting to the a PLC, automatic fill valve control from the PLC (supplying back-up water from the Utility water line), moisture detection between the liner and the tank, and controlling the diverter valve from the PLC. These were ultimately precluded in favor of simplicity. Automation of the backup water supply was intentionally omitted to retain a "person in the loop" philosophy. Flow sensors at each system input and output were discussed but ultimately not included at the University's direction. Ports for water sampling have been included at the primary tank, and within the sidestream circulation path both upstream and downstream of the ozone generator.

Treatment for Interior Non-Potable Use:

Within California, there is currently no reference standard for treatment of non-potable interior flushing water. A required level of treatment (if any) has not been prescribed by the University. Suggested references for treatment standards are (1) 2004 USEPA document "Guidelines for

[4] See http://www.winebusiness.com/wbm/?go=getArticle&dataId=50707 for a review of various types of water storage tanks used in agricultural and winery applications.

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Water Reuse," or (2) International Association of Plumbing and Mechanical Officials (IAPMO) "Draft Green Plumbing and Mechanical Code Supplement," dated August 28, 2009.

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Operation:

1. Normal Condition:
   a. Monitor the system for alert conditions
   b. Perform recommended maintenance operations
   c. Periodically observe the stored water volume (recommended: monthly)
   d. Ensure adequate stored water volume by supplementing with back-up water when necessary

2. Special Conditions:
   a. Offline individual tank:
      i. Close individual tank inlet, outlet, and ozone return header valves

   b. Drain individual tank to other tanks
      i. Shut off sidestream ozone system
      ii. Close individual tank inlet and ozone return header valves.
      iii. Close all other tank outlet header valves
      iv. Open normally closed isolation valve between pump outlet and inlet header
      v. Close normally open valve from pump outlet to irrigation system
      vi. Manually operate pump until subject tank is emptied

   c. Drain all tanks:
      i. Post "Restroom Closed" notices
      ii. Shut off sidestream ozone system
      iii. Activate lift station diverter valves to storm drainage
      iv. Close all ozone return header valves
      v. Close all tank inlet header valves
      vi. Open normally closed isolation valve between pump outlet and inlet header
      vii. Remove plug and open normally closed inlet header end-run valve. Drain to grade or connect to alternative water storage.
      viii. Manually operate pump until tanks are emptied.

   d. Fill with backup water
      i. Open normally closed isolation valve from back-up water supply to inlet header until desired tank water level is reached.

   e. Bypass system for irrigation
      i. Activate lift station diverter valves to storm drainage
      ii. Close all tank inlet header valves
      iii. Open normally closed isolation valve from back-up water supply to inlet header.
      iv. Open normally closed isolation valve between pump outlet and inlet header

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Maintenance:

Refer to individual equipment literature and manufacturer's recommendations for maintenance requirements. Additionally, the rainwater harvesting system will require the following maintenance:

- Inspect all exterior piping annually.
- Check bolts on seismic anchors annually.
- Clean sediment from storage tanks and lift station sump annually prior to the rainy season. Otherwise, sediment can be allowed to accumulate until it becomes a maintenance problem for the filters, at which time the tanks should be taken off-line cleaned one at a time. Ports for vacuum truck connections have been provided at each tank.

References:

Estimating Irrigation Water Needs of Landscape Plantings in California, University of California Cooperative Extension and California Department of Water Resources, August 2000, http://ucce.ucdavis.edu/files/filelibrary/1726/15359.pdf

U.S. Green Building Council LEED-NCv2.2 Reference Guide, 2nd Edition, SS 6.1 and SS 6.2; WE 1.2, http://www.usgbc.org/.

2008 Green Building Standards Code, California Building Standards Commission, http://www.documents.dgs.ca.gov/bsc/2009/part11_2008_calgreen_code.pdf.

Rainwater Harvesting Potential and Guidelines for Texas, 2006, Texas Rainwater Harvesting Evaluation Committee, et. al. http://www.twdb.state.tx.us/iwt/rainwater/docs/RainwaterCommitteeFinalReport.pdf.

Design for Water, Heather Kinkade-Levario, 2007.

UC Davis Brewery, Winery and Food Pilot Facilities (UCD BWF) Stormwater Hydrology and Hydraulics, Creegan + D'Angelo, May 01, 2009.

Attachments:

Supplemental Drawing, Rainwater Harvesting Schematic, The HLA Group, April 12, 2010.

Estimate of Annual Landscape Water Demand, The HLA Group, September 7, 2009.

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Estimate of Annual Landscape Water Demand

*** Based on WUCOLS 2000 CIMIS, & UC CE guide**

Project Name: **UCD Brewery Winery**
Project #: **83008**

Date: 7/7/2009
POC: **n/a**

Location of ET_O Data: Davis — 55.77 in/year

Hydrozone #1

	9,999 sqft	0.23 acres	**Description:** ***Shrubs/grndcvr/trees (low, sub-surface d***
Species factor (k_s):	0.2	Low	**Landscape Coefficient (K_L) = (k_s x k_d x k_{mc}) =** 0.160
Density factor (k_d):	0.8	Low	
Microclimate factor (k_{mc}):	1	Average	**Landscape Evapotranspiration (ET_L) = (K_L x ET_O) =** 8.92 in/year
Irrigation Efficiency (IE):	0.9	Drip	**Total Water Applied (TWA) / year = (ET_L / IE) =** 9.91 in/year
			Gallons per year (GPW) = (TWA x H_A x 0.62) = 61,465 gal/year

Hydrozone #2

Area (H_A):	6,626 sqft	0.15 acres	**Description:** ***Trees (low, bubblers)***
Species factor (k_s):	0.2	Low	**Landscape Coefficient (K_L) = (k_s x k_d x k_{mc}) =** 0.160
Density factor (k_d):	0.8	Low	
Microclimate factor (k_{mc}):	1	Average	**Landscape Evapotranspiration (ET_L) = (K_L x ET_O) =** 8.92 in/year
Irrigation Efficiency (IE):	0.9	Drip	**Total Water Applied (TWA) / year = (ET_L / IE) =** 9.91 in/year
			Gallons per year (GPW) = (TWA x H_A x 0.62) = 40,731 gal/year

Hydrozone #3

Area (H_A):	6,091 sqft	0.14 acres	**Description:** ***Trees (med., edge of site, bubblers)***
Species factor (k_s):	0.5	Medium	**Landscape Coefficient (K_L) = (k_s x k_d x k_{mc}) =** 0.400
Density factor (k_d):	0.8	Low	
Microclimate factor (k_{mc}):	1	Average	**Landscape Evapotranspiration (ET_L) = (K_L x ET_O) =** 22.31 in/year
Irrigation Efficiency (IE):	0.9	Drip	**Total Water Applied (TWA) / year = (ET_L / IE) =** 24.79 in/year
			Gallons per year (GPW) = (TWA x H_A x 0.62) = 93,605 gal/year

Hydrozone #4

Area (H_A):	5,538 sqft	0.13 acres	**Description:** ***Native grasses/subsurface drip***
Species factor (k_s):	0.3	Low	**Landscape Coefficient (K_L) = (k_s x k_d x k_{mc}) =** 0.300
Density factor (k_d):	1	Average	
Microclimate factor (k_{mc}):	1	Average	**Landscape Evapotranspiration (ET_L) = (K_L x ET_O) =** 16.73 in/year
Irrigation Efficiency (IE):	0.9	Drip	**Total Water Applied (TWA) / year = (ET_L / IE) =** 18.59 in/year
			Gallons per year (GPW) = (TWA x H_A x 0.62) = 63,830 gal/year

ET_O by month

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
ET_O/Mo.	0.99	1.73	3.37	5.47	6.89	8.12	8.49	7.48	5.79	4.24	2.04	1.16

Water Use by Month

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Hydrozone #1 gal.	1,091	1,907	3,714	6,029	7,594	8,949	9,357	8,244	6,381	4,673	2,248	1,278
Hydrozone #2 gal.	723	1,263	2,461	3,995	5,032	5,930	6,201	5,463	4,229	3,097	1,490	847
Hydrozone #3 gal.	1,662	2,904	5,656	9,181	11,564	13,629	14,250	12,554	9,718	7,116	3,424	1,947
Hydrozone #4 gal.	1,133	1,980	3,857	6,261	7,886	9,294	9,717	8,561	6,627	4,853	2,335	1,328
Interior Flushing	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860	1,860
Winery	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	**6,469**	**9,914**	**17,549**	**27,325**	**33,936**	**39,662**	**41,384**	**36,682**	**28,815**	**21,599**	**11,357**	**7,260**

Yearly Total (gal.): **281,950**

Available Water Input by Month

Watershed Area (sf) ***(only impermeable area is used for this calculation)*** 58,167

Hist. Ave Precip (in.)	3.67	3.05	2.15	1.23	0.44	0.14	0.02	0.03	0.15	0.93	1.86	3.16
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Eff. Precip (-.2"*75%)	2.60	2.14	1.46	0.77	0.18	0.00	0.00	0.00	0.00	0.55	1.25	2.22
Rainwater Capture (gal.)	93,663	76,798	52,317	27,292	5,803	0	0	0	0	19,132	44,429	79,790
Winery Process	0	0	0	0	0	0	0	0	0	0	0	0
On-Site Recovery	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020	1,020
TOTAL (gal.)	**94,685**	**77,820**	**53,338**	**28,313**	**6,823**	**1,020**	**1,020**	**1,020**	**1,020**	**20,152**	**45,450**	**80,812**

Yearly Total (gal.): 411,474

Water Storage (= input/available storage capacity - use)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Estimated Storage (gal.)	88,217	156,123	176,000	176,000	148,888	110,246	69,882	34,220	6,425	4,978	39,071	112,623

MAX. STORAGE (gal.)	**176,000**
RESERVE (%) ***(lowest month / max storage capacity)***	3%

Notes:

1) ET_O and Historical Average Precipitation from CIMIS weather stations in Davis, CA.
2) Calculation does not address plant establishment period (typically 125-150% of normal use). Additional potable water use allowabe within first year per LEED WEc1.2.
3) Refer to "A guide to estimating irrigation water needs of landscape plantings in California" by the UC Cooperative Extension, 2000ed. for further information on the calculations used in this worksheet.
4) Refer to WUCOLS 2000ed. and local 'best practice' for information on determining water requirements for landscape plants.
5) Refer to CIMIS data for the historical average reference evapotranspiration rate.
6) Historical average precip reduced by 2/10" due to first flush, evaporation, etc.
7) Current design uses filtered on-site runoff from bioswales, with auto-shutoff for pump feeding storage tanks.
8) Four (4) CorGreen tanks @ w/ 17' net storage height = 44,000gal ea. = 176,000 gallons total