



Onsite Non-Potable Water Uses: Economics and Embedded Energy

Southern California Water Dialogue

Prepared by

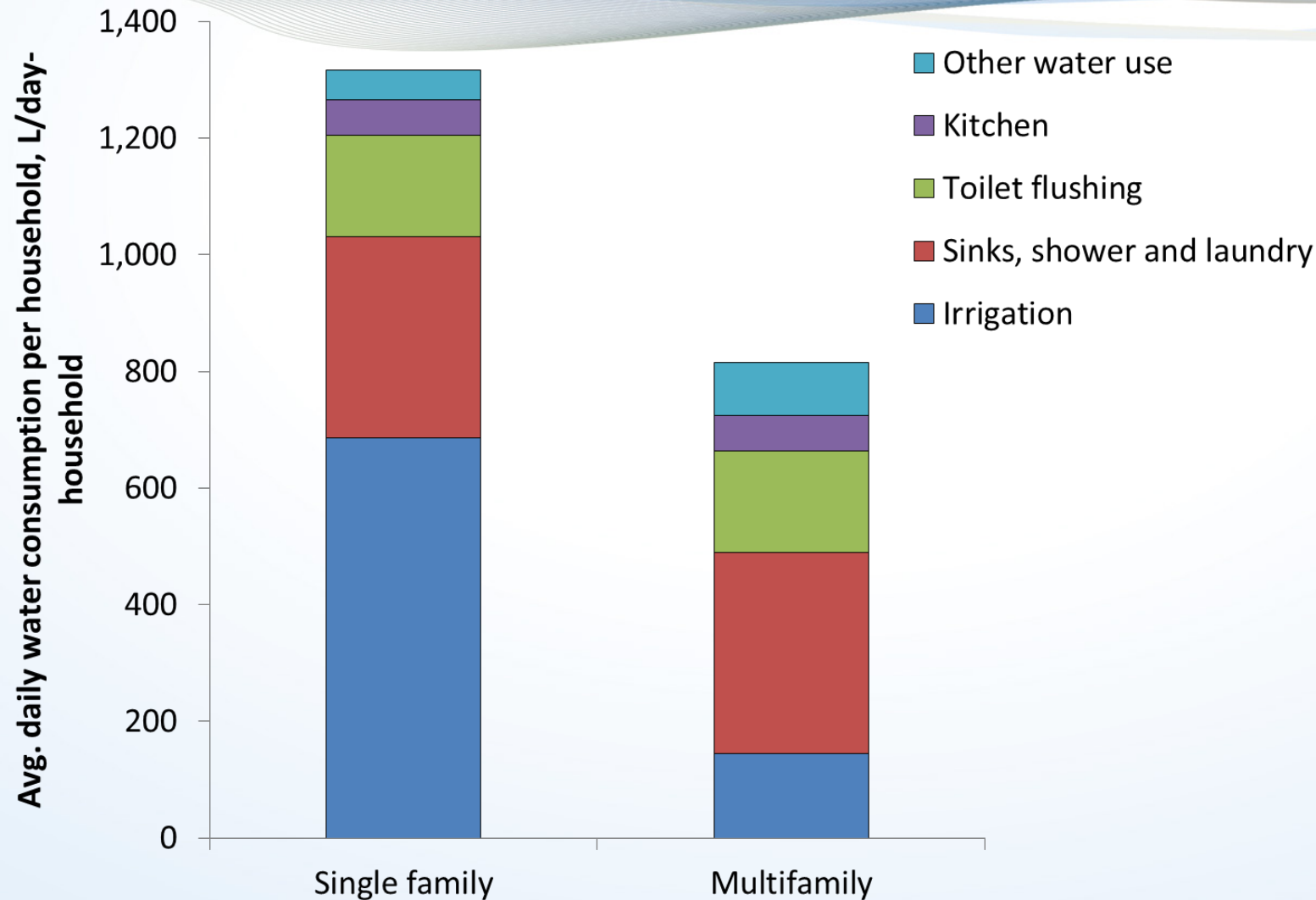
Zita Yu, Ph.D.

March 23, 2016

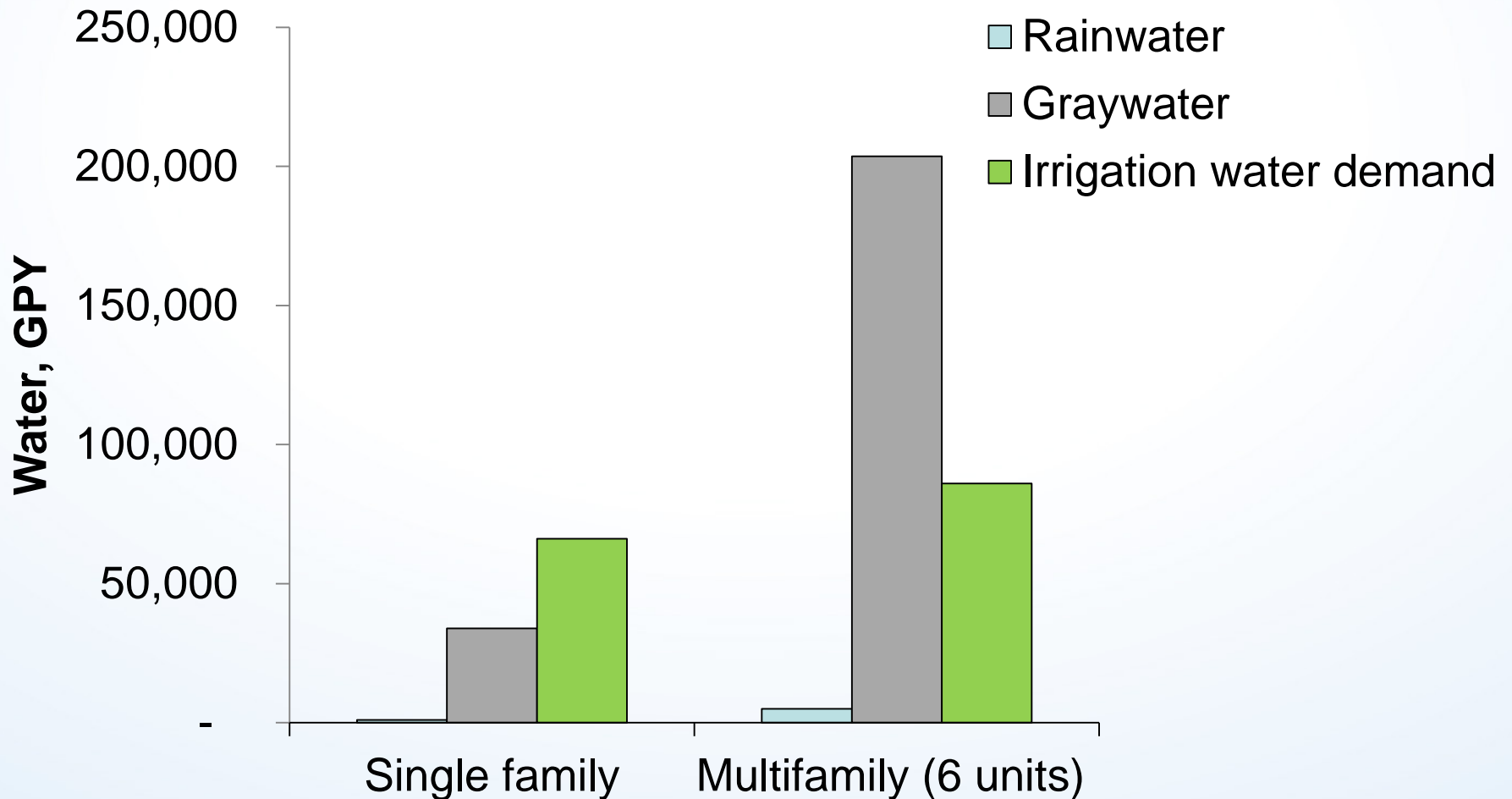
This talk is dedicated to my grandmother.

- Residential Homes
 - Water demand
 - Non-potable source options
 - Potable water augmentation
 - Infrastructure requirements and costs
- Non-Residential Buildings
 - Typical commercial water demand profiles
 - Non-potable water recycling: considerations
 - Case Studies
- Summary

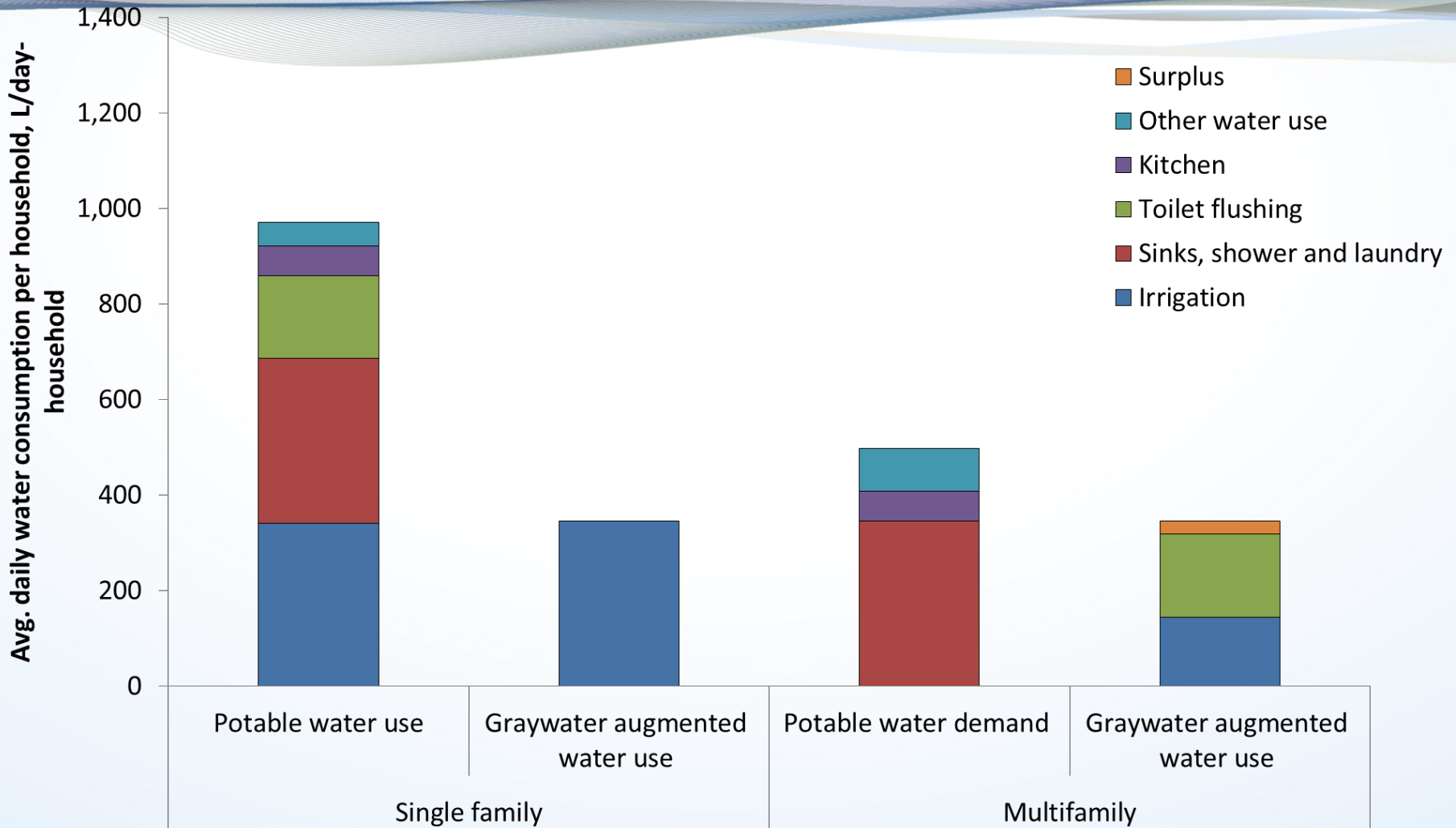
Residential Water Use Demand



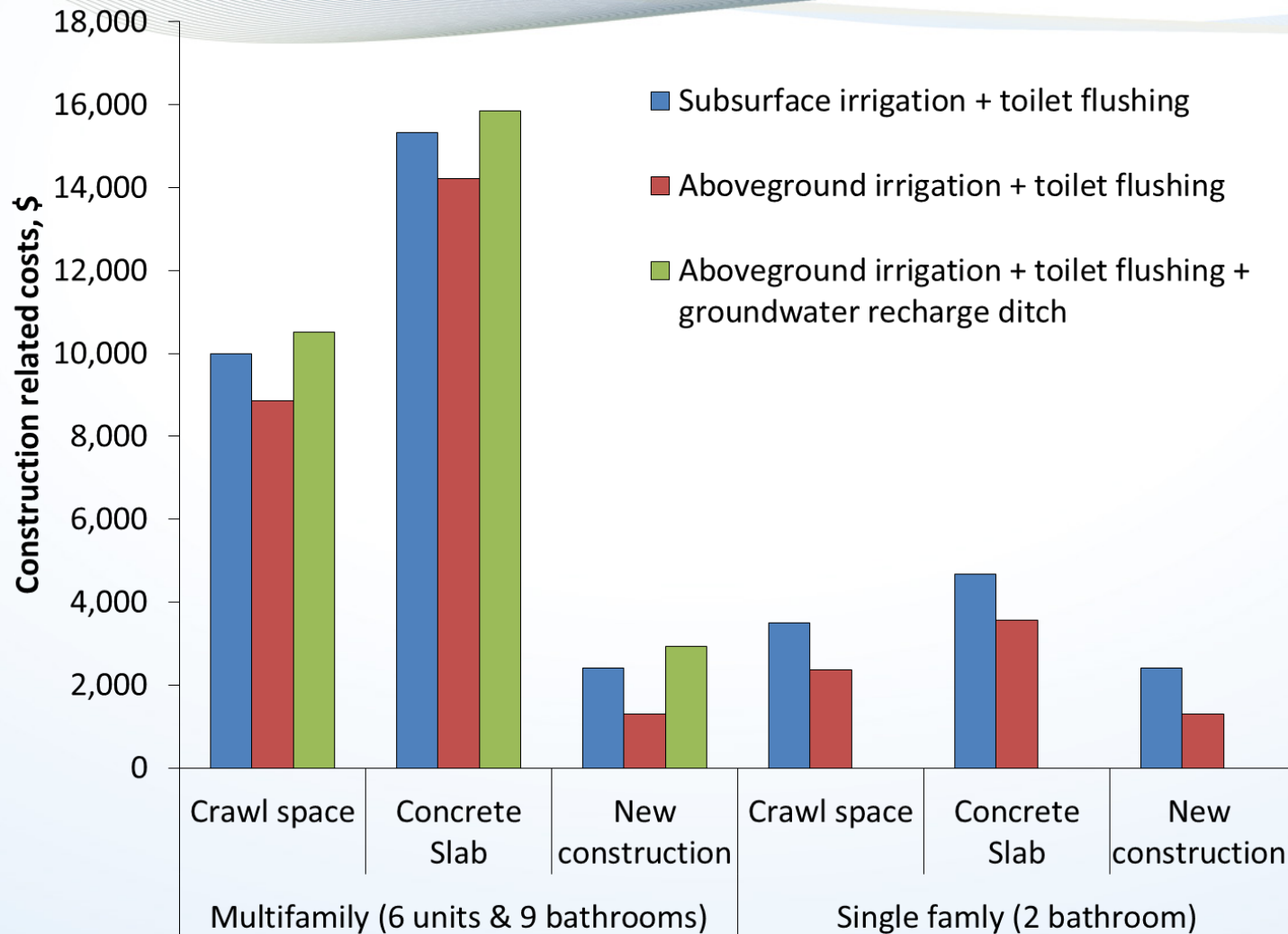
Non-Potable Source Options



Potable Water Augmentation by Graywater

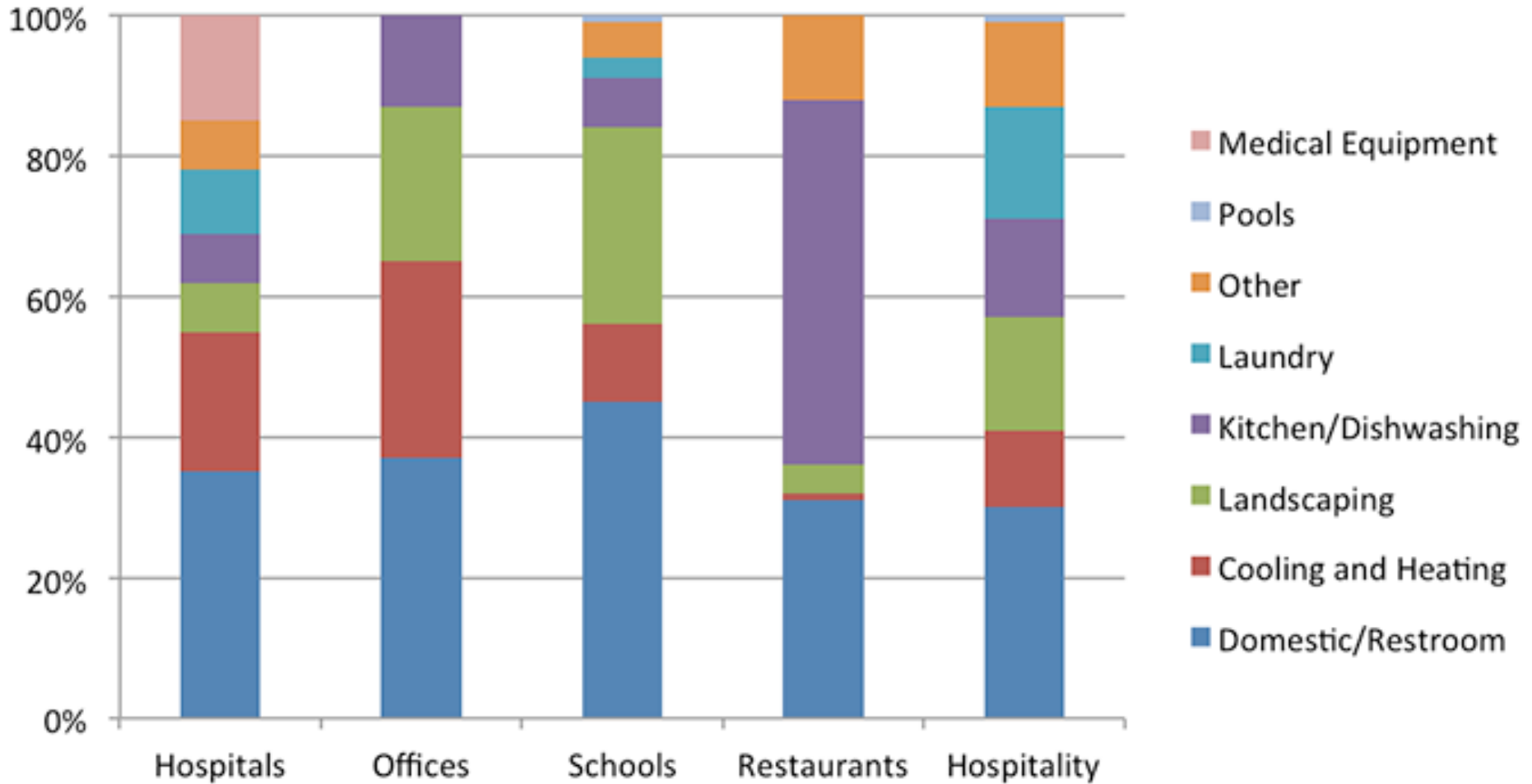


Graywater Collection and Distribution Costs (Residential)



Onsite Non-Potable Water Recycling in Non-Residential Buildings

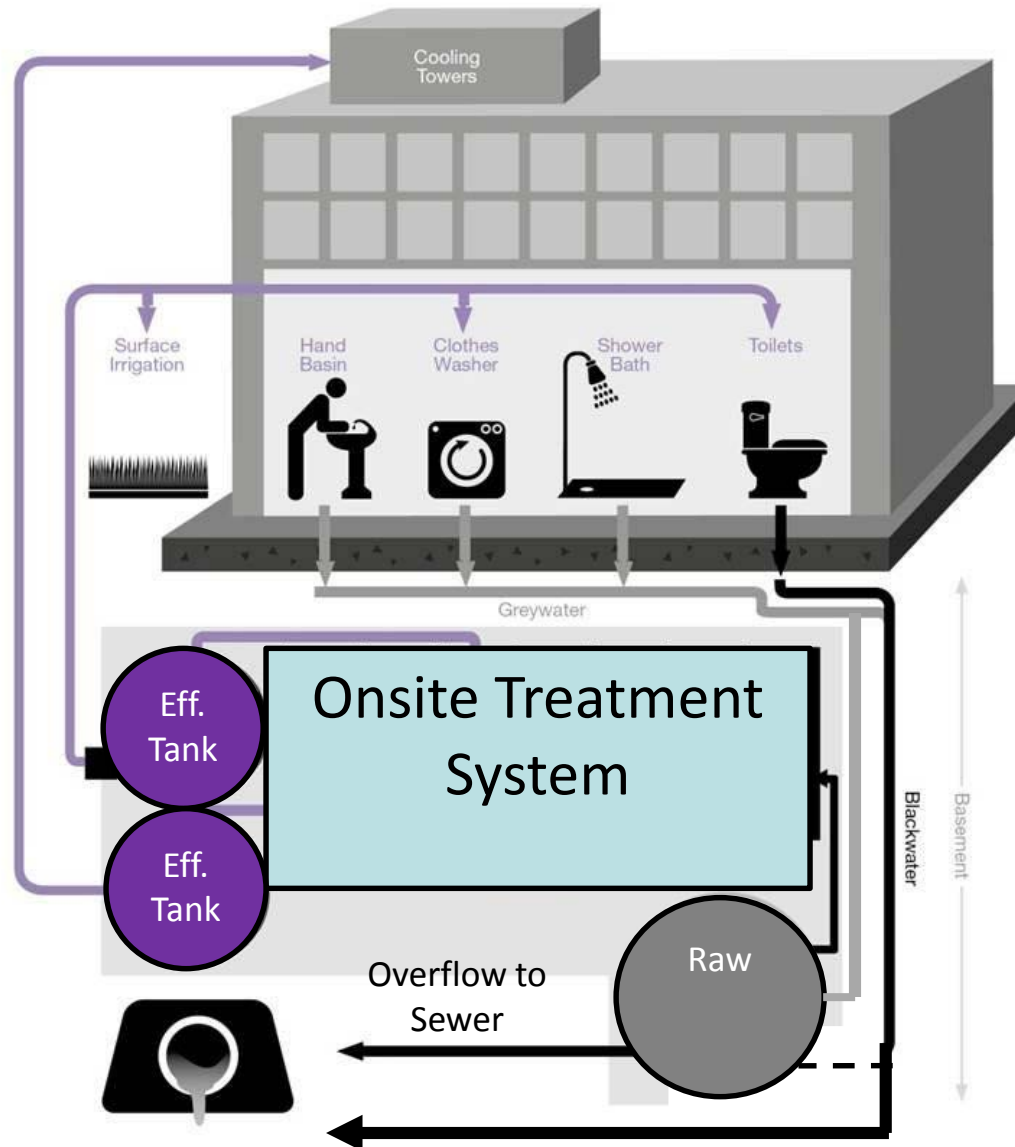
Water Demand



	Roof runoff	Surface Runoff	Graywater	Blackwater
Organic contaminant concentration	Good	Good	Fair	Poor
Treatment capital cost	Good	Good	Fair	Poor
Treatment O&M	Good	Good	Fair	Poor
Daily supply stability and reliability	Poor	Poor	Good	Good
Storage requirements	Poor	Poor	Good	Fair
Energy demand & carbon footprint	Good	Good	Fair	Poor
Onsite technical labor	Good	Good	Fair	Poor
Reuse for irrigation purpose	Good	Good	Good	Good
Good	Good			
Fair	Fair			
Poor	Poor			

Note: The above matrix was developed specifically for the sites presented in the Case Studies section. The site is a private commercial property located in the Bay Area, CA. The above matrix is intended to be used as an example.

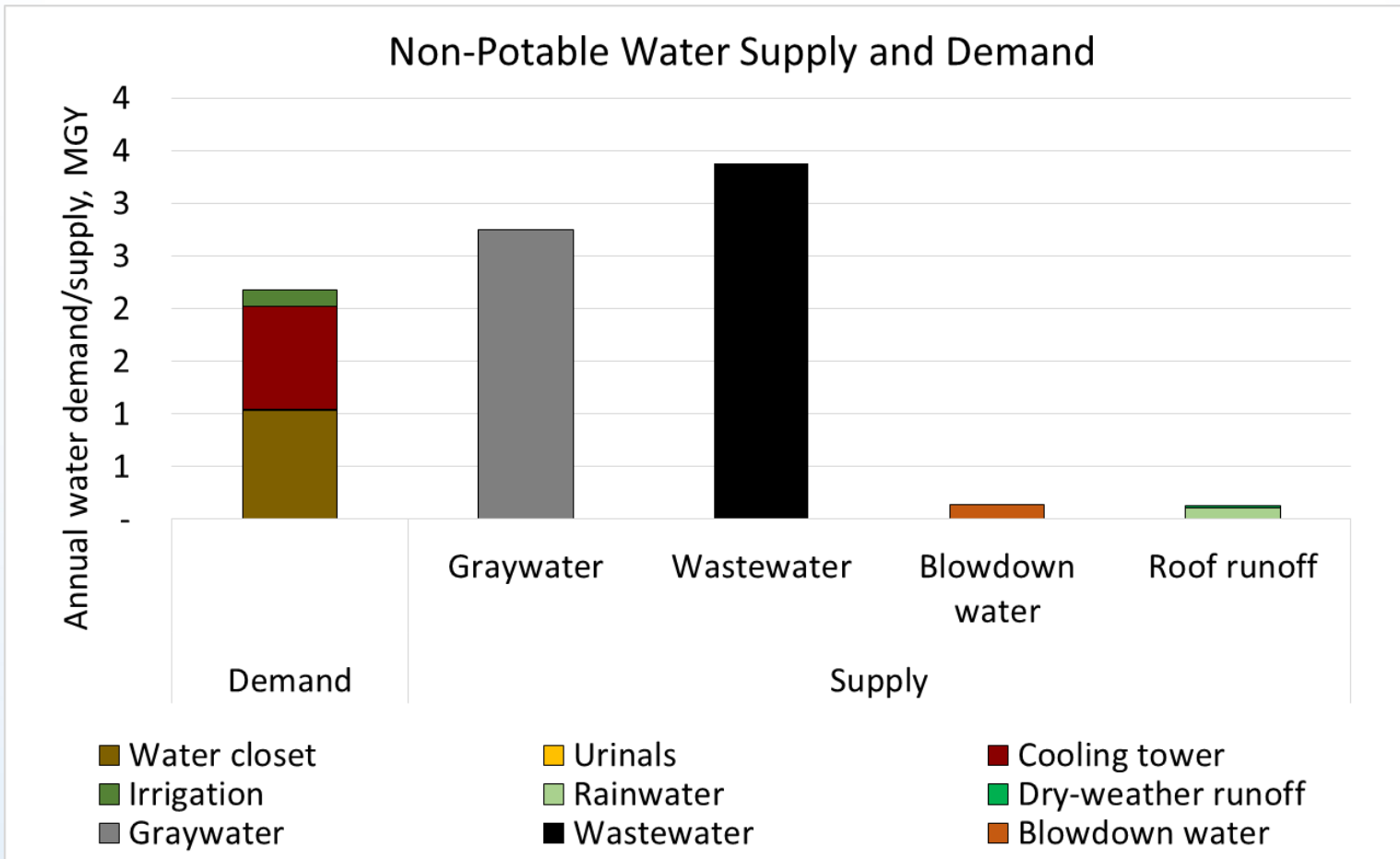
Onsite Water Recycling Infrastructure



Case Study
Project Location: Bay Area, CA
Hotel

Non-Potable Water Supply and Demand

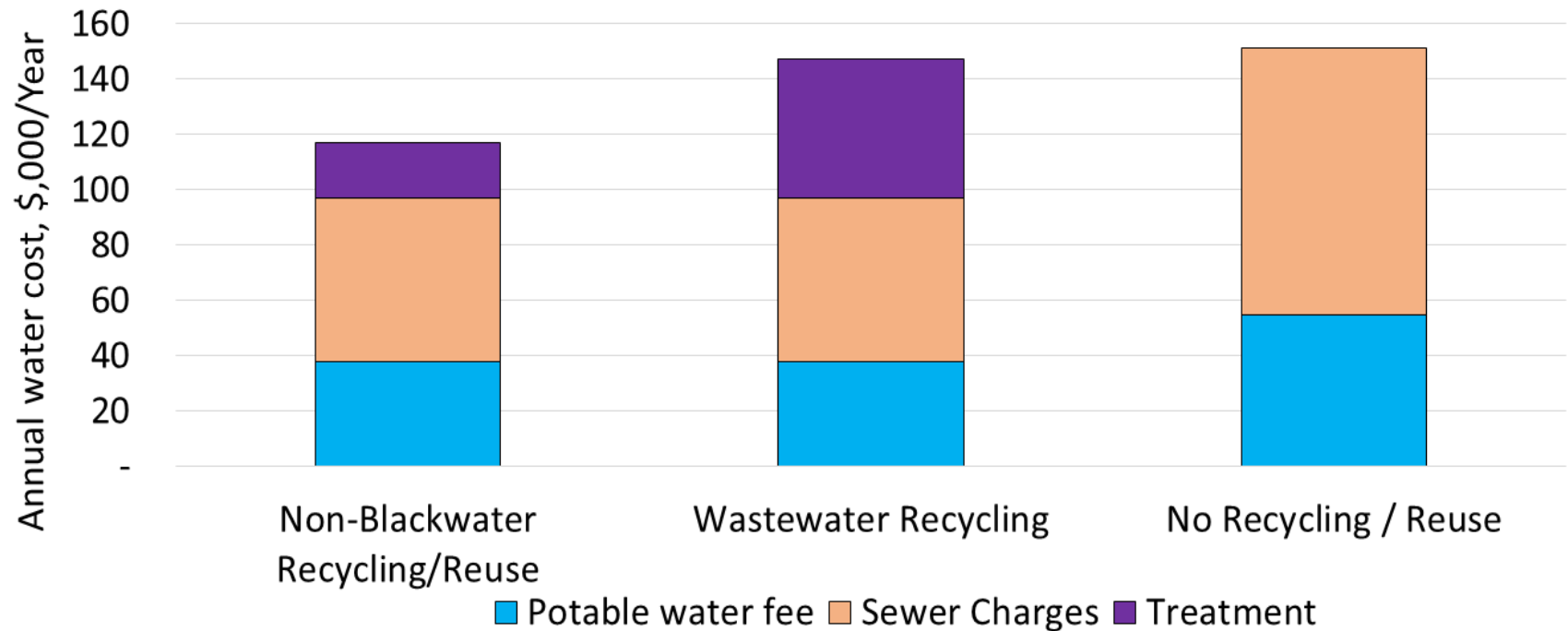
Design Details	
Capacity, employees	600
Function	Hotel with 200 rooms, with green roof
Status	Planning
Project Location	Bay Area, CA



Project Location

Bay Area, CA

Annual Water Cost

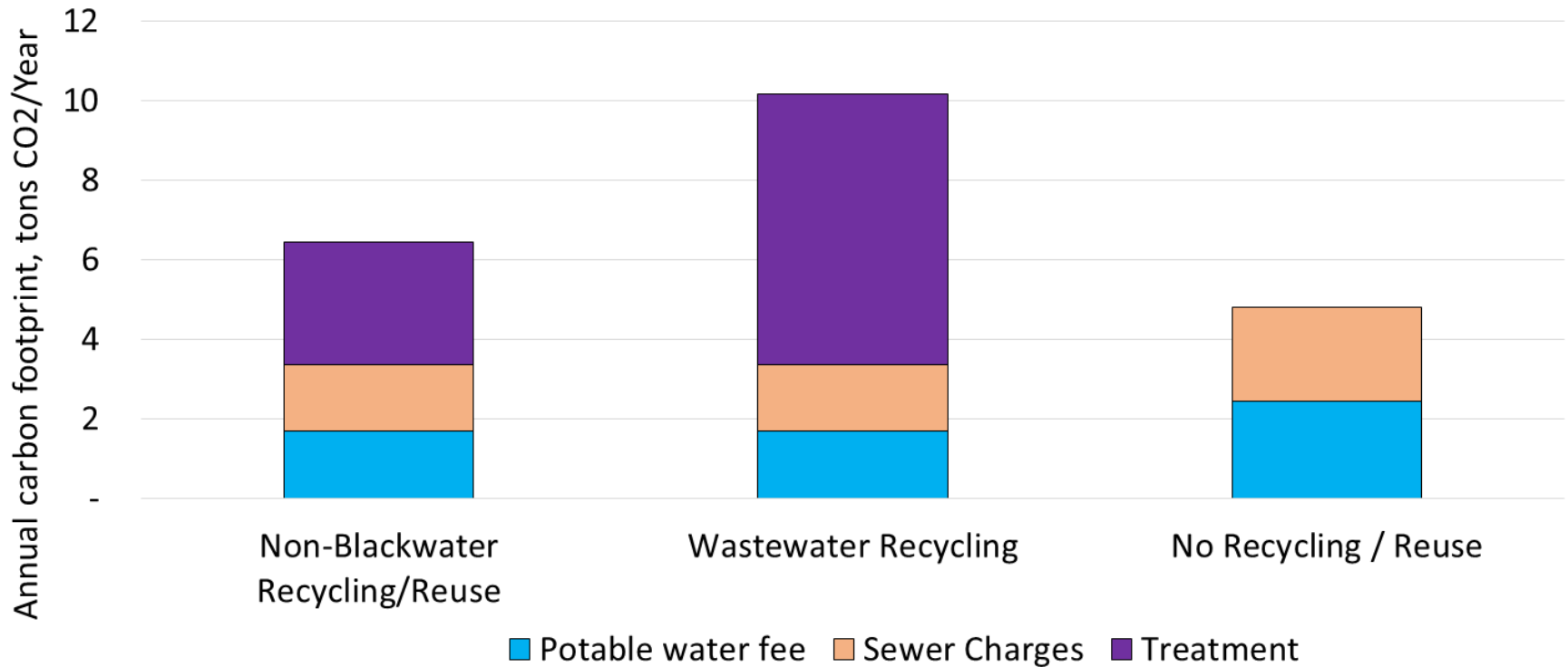


Note: Cost calculations excluded the costs required for storage and salaries for onsite operators. The costs presented above include capital, O&M, routine monitoring and reporting. It was assumed that treated effluent water quality and monitoring requirements met the San Francisco On-site Non-Potable Water Use Guide

Project Location

Bay Area, CA

Annual Water CO2

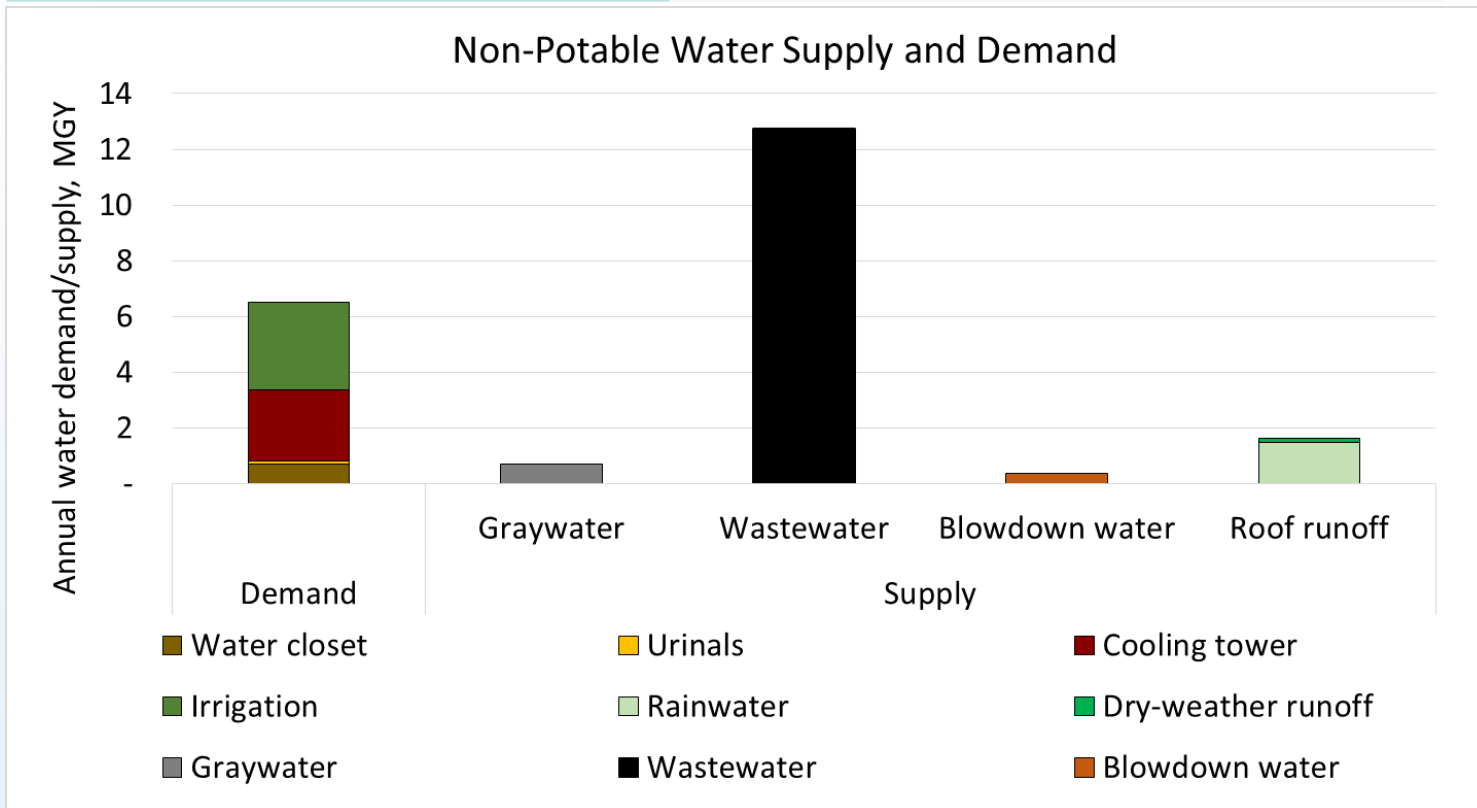


Note: Carbon footprints calculations assumed no onsite renewable energy supply as the worst case scenario. Also, embedded carbon footprint calculation is location specific and depends highly on local water supply portfolio.

Case Study
Project Location: Bay Area, CA
Office Building

Non-Potable Water Supply and Demand

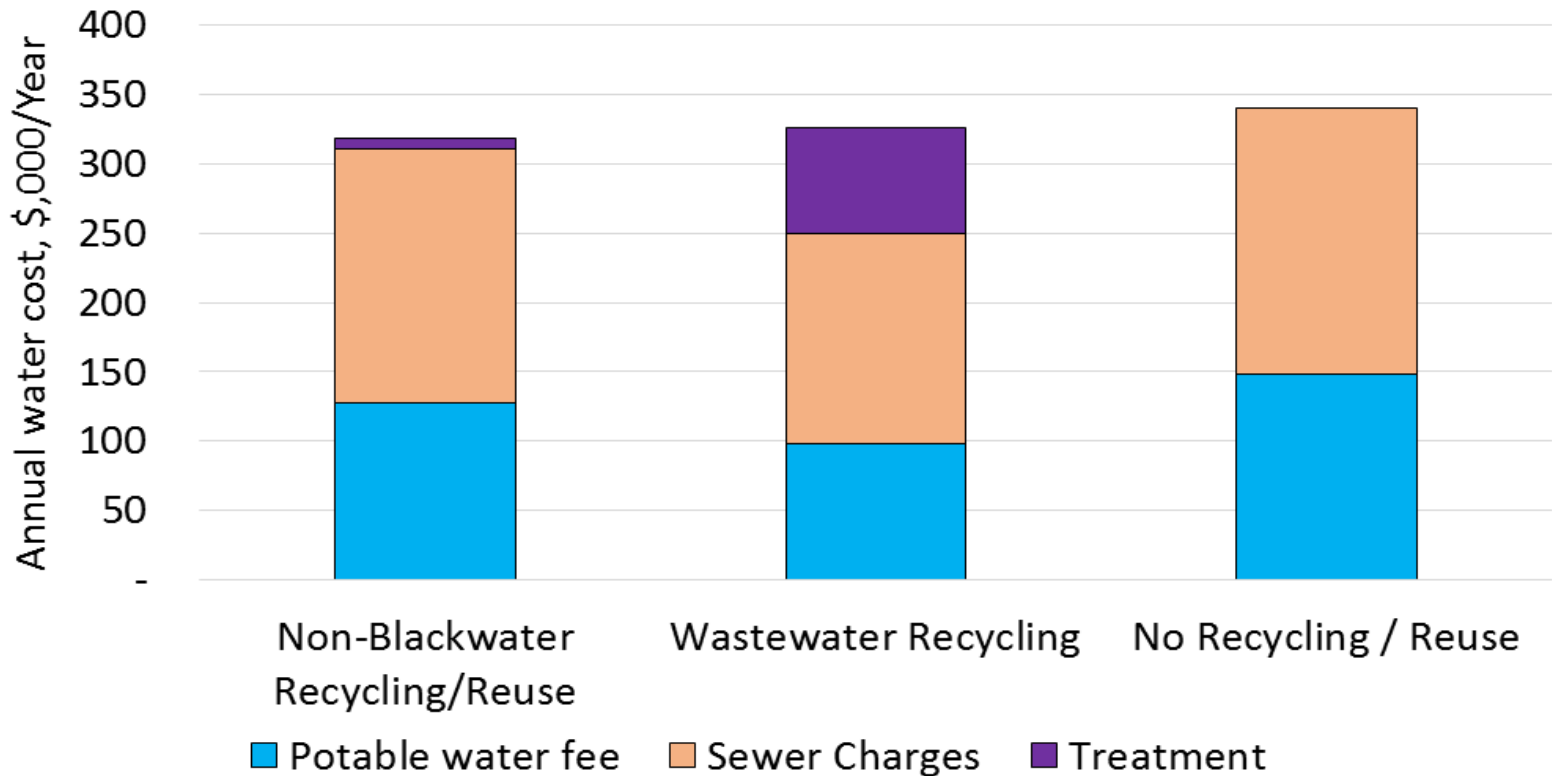
Capacity, employees	3,600
Function	Office building with event space with green roof
Status	Design
Project Location	Bay Area, CA
Green Building Certification	LEED



Project Location

Bay Area, CA

Annual Water Cost

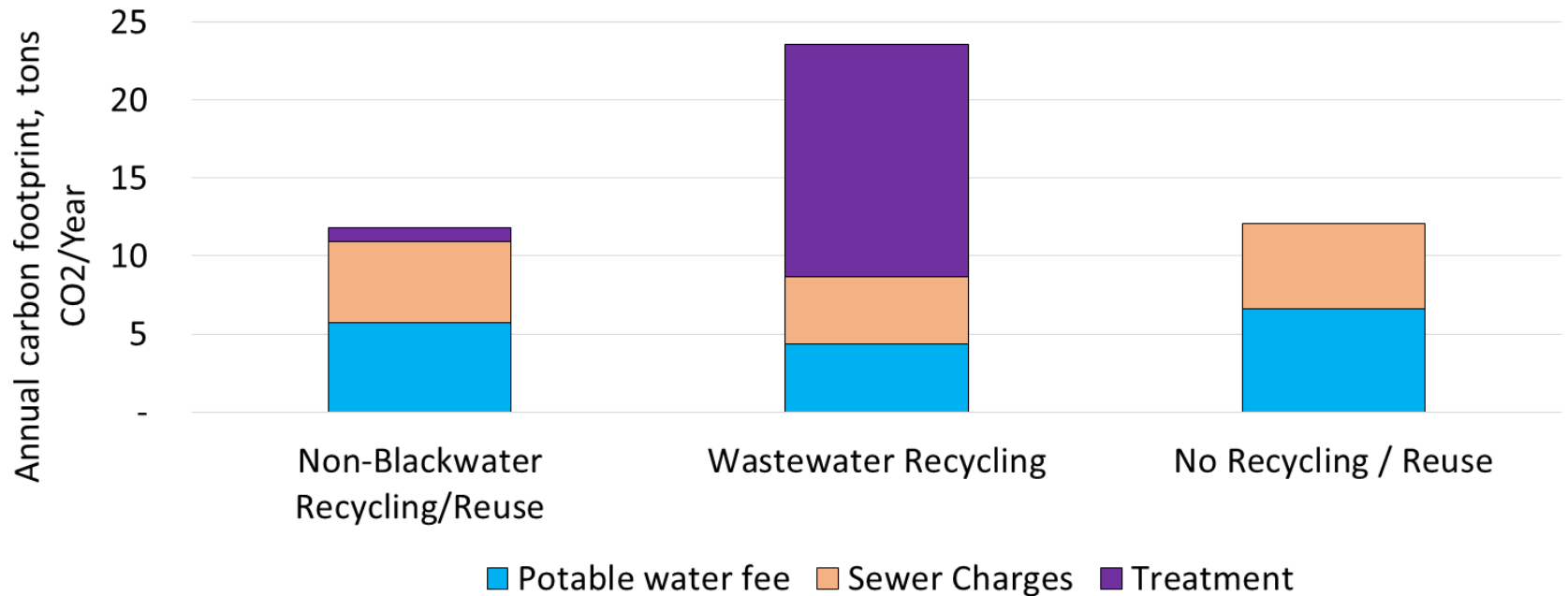


Note: Cost calculations excluded the costs required for storage and salaries for onsite operators. The costs presented above include capital, O&M, routine monitoring and reporting. It was assumed that treated effluent water quality and monitoring requirements met the San Francisco On-site Non-Potable Water Use Guide

Project Location

Bay Area, CA

Annual Water CO2



Note: Carbon footprints calculations assumed no onsite renewable energy supply as the worst case scenario. Also, embedded carbon footprint calculation is location specific and depends highly on local water supply portfolio.

- Bottom-up approach to water supply will help increase our water reliability and make individual properties more drought prepared
- Residential homes:
 - Having graywater ready homes will help lower the implementation costs of graywater recycling
- For non-residential buildings:
 - A water budget analysis will be a useful tool to help make sound decisions.
 - In addition to quantity, the quality of non-potable water sources should also be considered.
 - Graywater could be a great non-potable resource for hotels.
 - Office buildings typically do not have enough non-potable water demand to consume all recycled water; thus offsite distribution of surplus to meet other offsite non-potable demand could be beneficial.

Thank You!

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Treatment
After Before

