Attachment 2: Water and Energy Savings and GHG Calculations

Introduction

The *Water-Energy Upgrades in Alameda County DACs* program consists of six residential, commercial and institutional projects in the neighboring cities of Oakland and San Leandro. These projects are designed to deliver significant water and energy savings and greenhouse gas emissions reductions. The program will be managed by StopWaste, which is the umbrella name for the Alameda County Waste Management Authority and the Energy Council.

StopWaste will administer the grant and manage its implementation in collaboration with two affordable multifamily property owners, a private company implementing upgrades at five hospitality businesses, two school districts, and a city parks department. StopWaste has worked with the project proponents to identify projects that are eligible for DWR Water-Energy Grant funding, do not have ready access to other sources of primary funding, and will be ready to begin implementation as soon as the DWR grant is awarded.

All project proponents have worked with StopWaste to develop scopes of work for their projects in this program, and have provided Letters of Commitment (included on the following pages) indicating their agreement to participate in this program. Signatories are:

- Project 1: Carlos Castellanos, Director of Real Estate Development, East Bay Asian Local Development Corporation
- Project 2: John Hudson, Asset Manager, Eden Housing, Inc.
- Project 3: Cal Eschbach, CEO, Total Ozone Solutions
- Project 4: Cesar Monterrosa, Acting Director of Facilities Planning and Management, Oakland Unified School District
- Project 5: Michael McLaughlin, Superintendent, San Leandro Unified School District
- Project 6: Jennifer Auletta, Deputy Public Works Director, City of San Leandro, Public Works

All the projects in the Water-Energy Upgrades in Alameda County DACs program are located in Oakland and San Leandro. These neighboring cities are home to numerous Disadvantaged Communities that have historically been burdened with more than their fair share of pollution and environmental degradation. The program is designed to provide direct, meaningful and assured benefits to residents and businesses in local DACs. Of the 18 facilities included in this program, 14 are physically located within a DAC. The four facilities that are not directly located in a DAC will provide direct, meaningful and assured benefits to a DAC, as defined by the California Environmental Protection Agency Air Resources Board's draft criteria to evaluate the investment benefits of projects in Disadvantaged Communities. The total DAC benefit area addressed by this proposal encompasses a little over 499 million square feet (11,462 acres).

The program's two residential projects include comprehensive indoor and outdoor water efficiency improvements at apartment complexes that house more than 320 senior and low-income residents. The commercial project will convert conventional laundry systems at five hospitality businesses to state-of-the-art ozone technology that can reduce hot water use by 85 to 95% and total water use by 25 to 35%. The institutional projects include pool heating system improvements, institutional kitchen upgrades, and landscape renovations that will significantly reduce water and energy use at seven public schools and four public parks.

EAST BAY ASIAN LOCAL DEVELOPMENT CORPORATION
BUILDING HEALTHY AND VIBRANT NEIGHBORHOODS SINCE 1975

Letter of Commitment

November 19, 2014

Laura Peters
Senior Engineer, Water Resources
California Department of Water Resources

RE: StopWaste DWR Water-Energy Grant Proposal, Letter of Commitment for Technology Implementation

Dear DWR Water-Energy Grant staff:

East Bay Asian Local Development Corporation (EBALDC) is committed to installing technology which reduces end-use demand for water and energy. Should funding be available to cover the measure costs, this letter confirms our intent to install the following equipment within the 2015-2017 calendar years:

- Apartment Low Flow Showerheads and Faucet Aerators
- Apartment ≤ 1.28 GPF Toilets
- Building Plumbing Leak Repair
- Lawn Conversion to drought tolerant Landscaping with efficient irrigation system
- High Efficiency Condensing Central Water Heater Upgrade
- Demand Controls on Central Water Heating Recirculation System

These improvements will be installed at Hismen Hin Nu Terrace Apartments located at 2501-2599 International Boulevard, Oakland, CA which is located within the top 20% of Disadvantaged Communities census tracts identified by the Cal EnviroScreen 2.0. International Blvd is part of the City of Oakland's revitalization where they are investing in transit oriented development and strategies for non-motorized transit.

EBALDC has worked with StopWaste in the past as a recipient of their Grants to Non-Profit Housing program for Green Building Certification and we currently have projects enrolled in their Bay Area Multifamily Building Enhancements energy efficiency incentive program. We look forward to collaborating with StopWaste and their consultants to implement this project should the DWR Water Energy grant funding be awarded. Please coordinate the tasks, deliverables, and invoicing with Jared Wright, Assistant Project Manager at (510) 287 5353 ext. 367 or jwright@ebaldc.org.

Sincerely,

Carlos Castellanos, Director of Real Estate Development
East Bay Asian Local Development Corporation

EDEN HOUSING

www.edenhousing.org

22645 Grand Street
Hayward, CA 94541

510.582.1460 Phone
510.582.6523 Fax

Letter of Commitment

November 19, 2014

Laura Peters
Senior Engineer, Water Resources
California Department of Water Resources

RE: StopWaste DWR Water-Energy Grant Proposal, Letter of Commitment for Technology Implementation

Dear DWR Water-Energy Grant staff:

Eden Housing is committed to installing technology which reduces end-use demand for water and energy. Should funding be available to cover the measure costs this letter confirms Eden Housing's intent to implement the following upgrades at the project described below with-in the 2015-2017calendar years:

- Apartment Low Flow Showerheads and Faucet Aerators
- Apartment ≤ 1.28 GPF Toilets
- Building Plumbing Leak Repair
- Lawn Conversion to drought tolerant landscaping with efficient irrigation system
- Demand Controls on Central Water Heating Recirculation System

These improvements will be installed at Eden Lodge, a 143 unit affordable housing community for seniors located at 400 Springlake Dr., San Leandro. The property is located within the top 20% of Disadvantaged Communities census tracts identified by the Cal EnviroScreen 2.0.

Eden has worked with StopWaste in the past as a recipient of their Grants to Non-Profit Housing program for Green Building Certification and we currently have projects enrolled in their Bay Area Multifamily Building Enhancements energy efficiency incentive program. We look forward to collaborating with StopWaste and their consultants to implement this project should the DWR Water- Energy grant funding be awarded. Please coordinate the tasks, deliverables, and invoicing with Cynthia Chew, Property Supervisor at 510-247-8115 or cchew@edenhousing.org

Sincerely,

John Hudson, Asset Manager
Eden Housing, Inc.

sea
Sustainable Energy Associates, LLC

November 14, 2014

Heather Larson
Green Building Program Manager
StopWaste
1537 Webster Street
Oakland, CA 94612

Dear Heather Larson:

As per our discussion, we understand that StopWaste is pursuing grant funding to support the installation of water-savings technologies.

This letter confirms our team's—Sustainable Energy Associates and Total Ozone Solutions—commitment to work with you on the installation of the following ozone laundry projects:

- Days Hotel - 8350 Edes Avenue, Oakland
- Red Lion - 150 Hagenberger Road, Oakland
- Holiday Inn Airport - 77 Hagenberger Road, Oakland
- Holiday Inn Express - 66 Airport Access Road, Oakland
- Bay Linen - 2993 Teagarden Street, San Leandro

Best regards,

Grant Cooke

Grant Cooke,
CEO
Sustainable Energy Associates

Cal J. Eshbach

Cal Eshbach
CEO Total Ozone Solutions

Letter of Commitment

November 19, 2014

Laura Peters
Senior Engineer, Water Resources
California Department of Water Resources

RE: StopWaste DWR Water-Energy Grant Proposal, Letter of Commitment for Technology Implementation

Dear DWR Water-Energy Grant staff:

Oakland Unified School District (OUSD) is committed to installing technology which reduces end-use demand for water and energy. Should funding be available to cover the measure costs, this letter confirms OUSD's intent to install the following equipment at the two OUSD high schools with Pool facilities that are used by students who live and attend school within the top 24% of Disadvantaged Communities described below within the 2015-2017 calendar years:

McClymonds

- Faucet aerators on kitchen hand washing sinks, fix leaking kitchen faucet
- Power winder to cover pool with new pool covers
- VFD pool pump
- Cogeneration system on pool

Castlemont

- Power winder to cover pool with new pool covers
- VFD pool pump
- Cogeneration system on pool
- Kitchen walk-in cooler install commutated motors, replace gasket and auto door closer
- Install scheduling controls for kitchen hot water heater booster pumps

McClymonds High School is located less than .5 miles from a census tract with a Cal EnviroScreen 2.0 Disadvantaged Communities (DAC) score of 80% or higher. Castlemont High School is attended by students who live in the DAC, is within a DAC zip code which includes a DAC Census tract of 80% or higher, and is one of two district owned and managed pools available for use by OUSD students who reside in DAC census tracts. Also, OUSD has a Local Business Policy, which requires 50% mandatory local participation on all District construction projects. To this end, OUSD will use a local business to complete the project in order to fulfill that 25% of project work hours will be performed by residents of a DAC.

We look forward to collaborating with StopWaste and their technical team to implement this project should the DWR Water-Energy grant funding be awarded. Please coordinate the tasks, deliverables, and invoicing with Cesar Monterrosa, Acting Director of Facilities Planning and Management at (510) 535-7053 or cesar.monterrosa@ousd.k12.ca.us.

955 High Street, Oakland, CA 94601
510.535.2728 ph | 510.535-7040 fax
www.ousd.k12.ca.us

Sincerely,

Cesar Monterrosa, Acting Director of Facilities Planning and Management
Oakland Unified School District

SAN LEANDRO UNIFIED SCHOOL DISTRICT

Mike McLaughlin, Ed.D.
Superintendent

ADMINISTRATIVE OFFICE
14735 Juniper Street, San Leandro, CA, 94579
(510) 895-4199

Letter of Commitment

November 19, 2014

Laura Peters
Senior Engineer, Water Resources
California Department of Water Resources

RE: StopWaste DWR Water-Energy Grant Proposal, Letter of Commitment for Technology Implementation

Dear DWR Water-Energy Grant staff:

San Leandro Unified School District (SLUSD) is committed to installing technology which reduces end-use demand for water and energy. Should funding be available to cover the measure costs, this letter confirms our intent to install water-energy savings equipment with-in the 2015-2018 calendar years at SLUSD schools which are located in a census tract with a Cal EnviroScreen 2.0 Disadvantaged Communities (DAC) score of 80% or higher. The schools in the DAC census tracts are Woodrow Wilson Elementary, Garfield Elementary, Muir Middle School and Monroe Elementary. Additionally, students from these schools have access to the district's swimming pool located at San Leandro High School which is located in proximity to and in the same zip code as the DACs.

Specific measure upgrades identified for implementation at these sites include:

- Irrigation controls
- Faucet aerators
- Kitchen upgrades to dishwashing and food steamer systems
- Solar pre-heating system on the district pool

We look forward to collaborating with StopWaste and their technical team to implement this project should the DWR Water- Energy grant funding be awarded. Please coordinate the tasks, deliverables, and invoicing with Greg Dyer, Maintenance Operations Manager at 510-618-4440 or gdyer@slusd.us.

Sincerely,

Michael McLaughlin, Ed.D.
Superintendent
San Leandro Unified School District

City of San Leandro
Civic Center, 835 E. 14th Street
San Leandro, California 94577
www.sanleandro.org

Letter of Commitment

November 17, 2014

Laura Peters
Senior Engineer, Water Resources
California Department of Water Resources

RE: StopWaste DWR Water-Energy Grant Proposal, Letter of Commitment for Technology Implementation

Dear DWR Water-Energy Grant staff:

City of San Leandro is committed to installing technology which reduces end-use demand for water and energy. Should funding be available to cover the measure costs, this letter confirms City of San Leandro's intent to install the following equipment at City of San Leandro Parks during the 2015-2018 calendar years:

Measure
High Efficiency Well Pump (2 sites)
Lawn conversion (2 sites)
Irrigation controls (2 sites)
More efficient sprinkler system (1 site)

The City of San Leandro has four parks located within the top 20% of Disadvantaged Community census tracts identified by the Cal EnviroScreen. These parks are named Halcyon, Thrasher, Warden and Williams St Island Park. At Thrasher and Halcyon there are wells which water is drawn from to irrigate the parks. They have very old pumps which will be upgraded to energy efficient models. At Williams St. Island and Warden parks measures will include lawn conversion, irrigation controls and more efficient sprinkler system on trees.

Marina Park is our largest Park in the City and is heavily used by members of the Disadvantaged Communities of San Leandro and other neighboring Disadvantaged Communities from other Cities. Since Marina Park is so large it has the highest identified water savings of all the projects on this list. For this reason we felt it should be included on the list.

We look forward to collaborating with StopWaste and their technical team to implement this project should the DWR Water- Energy grant funding be awarded. Please coordinate the tasks, deliverables, and invoicing with Winston McKee, Parks Maintenance Supervisor at 510-577-3444 or wmckee@sanleandro.org.

NOV 24 2014

Sincerely,

Jennifer Auletta, Deputy Public Works Director
City of San Leandro, Public Works

Water and Energy System

All projects included in this proposal receive water from the East Bay Municipal Utility District (EBMUD) and gas and electric services from the Pacific Gas & Electric Company (PG&E). An overview of the service systems for EBMUD and PG&E is provided below.

Note that EBMUD and PG&E are not project participants and will not receive funds as part of this grant proposal. StopWaste will coordinate closely with both agencies to ensure that all available incentives are applied to the projects included in this proposal and to verify existing water and energy use, and future savings. No duplication of rebate incentives from EBMUD, PG&E, and DWR grant funds will occur.

East Bay Municipal Utility District

EBMUD supplies water and provides wastewater treatment for significant parts of Alameda and Contra Costa counties. Based on 2010 census data, approximately 1.3 million people are served by EBMUD's potable water system in a 332-square-mile area extending from Crockett to the north, southward to San Lorenzo (encompassing the major cities of Oakland and San Leandro), eastward from San Francisco Bay to Walnut Creek, and south through the San Ramon Valley. EBMUD's wastewater system serves approximately 650,000 people in an 88-square-mile area of Alameda and Contra Costa counties along the Bay's east shore, extending from Richmond on the north, southward to San Leandro. EBMUD customers include residential, industrial, commercial, institutional and irrigation water users.

EBMUD's water supply originates in the Mokelumne River watershed in the Sierra Nevada and is gravity fed through pipelines to EBMUD's service area in the San Francisco Bay Area (see Figure 1). An additional 10% of EBMUD's water supply is local runoff captured from lands draining to terminal reservoirs located in Alameda and Contra Costa counties. However, during dry years these local supplies do not significantly contribute water supply. In non-drought years, EBMUD produces an average of 220 million gallons of potable water per day (MGD) (EBMUD 2012[1]).

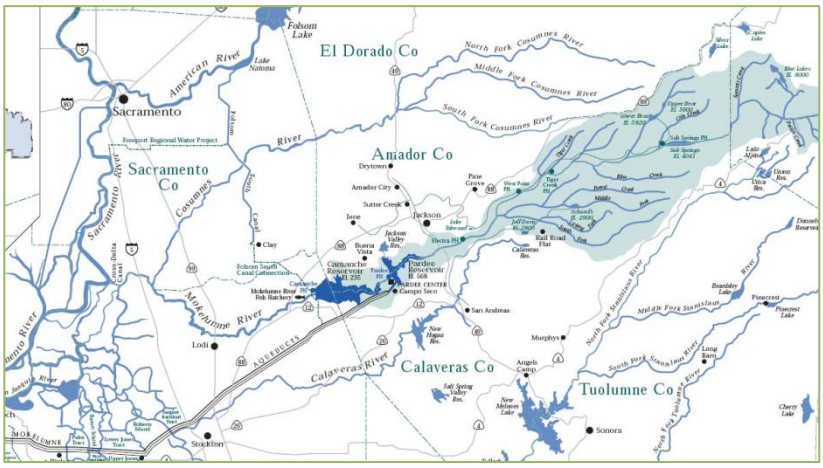


Figure 1: EBMUD Supply System (CPUC 2010)

EBMUD operates a total of five water treatment plants. Water from EBMUD's Upper San Leandro and San Pablo reservoirs supply water to three treatment plants that serve the EBMUD distribution system west of the Oakland-Berkeley Hills, including proposed projects in Oakland and San Leandro. The Upper San Leandro Water Treatment Plant (WTP), San Pablo WTP, and Sobrante WTP provide full conventional treatment to this portion of EBMUD's service area. In addition, EBMUD operates three inline filtration plants located in Walnut Creek, Lafayette and Orinda, east of the Oakland/Berkeley Hills. Figure 2 illustrates EBMUD's East Bay distribution system.

[1] East Bay Municipal Utility District (EBMUD). 2012. Water Supply Management Program 2040. April. Available: https://www.ebmud.com/water-and-wastewater/water-supply/water-supply-management-program-2040. Accessed: November 21, 2014.

High quality raw water from the Mokelumne River and Pardee Reservoir are conveyed to EBMUD's terminal reservoirs and treatment plants in the San Francisco Bay Area in a series of tunnels, aqueducts, and pipelines. This system is gravity-fed, with some use of pumps to assist flows when needed. Booster pumps are used to distribute water to customers at elevations above 250 feet. Proposal projects in Oakland and San Leandro are below 250 feet so booster pumps are not necessary to distribute water from the treatment plants. Due to the largely gravity-fed system with minimal treatment and pumping needs, EBMUD's water transmission system is highly efficient.

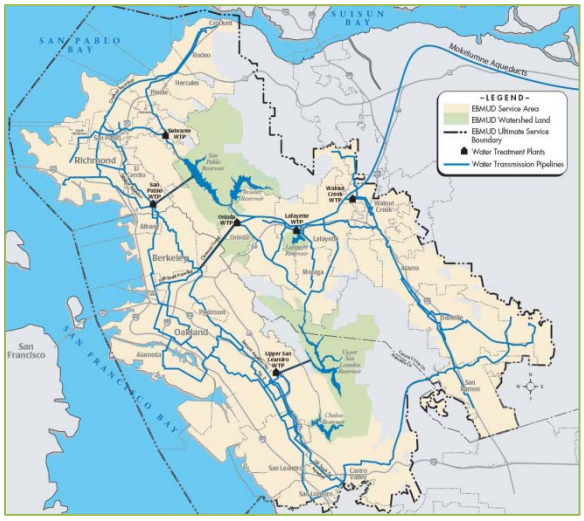


Figure 2: East Bay EBMUD System (CPUC 2010)

EBMUD conducts a wide range of water conservation efforts to extend and efficiently use the water supply. For commercial services, EBMUD offers free water use surveys and has rebate programs for high-efficiency toilets and clothes washers, lawn conversions and irrigation upgrades at multi-family residences, replacement of high-water use spray nozzle(s) with water-efficient models, and high-efficient water brooms. In the residential sector, EBMUD has rebate programs for installation of high-efficiency toilets, high-efficiency clothes washers, lawn conversion and irrigation upgrades, and graywater systems. EBMUD also offers incentives for installation of sub-meters in multi-family unit and offers free water-saving devices like high-efficiency showerheads and faucet aerators (EBMUD 2014[2]).

EBMUD operates solar panels on two of its treatment facilities to offset water treatment electricity needs by 640 MWh/year (CPUC 2010[3].) EBMUD also implements an extensive recycled water distribution program to curtail potable water supply demands.

Pacific Gas and Electric Company

The Pacific Gas and Electric Company (PG&E) is the sole provider of electricity and natural gas for the East Bay, and EBMUD's service area, including Oakland and San Leandro. PG&E was incorporated in 1905 and is headquartered in San Francisco. PG&E's energy supply is generated by 68 hydroelectric plants and 1 nuclear power plants and conveyed through a complex grid of transmission and distribution lines. PG&E is currently installing a Smart Grid to improve electricity reliability, efficiency, and data collection. Natural gas is conveyed to customers in California and the United States through over 1.5 million miles of transmission lines. PG&E is also incorporating renewable energy sources including wind and solar energy into the grid. Over half the energy PG&E delivers is generated by zero-carbon sources (PG&E 2014[4]).

PG&E offers a host of rebates and incentives for various businesses including agriculture/food processing, government, schools, retail, office buildings, hotels, and other types of businesses. Example incentives offered by PG&E include rebates for energy efficient lighting, heating, ventilation and air conditioning, boilers and water heaters, and

[2] East Bay Municipal Utility District (EBMUD). 2014. WaterSmart Center. Available: https://www.ebmud.com/water-and-wastewater/watersmart-center. Accessed November 24, 2014.

[3] California Public Utilities Commission (CPUC). 2010. Embedded Energy in Water Studies-Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles. Prepared by GEI Consultants/Navigant Consulting. Prepared for the CPUC Energy Division. Managed by The California Institute for Energy and Environment. August 31, 2010. Available: http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/EM+and+V/Embedded+Energy+in+Water+Studies1_and_2.htm. Accessed November 21, 2014

[4] Pacific Gas and Electric Company (PG&E). 2014. How the System Works Webpages. Available: http://www.pge.com/en/safety/systemworks/index.page? Accessed: November 21, 2014.

refrigerators. In addition, PG&E has Demand Response programs that offer incentives to businesses that reduce the energy use of their facilities during times of peak demand (PG&E 2014[5]).

Assumptions

Energy Intensity and GHG Emission Rates

The California Public Utilities Commission (CPUC) is encouraging the water sector to evaluate energy efficiency efforts statewide. In response, the University of California at Davis (UC Davis) conducted a technology evaluation of embedded energy in water systems associated specifically with PG&E's and EBMUD's service systems. The study was funded by PG&E's Emerging Technologies Program in 2012. (PG&E 2013[6]) A complete copy of the study is included in the documentation appendix to Attachment 2.

UC Davis conducted a high-resolution assessment of the energy required to deliver and treat water supply to the EBMUD's service area. One of the goals of the study was to characterize the variance of EBMUD's embedded energy across the full water use cycle in space and time. The assessment was conducted by evaluating five years (2006-2012) of system-wide monthly use data for water and energy use by energy category. Monthly and hourly system-wide Energy Intensity (EI) values were calculated by geographic location in the system, and for outdoor and indoor uses.

The projects included in this grant proposal are all located in the low elevations in the western portion of EBMUD's service area. This area is supplied by water treated at the Upper San Leandro Water Treatment Plant and distributed in the Sequoia 1 Aqueducts. The UC Davis study evaluated EBMUD's entire system, which includes a substantial amount of energy use to transport water to higher elevations. The **system specific EBMUD EI values** for EBMUD's entire system and the pressure zone elevation of the projects included in this proposal are summarized in the table below.

2012 System Specific Energy Intensity Values for EBMUD

Segment	Min	Median	Mean	Max
System-wide Outdoor EI[1]	814	1,205	1,197	1,539
System-wide Indoor EI[1]	2,502	3,286	3,226	3,905
Sequoia 1 Aqueduct EI (Transmission Pipeline)[2]	473	657	651	788
Upper San Leandro (Treatment Plant)[2]	14	975	932	2,147

Source: PG&E 2013.
Notes: [1] Table 2 in PG&E (2013); [2] Table 3 in PG&E (2013)

The UC Davis-PG&E study provides the most current EI values for EBMUD's entire system. Table 2 in PG&E (2013) provides system-wide EI values for indoor use (includes wastewater treatment) and outdoor use. Table 3 in PG&E (2013) provides EI values for pressure zones in the system.

For the grant application, the mean system-wide outdoor use EI value of 1,197 kWh/MG is used for Step 7 of the Excel worksheets included in this Attachment.

Since 100% of EBMUD's water is imported to the East Bay, the EI value for raw water pumps represent the supply and conveyance segment of EBMUD's system (the EI for water treatment is not considered). Figure 26 in the PG&E (2013)

[5] Pacific Gas and Electric Company (PG&E). 2014. Rebates & Incentives. Available: http://www.pge.com/en/mybusiness/save/rebates/index.page. Accessed November 24, 2014.
[6] Pacific Gas and Electric Company (PG&E). 2013. A Statistical Approach to the Embedded Energy in Water: Understanding Variance in Space and Time Across Hydraulic Systems. PG&E Emerging Technologies Program Project Number ET12PGE5411. Prepared by UC Davis Center for Water-Energy Efficiency. June 14, 2013. Davis, CA. Available: http://www.etcc-ca.com/sites/default/files/reports/ET12PGE5411_Embedded%20Energy%20in%20Water_0.pdf. Accessed December 2, 2014.

study shows the minimum, mean, and maximum EI value for raw water pumping compared to a study conducted by the CPUC in 2010[7] which also evaluated EBMUD's specific service system, but used 2008 data. The mean EI value for raw water pumping (supply and conveyance) was identified as 310 kWh/MG in the CPUC (2010) study, while the more updated numbers used for the PG&E (2012) study identify the EI value as approximately 160 kWh/MG. Additionally, EBMUD and the Department of Water Resources conducted an embedded energy study in 2008 under the Proposition 50 Drought Assistance Grant. For that grant, EI values were broken down by system segments, including the supply and conveyance segment. The EBMUD EI value presented in that study for the supply and conveyance segment is 162 kWh/MG[8]. Since the PG&E study and the EBMUD-DWR study align, the EI value of 162 kWh/MG was used to represent the system specific supply and conveyance segment of imported water for Step 9 of the Excel worksheets included in this Attachment.

The East Bay and project locations are 100% serviced by PG&E, which is the largest electricity and natural gas provider in the state. It is highly likely that PG&E's emission rates are represented in the CAMX sub-region, as presented in (USEPA 2010[9].) Therefore, the statewide annual total-output emission rate of 0.278 kg Co2e/kWh is most representative of energy use and GHG emissions in the Proposal area and is used to determine the project-level annual and lifetime GHG-emission reductions.

Summary of Water and Energy Saving Features

This section provides a general overview of all the water and energy saving features that will be funded by the grant. Each project narrative in Attachment 2 describes project-specific upgrades and assumed water and energy savings.

Water Savings

Residential In-Unit Measures:

- High efficiency toilets – existing toilets will be replaced with toilets that use 0.84 gallons per flush (gpf).
- Low-flow showerheads – existing 2.5 gallons per minute (gpm) showerheads will be replaced with water-conserving showerheads that use 1.5 gpm.
- Kitchen and bathroom faucet aerators – existing 1.8 gpm or higher faucet aerators will be replaced with new aerators that use 1.5 gpm or less.

Landscaping Measures will meet water savings criteria established by the Bay-Friendly Basics, a high performance landscape standard developed by StopWaste.[10] When implemented in a new or renovated landscape, the nine best practices that make up the Bay-Friendly Basics reduce water use by 50 to 90%, reduce runoff by 73 to 90%, reduce greenhouse gas emissions by up to 53.5 tons CO2E/acre-year,[11] and reduce fertilizer and pesticide use, erosion, green waste and fuel use. The landscape upgrades include:

[7] California Public Utilities Commission (CPUC). 2010. "Study 2: Water Agency and Function Component Study and Embedded Energy-Water Load Profiles". Embedded Energy in Water Studies. Prepared for the California Public Utility Commission (CPUC) by GEI Consultants/Navigant Consulting, Inc.

[8] Personal communication. Jin Lu (Jim) Lin, Water Use and Efficiency Branch, Department of Water Resources. Email to Cory Saltsman, Environmental Scientist at Department of Water Resources, in response to an inquiry from Jill Sunahara, Senior Associate at Horizon Water and Environment. December 2, 2014.

[9] U.S. Environmental Protection Agency (USEPA). 2010. Emissions & Generation Resource Integrated Database (eGRID). Ninth edition with 2010 data (Version 1.0). CAMX sub-region output emission rates. Available: http://www.epa.gov/cleanenergy/energy-resources/egrid/. Accessed: November 19, 2014.

[10] StopWaste. Bay-Friendly Basics Checklist. Available: http://www.stopwaste.org/resource/policies/bay-friendly-basics. Accessed: December 5, 2014.

[11] Calculated by StopWaste, based on analysis in: California Air Resources Board and California Environmental Protection Agency. Method for Estimating Greenhouse Gas Emission Reductions from Compost from Commercial Organic Waste. November 14, 2011. Available: http://www.arb.ca.gov/cc/protocols/localgov/pubs/compost_method.pdf. Accessed December 5, 2014.

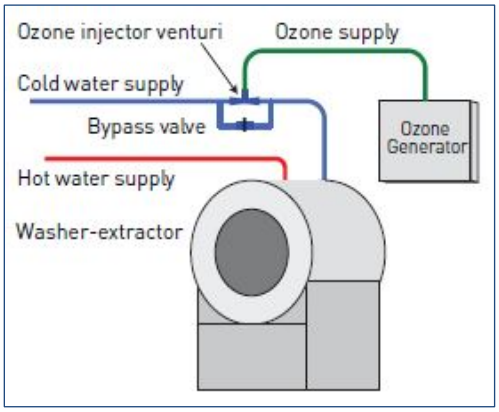
- Lawn to water-efficient landscape conversions – in two public parks, the near-zero waste technique of sheet mulching will be used to convert high water-using grass lawns to water-efficient landscaping. Layers of recycled cardboard, compost and mulch will be placed over the existing turf. The turf and cardboard gradually decompose, enriching the soil and improving its ability to retain moisture. Every acre of turf that is sheet mulched keeps 85 tons of sod out of the landfill or prevents the use of 10 lbs. of herbicides. Application of 1 inch of locally produced compost to the soil helps plants thrive and reduces greenhouse gases by 52 MTCO2e per acre. Low water-using ground cover, shrubs and trees suitable for the local climate will be installed in place of the existing turf. Soil in planting areas will be covered with a minimum of 3 inches of mulch to reduce runoff and retain soil moisture.
- Efficient irrigation systems – in two public parks and one multifamily property, water-wasting spray irrigation will be replaced with drip irrigation systems that apply water accurately to the plant root zones. At some facilities, weather-based irrigation controllers will be installed to ensure that irrigation water is applied only when needed.

Leak Detection and Repairs:

- Interior systems –measures will be taken at apartments to identify and repair leaking pipes and plumbing fixtures.

Industrial Laundry Measures:

- Ozone laundry system conversion – Ozone has strong oxidizing properties and is a highly effective cleaning agent. Installing an ozone generator on commercial laundering systems substantially reduces consumption of natural gas, electricity, and water. As illustrated to the right, ozone is generated as needed and introduced directly into the wash cycle. Hot water and chemicals like chlorine are not needed to clean and sanitize clothes and linens. These systems do not need hot water and are highly efficient, resulting in substantial water, sewage, electricity and natural gas savings. These systems reduce hot water consumption by over 90%. Total water consumption for laundry operations have been shown to decrease by an average of 2,432 gallons per day or over 35%. This is equivalent to consuming 863,000 fewer gallons of water per year.



Institutional Kitchen Measures:

- Faucet aerators – Kitchen hand washing sinks will be retrofitted with aerators to reduce flow rate from 8 gallons per minute to 0.5 gpm, saving 2,000 gal/yr.

Pools (schools):

- Pool cover power winder – At two schools, power-winder devices will increase the use of the pool covers which are often not used because they are difficult for one custodian to put in place without help. Use of pool covers prevents evaporation of 501,580 gallons of heated water in the pool.

Energy Savings

Domestic Hot Water System Measures:

- Central Water Heater Demand-controlled Recirculation Pump – In multifamily properties, existing central water heater recirculation pumps will be upgraded with demand-controlled recirculation pumps. This will result in substantial gas and electricity savings.

Pools (schools):

- Solar heating pool system – At a public school, two pools will be upgraded with a solar heating systems that will offset 395,280 kWh/year of natural gas and electricity with renewable energy.
- Cogeneration systems – At two schools, cogeneration systems will be installed that will produce heat for the pools and showers and energy for the school facilities. These systems will save 637,707 kWh/year of energy.

Industrial Laundry Measures:

- Industrial laundry ozone conversions – As described above, ozone laundry systems lower energy usage by reducing hot water consumption and drying time. Ozone laundry systems result in electricity savings of over 8,600 kWh/ year and decrease natural gas usage by 10,383 therms/year.

Institutional Kitchen Measures:

- Commercial refrigeration – A school kitchen's walk-in cooler will be retrofitted with a more efficient motor, new gaskets and an automatic door closer, saving over 2,800 kWh/yr.
- Water heater pump – Controls will be added to a water heater booster pump, producing estimated savings of 18,221 kWh/yr.

Park Well Pump Measures:

- Groundwater well pump replacements – Existing 25 year old well pumps will be replaced with efficient variable frequency drive pumps that will save 15,181 kWh/year. The new pumps will improve energy efficiency but will not result in additional groundwater extraction compared to existing conditions.

Additional GHG Emission Reductions

Landscaping Measures:

- Lawn to water-saving landscape conversions – At two public parks, 92,000 sq. ft. (2.1 acres) of lawn will be converted to low water-using landscapes. These projects will meet the requirements of the Bay-Friendly Basics, a high performance landscape standard developed by StopWaste. Landscapes renovated to meet the Bay-Friendly Basics standard reduce greenhouse gas emissions by 53.5 tons MTCO2e/acre. The majority of these savings derive from the application of 1 inch of compost to the soil, which reduces greenhouse gases by 52 MTCO2e per acre. Studies show that the biological activity in compost stimulates additional carbon sequestration in the soil well beyond the amount of carbon originally in the compost.

Project Water and Energy Savings and GHG Calculations

Project savings are presented in this section for the six projects listed below. Project 7 (Program Management) does not involve water or energy savings and is not included in this discussion.

The Excel workbook containing detailed project information and the total proposal savings is included in File 2 of Attachment 2.

Documentation to support claimed savings and project benefits is included in File 3 of Attachment 2.

Project ID#	Project Proponent	Project Title
1	East Bay Asian Local Development Corporation (EBALDC)	Multifamily Housing EBALDC Upgrades
2	Eden Housing	Eden Housing Multifamily Upgrades
3	Total Ozone Solutions	Industrial Laundry Upgrades in Oakland and San Leandro
4	Oakland Unified School District (OUSD)	Oakland USD School Upgrades
5	San Leandro Unified School District (SLUSD)	San Leandro USD School Upgrades
6	City of San Leandro	San Leandro Park Upgrades

Project 1 – Multifamily Housing EBALDC Upgrades

Overview

This project involves installation of water and energy saving devices in 92 apartment units and a total of 102 bathrooms at the Hismen Hin-Nu Apartment complex in Oakland, CA. The total estimated savings from this project are 194,607 gallons of water per year, 11,704 therms per year, and 2,576 kWh per year of energy savings.

Project Assumptions Project 1 Multifamily Housing EBALDC Upgrades Total Project Cost: $210,601			
Step 1:	Baseline (pre-project) volume of water associated with the project	6.98	MG/year
Step 2:	Volume of water that will be delivered after the project is implemented.	6.79	MG/year
Step 3:	Volume of hot water saved from the project's electric water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 4:	Volume of hot water saved from the project's natural gas water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0.02	MG/year
Step 5:	Useful life in years for the project	20	years
Step 10:	Additional annual energy savings from energy efficiency and renewable energy (EE/RE), etc.	205,311	kWh/year

Justification

The baseline volume of water associated with the housing complex is 6,980,635 gallons/year (6.98 MG/year). The baseline water use information represents actual water use data from bi-monthly water bills from October 2013 through August 2014.

Therm savings below were converted to kWh savings using the conversion factor of 29.28 kWh/therm.

Proposed water and energy saving measures to be installed and associated savings are shown in the table below.

Measure	Site Gallons/ Yr Water Savings	Site Therms/ Yr Savings	Site kWh/ Yr Savings
102 Upgraded Low Flow Showerheads and Faucet Aerators	55,998	4,692	0
102 Upgraded Toilets to 0.84 GPF	26,112	0	0
Building Plumbing Leak Repairs	29,937	88	0
Lawn Conversion to Drought Tolerant Landscaping with Efficient Irrigation System	82,560	0	0
High Efficiency Condensing Central Water Heater Upgrade	0	4,716	0
Demand Controls on Central Water Heating Recirculation System	0	2,208	2,576
TOTAL	**194,607**	**11,704**	**2,576**

Water Savings

Property staff have documentation showing that the existing bathroom faucet aerators are 2.2 gpm and all showerheads are 2.5 gpm. Existing kitchen aerators are assumed to be 1.8 gpm. Existing toilets are 1.6 gpf.

The project will be installing new bathroom faucet to less than or equal to 1.5 gpm and and showerheads to 1.5 gpm. Any identified kitchen faucet areators that are 2.0 gpm or greater will also be reduced to 1.5 gpm. Toilets will be replaced with 0.84 GPF models (savings based on going to 1.06 gpf).

The savings for these upgrades are based on the Pay As You Save (PAYS) for water bill repayment program's savings calculator, which references ACS 2012 3-Year Estimates Table DP04 vacancy rates, flushes and showers per day, and Aquacraft's California Single Family Water Use Efficiency Study (2011). Bathroom and kitchen faucet gallons per day were based on Aquacraft analysis of bathroom faucet use (letter report to Barnacle Water Saver, LLC, dated March 17, 2005) and Conservefloridawater.org (May 2008), and Aquacraft analysis of bathroom faucet use (letter report to Barnacle Water Saver, LLC, dated March 17, 2005). From this tool, the projected savings are 475 gallons/apartment total water saving, and a savings of 43 therms/apartment of hot water. For replacement of 2.5 gpm showerheads to 1.5 gpm showerheads, 74 gallons/apartment of total water savings, and 3 therms/apartment of hot water are saved. For bathroom aerator replacement, water savings include 165 gallons/apt; for kitchen aerator replacement, water savings include 5 therms/apt and 256 gallons/apt are saved for toilet replacement. Assuming 25% of the total water savings from these upgrades (55,998 gallons/yr) would be hot water savings, 14,000 gal/yr of hot water would be saved (4,692 therms/yr).

To address leaking pipes, a more intensive apartment survey will be conducted to identify the leak source and repair the issue. Initially, the project assumes 10% of apartments have leaks at 1 drip per second, with 25% of the leaks being hot water. Assuming apartments with leaks waste 3,254 gallons per year, and 9 apartments would be repaired, these repairs would result in 29,937 gallons/yr in overall water savings, of which 7,484 gallons/yr are assumed to be hot water resulting in a related 88 therms/yr in savings.

The property currently has 43 planters which are assumed to be 64 square feet each. Each planter contains non-drought tolerant plants, and the current irrigation system has no controls and consists of a standard spray irrigation system. The project involves replacing the plants with drought tolerant species and installing high efficiency drip irrigation. Calculations are based on average baseline irrigation consumption of 50 gallons per square foot of irrigation, and that drip irrigation saves 60% irrigation use on average when compared to standard irrigation (Schoonmaker, 2014).

Energy Savings

The property currently has four minimum efficiency small commercial tank type water heaters. They will be replaced with high efficiency condensing water heaters with a thermal efficiency of 90% or greater. Energy savings for this measure are based on the California Public Utilities Commission (CPUC) Database for Energy Efficiency Resources (2014).

The property also has four domestic hot water recirculation systems that are operating continuously, regardless of actual hot water demand. The recirculation systems will be upgraded to demand controlled systems that only operate when the water loop has fallen below acceptable water temperatures and when people are using hot water. For example, the recirculation loop will likely not be running to late evening hours. This will result in significantly reduced thermal losses from keeping the loop temperature hotter than needed, and will result in reduced hot water pump runtime. This upgrade will result in reduced therms to heat the water and reduced electricity to run the pump. The energy savings calculations are based on the California Public Utilities Commission Energy Division Guidance.

With these combined water heater efficiency improvements, the total energy savings are 205,311 kWh/year.

Estimated Useful Life of the Project

The estimated useful life of the project as a whole is 20 years. This is a combined estimate considering the specific useful life estimates listed below:

- Low-flow showerheads: 30 years
- Kitchen and bathroom faucet aerators: 15-20 years
- Ultra-low 0.84 gpf toilets: 20 years (Fannie Mae, 2014)
- Commercial planting and irrigation is estimated at 15 years, but in practice they function up to 25 years (and beyond). These estimates apply to drought tolerant plants and drip irrigation to be installed at this facility.
- High efficiency condensing central water upgrade: 15 years. (Per CPUC)
- Demand controls on central water heating recirculation systems: 15 years (Per CPUC)

Documentation of water and energy savings assumptions specific for this project.

Copies of referenced documents are included in Attachment 2 references.

American Water Works Association (AWWA). Drip Calculator for Dripping Faucets. Available: http://www.awwa.org/resources-tools/public-affairs/public-information/dripcalculator.aspx. Accessed December 2014.

Aquacraft, Inc. (2011). California Single Family Water Use Efficiency Study. April 2011.

City of Hayward (2014). Pay as You Save (PAYS) calculation tool.

California Public Utilities Commission (CPUC) DEER Database tool: http://www.deeresources.com/index.php

California Public Utilities Commission (CPUC) (2014). Demand Control Disposition: http://www.deeresources.com/index.php/non-deer-work-paper-values-13-14

Fannie Mae (2014). Instructions for Performing a Multifamily Property Condition Assessment (Version 2.0). Available at: https://www.fanniemae.com/content/guide_form/4099f.pdf.

U.S. Census Bureau. American Community Survey (ACS) 2010-2012 3-Year Estimates Table DP04. Available at: http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_12_3YR_DP04&prodType=table.

Schoonmaker, Kelly (2014). E-mail communication. November 19, 2014.

TLV (2014). Water Flow Rate through an Orifice. Available: http://www.tlv.com/global/TI/calculator/water-flow-rate-through-orifice.html. Accessed December 2014.

Project 2 – Eden Housing Multifamily Upgrades

Overview

This project involves installation of water and energy saving devices in 143 apartment units at the Eden Lodge senior housing complex in San Leandro, CA. The total estimated savings from this project are 1.1 MG of water per year, 7,580 therms per year, and 4,004 kWh per year of energy savings.

Project Assumptions Project 2 Eden Housing Multifamily Upgrades Total Project Cost: $224,834			
Step 1:	Baseline (pre-project) volume of water associated with the project	3.155	MG/year
Step 2:	Volume of water that will be delivered after the project is implemented.	2.01	MG/year
Step 3:	Volume of hot water saved from the project's electric water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 4:	Volume of hot water saved from the project's natural gas water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0.028	MG/year
Step 5:	Useful life in years for the project	20	years
Step 10:	Additional annual energy savings from energy efficiency and renewable energy (EE/RE), etc.	104,493	kWh/year

Justification

The baseline volume of water associated with the housing complex is 3,155,041 gallons/year. The baseline water use information represents actual water use data from EBMUD bi-monthly water bills from October 2012 October 2014. The billed dollar amount from EBMUD invoices was translated to $0.010 per gallon to quantify the gallons used.

Proposed water and energy saving measures to be installed and associated savings are shown in the table below. Therm savings below were converted to kWh using the conversion factor of 29.28 kWh/therm.

Measure	Site Gallons/ Yr Water Savings	Site Therms/ Yr Savings	Site kWh/ Yr Savings
65 Upgraded Low-flow Showerheads and 143 Faucet Aerators	67,203	4,011	0
143 Upgraded Toilets to 0.84 GPF	36,608	0	0
Building Plumbing Leak Repairs	46,532	137	0
Efficient Drip Irrigation System (50,000 sq. ft.) and Replacement of 2,100 sq. ft. of Lawn with Low Water-using Landscaping	952,500	0	0
Demand Controls on Central Water Heating Recirculation System	0	3,432	4,004
TOTAL	**1,102,843**	**7,580**	**4,004**

Water Savings

Property staff have documentation showing that all existing bathroom faucet aerators and all kitchen aerators are 2.2 gpm and 65 showerheads are 2.5 gpm (other showerheads in the complex are already upgraded). Existing toilets are 1.6 gpf. The project will be installing new bathroom and kitchen faucet aerators (less than or equal to 1.5 gpm) and new 1.5 gpm showerheads. Toilets will be replaced with 0.84 gpf models.

The savings for these upgrades are derived from calculations provided by the Pay As You Save (PAYS) on-water bill repayment program (reference listed below). Using this tool, the projected savings are:

Fixture Replacement	Total Water Savings (gal/apt)	Hot Water Savings (gal/apt)	Water Heating Energy Savings (therms/apt
Showerhead	475	119	43
Bathroom faucet aerator	74	19	3
Kitchen faucet aerator	165	41	5
Toilet	256	-	-

To address leaking pipes, a more intensive apartment survey will be conducted to identify and repair the leaks. For the purpose of this proposal, we have assumed 10% of apartments have leaks at 1 drip per second, with 25% of the leaks being hot water. Assuming apartments with leaks waste 3,254 gallons per year, and 14 apartments would be repaired, these repairs would result in 46,532 gal/year in water savings, of which 11,389 gal/yr are assumed to be hot water resulting in a related 137 therms/year in savings.

Additional hot water savings will be realized from upgrades to showerheads and faucet aerators, with 25% of the savings being hot water. Upgrades will result in a total of 67,203 gallons/yr of water savings and 16,801 gallons/yr of hot water savings (4,011 therms/yr).

Currently, 50,000 sq. ft. of conventional landscaping and 2,100 sq. ft. of sod is irrigated with a standard spray system with no controls. The project proposes to install high efficiency drip irrigation throughout the landscaping and replace the sod with low water-using plants. Calculations are based on an average baseline irrigation consumption of 30 gal/sq. ft. and the assumption that drip irrigation saves 60% irrigation use on average compared to standard irrigation and lawn to low-water landscape conversions typically save 25 gal/sq. ft.

Energy Savings

Demand Controls on Central Water Heating Recirculation System: Current recirculation pumps operate continually. They will be replaced with a demand controlled recirculation pump that will reduce natural gas and electricity use. The estimated energy savings from this upgrade is 104,493 kWh/year. Energy savings are based on the California Public Utilities Commission deemed savings.

Estimated Useful Life of the Project

The estimated useful life of the project as a whole is 20 years. This is a combined estimate considering the specific useful life estimates listed below:

- Low-flow showerheads: 30 years
- Kitchen and bathroom faucet aerators: 15–20 years
- Ultra-low 0.84 gpf toilets: 20 years
- Commercial planting and irrigation is estimated at 15 years, but in practice they function up to 25 years (and beyond). These estimates apply to drought-tolerant plants and drip irrigation to be installed at this facility.
- Demand controls on central water heating recirculation systems: 15 years

Documentation of water and energy savings assumptions specific for this project (Included in File 3 of Attachment 2)

City of Hayward Pay As You Save (PAYS) Calculator for estimating water and energy savings for multifamily units

CPUC DEER Database tool: http://www.deeresources.com/index.php

CPUC Demand Control Disposition: http://www.deeresources.com/index.php/non-deer-work-paper-values-13-14

Water Leaks: http://www.tlv.com/global/TI/calculator/water-flow-rate-through-orifice.html

Water Leaks: http://www.awwa.org/resources-tools/public-affairs/public-information/dripcalculator.aspx

Irrigation and lawn conversion savings: Provided by StopWaste's Bay-Friendly Landscaping program. Baseline irrigation use is highly variable due to differences in reference evapotranspiration (ET) and human factors in irrigation scheduling. A high but not unreasonable baseline estimate for irrigation water use is 50 gal/sq. ft. (to be conservative, reduced to 30 gal/sq. ft. for this proposal). Conventional spray irrigation efficiency ranges from 0.4 to 0.6. Drip irrigation efficiency ranges from 0.8 to 0.9.

Project 3 – Industrial Laundry Upgrades in Oakland and San Leandro

Overview

This project involves installation of five ozone laundry systems at four hospitality facilities in Oakland (Days Hotel, Holiday Inn Express Oakland Airport, Holiday Inn Oakland Airport, and Red Lion Hotel) and one commercial laundry facility in San Leandro (Bay Linen). This project would result in approximately 6 MGY of hot water savings and nearly 1.4 million kWh/year of energy savings. Note that the volume of hot water savings is higher than the volume of water saved because cold water would still be used throughout the ozone wash system.

Project Assumptions Project 3 Industrial Laundry Upgrades in Oakland and San Leandro Total Project Cost: $83,041			
Step 1:	Baseline (pre-project) volume of water associated with the project	8.22	MG/year
Step 2:	Volume of water that will be delivered after the project is implemented.	5.35	MG/year
Step 3:	Volume of hot water saved from the project's electric water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 4:	Volume of hot water saved from the project's natural gas water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0". **See explanation below.**	0	MG/year
Step 5:	Useful life in years for the project	5	years
Step 10:	Additional annual energy savings from energy efficiency and renewable energy (EE/RE), etc.	1,396,920	kWh/year

Justification

This project includes hot water and energy use efficiency upgrades at five hospitality facilities in Oakland and San Leandro. The discussion below provides detail on each site and the justification for the combined hot water and energy savings.

Water Savings

Total Ozone Solutions prepared an Ozone Savings Analysis for each site. These analyses evaluate data specific to the property's laundry operation and industry. Data collected include baseline water use, total processed linen, laundry formulas, hot water temperature, utility costs, etc. The analysis calculates projected hot water usage reduction and total water savings. Copies of each facility Ozone Savings Analysis are included with documentation for Attachment 2.

The volume of water delivered after the project is implemented is shown in the last row of the table below. It is important to note that the hot water use that is reduced by the ozone system is replaced with cold water. However, the ozone systems result in reduced hot water usage and energy savings (therms). The total water usage (new hot water and cold water combined usage) is reduced as a result of the shorter laundry cycles, but cold water is still used for the laundering process. There is a reduction in the amount of (cold) water used compared to existing conditions due to elimination for the need to rewash linens due to the highly effective cleaning and disinfecting capability of the ozone system.

Proposed Ozone Laundry Upgrade Sites	Existing Water Use (MG/year)	Estimated Hot Water Savings (MG/year)
Bay Linen	3.285	2.605188
Days Hotel	1.108688	0.773344
Holiday Inn Airport	1.108688	0.773344
Holiday Inn Express	0.881475	0.614295
Red Lion Hotel	1.836406	1.2775
Total gallons/year	8,220,257	6,043,671
Total MG/year	8.220257	6.043671
Volume delivered after Project (MG/year)		**5.353523**

For this unique technology, the annual volume of hot water savings is not considered in the water-energy Excel spreadsheet calculations (a "0" is entered for Step 3 and Step 4). Instead, the energy associated with the hot water savings is counted in Step 10. See the energy savings discussion below.

Energy Savings

Water used at each of the five sites is currently heated by natural gas, not electricity. The annual savings due to reduced reliance from natural gas heated water system was calculated by multiplying the annual water saved in gallons, multiplied by 8.3 pounds per gallon, divided by 0.8 which is the boiler efficiency, multiplied by the temperature rise, divided by 100,000.

The table below shows the energy savings are in therms per year, and the conversion to kWh/year for each facility.

	Energy Savings	
Proposed Ozone Laundry Upgrade Sites	**Therms/year**	**kWh/year***
Bay Linen	20,565	602,143
Days Hotel	6,105	178,754
Holiday Inn Airport	6,105	178,754
Holiday Inn Express	4,849	141,979
Red Lion Hotel	10,085	295,289
Total annual energy savings from energy efficiency (kWh/year)		**1,396,920**

*Converted therms to Btu (1 therm = 100,000 Btu), then converted Btu to KWh (multiplied the value in Btu by 0.0002928).

Estimated Useful Life of Project

Washing laundry with ozone is relatively new, as this technology was first introduced approximately 15 years ago. Over time, the equipment has become more effective. While this analysis uses a useful life of 5 years as a conservative estimate, with proper maintenance and attention, this equipment could operate for an estimated time of 10 to 20 years.

Attachment 2 Documentation of water and energy savings assumptions specific for this project.

Total Ozone Solutions, 2014. Ozone Savings Analyses for the following facilities:

- Red Lion Hotel, 150 Hegenberger Road, Oakland CA 94621
- Holiday Inn Express Oakland Airport, 66 Airport Access Road, Oakland, CA 94603
- Holiday Inn, 77 Hegenberger Road, Oakland, CA 94621
- Days Hotel, 8350 Edes Avenue, Oakland, CA 94621
- Bay Linen, 2993 Teagarden Street, San Leandro, CA 94577

As noted on the Ozone Savings Analyses, data used by Total Ozone Solutions was obtained from:

- Information provided by the property specific to their laundry operation. When not provided, then the information utilized is based on average data for similar operations.
- Knowledge of traditional cycles/formulas used by national chemical companies in comparison to ozone laundry formulas.
- Utility costs per the properties' records or, if records were not available, the local averages.

Project 4 – Oakland USD School Upgrades

Overview

This project consists of water and energy efficiency upgrades at McClymonds High School and Castlemont High School in Oakland. Proposed improvements at both schools consist of upgrading the swimming pool pumps, installing power winders for the pool covers, and installing a cogeneration system for water heating. Also, at McClymonds High School kitchen faucet aerators will be installed and leaks repaired. At Castlemont High School, the industrial kitchen refrigerator will be upgraded and controls for kitchen water heater booster pumps will be installed.

This project will result in 504,580 gallons/year of water savings, most of which would be hot water savings (therms/year) and 637,707 kWh/year of energy savings.

Project Assumptions Project 4 Oakland USD School Upgrades Total Project Cost: $509,573			
Step 1:	Baseline (pre-project) volume of water associated with the project	13.6	MG/year
Step 2:	Volume of water that will be delivered after the project is implemented.	13.095	MG/year
Step 3:	Volume of hot water saved from the project's electric water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 4:	Volume of hot water saved from the project's natural gas water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0.5	MG/year
Step 5:	Useful life in years for the project	10	years
Step 10:	Additional annual energy savings from energy efficiency and renewable energy (EE/RE), etc.	637,707	kWh/year

Justification

The baseline water use volume is estimated from 2011 East Bay Municipal Utility District (EBMUD) water bills and does not include water use for irrigation or fire water meters.

Water Savings

Install power winders for use with pool covers – Oakland USD will be installing free pool covers in December 2014, courtesy of a PG&E third-party program. However, even though pool covers have the potential to save energy and water from reduced heat loss and water evaporation, they are often underutilized. In fact, on the day of a site inspection, the pool was uncovered despite a week-long school vacation. Installation of a power winder at each of the two school's pools will make it easier for the grounds and custodial staff to use the pool cover, reduce the number of staff needed to use the pool cover, and ensure savings are actually realized.

a. It is estimated that the pool covers with power winders will save 501,580 gal/yr at the two pools. This water savings is counted as hot water savings, because the water is heated prior to entering the pool.

b. This measure is estimated to save 6,526 therms/yr. However, this energy savings is incorporated into the hot water savings as part of Step 4.

c. The estimated useful life of the power winder is 6 years.

Kitchen Sink Upgrades – This project will add two aerators to the kitchen hand washing stations, reducing the water flow rate from 8 gallons/minute to 0.5 gallons/minute, and fix a leaking faucet (at McClymonds only).

a. Estimated water savings is 2,000 gal/yr with a cost to install the aerators (in-house) of $54.

b. Estimated water savings is 1,000 gal/yr with a cost to fix leaking faucet (in-house) of $225.

d. The estimated useful life of these upgrades is five years.

Energy Savings

Install cogeneration at McClymonds and Castlemont High Schools – Cogeneration allows one energy unit (therm) to produce heat for the pools and showers and energy for the school site. While we have not completed an engineering calculation for the demand requirements of these high school sites and the amount of heat needed for pools/showers/bathrooms, a 60 kW microturbine is commonly used for this purpose and the following savings are estimated based upon a similar installation at a pool for City of Albany/Albany School District. The demand requirements will be refined further if grant funding is awarded.

a. Estimated energy savings and increase in energy use:

   - 637,707 kWh/yr savings (reduced by 46,188 therms/yr used in lieu of the kWh savings)

b. Cogeneration equipment is estimated to function for 15 years.

Install variable frequency drive (VFD) for the pool pumps – The McClymonds and Castlemont High School pools have pumps that work at a 100% level around the clock (24 hours/day). The purpose of the VFD pump is to reduce the pumping speed when the pool is not being used or is less utilized. This measure will save:

a. 91,368 kWh/yr at the two pools

b. The estimated useful life of the VFD pump is 10 years.

Industrial Kitchen Refrigerator Upgrades – Install commutated (digital) motor in walk-in cooler in kitchen; replace gaskets, and add auto door closer (at Castlemont only)

a. These measures will save energy by replacing the motor with a more efficient model, reducing cold air leakage, and ensuring that the door closes automatically after each use.

b. Energy savings are estimated to be 2,842 kWh/year and a cost savings of $374/yr.

c. The estimated useful life of the refrigerator upgrades is 8 years.

Kitchen Water Heater Booster Pump Upgrade – Install scheduling controls for kitchen water heater booster pumps that reduce water heating and recirculation when there is not demand or usage (at Castlemont only)

a. Energy savings are estimated to be 18,221 kWh/year and cost savings are estimated to be $22,972.

d. The estimated useful life of the scheduling control equipment is 10 years.

Attachment 2 Documentation of water and energy savings assumptions specific for this project.

The savings estimates were developed by an engineer at Beacon Consulting's *Leadership In Energy Efficiency Program for Schools* who has been working for the past four years under the Alameda County Office of Education with projects throughout Alameda County on their Proposition 39 applications and other water-energy audits and installations.

The savings estimates are from an ASHRAE Level II commercial building energy audit for Castlemont High School conducted by kW Engineering in 2012. A copy is included in the documentation for Attachment 2. The estimates from Castlemont High School were applied to the estimates for McClymonds High School.

Project 5 – San Leandro USD School Upgrades

Overview

This project consists of water and energy efficiency improvements at four schools in the San Leandro Unified School District: Wilson, Monroe and Garfield Elementary Schools and J. Muir Middle School. Energy saving devices would also be installed at two pools at San Leandro High School. The total estimated water savings from this project are 1.7 MG of water per year. The total estimated energy savings are 395,280 kWh per year.

Project Assumptions Project 5 San Leandro School Upgrades Total Project Cost: $948,331			
Step 1:	Baseline (pre-project) volume of water associated with the project	7.28	MG/year
Step 2:	Volume of water that will be delivered after the project is implemented.	5.60	MG/year
Step 3:	Volume of hot water saved from the project's electric water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 4:	Volume of hot water saved from the project's natural gas water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 5:	Useful life in years for the project	20	years
Step 10:	Additional annual energy savings from energy efficiency and renewable energy (EE/RE), etc.	395,280	kWh/year

Justification

The baseline volume of water associated with the schools is 7,285,000 gallons/year. The baseline water use information represents actual water use data from EBMUD bi-monthly water bills from January 2013 through December 2013. The EBMUD usage information was provided by the San Leandro Unified School District for the five school campuses.

Proposed water and energy saving measures to be installed and associated savings are shown in the table below.

Measure	Site Gallons/ Yr Water Savings	Site Therms/ Yr Savings	Site kWh/ Yr Savings
Turf Conversion to Low Water, Climate-Adapted Landscaping with Efficient Irrigation System	396,600	0	0
Time-Clock Irrigation Controllers Replaced with Weather-Based “Smart” Controllers	1,143,400	0	0
Upgrade Toilets to 1.28 gpf from 1.5 and 1.6 gpf	73,600	0	0
Upgrade Sinks to 1 gpm metered at 10 sec from non-metered fixtures (2gpm, 2.2gpm, 1.5gpm)	15,500	0	0
Upgrade Urinals to 0.125 gpf (or better) from 1.25 and 1.5 gpf existing fixtures	52,400	0	0
Install solar water heating systems at two pools		13,500	395,280
TOTAL	**1,681,500**	**13,500**	**395,280**

Greenhouse Gas Reductions

The lawn to water-saving landscape conversions at the four elementary and middle schools will be carried out using the near-zero waste technique of sheet mulching. Lawn conversions using sheet mulch are estimated to reduce GHG emissions by 53.4 MTCO2e per acre, according to the Bay-Friendly Landscaping program. Much of this benefit derives from the application of compost to the soil; studies show that the biological activity in compost stimulates additional carbon sequestration in the soil well beyond the amount of carbon originally in the compost.[1] San Leandro USD is proposing to convert approximately 61,000 sq. ft. (1.4 acres) of lawn to low water landscaping, yielding GHG savings of 75 MTCO2e over 30 years.

Water Savings

The existing fixture count is based on information provided from building staff and from a survey of a representative campus. Existing bathroom aerators range from unmetered 2.2 gpm to metered 1 gpm (10 sec), the toilets range from 1.28 to 1.6 gpf, and the urinals range from 1.25 to 1.28 gpf. Roughly 70% of the fixtures have been recently upgraded to more efficient units. This project will address the remaining inefficient units.

The project savings are based on replacing the inefficient units at the four elementary and middle schools with units with similar efficiency to the recent upgrades.

The upgrades include: 27 Toilets @ 1.28 gpf

27 Sinks @ 1 gpm with 10 second metering

13 Urinals @ 0.125 gpf

The water savings are based on the student counts with use patterns based on values provided by the LEED *Reference Guide for Green Interior Design and Construction*, 2009 Edition.

Front lawns at these four schools will be converted to low water-using landscaping with efficient irrigation systems. Additionally, weather-based "smart" irrigation controllers will be installed for play fields currently controlled with standard timers. The current usage for each school was determined from billing data and end use.

The landscaping water savings were developed from the percentage reductions projected in *Weather and Soil Moisture Based Landscape Irrigation Scheduling Devices*, U.S. Department of Interior, July 2012.

Energy Savings

Solar water heating systems will be installed at San Leandro High School's instructional pool and competition pool. These systems would involve installation of a large solar awning on the northern side of the competition pool and installation of collectors on the rooftops for heating the instructional pool. Given the dimensions of the two pools, the estimated energy savings are 10,000 therms for the competition pool and 3,500 therms for the instructional pool for a total of 395,280 kWh.

These estimates were generated by Sun Light and Power, the contractor that will be responsible for installing these solar water heating systems.

Estimated Useful Life of the Project

The estimated useful life of the project as a whole is 20 years. This is a combined estimate considering the specific useful life estimates listed below:

- Kitchen and bathroom faucet aerators: 15 to 20 years
- Low flow toilets: 10 years

[1] California Air Resources Board and California Environmental Protection Agency. Method for Estimating Greenhouse Gas Emission Reductions from Compost from Commercial Organic Waste. November 14, 2011. Available: http://www.arb.ca.gov/cc/protocols/localgov/pubs/compost_method.pdf. Accessed December 5, 2014.

- Commercial planting and irrigation is estimated at 15 years, but in practice they function up to 25 years (and beyond). These estimates apply to drought tolerant plants and drip irrigation to be installed at this facility.
- The useful life of the solar water heating system for the pools is 15 to 20 years.

Attachment 2 Documentation of water and energy savings and assumptions specific to this project:

EBMUD. (2014). 2013-2014 water utility bills and water budget calculations for the following schools are below:

- Garfield Elementary School
- J. Muir Middle School
- Monroe Elementary School
- Wilson Elementary School

See File 3 of Attachment 2 for a copy of:

Sun Light and Power (2014). Solar Pool Heating at San Leandro High School scope letter. December 10.

Garfield ES							
Date	From	To	Days	Use	Units	Gal/day	Cost
2013 - 02	1/12/2013	3/14/2013	61	72,556	GAL	1189	$431
2013 - 04	3/14/2013	5/14/2013	61	69,564	GAL	1140	$418
2013 - 06	5/14/2013	7/12/2013	59	59,092	GAL	1002	$435
2013 - 08	7/12/2013	9/10/2013	60	112,200	GAL	1870	$665
2013 - 10	9/10/2013	11/11/2013	62	74,800	GAL	1206	$484
2013 - 12	11/11/2013	1/11/2014	61	47,872	GAL	785	$353
2014 - 02	1/11/2014	3/14/2014	62	53,108	GAL	857	$913
2014 - 04	3/14/2014	5/12/2014	59	51,612	GAL	875	$372
2014 - 06	5/12/2014	7/15/2014	64	70,312	GAL	1099	$531
2014 - 08	7/15/2014	9/11/2014	58	47,124	GAL	812	$383

J. Muir MS							
Date	From	To	Days	Use	Units	Gal/day	Cost
2013 - 01	1/2/2013	1/31/2013	29	81,532	GAL	2811	$457
2013 - 02	1/31/2013	3/5/2013	33	94,248	GAL	2856	$513
2013 - 03	3/5/2013	4/4/2013	30	122,672	GAL	4089	$639
2013 - 04	4/4/2013	5/3/2013	29	145,860	GAL	5030	$741
2013 - 05	5/3/2013	6/3/2013	31	253,572	GAL	8180	$1,216
2013 - 06	6/3/2013	7/2/2013	29	177,276	GAL	6113	$941
2013 - 07	7/2/2013	8/1/2013	30	161,568	GAL	5386	$889
2013 - 08	8/1/2013	8/30/2013	29	168,300	GAL	5803	$922
2013 - 09	8/30/2013	10/1/2013	32	234,124	GAL	7316	$1,240
2013 - 10	10/1/2013	10/30/2013	29	217,668	GAL	7506	$1,161
2013 - 11	10/30/2013	12/2/2013	33	119,400	GAL	3618	$668
2013 - 12	12/2/2013	1/2/2014	31	61,000	GAL	1968	$379
2014 - 01	1/2/2014	1/31/2014	29	95,744	GAL	3302	$570
2014 - 02	1/31/2014	3/4/2014	32	260,304	GAL	8135	$1,367
2014 - 03	3/4/2014	4/3/2014	30	130,152	GAL	4338	$737
2014 - 04	4/3/2014	5/1/2014	28	111,452	GAL	3980	$646
2014 - 05	5/1/2014	6/2/2014	32	188,496	GAL	5891	$1,019
2014 - 06	6/2/2014	7/1/2014	29	173,536	GAL	5984	$1,009
2014 - 07	7/1/2014	7/31/2014	30	188,496	GAL	6283	$1,115
2014 - 08	7/31/2014	8/29/2014	29	167,552	GAL	5778	$1,004
2014 - 09	8/29/2014	9/30/2014	32	209,440	GAL	6545	$1,226

Monroe ES							
Date	From	To	Days	Use	Units	Gal/day	Cost
2013 - 02	1/14/2013	3/15/2013	60	283,492	GAL	4725	$1,446
2013 - 04	3/15/2013	5/15/2013	61	434,588	GAL	7124	$2,112
2013 - 06	5/15/2013	7/15/2013	61	1,052,436	GAL	17253	$5,009
2013 - 08	7/15/2013	9/12/2013	59	898,348	GAL	15226	$4,562
2013 - 10	9/12/2013	11/9/2013	58	655,996	GAL	11310	$3,389
2013 - 12	11/9/2013	1/14/2014	66	268,532	GAL	4069	$1,514
2014 - 02	1/14/2014	3/15/2014	60	150,348	GAL	2506	$942
2014 - 04	3/15/2014	5/13/2014	59	333,608	GAL	5654	$1,829
2014 - 06	5/13/2014	7/16/2014	64	1,078,616	GAL	16853	$5,621
2014 - 08	7/16/2014	9/12/2014	58	741,268	GAL	12780	$4,159

Wilson ES							
Date	From	To	Days	Use	Units	Gal/day	Cost
2013 - 02	1/6/2013	3/7/2013	60	68,068	GAL	1134	$411
2013 - 04	3/7/2013	5/8/2013	62	164,560	GAL	2654	$837
2013 - 06	5/8/2013	7/8/2013	61	345,576	GAL	5665	$1,712
2013 - 08	7/8/2013	9/4/2013	58	375,496	GAL	6474	$1,939
2013 - 10	9/4/2013	11/2/2013	59	317,900	GAL	5388	$1,660
2013 - 12	11/2/2013	1/7/2014	66	146,608	GAL	2221	$831
2014 - 02	1/7/2014	3/8/2014	60	212,432	GAL	3541	$1,150
2014 - 04	3/8/2014	5/6/2014	59	171,292	GAL	2903	$951
2014 - 06	5/6/2014	7/9/2014	64	305,184	GAL	4769	$1,679
2014 - 08	7/9/2014	9/3/2014	56	195,976	GAL	3500	$1,171

The water budget developed for each school used the information available from staff and the site audit to allocate the water consumption identified by the EBMUD utility bills to the fixture and landscape area end uses. The savings estimates are based on the projected percentage savings for each application and end use.

Water Use Summary 2013					
School	Students	Irrigated Area (sqft)	Water Use 2013 (gals)	Non Irrigation Use (gals/yr)	Irrigation Use (gal/year)
Wilson ES	785	138,283	1,418,208	287,310	1,130,898
J. Muir MS	965	266,520	1,837,220	352,225	1,484,995
Monroe ES	358	121,170	3,593,392	130,670	3,462,722
Garfield ES	422	89,520	436,084	153,608	282,476
Total	2530	615,493	7,284,904	923,813	6,361,091

Water Use and Projected Savings Summary					
School	Students	Irrigated Area (sqft)	Existing Water Use - 2013 (gals)	Proposed Water Use (gals/yr)	Water Savings (gals/yr)
Wilson ES	785	138,283	1,418,208	1,232,300	185,900
J. Muir MS	965	266,520	1,837,220	1,654,600	182,600
Monroe ES	358	121,170	3,593,392	2,393,500	1,199,900
Garfield ES	422	89,520	436,084	316,300	119,800
Total	2530	615,493	7,284,904	5,596,700	1,688,200

Landscape Water Use Summary 2013					
School	Students	Irrigated Area (sqft)	Existing Irrigation Use (gals/yr)	Proposed Irrigation Use (gals/yr)	Water Savings (gals/yr)
Wilson ES	785	138,283	1,130,898	991,000	139,900
J. Muir MS	965	266,520	1,484,995	1,358,900	126,100
Monroe ES	358	121,170	3,462,722	2,283,800	1,178,900
Garfield ES	422	89,520	282,476	187,400	95,100
Total	2530	615,493	6,361,091	4,821,100	1,540,000

Toilets, Sinks and Urinal Use Summary 2013					
School	Students	Fixtures	Existing Fixture Water Use (gals/yr)	Proposed Fixture Use (gals/yr)	Water Savings (gals/yr)
Wilson ES	785	93	210,272	164,300	46,000
J. Muir MS	965	112	258,487	202,000	56,500
Monroe ES	358	88	95,895	74,900	21,000
Garfield ES	422	41	113,038	88,300	24,700
Total	2530	334	677,692	529,500	148,200

Conversion of bathroom fixtures to more efficient units. These values are based on information provided by school staff and data collected from on-site sampling of fixtures to determine flow rates.

Existing Fixture Count	Total Count	Toilet 1.28 gpf	Toilet 1.5 gpf	Toilet 1.6 gpf	Sink 2.2 gpm/8 sec	Sink 1 gpm/10 sec	Sink .5 gpm	Sink 2 gpm	Sink 2.2 gpm	Sink 1.5 gpm	Urinal 1.28 gpf	Urinal 1.5 gpf	Urinal 0.125 gpf
Wilson ES	93	33	4	4	28	1	2	6	1	1	2	1	10
J. Muir MS	112	33	4	4	34	1	3	7	1	1	4	2	18
Monroe ES	88	31	4	4	26	1	2	5	1	1	2	1	10
Garfield ES	41	16	2	2	10	0	1	2	0	0	1	1	5
Total	334	114	14	14	98	4	8	20	4	4	9	4	43

Proposed Fixture Count	Total Count	Toilet 1.28 gpf	Toilet 1.5 gpf	Toilet 1.6 gpf	Sink 2.2 gpm/8 sec	Sink 1 gpm/10 sec	Sink .5 gpm	Sink 2 gpm	Sink 2.2 gpm	Sink 1.5 gpm	Urinal 1.28 gpf	Urinal 1.5 gpf	Urinal 0.125 gpf
Wilson ES	93	41	0	0	28	9	2	0	0	0	0	0	13
J. Muir MS	112	41	0	0	34	11	3	0	0	0	0	0	23
Monroe ES	88	39	0	0	26	8	2	0	0	0	0	0	13
Garfield ES	41	20	0	0	10	3	1	0	0	0	0	0	7
Total	334	141	0	0	98	31	8	0	0	0	0	0	56
Change		27	-14	-14	0	27	0	-20	-4	-4	-9	-4	13

Existing Fixture Usage (gals/day)	Total Use (g/d)	Toilet 1.28 gpf	Toilet 1.5 gpf	Toilet 1.6 gpf	Sink 2.2 gpm/8 sec	Sink 1 gpm/10 sec	Sink .5 gpm	Sink 2 gpm	Sink 2.2 gpm	Sink 1.5 gpm	Urinal 1.28 gpf	Urinal 1.5 gpf	Urinal 0.125 gpf
Wilson ES	576	243	34	36	154	3	3	28	6	4	31	18	15
J. Muir MS	708	299	42	45	190	3	3	34	8	5	38	22	19
Monroe ES	263	111	16	17	70	1	1	13	3	2	14	8	7
Garfield ES	310	131	18	20	83	2	2	15	3	2	17	10	8
Total	1857	783	110	118	497	9	9	90	20	14	100	58	49

Proposed Fixture Usage (gals/day)	Total Use (g/d)	Toilet 1.28 gpf	Toilet 1.5 gpf	Toilet 1.6 gpf	Sink 2.2 gpm/8 sec	Sink 1 gpm/10 sec	Sink .5 gpm	Sink 2 gpm	Sink 2.2 gpm	Sink 1.5 gpm	Urinal 1.28 gpf	Urinal 1.5 gpf	Urinal 0.125 gpf
Wilson ES	450	251	0	0	154	22	3	0	0	0	0	0	20
J. Muir MS	553	309	0	0	190	28	3	0	0	0	0	0	24
Monroe ES	205	115	0	0	70	10	1	0	0	0	0	0	9
Garfield ES	242	135	0	0	83	12	2	0	0	0	0	0	11
Total	1451	810	0	0	497	72	9	0	0	0	0	0	63

The landscape water use by area is provided below with the proposed strategy to reduce consumption. The areas are identified by school on the following maps.

J. Muir MS Existing Irrigation Strategy and Use						J. Muir MS Proposed Irrigation Strategy and Use					
J. Muir MS	Area 1	Area 3	Area 4	Area 7	Total Estimated Existing Use (gal/day)	Area 1	Area 3	Area 4	Area 7	Total Estimated Existing Use (gal/day)	Total Estimated Savings (gal/yr)
	Front	BB Field	FB Field	Between Bldgs		Front	BB Field	FB Field	Between Bldgs		
Existing Irrigation Strategy	Turf TimeClock - Spray	Play Field Weather Based-Stream	Play Field Weather Based-Stream	Ornamental Hose Soaker		Ornamental Drip	Play Field Weather Based-Stream	Play Field Weather Based-Stream	Ornamental Drip		
2013 - 01	206	840	788	13	1,850	54	840	788	8	1,690	4,640
2013 - 02	211	860	807	13	1,890	56	860	807	8	1,730	5,280
2013 - 03	348	1,421	1,333	22	3,120	92	1421	1333	13	2,860	7,800
2013 - 04	453	1,849	1,734	29	4,060	120	1849	1734	17	3,720	9,860
2013 - 05	803	3,283	3,077	51	7,210	212	3283	3077	30	6,600	18,910
2013 - 06	573	2,342	2,196	37	5,150	151	2342	2196	21	4,710	12,760
2013 - 07	492	2,011	1,886	31	4,420	130	2011	1886	18	4,050	11,100
2013 - 08	539	2,201	2,064	34	4,840	142	2201	2064	20	4,430	11,890
2013 - 09	707	2,890	2,709	45	6,350	187	2890	2709	26	5,810	17,280
2013 - 10	728	2,976	2,790	47	6,540	192	2976	2790	27	5,990	15,950
2013 - 11	295	1,207	1,132	19	2,650	78	1207	1132	11	2,430	7,260
2013 - 12	112	456	428	7	1,000	30	456	428	4	920	2,480
Annual	165,327	675,658	633,429	10,580	1,484,490	43,699	675,658	633,429	6,123	1,359,280	125,210

Garfield ES Existing Irrigation Strategy and Use					Garfield ES Proposed Irrigation Strategy and Use				
Garfield ES	Area 1	Area 2	Area 3	Total Estimated Existing Use (gal/day)	Area 1	Area 2	Area 3	Total Estimated Existing Use (gal/day)	Total Estimated Savings (gal/yr)
	Front	playground	Small Field		Front	playground	Small Field		
Irrigation Strategy	Turf TimeClock - Spray	Turf TimeClock - Spray	Turf TimeClock - Spray		Ornamental Drip	Turf Weather Based-Stream	Turf Weather Based-Stream		
2013 - 02	37	592	139	770	10	404	95	510	15,860
2013 - 04	35	554	130	720	9	378	89	480	14,640
2013 - 06	28	447	105	580	7	305	72	380	11,800
2013 - 08	70	1,116	262	1,450	18	763	179	960	29,400
2013 - 10	38	605	142	780	10	413	97	520	16,120
2013 - 12	18	280	66	360	5	191	45	240	7,320
Annual	13,632	217,726	51,118	282,430	3,603	148,822	34,941	187,290	95,140

Monroe ES Existing Irrigation Strategy and Use					Monroe ES Proposed Irrigation Strategy and Use				
Monroe ES	Area 1	Area 2	Area 3	Total Estimated Existing Use (gal/day)	Area 1	Area 2	Area 3	Total Estimated Existing Use (gal/day)	Total Estimated Savings (gal/yr)
	Front	Park	Field		Front	Park	Field		
Irrigation Strategy	Turf TimeClock - Spray	Turf TimeClock - Spray	Turf TimeClock - Spray		Ornamental Drip	Turf Weather Based-Stream	Turf Weather Based-Stream		
2013 - 02	250	1,730	2,387	4,370	66	1182	1632	2,880	89,400
2013 - 04	387	2,680	3,699	6,770	102	1832	2528	4,460	140,910
2013 - 06	966	6,693	9,236	16,900	255	4575	6313	11,140	351,360
2013 - 08	850	5,890	8,128	14,870	225	4026	5556	9,810	298,540
2013 - 10	626	4,339	5,987	10,950	166	2966	4092	7,220	216,340
2013 - 12	212	1,470	2,029	3,710	56	1005	1387	2,450	83,160
Total	198,041	1,371,715	1,892,966	3,463,360	52,345	937,604	1,293,893	2,283,650	1,179,710

Wilson ES Existing Irrigation Strategy and Use				Wilson ES Proposed Irrigation Strategy and Use				
Wilson ES	Area 1	Area 2	Total Estimated Existing Use (gal/day)	Wilson ES	Area 1	Area 2	Total Estimated Proposed Use (gal/day)	Total Estimated Savings (gal/yr)
	Front	Field			Front	Field		
Irrigation Strategy	Turf TimeClock - Spray	Play Field Weather Based-Stream		Irrigation Strategy	Ornamental Drip	Play Field Weather Based-Stream		
2013 - 02	59	291	350	0	16	291	306	2,630
2013 - 04	314	1,555	1,870	0	83	1555	1,638	14,380
2013 - 06	820	4,060	4,880	0	217	4060	4,277	36,800
2013 - 08	956	4,733	5,690	0	253	4733	4,986	40,860
2013 - 10	774	3,829	4,600	0	205	3829	4,034	33,400
2013 - 12	241	1,195	1,440	0	64	1195	1,259	11,970
Total	3,165	15,662	18,830	Total	837	15,662	16,499	140,040

James Monroe Elementary School

Landscape Areas

1) Front Area 1: 11,550 sq. ft.; 60% irrigated; Time clock controlled
2) Rear Area 2: 60,000 sq. ft.; 80% irrigated; Time clock controlled
3) Rear Area 3: = 82,800 sq. ft.; 80% irrigated; Time clock controlled

Garfield Elementary School

Landscape Areas

1) Front 1: 10,800 sq. ft.; 40% irrigated; Time clock controlled

2) Rear Area 2: 69,000 sq. ft.; 100% irrigated; Time clock controlled

3) Rear Area 3: 16,200 sq. ft.; 100% irrigated; Time clock controlled

Woodrow Wilson Elementary School

Landscape Areas

1) Front Area 1: 30,725 sq. ft.; 70% irrigated; Time clock controlled
2) Rear Areas 2 and 3: 155,700 sq. ft.; 75% irrigated; Time clock controlled

John Muir Middle School

Landscape Areas

1) Front Area 1: 33,900 sq. ft.; 80% irrigated, Time clock controlled
2) Front Area 2: Excluded per staff supplied data
3) Rear Area 3: 152,000 sq. ft.; 80% irrigated, Weather based controlled
4) Rear Area 4: 120,000 sq. ft.; 95% irrigated, Weather based controlled
5) Rear Area 5: Excluded per staff supplied data
6) Rear Area 6: Excluded per staff supplied data
7) Middle Area 7: 19,000 sq. ft.; 20% irrigated; Ornamental Hose Soaker

Project 6 – San Leandro Park Upgrades

Overview

This project involves converting nearly 2 acres of high water-using lawns irrigated with sprinklers to low water-using landscaping irrigated with efficient drip irrigation. The lawn conversions will use the near-zero waste technique of sheet mulching to mulch the existing lawns in place rather than using herbicides to kill the turf or disposing of the turf in a landfill. The lawn conversions will comply with the Bay-Friendly Basics checklist, a high performance landscape standard developed by StopWaste. This project also includes replacement of two old groundwater well pumps used for park irrigation with energy efficient pumps. This project does not include hot water savings.

Project Assumptions Project 6 San Leandro Park Upgrades Total Project Cost: $426,000			
Step 1:	Baseline (pre-project) volume of water associated with the project	2.725	MG/year
Step 2:	Volume of water that will be delivered after the project is implemented.	0.475	MG/year
Step 3:	Volume of hot water saved from the project's electric water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 4:	Volume of hot water saved from the project's natural gas water heating system (the summation of step 3 and step 4 must not exceed annual volume of water savings). If not applicable, enter "0".	0	MG/year
Step 5:	Useful life in years for the project	20	years
Step 10:	Additional annual energy savings from energy efficiency and renewable energy (EE/RE), etc.	15,181	kWh/year

Justification

This project includes landscaping water and energy efficiency upgrades at four public parks in San Leandro. The discussion below provides detail on each park, and the justification for the combined water and energy savings estimates that are used in the project assumption calculations.

Greenhouse Gas Reductions

The lawn to water-saving landscape conversions at Marina Park and Williams Street Island Park will adhere to the requirements of the Bay-Friendly Basics, a high performance landscape standard developed by StopWaste. Landscapes renovated to meet the Bay-Friendly Basics standard reduce greenhouse gas emissions by 53.5 tons MTCO2e/acre. The majority of these savings derive from the application of 1 inch of compost to the soil, which reduces greenhouse gases by 52 MTCO2e per acre. Studies show that the biological activity in compost stimulates additional carbon sequestration in the soil well beyond the amount of carbon originally in the compost.[1]

San Leandro Parks Department is proposing to convert 92,000 sq. ft. (2.1 acres) of lawn to low water landscaping, yielding GHG savings of 112.4 MTCO2e.

[1] California Air Resources Board and California Environmental Protection Agency. Method for Estimating Greenhouse Gas Emission Reductions from Compost from Commercial Organic Waste. November 14, 2011. Available: http://www.arb.ca.gov/cc/protocols/localgov/pubs/compost_method.pdf. Accessed December 5, 2014.

Water Savings

The baseline volume of water associated with two landscaping upgrade projects is shown in the table below. The baseline water use information represents actual water use data from bi-monthly water bills from January 2013 through October 2014.

Volume of water delivered after the two landscaping upgrade projects are implemented is shown in the estimated water savings column in the table below.

Park	Proposed Upgrades	Existing Water Use (MGY)	Estimated Water Savings (MGY)
Marina Park	Convert 80,000 sq. ft. of turf to low water-using landscaping	2.4	2
Williams Street Island Park	Convert 12,000 sq. ft. of turf to low water-using landscaping. Install weather-based irrigation controller.	.325	.25
	Total MG/year	2.725	2.25
	Volume delivered after Project (MG/year)		**0.475**

Water savings were calculated by taking the actual water budget provided by EBMUD which averages 30-35 gallons per square foot which will be reduced to 10 gallons per square foot per month.

Installation of a Rain Master Smart Irrigation Controller is estimated to save 50,000 gallons/year. This is based on manufacturer estimates.

Energy Savings

An existing 10 horsepower (HP) groundwater well pump at Halcyon Park and Thrasher Park have been in service for over 25 years. The two pumps will be replaced with an energy efficient variable frequency drive (VFD) pump. The new pump at Halcyon Park is expected to save 3,164 kWh per year. The new pump at Thrasher Park is expected to save 12,017 kWh per year.

Thrasher Park:

- Total Annual energy usage is $4,461.31 and 2,4033 kWh with an average cost per kWh of $0.19/kWh (project uses time of use rates which fluctuate).
- Assumed savings from new variable speed pump and ability to reduce pump run times is 60% of original usage; 50% reduction was used in order to be conservative.
- Total Usage times 50% = 12,017 kWh savings per year
- Total utility bill cost savings per year = $2,231
- Cost of Measure = $20,000 (payback = 8.9 years)

Halcyon Park:

- Total annual energy usage (from utility bills) is $1485.67 and 6328 kWh with an average cost per kWh of $.28 (project uses time of use rates which fluctuate).
- Assumed savings from new variable speed pump and ability to reduce pump run times is 60% of original usage; 50% reduction was used in order to be conservative.
- Total usage times 50% = 3,164 kWh savings per year
- Total utility bill cost savings per year = $884.41
- Cost of Measure = $20,000 (Payback = 22 years)

Estimated Useful Life of Project

The estimated useful life of the park landscaping upgrades is 20 years. This is the length of time the water savings is anticipated to be realized.

The two new energy efficient pumps are expected to last 30 years because they only run a few days each week.

Documentation of water and energy savings assumptions specific for this project.

City of San Leandro water bill summary Excel spreadsheet

City of San Leandro energy bill summary excel spreadsheet

City of San Leandro Park upgrade summary document