

Total Water Use Reduction Report

639 South La Brea

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1. PROJECT DESCRIPTION AND WATER EFFICIENCY FEATURES

The proposed project is a mixed use building located in Los Angeles, California. The building consists of 6 stories above grade and 2 stories below grade, consisting of 121 residential units, 125 hotel rooms, 13,037 SF retail space and 2 levels of underground parking.

Domestic water service is provided to the site by the Los Angeles Department of Water and Power (LADWP). Based on available water service map 134-183 provided by LADWP, there is a 12-inch water main in South La Brea Avenue, where the project site appears to have domestic water connection off from. The map also indicates an 8" water main on Wilshire Blvd. and 6th Street. Both are cross streets to La Brea Ave.

The analysis focuses on estimating the average daily water usage of the project. The water usage was estimated based on expected occupancy, water fixtures and daily usage profiles per 2016 California Plumbing Code and 2016 California Green Building Standards Code method.

The following are some of the water efficient strategies that are proposed for the project.

- Low flow showerheads: 1.5 gallons per min
- Low flow lavatory faucets: 0.5 gallons per min
- Low flow kitchen faucets: 1.5 gallons per min
- Low flow toilets: 1.28 gallons per flush
- Low flow urinals: 0.125 gallons per flush
- Energy star certified dish washers
- Energy star certified clothes washers

2. PLUMBING DOMESTIC WATER USAGE

Occupancy load was estimated per architect (Table 1). For retail space, assuming 872 occupants has 50 employees and 822 visitors when doing the calculation. And gender ratio is assumed as 50% male and 50% female (Table 2).

TABLE 1. ESTIMATED OCCUPANCY

ESTIMATED OCCUPANCY	
	OCCUPANTS
RESIDENTIAL	876
HOTEL	629
RETAIL EMPLOYEE	50
RETAIL VISITORS	822

TABLE 2. OCCUPANCY GENDER DISTRIBUTION

OCCUPANCY (RESIDENTIAL)		
	OCCUPANTS	GENDER RATIO
Total	1505	100%
Male	753	50%
Female	752	50%
OCCUPANCY (Commercial)		
	OCCUPANTS	GENDER RATIO
Total	872	100%
Male	436	50%
Female	436	50%

Assuming annual days of operation of the building is 365 days, annual plumbing domestic water usage (exclude dishwasher and clothes washer) of residential units & hotel rooms and the retail space is calculated (Table 3, Table 4) based on LEED V4 Water Use Reduction Calculator using full-time equivalency (FTE).

TABLE 3. FLUSH FIXTURES IN RESIDENTIAL UNITS & HOTEL

Fixture Information			Flush Rate	Uses per Day	Total Daily Water Use
Fixture ID	Fixture Family	Fixture Type	Design Flush Rate (gpf)	Residential (FTE)	Design (gallons)
WC-1	Toilet (female)	Low-Flow Water Closet	1.28	5.0	4,812.8
WC-1	Toilet (male)	Low-Flow Water Closet	1.28	5.0	4,812.8
Design case daily flush volume (gallons/day)					9,625.6
Design case annual flush volume (gallons/year)					3,513,344.00

TABLE 4. FLOW FIXTURES IN RESIDENTIAL UNITS & HOTEL

Fixture Information		Duration	Flow Rate	Uses per Day	Total Daily Water Use
Fixture ID	Fixture Type	Default (sec)	Design Flow Rate (gpm)	Residential (FTE)	Design (gallons)
L-1	Private (residential) lavatory faucet	60	0.5	5.0	3,762.50
S-1	Residential kitchen faucet	60	1.5	4.0	9,030.00
SH-1	Residential showerhead	480	1.5	1.0	18,060.00
Design case daily flush volume (gallons/day)					30,852.5
Design case annual flow volume (gallons/year)					11,261,162.50

Dishwasher in each unit is required to be Energy Star certified unit per 2016 California Plumbing Code. According to 2016 California Green Building Standard Code, a standard Energy Star dishwasher uses 4.25 gallons water per cycle. There are 121 residential units which has one dishwasher in each unit. Assuming each unit is using dishwasher once per day, then total water consumption of dishwashers usage will be $4.25 \text{ gallons/cycle} \times 1 \text{ cycle} \times 1 \text{ use/day} \times 121 \text{ units} = 514 \text{ gallons/day}$.

Clothes washer in each unit is required to be Energy Star certified unit per 2016 California Plumbing Code. According to 2017 Title 20 California Code of Regulation, Water Factor (WF) of a standard front-loaded residential clothes washer after January 1, 2018 is 4.7 gallons/cu./cycle. Capacity of the proposed clothes washer is 1.6 cubic feet. So water consumption for each clothes washer is $4.7 \text{ gallons/cu./cycle} \times 1.6 \text{ cu.} = 7.52 \text{ gallons/cycle}$. There are 121 residential units which has one clothes washer in each unit. Assuming each unit is using clothes washer once per day, then total water consumption of clothes washers usage will be $7.52 \text{ gallons/cycle} \times 1 \text{ cycle} \times 1 \text{ use/day} \times 121 \text{ units} = 877 \text{ gallons/day}$.

For retail space, assuming 872 occupants consist of 50 employees and 822 visitors, water consumption of flush fixtures and flow fixtures is calculated and shown separately (Table 5, Table 6).

TABLE 5. FLUSH FIXTURES IN RETAIL

Fixture Information			Flush Rate	Uses per Day		Total Daily Water Use
Fixture ID	Fixture Family	Fixture Type	Design Flush Rate (gpf)	Employees (FTE)	Visitors	Design (gallons)
WC-1	Toilet (female)	Low-Flow Water Closet	1.28	3.0	0.5	359.04
WC-1	Toilet (male)	Low-Flow Water Closet	1.28	1.0	0.1	84.608
UR-1	Urinal	Low-Flow Urinal	0.125	2.0	0.4	26.8
Design case daily flush volume (gallons/day)						470.448
Design case annual flush volume (gallons/year)						171,713.52

TABLE 6. FLOW FIXTURES IN RETAIL

Fixture Information		Duration	Flow Rate	Uses per Day		Total Daily Water Use
Fixture ID	Fixture Type	Default (sec)	Design Flow Rate (gpm)	Employees (FTE)	Visitors	Design (gallons)
L-1	Public lavatory (restroom) faucet	30	0.5	3.0	0.5	140.255
S-1	Kitchen faucet	15	1.5	1.0	0.0	18.75
Design case daily flush volume (gallons/day)						159.005
Design case annual flow volume (gallons/year)						58,035.00

To sum up, per LEED V4 calculation method, total plumbing domestic water use is 42,498.55 gallons/day, 15,511,970.75 gallons/year (Table 7).

TABLE 7. SUMMARY FOR PLUMBING DOMESTIC WATER USE CALCULATION

Group Name	Design Case Daily Water Usage (gallons/day)			Design Case Annual Water Usage (gallons/year)		
	Daily Flush Volume	Daily Flow Volume	Daily Consumption	Annual Flush Volume	Annual Flow Volume	Annual Consumption
Residential & Hotel (exclude dishwasher & clothes washer)	9,625.60	30,852.50	40,478.10	3,513,344.00	11,261,162.50	14,774,506.50
Dishwasher	-	-	514.00	-	-	187,610.00
Clothes Washer	-	-	877.00	-	-	320,105.00
Retail	470.45	159.00	629.45	171,713.52	58,035.00	229,748.52
Daily design water consumption (gallons/day)						42,498.55
Annual design water consumption (gallons/year)						15,511,970.75

3. AMENITY WATER USAGE

Per architectural drawings, the project has residential amenity area of 2,092 SQFT, and hotel amenity area of 2,450 SQFT. Considering occupancy load factor as 30 SQFT/ person per 2016 CPC Chapter 4 Table A Occupant Load Factor (Table 8). Water usage of residential amenity area is 1,526 gallons/day, and water usage of hotel amenity area is 1,788 gallons/day.

TABLE 8. OCCUPANT LOAD FACTOR (2016 CPC CHAPTER 4 TABLE A)

TABLE A.
OCCUPANT LOAD FACTOR:
[DSA-SS & DSA-SS/CC]

OCCUPANCY ¹	OCCUPANT LOAD FACTOR (square feet)
Group A	
1. Auditoriums, convention halls, dance floors, lodge rooms, stadiums, and casinos (where no fixed seating is provided) (use 1/2 "one-half" the number of fixed seating)	15
2. Conference rooms, dining rooms, drinking establishments, exhibit rooms, gymnasiums, lounges, stages, and similar uses, including restaurants classified as Group B occupancies	30
3. Worship places; principal assembly area, educational and activity unit (where no fixed seating is provided) (use 1/2 "one-half" the number of fixed seating)	30
Group B	
Office or public buildings (area accessible to the public)	200
Group E	
Schools for day care, elementary, secondary	50
Educational Facilities Other than Group E	
Colleges, universities, adult centers, etc.	50
Group F	
Workshops, foundries and similar establishments	2,000
Group H	
Hazardous materials fabrication and storage	2,000
Group I	
Hospital general use area, health care facilities	200
Group M	
Retail or wholesale stores	200
Group R	
Congregate residence, Group R-1	200
Group S	
Warehouse	5,000

* Any uses not specifically listed shall be based on similar uses listed in this table.

** For building or space with mixed occupancies, use appropriate occupancy group for each area (for example, a school may have an "A" occupancy for the gymnasium, a "B" occupancy for the office, an "E" occupancy for the classrooms, etc.) Accessory areas may be excluded (for example: hallway, restroom, stair enclosure)

4. IRRIGATION WATER USAGE

The irrigation demand was calculated based on the Maximum Applied Water Allowance (MAWA) from the City of Los Angeles interim Irrigation Guidelines as Compliance with State Landscape Ordinance Pursuant to AB 1881 (<https://water.ca.gov/LegacyFiles/wateruseefficiency/landscapeordinance/Model-Water-Efficient-Landscape-Ordinance/Local-Ordinances/Los Angeles Irrigation Guidelines Complete Package.pdf>) [Accessed 04/02/2019].

Landscape area of the project is expected to be approximately 5,072 SQFT. Reference Evapotranspiration of Los Angeles is 50.1 inches per year.

$$\text{MAWA} = (\text{ET}_o) (0.62) [(0.7 \times \text{LA}) + (0.3 \times \text{SLA})]$$

MAWA = Maximum Applied Water Allowance (gallons per year)

ET_o = Reference Evapotranspiration (inches per year)

0.62 = Conversion Factor (to gallons)

0.7 = ET Adjustment Factor (ETAF) LA = Landscape Area including SLA (square feet)

0.3 = Additional Water Allowance for SLA

SLA = Special Landscape Area (square feet)

MAWA = (50.1 inches) (0.62) [(0.7 x 5,072 square feet) + (0.3 x 0)] = 110,283 gallons per year

So the total estimated water of use for irrigation is 110,283 gallons per year, which is 302 gallons of water per day.

5. POOL WATER USAGE

This project has plans to include a 420 SQFT (30ft x 14ft) pool and a 504 SQFT (36ft x 14ft) pool per architectural plan. Total pool surface area is 924 SQFT. Due to evaporation /splash, approximately $\frac{3}{4}$ " of water loss per square feet per day. As a result, 433 gallons of water is need to be made up per day. Plus 1 backwash per week will be using approximately 500 gallons water each time, which ends up using 71 gallons of water per day in average. Total pool makeup water would be 504 gallons/day in average.

6. COOLING TOWER

Based on 26 gpm evaporation for the two (2) cooling towers with operation at 8 hours per day, 7 days per week and 65% load capacity. Water usage of cooling towers is 8,112 gallons.

7. PARKING STRUCTURE

Based on the City of Los Angeles Department of Public Works - Bureau of Sanitation Sewer Generation Rates (0.02 gallons per SQFT), water usage of 97,729 SQFT parking area is 1,955 gallons/day.

8. TOTAL WATER USAGE & CONCLUSION

TABLE 9 ESTIMATED WATER USAGE SUMMARY

Plumbing Domestic Water Use				
Plumbing Domestic Water Use Total				42,499
Amenity / Common Area Water Use				
Room	Area	Occupant Load Factor	Occupants	Gallons per Day
Residential Amenity	2,092	30	70	1,526
Hotel Amenity	2,450	30	82	1,788
Irrigation				302
Pool				504
Cooling Tower				8,112
Parking Structure	97,729 SQFT			1,955
Amenity / Common Area Water Use Total				14,187
Proposed Design – Total Water Demand				56,686
Baseline – Total Water Demand				210,340
Percent Reduction from Baseline				73.0%

According to the Metropolitan Water District Water Tomorrow Annual Report to the California State Legislature, Covering Fiscal Year 2017/18 (page 17), the average regional gallons per capita per day usage is 130 gallons

(http://www.mwdh2o.com/PDF_About_Your_Water/3.1_1.2_Regional_Progress_Report.pdf) [Accessed 03/04/2019].

Since not all the occupants listed in Table 1 are staying 24 hours within the project area, for an individual person, not all the daily water consumption is happening on this project site. Thus a “total equivalent occupancy” needs to be estimated in order to get a water usage baseline from average regional water consumption data.

Based on full-time equivalency (FTE) from LEED calculation method, in residential units/ hotel, occupants are using water closet 5 times a day/person; in retail space employees are using water closet /urinal 3 times a day/person, and visitors are using 0.5 time a day/person. Considering FTE values as weighed factors when calculating total equivalent occupancy, then total equivalent occupancy of the project is 1608 (Table 10).

TABLE 10. TOTAL EQUIVALENT OCCUPANCY

	Occupancy	WC (female) Times of Use per day (FTE)	Weighted Factor	Equivalent Occupancy
Residential unit/ hotel	1505	5.0	1.0	1505
Retail Employees	50	3.0	0.6	30
Retail Visitors	822	0.5	0.1	83
Total Equivalent Occupancy				1618

As a result, total water consumption of this building according to average regional gallons is 130 gallons/capita/day x 1618 equivalent occupancy =210,340 gallons. Comparing with estimated water usage of proposed design, water saving of this project is $(210,340-56,686)/210,340=73.0\%$.